Volume I

Power Infrastructure – Part A

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Power Infrastructure Report, Part A
Volume I

Prepared for:
The City of Los Angeles

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Objectives & Approach

This report presents Navigant's findings on Power Infrastructure, Part A for the IEA Survey. Power Infrastructure is particularly important as LADWP enters a major transition period to simultaneously reduce greenhouse gas emissions and realize a cleaner energy future, repower in-basin units to eliminate once-through cooling, and deliver reliable electricity while supplying power to its customers at competitive prices. For the IEA Survey, Power Infrastructure encompasses:

- Power Generation Infrastructure (Part A)
- Power Transmission and Distribution (T&D) Infrastructure (Part B)

Power Generation Infrastructure: Part A (this report) focuses on LADWP's 2014 Integrated Resource Plan. The current and future mix of power generation resources is critical for meeting and balancing the Department's key objectives related to the reliable supply of electricity, affordable rates, and environmental stewardship. LADWP will face significant new challenges as renewable generation capacity is increased to a major portion of the resource portfolio and new demand-side resources are developed. In this report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio.

Power Transmission and Distribution (T&D) Infrastructure: Part B is featured as a separate report. LADWP is contending with aging infrastructure, sub-optimal contracting processes, and budget pressures. Additionally, it must integrate increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges will put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function. To ensure that the Department has a sound plan to maintain, repair and replace its T&D assets, Navigant assessed the Department's approach to asset management against best practice in the power utility industry, identified gaps, and provided recommendations to address existing gaps, using primarily the 2013 Power System Reliability Program (PSRP) and the 2014 Long-Term Transmission Assessment.

Insights from interviews and supporting document review complemented these analyses. To a certain extent, this report also addresses linkages (or lack thereof) between the two Power Infrastructure areas, since best practice aligns resource planning with infrastructure asset management to ensure aging assets are replaced with infrastructure that is able to meet new system requirements and maintain reliability with a modern generation mix.

The 2014 Integrated Resource Plan

An integrated resource plan is an electric utility's long-term plan for meeting customer loads while meeting regulatory mandates, making prudent economic decisions, and satisfying the policy and operational goals dictated by management and key stakeholders. LADWP's 2014 IRP covers the 2014-2034 period.

Goals & Objectives

The Department has been focused on transforming the Power System from one dominated by fossil fuel resources (low-cost but highly polluting assets) to a cleaner, more nimble generation fleet. Significant progress has been made to this end, but in 2013 coal still accounted for 42 percent of the generation mix. The IRP completed comprehensive scenario planning which lays out alternative strategies to shape the Department's resource portfolio in order to complete this major transformation over the next 20 years.

Most importantly, LADWP must comply with mandated greenhouse gas (GHG) emissions levels. Hence, the major focus in the 2014 IRP is on evaluating multiple resource strategies to reduce GHG emissions. Specific goals featured in the 2014 IRP's recommended resource portfolio are the following:

- Reduce GHG emissions 80 percent below 1990 levels by 2050
- Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029
- Eliminate coal by 2025
- Achieve 15 percent energy efficiency savings by 2020 compared to the 2010 baseline
- Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030
- Implement 506 MW of demand response capability by 2026
- Install 178 MW of energy storage by 2021 (including 24 MW by 2016 and 154 MW more by 2021)

The 2014 IRP also includes objectives to increase local (distributed) solar, electrify the transportation sector, and invest in LADWP's Power System Reliability Program (PSRP).

State mandates impact the majority of LADWP's goals in the 2014 IRP. Coal replacement, elimination of once-through cooling, reduction of GHG emissions, higher RPS, distributed solar programs, energy efficiency and demand response are all mandated in various ways in California.

- **Reduce GHG Emissions:** The California Global Warming Solutions Act of 2006 established an aggressive GHG reduction target for the State of California, which requires LADWP to reduce GHG emissions to 1990 levels by 2020. The state goal is 80 percent below 1990 levels by 2050.
- **Eliminate Once-Through Cooling and Repower In-Basin Units:** The Clean Water Act requires LADWP to eliminate OTC cooling at its in-basin power plants by 2029. In 2000, LADWP also received a Stipulated Order for Abatement to reduce local air emissions through the repowering of its less efficient in-basin generating facilities.
- **Eliminate Coal:** Senate Bill 1368 requires LADWP to end its two coal plant contracts when they expire in 2019 and 2027 because they exceed the minimum emissions standard. Above this requirement, the Department has opted for pre- end of contract replacement (2015 and 2025).
- **Increase Energy Efficiency and Demand Response:** Senate Bill 1037 and Assembly Bill 2021 require LADWP to meet its resource needs first through all cost-effective energy efficiency and demand response. This is an open-ended requirement determined by cost-effectiveness studies.
- **Meet the Renewable Portfolio Standard:** Senate Bill 2 (1X) requires LADWP to procure 25 percent of its retail sales for RPS-eligible resources in 2016 and 33 percent in 2020. Above this requirement, the Department has opted for a 40 percent RPS in 2030; however, Senate Bill 350 recently established a 50 percent RPS in 2030.
- **Increase Local Solar:** Senate Bill 1 requires LADWP to offer a solar incentive program for customer net-metered solar up to a funding cap of $313 million, and Senate Bill 32 requires LADWP to offer a feed-in tariff to buy 75 MW of electricity from eligible renewable energy

systems. Significantly above this requirement, the Department currently offers a feed-in tariff for 150 MW and will add an additional 300 MW.

- **Install Energy Storage:** Assembly Bill 2514 requires LADWP to determine an appropriate target for cost-effective energy storage on the grid. Accordingly, LADWP developed an Energy Storage Development Plan which quantified targets for the 2016 and 2020 deadlines.

The Department's goals are also driven by the core objective of "environmental stewardship exceeding all regulatory obligations."[1] Policies and positions that are non-binding, but are influential on those of LADWP's goals that go above and beyond state mandates, include the California Energy Action Plan and the California Energy Commission's Integrated Energy Policy Report. Mayor Garcetti's Sustainable City pLAn describes a vision for Los Angeles to be an environmental leader, and public feedback also made environmental concerns a top priority.

Navigant considers the Department's goals in the 2014 IRP to be in line with the policy positions of the State of California and City of Los Angeles, as summarized in the following table. LADWP's voluntary goals also contribute to meeting one crucial mandate: reducing GHG emissions 80 percent below 1990 levels by 2050 under AB 32.

Table E-1. Summary of 2014 IRP Goals & Drivers

Goals	Drivers
Reduce GHG emissions 80 percent below 1990 levels by 2050	AB 32; core objective (environment)
Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029	Clean Water Act section 316(b)
Eliminate coal by 2025	SB 1368; AB 32; public feedback; core objective (environment)
Achieve 15 percent energy efficiency improvement by 2020	SB 1037; AB 2021; AB 32; California Energy Commission; Mayor's pLAn, public feedback
Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030	SB 2; AB 32; SB 350; Mayor's pLAn; public feedback; core objective (environment)
Implement 506 MW of demand response capability by 2026	SB 1037; California Energy Commission
Install 178 MW of energy storage by 2021	AB 2514; Mayor's pLAn; public feedback
Increase local solar	SB 1; SB 32; Mayor's pLAn; public feedback
Electrify the transportation sector	California Energy Commission; Mayor's pLAn, public feedback
Invest in the Power System Reliability Program	Core objective (reliability); California Energy Commission

Methodology & Modeling

As the comprehensive 20-year roadmap to guide the Power System, it is critical that the 2014 IRP be created using a robust methodology and modeling approach. The IRP conforms to best practice through its preparation by a group of engineers dedicated to resource planning who collaborate with numerous work groups and functional areas of the utility, including wholesale marketing, grid operations, renewable procurement, environmental and legislative affairs, and financial services.

For the 2014 IRP, a new IRP Advisory Committee formed the cornerstone of the public outreach process. Although it did not have approval authority, the Committee played an important role in the

[1] 2014 IRP, Executive Summary (ES-1).

development of the resource cases that were evaluated and the final selection of the recommended case. This addition, along with several other changes to public outreach, demonstrates the Department's new alignment with stakeholder best practice.

The 2014 IRP uses system modeling tools to analyze and determine the long-term economic, environmental, and operational impact of select alternative resource portfolios. The resource scenarios are selected based on LADWP goals and input from Department groups. Model assumptions change based on market conditions for fuel, resource availability and pricing, regulations, load forecasts, and system reliability needs.[2] Navigant evaluated the core assumptions informing the model, which are effectively in line with benchmarks.

- **Load Forecast:** The IRP's load forecast is a particularly important assumption because it directly impacts electricity generation required over the 20-year timeframe. Navigant performed a benchmarking study comparing LADWP's forecast with other California utilities and found that the growth rate is generally in line with the California IOUs and SMUD (until 2020). However, it does not include a sensitivity analysis for a range of load growth scenarios.
- **Fuel Prices:** Navigant compared LADWP's natural gas price forecasts to the Energy Information Administration's Energy Outlook for the Pacific region and the California Energy Commission's forecast, and found that the Department is consistent with these for the 2014-2024 period.
- **Renewable Costs:** LADWP used a base renewable portfolio levelized cost of energy (LCOE) based on recently signed power purchase agreements for large central solar, geothermal, and wind projects. Navigant compared the Department's LCOE inputs to Lazard's subsidized LCOE analysis.[3] LADWP's LCOE is consistent with Lazard for most resources, but is substantially higher for wind and LADWP-built solar, likely due to older wind projects and high labor costs.
- **Carbon Prices:** Navigant benchmarked LADWP's carbon price assumptions against an industry expert forecast range and found them to be in line with the mid scenario and the California Energy Commission's low preliminary Integrated Energy Policy Report forecast.
- **Risk Analysis:** The 2014 IRP quantifies risk associated with natural gas price volatility by modeling high and low fuel price scenarios for each resource case and integrating a natural gas hedging program. Navigant found that other risks should also be considered for a more complete model, as discussed in Section 2.3.3.

The 2014 IRP reflects the standard practices in integrated resource planning and Navigant considers it to be in line with peer and industry expectations. However, LADWP should still consider adopting IRP best practices from leading utilities, particularly for load sensitivity analysis, risk analysis, and portfolio optimization to consider lowest-cost scenarios outside of the fixed selection.

The 2014 IRP Cases

The Department created five cases for the 2014 IRP based on the goals and requirements above and including updated assumptions. The cases analyzed include two coal replacement cases and three renewable and energy efficiency combinations. The 2014 IRP base case includes no pre- contract end date coal replacement, a 33 percent RPS maintained through 2030, moderate energy efficiency, 500 MW of

[2]LADWP 2014 IRP, p. 133.
[3]Lazard's Levelized Cost of Energy Analysis – Version 8.0, 2014, p. 4.

local solar, and base case electrification of the transportation sector. Case 5 represents the high case, and includes pre- contract end date coal replacement, a 50 percent RPS by 2030, advanced energy efficiency, 1,200 MW of local solar, and high electrification of the transportation sector (100 percent over the base).

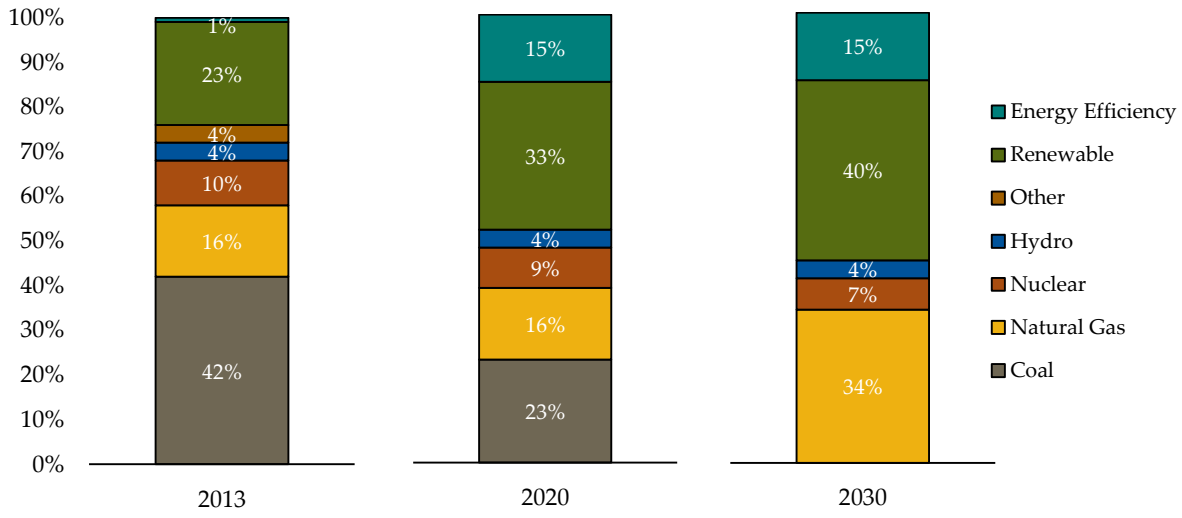
The Recommended Strategic Case

The Recommended Strategic Case is the preferred resource scenario selected by the Department as the basis for LADWP's supply and demand-side resource plans and programs going forward that meets its goals. Navigant comprehensively evaluated the 2014 Recommended Strategic Case, which comprises the scenarios in the following table and produces the future energy mix shown in Figure E-1.

Table E-2. The 2014 IRP Recommended Case

Attribute	Case	Year
Coal Replacement	Navajo early divestiture IPP early replacement	2015 2025
Energy Efficiency	15 percent less electricity usage (2010 baseline); "advanced"	2020
RPS	25 percent of retail electricity sales 33 percent of retail electricity sales 40 percent of retail electricity sales	2016 2020 2030
Local Solar	800 MW	2023
Transportation Electrification	2,344 GWh for 580,000 electric vehicles; "high"	2030
Demand Response	506 MW	2026
Energy Storage	178 MW	2021

Figure E-1. LADWP 2014 IRP Energy Mix



Source: Navigant analysis of LADWP 2015 Briefing Book

In terms of its overall resource mix, LADWP is ahead of California for renewable energy but still relies heavily on coal for its power supply. This sets it apart from the rest of the State of California and maintains a long reliance on coal. Cost and contractual issues are the primary constraints driving this continued dependence. However, by 2030 LADWP's power portfolio is expected to eliminate coal and

more closely resemble California's. The 2030 resource mix reasonably represents LADWP's interest in becoming a leader in clean energy without deviating dramatically from the rest of the state.

Navigant evaluated the components of the Department's Recommended Strategic Case in terms of approach, current status, and future outlook.

Greenhouse Gas Emissions:

Approach	Multiple activities contribute to the reduction of GHG emissions, including eliminating coal, repowering in-basin natural gas plants, and increasing renewables. The Recommended Strategic Case is designed to make progress towards the required 80 percent reduction by 2050.
Status	In 2014, LADWP's GHG emissions were 23 percent below 1990 levels.
Outlook	LADWP expects emissions to be 55 percent below 1990 levels by 2025 and 60 percent by 2030 (potentially, 74 percent by 2030 after including forecasted transportation emissions savings from fuel switching/electrification). LADWP has not yet defined a strategy to reach 80 percent. Although this is beyond the timeframe of the 2014 IRP, it is important to prepare a complete plan in the future.

Once-Through Cooling and Repowering:

Approach	LADWP is required to eliminate OTC from its coastal power plants by 2029, which is discussed in the 2014 IRP.
Status	The Department reports being on schedule: Haynes Units 5 and 6 began commercial operation in June 2013, and Scattergood 3 broke ground in June 2013 and is expected to reach substantial completion by December 30, 2015.
Outlook	LADWP appears to have made good progress on OTC and repowering. In the past two years the repowering program has been relatively in line with its overall budget. The current Scattergood Unit 3 project appears to be on scheduled based on monthly reports highlighting completed work and remaining work items by activity.

Coal Replacement:

Approach	LADWP is required to let expire contracts for power that does not meet an emissions standard. In the 2014 IRP, LADWP examined cases for divesting from and replacing two coal plants by 2015 and 2025 respectively, before contracts end.
Status	LADWP finalized the sale of Navajo Generating Station in 2015 and secured power from Apex Generating Station (natural gas) as part of the replacement. The agreement to repower the Intermountain Power Project (IPP) with natural gas has been delayed by other participants but is expected by the end of 2015, and LADWP still intends to eliminate coal in 2025.
Outlook	Repowering IPP two years before the contract ends is relatively conservative in terms of California's resource portfolio (largely divested from coal today), but may still be a challenge for LADWP because of difficulties coordinating natural gas repowering among various participants and because the Department estimates an approximately 10-year lead time for alternate replacement projects requiring new approvals, partners, and transmission assets. Having successfully sold Navajo, LADWP should now focus on other solutions for IPP.

Energy Efficiency:

Approach	The 2013 Energy Efficiency Potential Study determined that 15 percent energy savings is feasible and cost-effective by 2020; this was adopted as the Recommended Strategic Case.

Status	In FY 2013-14 LADWP achieved 3.7 percent energy savings and has improved year-over-year since 2012. The Department has struggled with staffing and contracting and has not spent its program budget in recent years; however, it has been closing the gap by adjusting estimates and improving spending towards energy efficiency programs in FY 2013-14 and 2014-15.
Outlook	The current energy efficiency portfolio is cost-effective and has a business plan through 2020, in which programs collectively meet energy and societal goals. The Efficiency Solutions group has improved energy efficiency performance, but going from 3.7 percent to 15 percent by 2020 will require a serious commitment by the Department for additional staffing, procurement, and project management support. To date, LADWP has no energy efficiency goals or estimates beyond 2020 but plans to update the potential study and adopt goals in line with SB 350.

Renewable Portfolio Standard:

Approach	LADWP plans to meet the required 33 percent RPS in 2020 and its voluntary (at the time of the 2014 IRP) 40 percent RPS in 2030 with solar PV, wind, and geothermal energy. Renewable wholesale purchases are expected to decrease. Replacing coal and increasing energy efficiency also contribute to the RPS.
Status	LADWP achieved 20 percent RPS in 2010 and has maintained this level by relying in part on wholesale renewable energy purchases and installed wind projects. Several large-scale solar PV projects have been recently completed or are under construction, but the Department has significantly underspent its capital budget in the past two years.
Outlook	Staff report that LADWP is on track to meet the 33 percent RPS by 2020. Notably, however, Senate Bill 350 increased the 2030 RPS to 50 percent which will pose additional challenges. In particular, the reliability impacts of such a high penetration of renewables are not yet fully understood. LADWP is in the process of studying these impacts and should place a high priority on finishing these studies and implementing any recommendations that result—this is critical to ensure system reliability and would follow best practice to closely link resource planning and asset management. Future plans and funding for RPS projects should be tied to the findings of these studies and the constraints identified, to ensure an integrated approach.

Local Solar:

Approach	LADWP offers a Solar Incentive Program for customer net-metered solar, a 100 MW feed-in tariff Set Pricing Program (FiT 100), and a 50 MW feed-in tariff Competitive Pricing Program (FiT 50). It plans to offer a 300 MW feed-in tariff to reach 800 MW of local solar by 2023. LADWP is also developing a new Community Solar Program, which has not yet begun.
Status	Customer net-metered solar (via the Solar Incentive Program) is roughly on track with 143 MW installed. The FiT 100 has suffered from significant processing times and wait list cancellations, and although it is on the final allocation, has only installed 7.1 MW.
Outlook	Because LADWP has completed only 7.1 MW of FiT projects, it will be challenging for the Department to meet local solar targets on the timeline outlined in the 2014 IRP (2023); however, some process improvements have been made and the Department is re-assessing interest in the program after clearing inactive projects in the wait list. LADWP should continue to focus on program improvements to attract participants (including re-evaluating pricing) and project management support as needed to manage the ramp-up to the larger FiT.

Electrification of the Transportation Sector:

Approach	LADWP modified the California Energy Commission's electric vehicle forecast to offer three cases in the 2014 IRP (base, medium, and high); the Advisory Committee selected the high case.

Status	LADWP continues efforts to support its preferred electrification case through rebates and physical charging infrastructure. The Charge Up LA! Home, Work, and On the Go program offers rebates for residential and commercial chargers and the Department has installed and retrofitted over 300 chargers on City property and is in the process of installing DC fast chargers around the city.
Outlook	In 2014, Los Angeles had 11,000 electric vehicles of the 118,000 in California. The high forecast is dramatically above this number but agrees with several third-party forecasts. LADWP's current efforts only indirectly support long-term electric vehicle integration goals, so to move toward its aggressive target, the Department must create a comprehensive plan and rate design to incentivize electric vehicle charging and integrate electric vehicles with the grid.

Demand Response:

Approach	LADWP created a detailed Demand Response Strategic Implementation Plan in 2013 which is featured in the 2014 IRP. The Department has begun its demand response Pilot I program for CII Curtailable Load and will implement Automated Demand Response in 2016.
Status	The first pilot program of the Plan is underway and reported to be on track.
Outlook	Pilot 2 is scheduled to roll out in 2016 and Pilot 3 in 2017. LADWP should report on program metrics and consider revising incentives and including an equipment installation incentive to encourage enough participation to meet its relatively aggressive goals.

Energy Storage:

Approach	LADWP developed an Energy Storage Development Plan to procure energy storage by the state mandated dates of 2016 and 2021. The Department calculated energy storage targets using two approaches, one for selected locations and the other for the entire power system.
Status	An expansion to pumped storage at the Castaic Power Plant was completed in 2013 and a 1 MW LADWP-sited storage system was completed in June 2015.
Outlook	Scheduled projects include thermal energy storage at Valley and Apex Generating Stations, battery energy storage at several utility-scale solar PV projects, battery energy storage on the distribution system, and customer-sited thermal energy storage (LAX and large customers). At the time of this Survey, construction has not started except for the 1 MW system at the John Ferraro Building. Other projects are scheduled to be completed from 2017 to 2020.

Smart Grid:

Approach	LADWP established a Smart Grid Investment Program in 2013 with 12 planned projects over the next 10 years, and is participating in the Smart Grid Regional Demonstration Program.
Status	The Department has installed 51,000 smart meters in three communities in Los Angeles.
Outlook	Advanced Metering Infrastructure is key for a number of other smart grid projects but it is unclear how LADWP intends to proceed at scale. LADWP should present its plan such that progress can be reported on a set timeline with milestones and metrics.

Conclusions

LADWP's 2014 IRP is a sound planning document based on Navigant's assessment of goals against regulatory mandates and policy objectives and the comparison of planning and modeling procedures to industry practices. The Recommended Strategic Case is a strong vision for the Department's future resource portfolio and LADWP has achieved a number of key accomplishments, including making significant progress towards eliminating OTC, increasing renewables, and replacing coal (the sale of Navajo Generating Station). Navigant considers the 2014 IRP to have established robust plans overall.

Certain programs do need further definition and refinement in future IRPs. For example, the plan to replace the coal-powered Intermountain Power Project (IPP) has encountered challenges due to contractual issues with other participants. After Navajo, LADWP must now take the opportunity to focus on IPP and make it a high priority to overcome these challenges with more creative replacement plans. Additionally, the Community Solar Program, demand response, and smart grid-related initiatives are early-stage programs that must be further developed. As they are, LADWP should actively communicate with stakeholders about the direction and status of the programs.

Despite the strength of the 2014 IRP as a planning document, implementation may prove to be a challenge. There are complex issues at the heart of LADWP's renewable energy and grid modernization efforts which will require careful management by the Department and City. Potential issues include maintaining power system reliability with a high penetration of renewables; requiring additional staffing resources, contracting ability, and project management; and lacking clear project metrics and oversight tying performance to rates. These areas have the potential to be significant risks.

The reliability impact of a high penetration of renewables is not yet fully understood. Goals for a high RPS and increased local solar are potentially at odds with the core objective to maintain power system reliability–at least, without careful implementation and specific, well-executed plans. The Department is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. LADWP must thoroughly understand distributed generation impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort with the PSRP. It is critical that any recommendations from these studies be implemented to ensure system operational reliability.

Most of the plans laid out in the 2014 IRP describe significant program ramp-ups over the next several years. This is also the case for the PSRP, which is discussed in the Power Infrastructure Report, Part B. However, the Department has struggled with capital underspending, reportedly due to staffing and contracting issues. Several programs have failed to achieve annual targets in recent years. These trends are a concern for LADWP's growth plans. Without sufficient support for struggling programs, there is little evidence the Department will be able to establish and maintain aggressive growth. Specifically, the Power System should meet needed staffing levels and adopt a more rigorous project management approach or hire a project management firm to support project contracting, execution, and tracking. Additionally, the Department would benefit from a review and redesign of its procurement practices. Navigant found proof of the ability to grow in the Efficiency Solutions group, which has increased staffing and spending towards the program budget—this should be emulated in other areas of the Department. Overall, the program escalation challenge is a Department-wide issue and is further discussed in the Governance report.

Capital program underspending is further complicated by opaque reporting of results and the restatement of project and annual budgets. In a number of cases, Navigant observed a lack of clarity in reporting on program progress toward specific goals and around the use of leftover funds from underspent capital programs. Complete information on the whole lifecycle of a project, including comparisons to original budgets, is often not readily available. Because achieving the clean energy transformation will come at a cost and LADWP's funding requirements will continue to increase, it is especially important to track program metrics on performance and spending. Tying progress and achievements to rates in some way would establish more transparency and accountability for the Department's budgets and plans. This would trigger more open discussions between the City and LADWP around program success and funding. For example, until the full cost of renewable integration

is fully understood, future rate increases related to new renewable generation resources should be tied to the results of such studies and phased based on the strategies adopted and progress against them.

Based on these findings, Navigant makes the following recommendations. Some are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Formalize current IRP practices and link the IRP more closely to rates, requiring by ordinance bi-annual written updates to be submitted to the rate-approving authority reporting on key performance metrics for IRP programs and goals. Establish specific milestones for programs to be reflected in the reported metrics. In this way, the IRP will remain an engineering document produced by the Power System but also be effectively leveraged for rate decisions.
- Prepare for a significantly higher level of activity and spending in capital programs by:
    1. Ensuring that Power System divisions have the necessary staffing and contracting resources. LADWP could benefit from adopting Navigant's recommendations regarding the structural changes to hiring processes made in the *Governance* report.
    2. Adopting a more sophisticated project management business discipline with project management specialists reporting more detailed and transparent project metrics to key stakeholders on a monthly basis. Enhance tools and processes to centrally and comprehensively manage programs throughout procurement, construction, and commissioning.
- Place a high priority on completing the renewable integration reliability studies and implement critical recommendations from these studies. The Department should continuously update these studies, assess the resulting impacts on the Power System, and identify potential policy changes. Each IRP should incorporate the latest results.

Medium Priority Recommendations

- Include additional IPP replacement scenarios and updated timelines in the next IRP. LADWP should conduct an in-depth assessment of alternative non-coal scenarios, evaluate pros and cons, and present its best proposed strategy for complete IPP replacement in the 2016 IRP.
- Form a new, longer-term energy efficiency goal now that there is guidance from SB 350. Coordinate IRP modeling efforts with the Efficiency Solutions group to improve energy efficiency estimates past 2020 over the timeframe of the IRP, backed by an updated Energy Efficiency Potential Study as needed.

- Continue to prioritize finalizing new customer-focused programs (community solar, demand response, and smart grid-related programs) and as they are developed and refined, actively communicate with and hold discussions among stakeholders. Regularly communicate costs and benefits, timelines, and program milestones and include updates in each IRP.
- Conduct an assessment of the solar feed-in tariff program and make changes to support installation targets. As part of this, analyze pricing and program attractiveness to participants as well as streamline the program with process improvements.
- Create a preliminary rate design to send price signals to customers with electric vehicles. LADWP's plan to eliminate renewable overgeneration issues with electric vehicle charging will require new rates that incentivize customers to align their vehicle charging time with peak output from renewable generation. IRPs should include this work as it develops.

Low Priority Recommendations

- Include additional sensitivity and risk analysis in IRP modeling beyond fuel price scenarios and the natural gas hedging program; specifically, incorporate a load forecast sensitivity analysis with high and low scenarios, a wholesale electricity price sensitivity analysis, hydroelectric generation risk scenarios based on water availability, and unplanned thermal outage risks.
- Add a scenario optimization model to the IRP process to determine the least-cost portfolio.
- Conduct an independent third-party review of the economics of the LADWP project ownership strategy for all generation resources to determine the most cost-effective approach. For example, assess LADWP-built utility-scale solar PV projects versus third-party PPAs.
- Establish a preliminary strategy in the next IRP to reduce GHG emissions fully 80 percent below 1990 levels by 2050 and refine this strategy during annual IRP updates as conditions change.

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1. Introduction

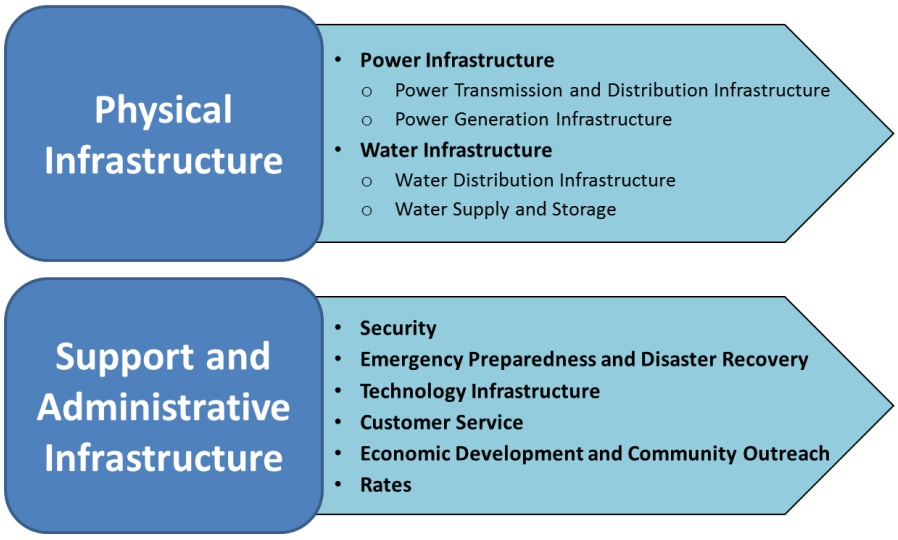
1.1 Study Objectives

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

Figure 1-1. Focus Areas of the 2015 IEA Survey



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Power Generation Infrastructure: The current and future mix of power generation resources is critical for meeting and balancing the Department's key objectives related to the reliable supply of electricity, affordable rates, and environmental stewardship. LADWP will face significant new challenges as

renewable generation capacity is increased to a major portion of the resource portfolio and new demand-side resources are developed. In this report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio.

Power Transmission and Distribution (T&D) Infrastructure: LADWP is contending with aging infrastructure, sub-optimal contracting processes, and budget pressures. Additionally, it must integrate increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges will put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function. To ensure that the Department has a sound plan to maintain, repair and replace its T&D assets, Navigant assessed the Department's approach to asset management against best practice in the power utility industry, identified gaps, and provided recommendations to address existing gaps. This work comprises the Power Infrastructure, Part B report.

This Power Generation Infrastructure report focuses on the 2014 Integrated Resource Plan (IRP), while the Power T&D Infrastructure report focuses on the 2013 Power System Reliability Program (PSRP) and the 2014 Long-Term Transmission Assessment. Insights from interviews and supporting document review complemented these analyses. To a certain extent, this report also addresses linkages (or lack thereof) between the two Power Infrastructure areas, since best practice integrates resource planning with infrastructure asset management to ensure aging assets are replaced with infrastructure that is able to meet new system requirements and maintain reliability with a modern generation mix.

1.2 Approach

Information for the Power Infrastructure report was derived from several primary sources:

- Interviews with LADWP Power System staff.
- Documents collected and reviewed from across the Power System including recent reports, budgets, model outputs, and other primary data provided in response to Navigant's data request.
- A literature review of California regulation, technical studies, and peer utility publications on relevant Power System topics.
- Best practices with regards to the management of T&D assets derived from Navigant's extensive experience working closely with utilities in this area.
- Navigant's experience with LADWP's prior IRPs, resource portfolios, and practices.

Navigant conducted interviews starting at the top level of Power System leadership down to expert staff on specific subjects. 3.3Appendix A contains a full description of the interviews conducted. Through a secure file share, the Department provided a total of 31 power-specific documents listed in 3.3Appendix B. The review of these documents was complemented with insights gathered from interviews with LADWP subject matter experts.

2. The 2014 Integrated Resource Plan

This chapter contains Navigant's assessment of the 2014 IRP. It first provides an overview of the nature of integrated resource planning and a high-level assessment of the Department's goals and its methodology for creating the 2014 IRP. Then, Navigant presents its in-depth evaluation of the 2014 Recommended Strategic Case for the future mix of power generation and related resources. The chapter is organized into the following subsections:

- Integrated Resource Planning
- Goals and Objectives
- IRP Methodology and Modeling
- The 2014 IRP Recommended Case

LADWP's goals and objectives in the 2014 IRP are discussed in terms of mandatory and non-mandatory directives; California state legislation is the primary driver for certain goals while other state and local policies influence LADWP's overall vision and voluntary goals.

In addition to goals and strategic direction, the process to create the 2014 IRP and the methods used to model the resource cases are critically important to the value of the IRP. Navigant reviewed LADWP's methodology and compared it to other utilities and best practice to further assess the quality of the plan.

The Recommended Strategic Case is the preferred resource scenario selected by the Department from a variety of options including coal replacement cases, RPS cases, energy efficiency cases, local solar cases, and electrification of the transportation sector cases. The Recommended Strategic Case is the basis for LADWP's supply and demand-side resource plans and programs going forward.

2.1 Integrated Resource Planning

An integrated resource plan is an electric utility's long-term plan for meeting customer load, while meeting regulatory mandates, making prudent economic decisions, and satisfying the policy and operational goals dictated by management and key stakeholders. More specifically, an IRP is a utility's plan "for meeting forecasted annual peak and energy demand, plus some established reserve margin, through a combination of supply-side and demand-side resources over a specific future period."[4] Because an IRP is such an important planning document for electric utilities, many states and regulatory agencies require the development of an IRP before approving procurement programs or rate increases. Navigant believes the linkage between LADWP's IRP and future proposed rate actions should be tightened.

While California does not have a formal IRP requirement for its publicly-owned utilities (POUs) like LADWP, the California Energy Commission (California's primary agency for energy policy and planning) requires load-serving entities other than investor-owned utilities (IOUs) to file certain electricity resource planning information for use in the Commission's annual Integrated Energy Policy

[4]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013 (www.raponline.org/document/download/id/6608).

Report.[5,6] IOUs are required by the California Public Utilities Commission (CPUC) to submit long-term procurement plans (LTPPs) every two years. Similar to an IRP, an LTPP must show that its proposed procurement will provide safe, reliable capacity which complies with state policies and is at the least cost to ratepayers.[7] As a POU, the LADWP must submit resource planning information to the California Energy Commission but is not required to submit an IRP or LTPP.

Instead, the Department has instituted its own annual integrated resource planning effort, with a new IRP issued every two years (even years) and updates provided in the interim years (odd years). Although voluntary, the IRP provides LADWP with a robust, evolving plan for successful integrating increasing levels of renewables, complying with greenhouse gas (GHG) emissions standards, and ensuring its infrastructure can reliably deliver electricity to customers into the future.

The LADWP 2014 Power Integrated Resource Plan (2014 IRP) serves as a comprehensive 20-year roadmap to guide the Power System in its efforts to supply reliable electricity in an environmentally responsible and cost-effective manner. The 2014 IRP was developed through a collaborative process and will be updated each year with input from customers and stakeholders. The IRP must take into account future energy demand, regulatory requirements, advances in renewable energy and other technologies, conservation and energy efficiency programs, and other factors.[8]

In particular, the 2014 IRP provides detailed analysis and results of several new resource cases. It investigates coal divestment timelines, higher levels of renewables, advanced energy efficiency, more local solar, and the electrification of the transportation sector. The IRP analyzes these cases and recommends a strategy to best meet the future electric needs of Los Angeles, using system modeling tools to determine the long-term economic, environmental, and operational impact of alternative resource portfolios. The 2014 IRP's recommended resource case is discussed in depth in this report.

2.2 Goals and Objectives

The purpose of the 2014 IRP is to establish a long-term resource strategy to meet the City of Los Angeles' future energy needs at the lowest cost and risk, while being consistent with the Department's environmental priorities, reliability standards, and regulatory mandates. The 2014 IRP clearly establishes its guiding principles; as in previous IRPs, the Department prioritizes the following key objectives:

[5]Overview of California's energy policy: www.energy.ca.gov/energypolicy.
[6]California Energy Commission electricity resource plan requirements: www.energy.ca.gov/2012publications/CEC-200-2012-007/CEC-200-2012-007-SF.pdf.
[7]Long-term procurement planning requirements: www.cpuc.ca.gov/PUC/energy/Procurement/LTPP.
[8]Overview of the LADWP Integrated Resource Plan: www.ladwp.com/lapowerplan.

In addition to reiterating the importance of balancing these long-standing objectives, the Department is preparing for a major transformation over the next 20 years. Electricity will be used in new applications and be affected by increasing customer expectations of clean, affordable energy. According to the IRP's Power System Vision,

> *By increasing energy efficiency, implementing demand response, promoting solar rooftop and other clean technologies that mitigate the need to build new fossil-fueled power plants, both LADWP and its customers are embracing the vision of a greener resource portfolio that helps sustain the environment for future generations.*

Most importantly, LADWP must comply with mandated greenhouse gas (GHG) emissions levels. Hence, the major focus in the 2014 IRP is on evaluating multiple resource strategies to reduce GHG emissions.[9] These strategies are incorporated in the Department's 2014 IRP. Specific goals featured in the 2014 IRP's recommended resource portfolio are the following:

- Reduce GHG emissions 80 percent below 1990 levels by 2050
- Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029
- Eliminate coal by 2025
- Achieve 15 percent energy efficiency improvement by 2020 compared to the 2010 baseline
- Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030
- Implement 506 MW of demand response capability by 2026
- Install 178 MW of energy storage by 2021 (including 24 MW by 2016 and 154 MW more by 2021)

The 2014 IRP also includes high level goals to increase local solar, support the electrification of the transportation sector,[10] and invest in LADWP's Power System Reliability Program (PSRP).

2.2.1 Legislative and Regulatory Mandates

State of California mandates affect both the demand and supply side of electricity. On the demand side, California has set some of the most ambitious energy efficiency goals in the nation. On the supply side, a range of policies encouraging large-scale renewables and distribution generation, coupled with restrictions on thermal power plants emissions, are reshaping the state's electricity supply mix.

State mandates impact the majority of LADWP's goals in the 2014 Integrated Resource Plan. Coal replacement, elimination of OTC, reduction of GHG emissions, higher RPS, distributed solar programs, energy efficiency, and demand response are all mandated in various ways in California. These legislative requirements are described below along with their impact on LADWP's goals.

2.2.1.1 Reduce Greenhouse Gas Emissions

Assembly Bill 32

[9] "L.A.'s Power Transformation." Power System 2014 Integrated Resource Plan Public Outreach Presentation, October/November 2014.

[10] Converting gasoline and diesel-powered vehicles, light rail, docked shipping vessels, and others to electric power.

The California Global Warming Solutions Act of 2006[11,12] established a leading and progressive GHG reduction target for the State of California. The target will reduce the state's CO_2 emissions to 1990 levels (427 MMT CO_2-e) by 2020. Regulations for implementing a GHG emissions Cap and Trade program were adopted in 2011 by the California Environmental Protection Agency Air Resources Board (CARB). Enforcement and compliance began on January 1, 2013. The long-term goal of AB 32 is to reduce GHG emissions to 80 percent below 1990 levels by 2050. The table below shows CARB staff's latest recommended emissions allocation for LADWP for the 2013-2020 period.

Table 2-1. Annual Allocation to LADWP under the Cap-and-Trade Regulation (tons CO_2-e)[13]

2013	2014	2015	2016	2017	2018	2019	2020
13,593,819	13,349,971	12,919,678	13,045,027	13,216,214	13,258,028	12,704,003	11,680,195

LADWP reports having already accomplished reducing its GHG emissions more than 20 percent below 1990 levels. In 2013, total CO_2 emissions were calculated to be 14.314 MMT, which is 3.611 MMT below 1990 levels despite net Megawatt-hour generation increasing nine percent over the period.[14] It is important to note, however, that LADWP primarily reduced its significant coal usage to accomplish this. Emissions were higher than the CARB allocation in 2013, but the 2014 IRP early coal cases reduce emissions below this level going forward to 2020 (due to divesting from Navajo in 2015). LADWP can accomplish large GHG emissions reductions compared to other California utilities, by replacing coal.

Achieving an 80 percent reduction below 1990 emissions by 2050 will require the Department to achieve an emissions level of 3.6 MMT CO_2-e. The resource cases discussed in the IRP approach this goal to varying degrees by 2034, but the timeframe does not extend to 2050. LADWP predicts an emissions reduction of 55 percent below the 1990 level by 2025 (9.8 MMT). It may be more of a challenge for the Department to make additional gains after eliminating coal from its portfolio

LADWP is required to reduce GHG emissions to 1990 levels by 2020 and directed to reduce GHG emissions 80 percent below 1990 levels by 2050. This mandate drives LADWP's otherwise voluntary goals for high RPS, energy efficiency, and electrification of the transportation sector and is impacted by coal and OTC plans.

2.2.1.2 Eliminate Once-Through Cooling and Repower In-Basin Plants

Clean Water Act Section 316(b)

Once-through cooling (OTC) is regulated by the Environmental Protection Agency (EPA) Clean Water Act section 316(b) and administered in California by the California State Water Resources Control Board (State Water Board). The State Water Board implemented the "Use of Coastal and Estuarine Waters for Power Plant Cooling" policy, effective on October 1, 2010, which established technology-based standards to reduce the harmful effects associated with cooling water intake structures on marine and estuarine

[11]AB 32, Nunez, Chapter 488, Statutes of 2006. Text of AB 32 available at: www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf

[12]Information from the California Environmental Protection Agency Air Resources Board: www.arb.ca.gov/cc/ab32/ab32.htm

[13]Annual Allocation to Electrical Distribution Utilities (EDU) under the Cap-and-Trade Regulation. Revised February 5, 2015 (www.arb.ca.gov/cc/capandtrade/allowanceallocation/edu-ng-allowancedistribution/electricity-allocation.pdf).

[14]2014 IRP, Appendix C. Total CO_2 emissions from owned and purchased generation including wholesale power sales.

life.[15] The policy was amended to include existing power plants on June 18, 2013,[16] and applies to LADWP's three coastal generating stations: Scattergood Generating Station in Playa Del Rey, Haynes Generating Station in Long Beach, and Harbor Generating Station in Terminal Island.

The Clean Water Act Section 316(b) originally required the elimination of OTC by 2020, while LADWP had sought a deadline of 2045 based on its preferred replacement cycle. The schedule was negotiated to adapt to the Department's unique system configuration and reliability requirements (no unit can be removed from service before its replacement is online, necessitating a step-wise process) and was settled at compliance in 2029.[17] Projects are underway according to the schedule.

According to Department interviews, in October the State Water Board will impose a mitigation fee for the use of ocean water, regardless of schedules to eliminate OTC. LADWP cannot accelerate the schedule due to the step-wise nature of the replacements, but fortunately does not expect a large mitigation fee.

NO_x Stipulated Order for Abatement

In 2000, LADWP predicted that its NO_x emissions from in-basin generating units would exceed its allocation of NO_x RECLAIM Trading Credits issues by the South Coast Air Quality Management District (SCAQMD). SCAQMD is the air pollution control agency for the four-county region including Orange County and parts of Los Angeles, Riverside, and San Bernardino Counties.

On August 29, 2000, the SCAQMD issued a Stipulated Order for Abatement[18] that requires LADWP to reduce local air emissions through repowering of its less efficient in-basin generating facilities (Haynes and Scattergood Generating Stations). Although the Department did not actually exceed its allocation that year, LADWP and SCAQMD agreed on a schedule for repowering the in-basin units.

LADWP is required to eliminate OTC cooling at its in-basin power plants and repower older units with more efficient turbines, according to a fixed schedule with compliance by 2029.

2.2.1.3 Eliminate Coal

Senate Bill 1368

LADWP must remove its remaining two coal-fired power plants from its generation portfolio when current contracts expire. This is due to Senate Bill 1368, the California Greenhouse Gas Emissions Performance Standard Act (Perata, Chapter 598, Statutes of 2006), which required the CPUC and the California Energy Commission to implement an emissions performance standard for all retail providers of electricity.[19] SB 1368 established a standard for baseload generation owned by or under long-term contract to POUs of 1,100 pounds per megawatt-hour (the performance standard that can be achieved by gas-fired combined cycle units). Because LADWP is prohibited from entering into long-term financial

[15] www.swrcb.ca.gov/water_issues/programs/ocean/cwa316

[16] www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_2014.pdf

[17] According to LADWP interviews and a proposed resolution regarding the Scattergood Generating Station Unit 3 Repowering Project, CAO File No. 0150-09704-0000.

[18] A Stipulated Order for Abatement requires a company operating out of compliance to take specific actions or to shut down its operations. This has the same legal effect as a regular Order for Abatement, with two differences: the Hearing Board is not required to find a violation of any rule or regulation, and the conditions of the order are agreed upon in advance by the parties (www.aqmd.gov/home/about/hearing-board/about-orders-for-abatement).

[19] Overview available at: www.energy.ca.gov/emission_standards.

commitments for baseload generation unless it complies with the CO_2 emissions performance standard, the Department may not import power from existing coal plants (they do not meet the standard) when current long-term contracts expire.

LADWP has one of the largest coal portfolios in the state, from contracts predating SB 1368 (42 percent of the energy mix in 2013). LADWP has already replaced its Navajo Generating Station (Navajo) which would have had contracts expire in 2019, and plans to not renew the coal contract for the Intermountain Power Project (IPP) in 2027. Beyond the SB 1368 emissions performance mandate, the Department opted for a voluntary pre- end of contract divestiture of Navajo (completed in 2015) and will attempt the same for IPP (in 2025). However, this time frame still lags behind the efforts of other large California utilities to eliminate coal from their portfolios and could be further scrutinized by LADWP.

Early coal replacement is strongly motivated by public support and political will; however, there are several critical operational and financial reasons for the comparatively slow removal of coal generation resources from the portfolio which will be discussed in Chapter 2.4.

LADWP is required to eliminate its two coal plants from the generation portfolio in 2019 and 2027. Above this requirement, the Department has opted for early replacement (2015 and 2025).

2.2.1.4 Increase Energy Efficiency and Demand Response

Senate Bill 1037 and Assembly Bill 2021

Senate Bill 1037 (Kehoe, 2005) directs local POUs to meet their resource needs first through all available energy efficiency and demand response resources that are cost-effective, reliable, and feasible. Assembly Bill 2021 (Levine, 2006) added to this policy by requiring each POU, beginning on or before June 1, 2007 and every three years after, to identify all potentially achievable cost-effective energy savings for the next 10-year period, establish annual targets, and report annually to the California Energy Commission.[20] Energy savings are supposed to meet the state goal of reducing energy consumption by 10 percent in 10 years.[21]

LADWP is required to meet its resource needs first through all cost-effective energy efficiency and demand response. This is an open-ended requirement determined by cost-effectiveness studies, resulting in LADWP adopting a 15 percent energy savings goal for 2020.

2.2.1.5 Meet the Renewable Portfolio Standard

Senate Bill 2 (1X)

California's Renewable Portfolio Standard (RPS) was originally established in 2002 under Senate Bill 1078, followed by Senate Bill 2 (SBX1-2, Simitian), or the California Renewable Energy Resources Act, on April 12, 2011.[22] SBX1-2 directed the California Energy Commission to set new RPS procurement targets, new renewable resource eligibility definitions, and new reporting requirements applicable to POUs. The

[20]Assembly Bill 2227 (Bradford, 2012) amended the reporting requirement to a quadrennial, rather than triennial basis.
[21]Levine, AB 2021, Chapter 734, Statutes of 2006. Full chapter text available at: www.energy.ca.gov/sb1/meetings/ab_2021_bill_20060929_chaptered.pdf
[22]SBX1-2 text available at: www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0001-0050/sbx1_2_bill_20110412_chaptered.html

California Energy Commission established RPS enforcement procedures for local POUs under the California Code of Regulations, Sections 3200-3208.[23,24] Each POU is required to obtain a minimum of:

- An average of 20 percent of retail sales from renewables between 2011-2013;
- 25 percent by the end of 2016; and
- 33 percent by the end of 2020.

In 2021 and later years, all retail sellers must procure 33 percent of their retail sales from RPS-eligible resources.

The LADWP Board of Commissioners adopted a resolution on December 9, 2011 to relax the goal of a 35 percent RPS established in 2008, in order to align exactly with state requirements.[25] For the compliance period report due July 1, 2014, the Department reported to the California Energy Commission a 20.00 percent RPS for the period 2011-2013.[26]

Senate Bill 350

Senate Bill 350 (SB-350), the Clean Energy and Pollution Reduction Act of 2015, was approved on September 11, 2015. The bill references Governor Brown's objectives in clean energy, clean air, and pollution reduction for 2030:

- Increase the procurement of electricity from renewable sources from 33 percent to 50 percent, and
- Double the efficiency of existing buildings.

The bill differs from Governor Brown's original objectives by having eliminated the goal to reduce petroleum consumption 50 percent by 2030. In the 2014 IRP, LADWP anticipated the RPS development by including a 50 percent RPS resource case; however, it is not the recommended case.

LADWP is required to procure 25 percent of its retail sales for RPS-eligible resources in 2016 and 33 percent in 2020. Above this requirement, the Department has opted for a 40 percent RPS in 2030; however, new legislation requires a 50 percent by 2030.

2.2.1.6 Increase Local Solar

Senate Bill 1

The Department's Solar Incentive Program (SIP) was established under state law and is a component of the IRP's goal to increase local solar. On August 21, 2006, Senate Bill 1 (SB 1) enacted the Million Solar Roofs Initiative and expanded the CPUC's California Solar Initiative and the California Energy

[23]Overview available at: www.energy.ca.gov/portfolio and full text at: www.energy.ca.gov/emission_standards/documents/sb_1368_bill_20060929_chaptered.pdf
[24]Chisholm, E., L. Gonzalez, A. Gould. 2013. *Enforcement Procedures for the Renewables Portfolio Standard for Local Publicly Owned Electric Utilities.* California Energy Commission. CEC-300-2013-002-CMF. (www.energy.ca.gov/2013publications/CEC-300-2013-002/CEC-300-2013-002-CMF.pdf)
[25]Los Angeles Department of Water & Power: Clean Energy Programs & Progress (http://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/Background.pdf)
[26]Local Publicly Owned Electric Utilities' Current Renewable Procurement Status. California Energy Commission. (www.energy.ca.gov/portfolio/pou_rulemaking/2013-RPS-01/POU_Reported_2011-2013_RPS_Percentage_Table.pdf)

Commission's New Solar Homes Partnership.[27] Effective 2007, POUs were required to implement solar energy incentive programs by January 1, 2008. This statewide effort is known collectively as Go Solar California and established a campaign goal of 3,000 MW of solar generating capacity with expenditures up to $3.35 billion by 2017.[28,29] In 2011, Senate Bill 585 (SB 585) amended Public Utilities Code Section 2851 to increase the total budget from $3.35 billion to $3.55 billion.[30]

SB 1 directed the California Energy Commission to establish eligibility criteria, conditions for incentives, and standard for projects applying to incentives. These are laid out in the *Guidelines for California's Solar Electric Incentive Programs*, now on its Fifth Edition.[31] SB 585 capped program funding for POUs at $784 million. POUs are also required to report on the progress of their solar incentive program to the California Energy Commission on an annual basis. As a POU, LADWP's cap for expenditure on net-metered solar energy systems over the 10-year period is $313 million (based on serving 39.9 percent of the municipal load in the state).

Senate Bill 32 and Senate Bill 1332

The Department's solar feed-in tariff (FiT) program was developed in compliance with Senate Bill 32 (SB 32)[32] and its successor, Senate Bill 1332 (SB 1332).[33]

SB 32 (October 9, 2009) Chapter 328 required POUs serving 75,000 customers or more to make a FiT available to owners and operators of an electric generation facility within the service territory of the utility until the utility meets its proportionate share of the statewide cap of 750 MW (for both IOUs and POUs). LADWP received a 10 percent, or 75 MW, share of the cap. Through this program, owners or operators of eligible renewable energy systems may sell their energy directly to LADWP. The purchase of qualifying energy includes all environmental attributes, capacity rights, and renewable energy credits, and therefore applies to LADWP's 33 percent by 2020 RPS. SB 1332 (September 27, 2012) updated the requirements of SB 32 to require that POUs adopt a feed-in tariff by July 1, 2013.

LADWP's 10 MW FiT Demonstration Program was the first compliance effort, launched in May 2012. On January 11, 2013 the Board of Water and Power Commissioners approved the 100 MW FiT Set Pricing Program as the first component of a 150 MW FiT.[34,35] The 100 MW FiT has been offered in 20 MW

[27]SB 1 (Murray, Chapter 132, Statutes of 2006, § 4), as codified in Public Resources Code Sections 25780-25784. A high-level overview from the California Energy Commission is accessible at: www.energy.ca.gov/sb1.
[28]Go Solar California website: www.gosolarcalifornia.ca.gov.
[29]Additional background information available at: www.energy.ca.gov/renewables.
[30]Senate Bill 585 (Kehoe, Chapter 312, Statutes of 2011) enacted on September 22, 2011.
[31]Pennington, G. William, P. Saxton, S. Neidich, S. Taheri, F. Nasim, J. Folkman. 2013. *Guidelines for California's Solar Electric Incentive Programs (Senate Bill 1), Fifth Edition.* California Energy Commission. CEC-300-2013-008-ED5-CMF. (www.energy.ca.gov/2012publications/CEC-300-2012-008/CEC-300-2012-008-ED5-CMF.pdf)
[32]SB 32 text available at: www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sb_32_bill_20091011_chaptered.html.
[33]SB 1332 text available at: www.leginfo.ca.gov/pub/11-12/bill/sen/sb_1301-1350/sb_1332_bill_20120927_chaptered.html.
[34]www.ladwp.com/fit
[35]www.labusinesscouncil.org/LargestintheNation-Feedin-Tariff-Solar-Program-Kicks-Off

allocations, or tranches, every six months starting in February 2013. The remaining 50 MW was bundled with a large, utility-scale solar project (Beacon Solar).

LADWP is required to offer a solar incentive program for customer net-metered solar up to a funding cap of $313 million, and is also required to offer a feed-in tariff to buy 75 MW of electricity from eligible renewable energy systems. The Department currently offers a feed-in tariff for 150 MW and will add an additional 300 MW, going significantly above requirements.

2.2.1.7 Add Energy Storage

Assembly Bill 2514

Assembly Bill 2514 (Skinner, Chapter 469, Statutes of 2020),[36,37] amended by Assembly Bill 2227, requires California utilities to incorporate energy storage into the grid. The legislation considers energy storage to be capable of reducing GHG emissions; reducing peak demand; deferring or eliminating investments in generation, transmission, or distribution assets; and improving the reliable operation of the grid.

By March 1, 2012, the governing board of each POU was required to initiate a process to determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems. Energy storage systems are to be achieved by the utility by December 31, 2016 and December 31, 2020.

LADWP is required to determine an appropriate target for cost-effective energy storage on the grid. Accordingly, LADWP developed an Energy Storage Development Plan which sets a target of 24 MW by the end of 2016 and an additional 154 MW by the end of 2021.

2.2.2 Policy and Strategy

As described above, the Department's goals are heavily influenced by compliance with state regulations. However, in the 2014 IRP they are also largely driven by the core objective of "environmental stewardship exceeding all regulatory obligations."[38] The Department and City of Los Angeles leadership have been relatively progressive in adopting clean energy goals and programs before formal laws and regulations are in place. For example, in 2005 the Department adopted a renewable procurement target of 20 percent by 2010 (which it accomplished). And with 132 MW of solar PV by the end of 2013, Los Angeles was the top city in the nation for installed solar capacity at the time. However, those accomplishments are tempered by the continued reliance on coal resources for the next decade.

The following policies and positions are non-binding but influential on those of LADWP's goals that go above and beyond state mandates, in line with its core environmental objective.

2.2.2.1 State of California Energy Action Plan

In 2003, the California Public Utilities Commission, the California Energy Commission, and the California Power Authority adopted an *Energy Action Plan* which established a unified approach to

[36]AB 2514 – Energy Storage Procurement Targets from Publicly Owned Utilities, California Energy Commission (www.energy.ca.gov/assessments/ab2514_energy_storage.html).
[37]Full text available at: leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100AB2514.
[38]2014 IRP, Executive Summary (ES-1).

meeting California's electricity and natural gas needs. The latest version, an update from 2008 in the wake of Assembly Bill 32 (the California Global Warming Solutions Act of 2006), examined the state's ongoing actions in the context of global climate change and established a number of key positions still relevant for California utilities:[39]

1. California must act to decrease its GHG emissions to reduce the impact of climate change.
2. California's programs are, in large measure, motivated by concerns about the environment.
3. Energy efficiency is a zero-emissions and least-cost strategy, and meeting AB 32 goals will require unprecedented levels of energy efficiency investment.
4. Emissions reduction mandates require the consideration of more demand response options.
5. Renewable energy policy is a cornerstone of our approach to reducing GHG emissions in the electricity sector.
6. As California seeks a cleaner energy future, it still has responsibility to ensure the reliability of the system using conventional power plants and transmission and distribution infrastructure.
7. One of the most promising options for reduction in GHG emissions from the transportation sector involves the increasing penetration of plug-in hybrid electric and all-electric vehicles.

These priorities, though they have evolved to a certain extent since 2008, are reflected in LADWP's current goals.

2.2.2.2 Integrated Energy Policy Report

Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the California Energy Commission to prepare a biennial Integrated Energy Policy Report (IEPR) that assesses major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors. The report also provides policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety.

The latest full report was the 2013 Integrated Energy Policy Report,[40] which provides the California Energy Commission's assessment of a wide range of energy issues facing the state. The report re-iterates the state's "loading order" prioritizing energy efficiency and demand response for meeting California's energy needs. Renewable energy is another of California's top priorities and is next in the loading order, along with distributed generation. These priorities become even more important in the context of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050. As an overall snapshot of California's energy, these are mostly reflected in state mandates and hence in LADWP's requirements.

One point to highlight in the 2013 IEPR is that to help ensure progress toward its 2050 greenhouse gas reduction goals, California needs to determine what the electricity system should look like in 2030 (as an interim target). This concept is important and will be discussed further later in the Survey report.

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[39]2008 Update to the Energy Action Plan available at: www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF.

[40]California Energy Commission. 2013. *2013 Integrated Energy Policy Report*. Publication Number: CEC-100-2013-001-CMF. Available at: www.energy.ca.gov/2013publications/CEC-100-2013-001/CEC-100-2013-001-CMF-small.pdf.

The most recent update to the IEPR[41] was published following Governor Brown's inaugural address on January 5, 2015, which proposed three ambitious goals:

1. Increase from one-third to 50 percent our electricity derived from renewable sources,
2. Reduce today's petroleum use in cars and trucks by up to 50 percent, and
3. Double the efficiency of existing buildings.

Accordingly, the 2014 IEPR Update focuses on next steps for transforming transportation energy use in California, and highlights the importance of incentives in helping speed this transition. The California Energy Commission maintains that, "To meet California's climate and clean air goals, a transformation of the transportation system to zero- and near-zero technologies and fuels is needed."

The 2014 IEPR Update describes the plug-in electric vehicle (PEV) market in California, which continues to grow dramatically. In 2013, PEV sales were triple 2012 levels, and as of December 2014 more than 118,000 PEVs were sold in California, representing about 40 percent of national PEV sales. However, the Commission identifies electric vehicle charging infrastructure deployment as an ongoing challenge. Continued strategic investments in charging infrastructure at residential, workplace, multi-unit dwellings, and public sites along with regional readiness plans will be needed to continue advancing the adoption of PEVs. Greater attention to vehicle and electric grid integration will be needed as well.

The 2014 IEPR Update supports LADWP's focus on the electrification of the transportation sector. It also highlights the same recommendations that will be made by Navigant in this Survey; specifically, to develop detailed electric vehicle charging plans and further study vehicle-to-grid integration.

2.2.2.3 The pLAn: Transforming Los Angeles

On the city level, Mayor Eric Garcetti's Sustainable City pLAn describes a vision for Los Angeles to be a leader in the environment. The pLAn is intended to be a comprehensive and actionable directive for the city to move toward a sustainable future, and the Mayor's Office intends to use it as a tool for managing the city. City departments including LADWP will report to the Mayor's Office of Sustainability on progress implementing the pLAn's initiatives. Outcomes set forth in the pLAn relating to the power system are summarized in the table below.

Table 2-2. Outcomes of the Mayor's pLAn

	2017	2025	2035
Local Solar	400 MW 1 MW solar on LA Convention Center	900-1,500 MW	1,500-1,800 MW
Energy Storage	24 MW (excluding the 1,500 MW Castaic Plant)	1,654-1,750 MW (including Castaic)	-
Energy Efficiency	Expand the Better Buildings Challenge to 60 million square feet and avoid 1,250 GWh of energy use	Energy use per square foot 14 percent below the 2013 baseline for all building types	Energy use per square foot 30 percent below the 2013 baseline for all building types

[41]California Energy Commission. 2015. *2014 Draft Integrated Energy Policy Report Update*. Publication Number: CEC-100-2014-001-CMF. Available at: www.energy.ca.gov/2014publications/CEC-100-2014-001/CEC-100-2014-001-CMF-small.pdf.

GHG Emissions	Pathway to achieve 50 percent renewable electricity by 2030	45 percent below 1990 baseline Completely divested from coal power plants	60 percent below 1990 baseline
Electrification	1,000 new publicly available EV charging stations	10 percent of all light-duty passenger vehicles electric or zero emission (~250,000)	25 percent of all light-duty passenger vehicles electric or zero emission (~625,000)[42]

An overall energy efficiency goal also aligns with LADWP's: using energy efficiency to deliver 15 percent of projected electricity needs by 2020 (like the 2014 IRP, the pLAn cites the 2013 Energy Efficiency Potential Study which is described in more detail in Section 2.4.5).

The pLAn also calls for a revised IRP that includes the Mayor's long-term local solar goals. The new scenario (in a 2015 update or 2016 IRP) would include an analysis of reliability, pricing, overall greenhouse gas reductions, future RPS regulatory targets and definitions, and the potential need to shift away from planned investments in fossil fuel power generation. It would incorporate technical studies on increased renewable penetration, integration technologies, energy storage, and transportation electrification. While the 2014 IRP partly meets these expectations, the Department is working on new technical studies to address several of these topics. Navigant agrees that increased renewable penetration and impacts on reliability are particularly important topics and should be top priorities.

Overall, although certain goals (such as the amount of local solar) are not identical between the pLAn and the 2014 IRP, the strategic direction is closely aligned.

2.2.2.4 Los Angeles Public Feedback

As a municipal utility, LADWP is accountable to the people of the City of Los Angeles. Hence, it is also extremely important for the Department to consider feedback from customer-citizens in the adoption of its goals. The comments in the table below were synthesized from public outreach efforts during the formation of the 2014 IRP.

Table 2-3. 2014 IRP Public Outreach Workshop Comments

Integrated Resource Plan	Comments
Natural Gas	Decrease natural gas (environmental concerns and cost risk)
	Consider other technologies to replace natural gas
Renewables	Strong support for 50 percent RPS with increased electrification of the transportation sector and local solar
Energy Efficiency	Maximize Energy Efficiency beyond 2020
	Implement EE educational programs to promote EE
	Provide an EE Home Assessment Program
Local Solar	Streamline the solar permitting process
	Expand community solar
	Increase local solar

[42]There are approximately 2.5 million private cars in Los Angeles, according to the Luskin Center for Innovation at UCLA (innovation.luskin.ucla.edu/news/complete-streets/reports-analyze-electric-vehicle-charging-los-angeles).

Energy Storage	Increase energy storage to assist with renewables
	Strong support for higher RPS cases w/Energy Storage

Of the more vocal stakeholders that participated in the Department's public outreach, environmental concerns were clearly a top priority. Participants pushed LADWP to develop a 50 percent RPS and decrease natural gas generation. The 2014 IRP includes a scenario for 50 percent RPS and also increasing levels of local solar, doing a reasonable job of providing options among which Los Angeles can choose. It did, however, take a more conservative approach to eliminating coal from the generation portfolio and does not have plan to decrease natural gas in its preferred scenario (this would be operationally very difficult based on resource adequacy and flexibility).

Additional commentary concerning the Department's outreach efforts can be found in the IEA Survey's report on Economic Development and Community Outreach.

2.2.3 Conclusions on the Goals and Objectives

Navigant considers the Department's goals in the 2014 IRP to be largely in line with the regulations and policy positions of the State of California and City of Los Angeles, with the exception of the prolonged use of coal as a generation fuel.[43] Most of the resource portfolio in the 2014 IRP is in fact driven by legislative and regulatory mandates in California, as described in the sections above and shown in

Table 2-4, below. Several components, including the 40 percent RPS and increased local solar, are voluntary goals clearly motivated by City policy and stakeholder input.

Table 2-4. Summary of 2014 IRP Goals & Drivers

Goals	Drivers
Eliminate coal by 2025	SB 1368; AB 32; public feedback; core objective (environment)
Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029	Clean Water Act section 316(b)
Reduce GHG emissions 80 percent below 1990 levels by 2050	AB 32; core objective (environment)
Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030	SB 2; AB 32; SB 350; Mayor's pLAn; public feedback; core objective (environment)
Achieve 15 percent energy efficiency improvement by 2020	SB 1037; AB 2021; AB 32; California Energy Commission; Mayor's pLAn, public feedback
Implement 506 MW of demand response capability by 2026	SB 1037; California Energy Commission
Install 178 MW of energy storage by 2021	AB 2514; Mayor's pLAn; public feedback
Increase local solar	SB 1; SB 32; Mayor's pLAn; public feedback
Electrify the transportation sector	California Energy Commission; Mayor's pLAn, public feedback
Invest in the Power System Reliability Program	Core objective (reliability); California Energy Commission

In most areas where the IRP goes beyond state mandates, feedback from Los Angeles citizens appears to be the main driver. In addition to the alignment with City and stakeholder positions, LADWP's voluntary goals all contribute to meeting one important goal: reducing GHG emissions below 80 percent of 1990 levels by 2050.

[43]Several other POUs are actually in the same situation, which will be discussed in a later section (Section 2.4.3).

One critique is that although the Department's goal for energy efficiency meets California's requirement for all cost-effective energy efficiency at this time (as determined by the 2013 cost-effectiveness study) and the Department has met its 10-year reporting requirement to the California Energy Commission, the energy efficiency goal ends in 2020 and makes no progress over the rest of the IRP period. Navigant recommends that a future IRP in the next few years extend energy efficiency goals past 2020—an improvement the Department reports that it is already intending to make. The City may also further consider how the energy efficiency portfolio of programs reflects its goals; for example, typically 20 percent of programs provide 80 percent of energy savings—making them by far the most cost-effective—but other programs are included to serve all customers equitably and support local job creation.

After reviewing the goals and determining them to be in line with regulatory mandates and the City's and public's objectives, Navigant identified potential issues with the Department's ability to accomplish certain goals which will be discussed in Chapter 2.4. One issue is that goals for a high RPS and increased local solar may be at odds with the core objective to maintain power system reliability – at least, without careful implementation and specific, well-executed plans. The reliability impacts of a high penetration of renewables are not yet fully understood. LADWP is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. It is critical that any recommendations from these studies be implemented to ensure system reliability.

Navigant also notes potential tension between the goals of the 2014 IRP and the Department's core objective of competitive electric rates consistent with sound business principles. Specifically, achieving the clean energy transformation while maintaining power system reliability will come at a cost and LADWP's funding requirements are likely to continue to increase. The City of Los Angeles should consider an ordinance requiring a formal update to the IRP to be submitted with any proposed rate action. In addition, the ordinance should call for annual written updates on key performance metrics tied to IRP programs and goals. This should include the costs of changes to LADWP's reliability infrastructure to accommodate the IRP's generation mix. Tying progress and achievements more closely to budget-setting and to rates would establish more transparency and accountability for the IRP.

2.3 IRP Methodology & Modeling

As the comprehensive 20-year roadmap to guide the Power System, it is critical that the 2014 IRP be created using a robust methodology and modeling approach. The decisions leading to the 2014 Recommended Case must be founded in stakeholder input, up-to-date information, and good modeling practices. This section investigates the Department's approach to the formation of the 2014 IRP.

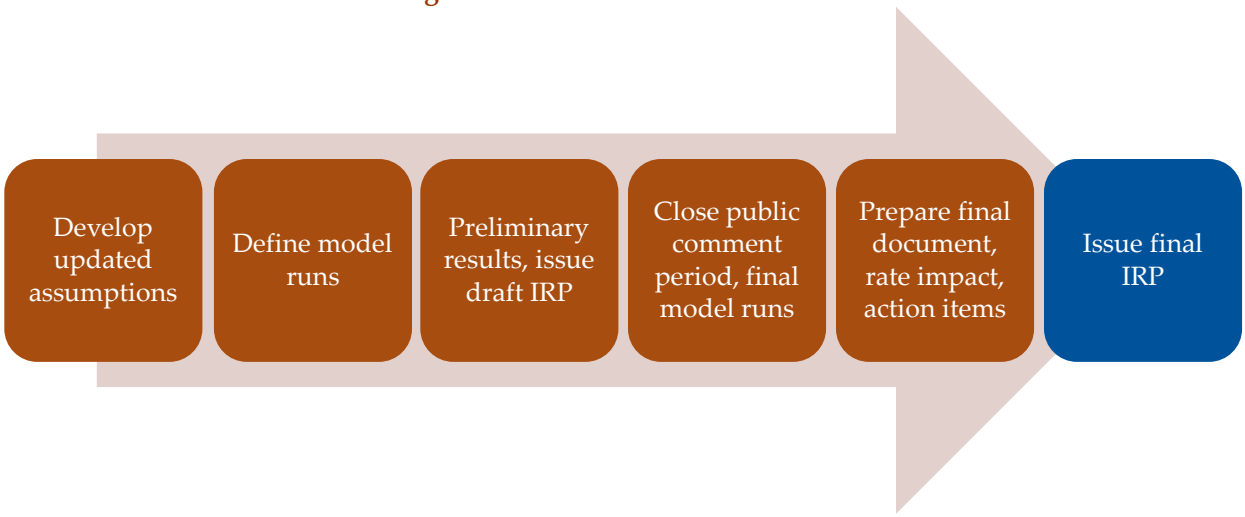
2.3.1 Development Process

LADWP's general sequence to develop the 2014 IRP was the following:

1. Gather stakeholder input
2. Establish clear goals and objectives
3. Identify and improve key assumptions
4. Establish strategic case alternatives
5. Conduct computer modeling of Power System operations
6. Present preliminary findings and gather internal and public comments
7. Recommend and approve a preferred resource case

The figure below depicts LADWP's 2014 IRP process flow chart for the modeling and IRP preparation.

Figure 2-1. LADWP 2014 IRP Process



The IRP is prepared by a group of engineers and professionals dedicated to resource planning who collaborate with numerous work groups and functional areas of the utility, including wholesale marketing, grid operations, renewable procurement, environmental and legislative affairs, and financial services. Modeling assumptions and case alternatives were approved by an internal IRP Steering Committee consisting of Power System Division and Section Managers.

For the 2014 IRP, a new IRP Advisory Committee formed the cornerstone of the public outreach process. Although it did not have approval authority, the Committee played an important role in the development of the resource cases that were evaluated and the final selection of the recommended case. The Committee was facilitated by the Power System and represented a range of stakeholder representatives including: Los Angeles City Council and Mayor's Office, Neighborhood Councils, the environmental community, Premier Account Customers, the business community, and academia. The Ratepayer Advocate of the Office of Public Accountability also attended as an observer. The IRP Advisory Committee met five times during the 2014 IRP process, including a kick-off meeting to begin updating assumptions and a meeting at each of the first three process steps in Figure 2-1, above.

In addition to the IRP Advisory Committee, the Department held three public outreach workshops in October and November 2014. The draft IRP was also made available for public comment on the LADWP website through the end of November 2014.

From the 2013 IRP development process to 2014, LADWP made several changes, including:

- New IRP Advisory Committee
- Energy Efficiency Potential Study (2013) recommendation adopted
- New Demand Response Implementation Plan (2014)
- Energy storage targets adopted
- New Power System Reliability Program
- Updated electric vehicle load growth based on the California Energy Commission's 2013 Integrated Energy Policy Report
- Updated natural gas prices and renewable energy costs

- Revised strategic case scenarios based on input from the 2014 IRP Advisory Committee

It is considered best practice for an IRP process to include meaningful stakeholder engagement; the utility should create and share the resource plan with stakeholders.[44] Convening a stakeholder advisory group, holding public meetings that are open to all interested parties, and providing a public draft are all elements of this process. These changes demonstrate the Department's new alignment with best practice in this regard.

2.3.2 Resource Cases

New resource cases in the 2014 IRP include higher levels of renewables, advanced energy efficiency, increased local solar, and greater electrification of the transportation sector. The IRP also includes an expanded Power System Reliability Program to incorporate not only electric distribution, but also generation, transmission, and substations.

The following are the resource cases in the 2014 IRP, based on the Department's determination of resource cases to meet goals, regulatory mandates, and power system requirements:

Early Coal Replacement

1. Navajo Generating Station (NGS): 2015 (early) or 2019 (mandatory)
2. Intermountain Power Project (IPP): 2025 (early) or 2027 (mandatory). Not considering 2020 in this IRP.

Higher Levels of Renewable Portfolio Standards

1. 33 percent by 2020 and maintained through 2030
2. 40 percent by 2030
3. 50 percent by 2030

Advanced Energy Efficiency

1. 10 percent EE savings by 2020
2. 14.8 percent EE savings by 2020

Higher Levels of Local Solar

1. 500 MW
2. 800 MW
3. 1,000 MW
4. 1,200 MW

Electrification of the Transportation Sector

1. Base case: California Energy Commission's 2013 Integrated Policy Report (127,000 plug-in electric vehicles by 2020 and 290,000 by 2030)
2. Medium case: 150 percent of the base case (190,000 plug-in electric vehicles by 2020 and 435,000 by 2030)

[44]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013.

3. High case: 200 percent of the base case (253,000 plug-in electric vehicles by 2020 and 580,000 by 2030)

Alternative strategic cases assess different replacement options for coal-fired generation, as well as different projected levels of renewable portfolio standard (RPS), energy efficiency, and local solar. Cases with higher levels of RPS include high fuel switching/electrification of the transportation sector with higher expected load growth.

Candidate portfolios were modeled and case results were analyzed and compared to evaluate environmental benefits and cost impacts (total million metric tons of CO_2 emissions and the average incremental dollars per megawatt-hour cost). High and low scenarios based on fuel prices were also modeled for several cases, including the final recommended case, to quantify the risk associated with fuel price volatility.

2.3.3 Modeling Assumptions

2.3.3.1 Resource Model

The 2014 IRP uses system modeling tools to analyze and determine the long-term economic, environmental, and operational impact of alternative resource portfolios by simulating the integration of new resource alternatives within the existing mix of assets and providing the analytic results to inform the selection of a recommended case.

LADWP chose a widely used and industry accepted hourly chronological unit commitment and dispatch model to simulate the power system under different scenarios: Planning & Risk (PaR) model using the PROSYM algorithm.

2.3.3.2 Load Forecast

The IRP's load forecast is a particularly important assumption because it directly impacts electricity generation required over the 20-year timeframe. Navigant performed a benchmarking study comparing LADWP's load forecast with other California utilities. The analysis includes Pasadena Water and Power (PWP), Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), Southern California Edison (SCE), Sacramento Municipal Utility District (SMUD), and PacifiCorp in its California service territory.

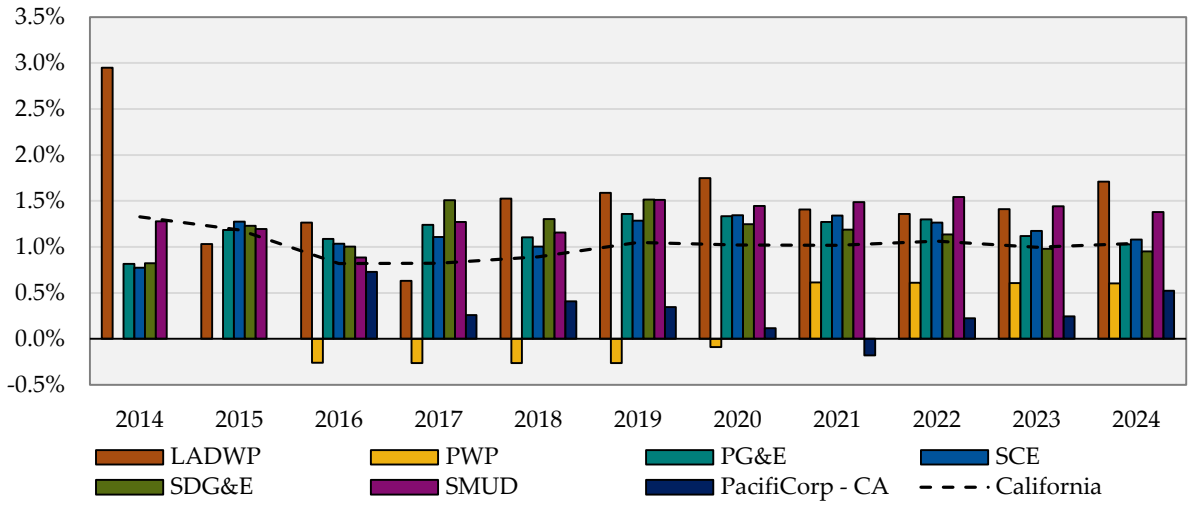
The Department's forecasted annual load growth (without energy efficiency measures) is on par with the California IOUs and particularly SMUD for the 2014-2024 period. However, Pasadena Water and Power's growth and PacifiCorp's California growth are both significantly lower, as shown below.

Table 2-5. Annual Load Growth Rate for the 2015-2024 Period (No Energy Efficiency)

Annual Growth Rate	LADWP	PWP	PG&E	SCE	SDG&E	SMUD	PacifiCorp (CA)
2015-2024	1.4%	0.1%	1.2%	1.2%	1.2%	1.3%	0.3%

The peer utilities' projected annual load growth rate is shown in Figure 2-2, below. The overall growth rate for California is estimated by the California Energy Commission to be approximately 1.0 percent per year through 2024. LADWP is consistently slightly above this rate, as are SMUD and the IOUs.

Figure 2-2. Annual Energy Load Growth for California Utilities (no Energy Efficiency)

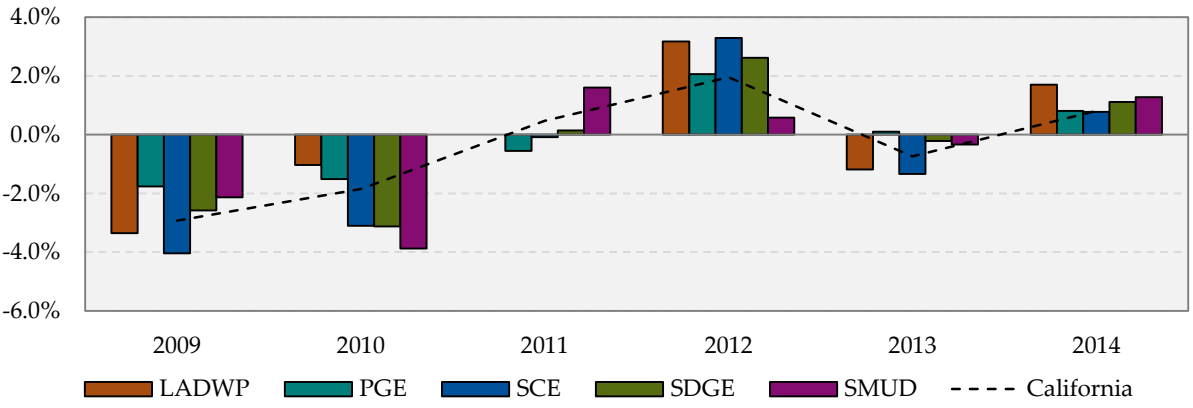


Sources: LADWP, Pasadena Water and Power, California Energy Commission, PacifiCorp[45]

The Department reported that the unusually high growth in 2014 was due to an increased commercial and residential customer count, which was changed by the Load Forecast group based on the forecasted population growth of Los Angeles.

LADWP has historically tracked closely with the IOUs and SMUD. And although this set of utilities sees consistent annual load growth in the future, they experienced similar variations in growth in the last several years as shown in Figure 2-3.

Figure 2-3. Annual Net Energy for Load Growth for California Utilities



Sources: LADWP 2014 IRP Appendix A – Net Energy for Load, California Energy Commission Demand 2014-2024 Baseline Forecast, Net Energy for Load (Mid)
Note: LADWP data was recorded on a Fiscal Year basis.

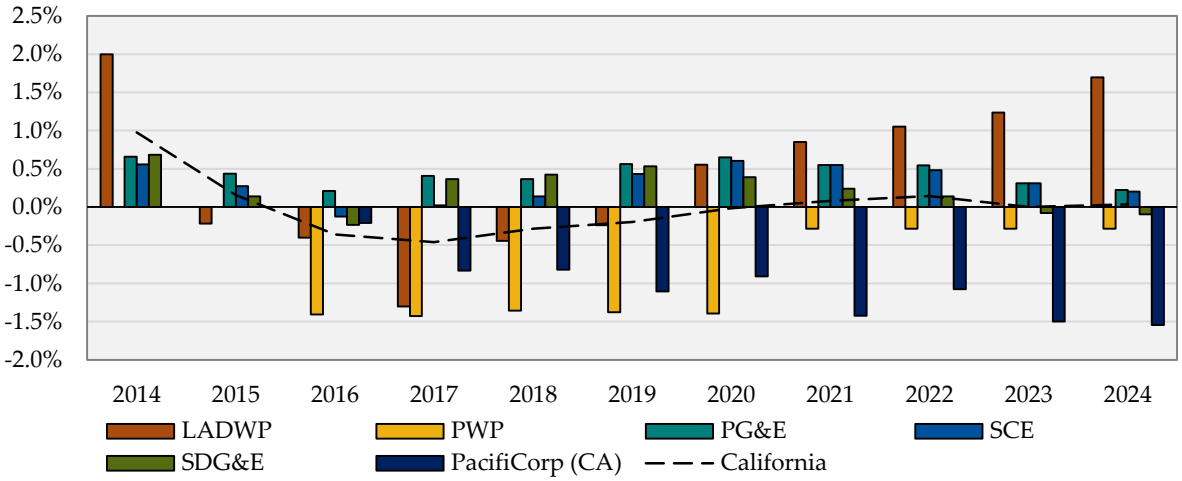
[45]LADWP 2014 IRP, Appendix N, p. N-25; PWP 2015 IRP Load Forecast Update, p. 1; California Energy Commission, California Energy Demand Forecast, 2014-2014, Form 1.1c (Mid Demand Baseline, no AAEE Savings); PacifiCorp 2015 IRP, Volume II, p. 3. The IOUs and SMUD are included in the California Energy Commission forecast.

LADWP's projected annual load growth rate with energy efficiency measures is also fairly consistent with the IOUs in California for the future 2015-2020 period; however, the Department's energy efficiency forecast is held constant after 2020. Consequently, the load growth rate is negative from 2014 to 2019 and positive from 2020 to 2024. PWP and PacifiCorp's load models have negative growth rates for the entire period (2014-2024). If the Department extended energy efficiency targets, it would likely be more in line with PWP for the entire period.

Table 2-6. Annual Load Growth Rate (with EE) for the 2015-2024 Period (Energy Efficiency)

Annual Growth Rate	LADWP	PWP	PG&E	SCE	SDG&E	PacifiCorp (CA)
2015-2024	0.3%	-0.9%	0.4%	0.3%	0.2%	-1.0%

Figure 2-4. Annual Energy Load Growth for California Utilities (with Energy Efficiency)



Sources: LADWP, Pasadena Water and Power, California Energy Commission, PacifiCorp[46]

To more accurately forecast future growth past 2020, LADWP should extend energy efficiency estimates through the entire IRP period. With its current inputs, the model unrealistically ends energy efficiency improvements in 2020 and load growth noticeably goes positive at this time. The energy efficiency goal is further discussed in Section 2.4.5.

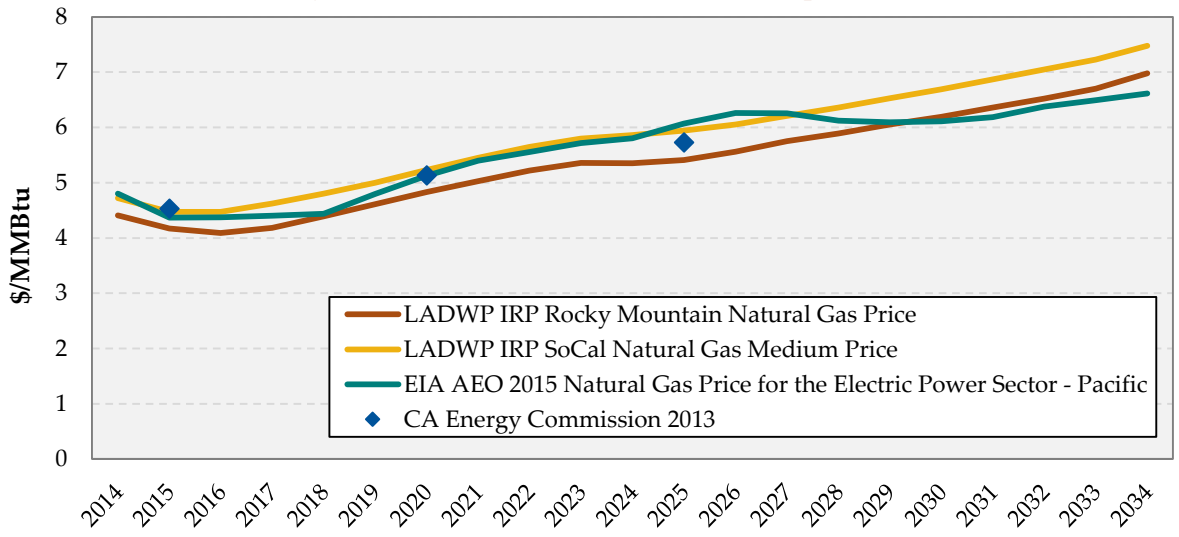
Navigant also recommends that the Department consider including a load forecast sensitivity analysis in the next iteration of the IRP, including high and low load scenarios. The Long Term Procurement Plans (LTPPs) filed by California IOUs include modeling similar to an integrated resource plan, and include a variety of sensitivity testing including at least three load scenarios. PacifiCorp also uses base, low, and high load forecast sensitivity analyses in its IRP. This is a good practice for LADWP to adopt in order to show a more complete range of future scenarios.

[46]LADWP 2014 IRP, Appendix N, p. N-25.; PWP 2015 IRP Load Forecast Update, p. 1.; California Energy Commission, California Energy Demand Forecast, 2014-2014, Form 1.1c (Mid Demand Baseline, Mid AAEE Savings); PacifiCorp 2015 IRP, Volume II, p. 16. The IOUs are included in the California Energy Commission forecast. SMUD does not have a publicly available IRP for recent years.

2.3.3.3 Fuel Prices

Navigant compared LADWP's natural gas price forecasts to the Energy Information Administration's (EIA) Energy Outlook for the Pacific region and the California Energy Commission 2013 Integrated Energy Policy Report. The Department's forecasts are consistent with both sources for the 2014-2024 period, as shown in the figure below.

Figure 2-5. Natural Gas Price Forecast Comparison



Sources: LADWP 2014 IRP, Appendix N; EIA Annual Energy Outlook 2015 – Pacific Region; California Energy Commission Integrated Energy Policy Report 2013 – Reference Case.

The Department did not include coal price projections in the published 2014 IRP report; however, the model includes coal prices and further includes a sensitivity analysis for both natural gas and coal prices. LADWP communicated to Navigant that coal prices were omitted from the document because coal supplied to the Intermountain Power Project is purchased on the open market in the Intermountain West region from various contracts between the Intermountain Power Agency (the owner) and the coal companies. However, the Department did share the aggregated, preliminary actual delivered cost of coal for FY 2014-15, which was $47.25 per ton. According to the EIA, the price of coal shipments to the electric power sector in Utah in 2013 was $45.17, in line with the Department's price.[47]

2.3.3.4 Renewable Costs

LADWP used a base renewable portfolio levelized cost of energy (LCOE) of $92 per MWh, based on recently signed power purchase agreements for large central solar, geothermal, and wind projects. Navigant compared the Department's LCOE inputs to Lazard's subsidized LCOE analysis. LADWP's LCOE is consistent with Lazard for most resources, but for some is substantially higher.

Table 2-7. Levelized Cost of Energy Comparison ($2014/MWh)

Resource	2014 IRP	Lazard LCOE
Solar Photovoltaic - PPA	$77	$72 - $86

[47] www.eia.gov/coal/data.cfm#prices.

Solar Photovoltaic - LA Solar	$143	$72 - $86
Solar Photovoltaic - Owens	$130	$72 - $86
Solar Feed-In-Tariff (C&I)	$161	$126 - $177
Wind	$111	$37 - $81
Geothermal	$101	$89 - $142
New Combined Cycle Gas	$91	$52 - $96
New Simple Cycle Gas	$241	$165 - $242

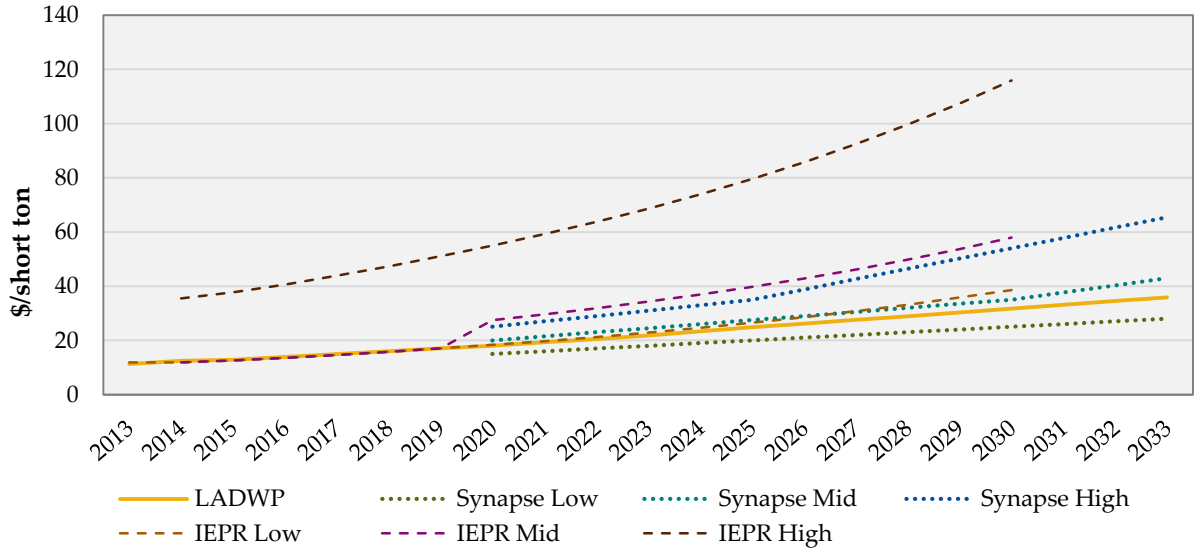
Sources: LADWP 2014 IRP, Lazard[48]
Note: Low and high end levelized cost of energy corresponds with +/-25 percent fuel price fluctuations.

Wind projects and LADWP-built and owned solar PV have much higher LCOEs than Lazard's estimates. These impact the generation portfolio used in the IRP's recommended scenario and drive up overall costs; however, the high LCOE for wind may be attributable to older projects, as wind was the Department's primary renewable resource in past years. LA Solar and Owens solar are assumed to be LADWP-built and owned, and also show high LCOEs. While these projects are not as cost-effective as third-party PPAs, the Department has a goal to own at least 50 percent of its eligible renewable energy resource portfolio, to maintain full control of its assets and avoid market price fluctuations. Navigant believes the City should revisit this policy as it may be contributing to higher rates and unfavorable work rules that further escalate costs.

2.3.3.5 Carbon Prices

Navigant benchmarked LADWP's carbon price assumptions against an industry expert forecast range,[49] shown in the figure below.

Figure 2-6. CO_2 Cost Forecast Benchmarking



[48]LADWP 2014 IRP, p. 121; Subsidized LCOE, Lazard's Levelized Cost of Energy Analysis – Version 8.0, 2014, p. 4.
[49]Based on an analysis of proposed federal regulatory measures, auctions under California's AB 32 Cap-and-Traded program, and 115 recent utility filings.

Sources: LADWP 2014 IRP, Appendix N; Synapse Energy Economics, Inc.[50]; California Energy Commission[51]
Note: The Synapse forecast begins in 2020 assuming the federal Clean Power Plan compliance is in effect.

On August 16, 2013, the California Cap-and-Trade auction price was $12.22 per short ton. On August 18, 2014, the California Cap-and-Trade auction price was $11.50 per short ton. These numbers are similar to LADWP's modeled costs. LADWP's assumptions are in line with Synapse's mid scenario and the California Energy Commission's low preliminary IEPR forecast.

2.3.3.6 Risk Analysis

The 2014 IRP quantifies risk associated with natural gas price volatility by modeling high and low fuel price scenarios for each resource case. Specifically, the Department integrates its natural gas hedging program into its resource portfolio strategy by employing physical and financial hedges. These hedging strategies mitigate risk associated with replacing a significant portion of coal resources with natural gas. While fuel price risk is critical to model optimization, other risks should be considered. For example, PacifiCorp incorporates stochastic risk in its modeling process through Monte Carlo simulations that analyze random samplings of stochastic variables such as load, natural gas and wholesale electricity prices, hydro generation, unplanned thermal outages. PacifiCorp also assesses deterministic risk by modeling the impact of various planning assumptions on top performing resource portfolios. These additional analyses ensure that risk metrics are considered when selecting a resource portfolio.

2.3.4 Modeling Methodology Benchmarking

The Department's planning methodology is generally similar to that of other utilities, based on the following process:

- Identify model assumptions (e.g. fuel prices, load forecasts, coal replacement, RPS goals, etc.).
- Evaluate and rank resource possibilities based on lowest cost.
- Run model and assess reliability, resource adequacy, GHG emissions, and economic cost/benefit.
- Perform sensitivity analyses associated with various natural gas and coal prices.
- Incorporate public input.
- Recommend strategic case.
- Complete rate analysis and long-term planning.

Good practice in integrated resource planning includes detailed consideration of the following elements: load forecast, reserves and reliability, demand-side management, supply options, fuel prices, environmental costs and constraints, evaluation of existing resources, integrated analysis, time frame, uncertainty, valuing and selecting plans, action plan, and documentation.[52] The 2014 IRP includes all of these elements to a certain extent; however, it can still benefit from examining the IRP practices of other utilities. Arizona Public Service (APS), Public Service Company of Colorado (PSCC), and PacifiCorp produce examples of IRP best practice.

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[50]Synapse 2015 CO_2 price projections in 2014 dollars per short ton CO_2. "2015 Carbon Dioxide Price Forecast," Synapse Energy Economics, Inc., March 3, 2015 (www.synapse-energy.com/sites/default/files/2015%20Carbon%20Dioxide%20Price%20Report.pdf).
[51]Preliminary 2015 IEPR Nominal Carbon Price Projections for GHG emitting resources in California only.
[52]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013.

Like LADWP, customer surveys showed that APS customers "favored an increase in the use of renewable energy resources, such as solar and wind, and were interested in both the environmental impacts and reliability of energy choices." APS used the PROMOD IV production simulation model, and included several sensitivity scenarios as well as its four resource portfolio options. Specifically, APS tested high and low assumptions for model variables such as fuel prices, production and investment tax credits for renewable resources, and monetization of SO_2, NO_x, PM and water. APS has a very clear outline of the four portfolios considered, including capacity of each type of resource in 2027 and its percentage of the energy mix. LADWP's IRP is quite similar to APS.

The PSCC 2011 IRP includes the retirement of base-load coal generation, fuel switch for coal to natural gas, and additional wind and solar. These changes are similar to those recommended and undertaken by LADWP. In addition to its least-cost baseline case, the utility designed eight alternative plans that evaluate increasing amounts of renewable and distributed generation resources. These portfolios were evaluated using the Strategic model form 2011-2050. PSCC also evaluated several sensitivity scenarios, including alternate prices of CO_2 emissions, natural gas prices, and level of sales. While the 2014 LADWP IRP model included sensitivity scenarios for various natural gas and coal prices, the next iteration should include additional sensitivity analyses. IRP best practice indicates that at least two additional load forecasts (low and high) should be included to account for load growth uncertainty. In interviews, the Department indicated that there are plans for adding sensitivity analysis in future IRPs.

In integrated resource planning, utilities often use resource optimization models to create resource portfolios that identify the number and type of resources to be added over time to make up the least-cost plan. PacifiCorp uses System Optimizer, a comprehensive portfolio modeling system with 67 input scenarios. This model determines capacity expansion plans, runs product cost simulations for each optimized portfolio, and performs risk assessments on these portfolios. Top resource portfolios consider both the lowest average portfolio cost and worst-case portfolio cost resulting from simulation runs. LADWP should incorporate a resource optimization model (with well-supported inputs) for its next IRP iteration. This would help the Department more fully evaluate alternate resource portfolios against a least-cost option, whereas the 2014 IRP evaluates alternate resource portfolios against the pre-designed base case, which does not represent the least-cost portfolio from a modeling standpoint. The lack of focus on least-cost resources is one of the more significant issues with this IRP and could create a false impression that the Department is insufficiently concerned with cost in its decision-making.

Sensitivity cases for the PacifiCorp IRP model include load forecast, distributed generation, energy storage, production tax credits, high CO_2 prices, solar resource costs, Class 3 DSM, and 111(d) restrictions. In addition to base, low, and high load forecast sensitivity analyses, PacifiCorp runs a 1-in-20 extreme weather scenario. High and low distributed generation sensitivities adjust annual reductions in technology costs, technology performance levels, and retail electricity rates. Energy storage sensitivities force large scale energy storage into the resource portfolio. In total, PacifiCorp defines 15 sensitivity cases in its IRP.[53] As mentioned above, the Department should investigate increasing its model sensitivity testing. PacifiCorp also uses an in-house spreadsheet based modeling tool, the 111(d) Scenario Maker, to facilitate modeling of the EPA's proposed rule to regulate CO_2 emissions from existing generating units. However, PacifiCorp does not include an analysis of the company's coal fleet, which makes up almost two-thirds of its generation. It also does not account for the large increase in

[53] 2015 PacifiCorp IRP, Vol. I.

operating costs due to compliance obligations. LADWP reported reading PacifiCorp's IRP and identifying ideas for improvements—this is good awareness of other practices, although it is not a formalized activity in the group.

Navigant also compared the LADWP IRP to the assumptions used in the Long Term Procurement Plans (LTPPs) filed by California IOUs. These plans include modeling similar to LADWP's IRP. The LTPPs include a variety of sensitivity testing including at least three load scenarios, five EE saving scenarios, and three solar PV projections, among others. The LTPP uses an RPS Calculator that incorporates four weighted policy priority metrics: permitting (10%), lowest cost (10%), least environmentally harmful (10%), and commercial interest (70%). A Scenario Tool is used to create RPS portfolios based on the RPS Calculator results. The LTPP identifies seven RPS portfolios and each portfolio is modeled twice to account for a 2024 target year and a 2034 target year.[54]

Overall, the Department evaluated fewer scenarios and metrics in its analysis than other utilities, including IOUs and those considered to be examples of IRP best practices. More scenarios will enable the Department to prepare for unexpected economic, environmental, and political changes. In addition, optimized portfolios would help ensure that LADWP identifies the lowest cost portfolio. Navigant recommends in future IRPs that the Department take these steps to increase the rigor and depth of its analysis. In addition, we recommend including financial modeling for the full economic costs of owning resources versus contracting via PPAs, to increase the transparency around the costs of these decisions.

2.3.5 Conclusions on IRP Methodology & Modeling

LADWP is in line with IRP best practices in a number of areas. The Department has improved its IRP development process with regard to stakeholder engagement; for the 2014 IRP, the Department convened a stakeholder advisory group, held public meetings open to all interested parties, and provided a public draft. The Department also uses an accepted hourly chronological unit commitment and dispatch model to simulate the power system under different scenarios. And for most inputs to the model, assumptions are in line with peers and industry standards.

Navigant recommends that LADWP consider adding the following items to its next iteration of the IRP:

- Load forecast sensitivity analyses.
- Energy efficiency assumptions beyond 2020.
- Additional scenarios and scenario optimization to identify the lowest cost portfolio.
- Financial modeling for the full economic costs of owning resources versus contracting via third-party PPAs.

[54]Further information on LTPP planning assumptions and scenarios available at: docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M091/K181/91181771.PDF.

2.4 The 2014 IRP Recommended Strategic Case

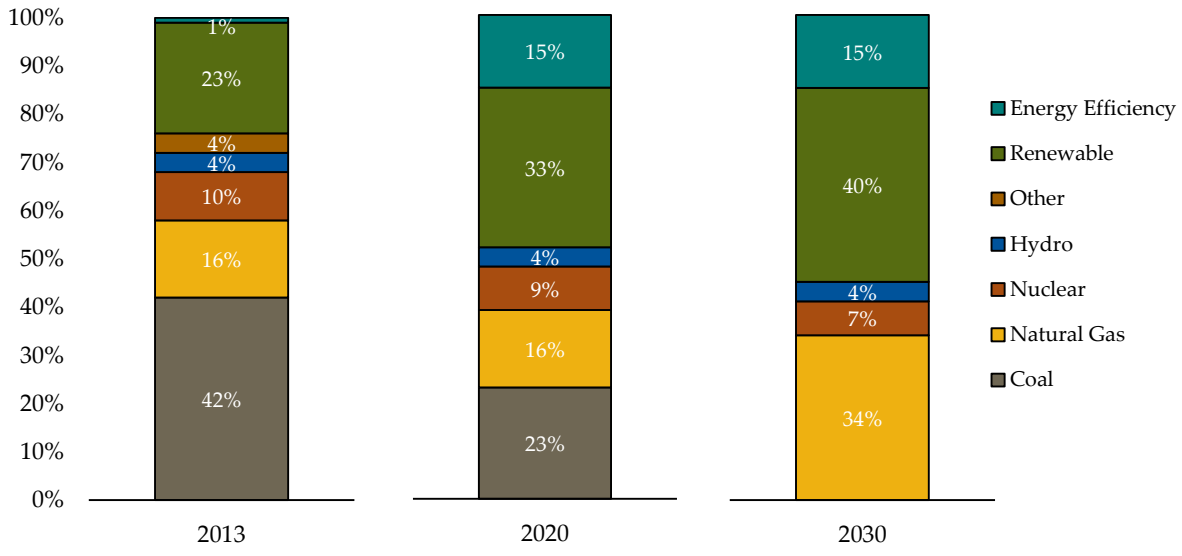
Here Navigant presents its evaluation of LADWP's Recommended Strategic Case, representing the preferred mix of power generation and related resources including both supply and demand-side resources. The 2014 Recommended Strategic Case comprises the scenarios in the following table.

Table 2-8. The 2014 IRP Recommended Case

Attribute	Case	Year
Coal Replacement	Navajo pre-contract end date divestiture IPP pre-contract end date replacement	2015 2025
Energy Efficiency	15 percent less electricity usage (2010 baseline); "advanced"	2020
RPS	25 percent of retail electricity sales 33 percent of retail electricity sales 40 percent of retail electricity sales	2016 2020 2030
Local Solar	800 MW	2023
Transportation Electrification	2,344 GWh for 580,000 electric vehicles; "high"	2030
Demand Response	506 MW	2026
Energy Storage	178 MW	2021

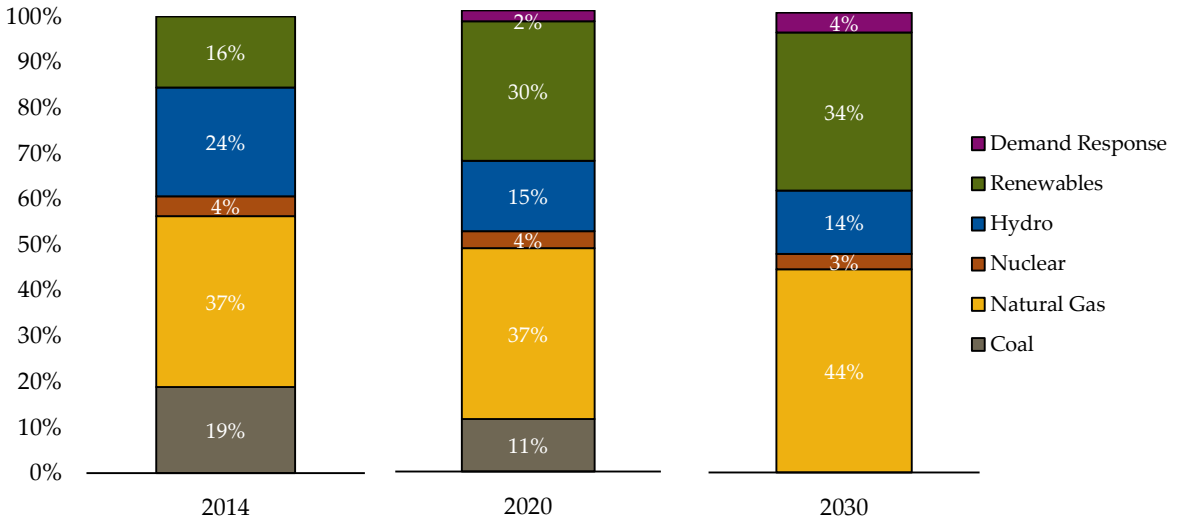
The Recommended Strategic Case includes a decrease in GHG emissions 60 percent below 1990 levels by 2030 (74 percent after including transportation sector emissions savings from fuel switching/electrification). LADWP's smart grid activities also impact the portfolio and are discussed in this chapter. Under the Recommended Case, the energy mix and portfolio resource capacity will change significantly as shown in Figure 2-7 and Figure 2-8.

Figure 2-7. LADWP 2014 IRP Recommended Energy Mix



Source: Navigant analysis of LADWP 2015 Briefing Book.

Figure 2-8. LADWP 2014 IRP Recommended Portfolio Capacity



Source: Navigant analysis of LADWP 2014 IRP and 2014 IRP model data.

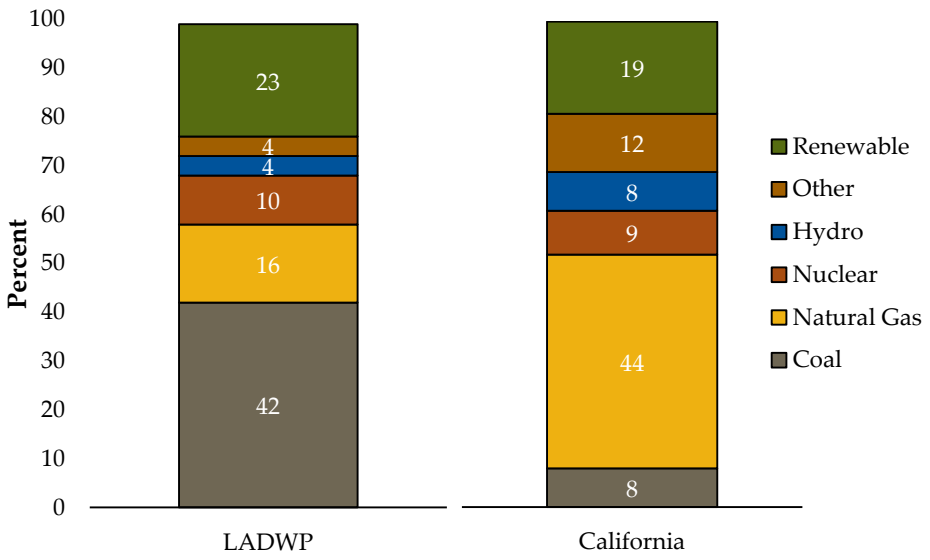
The remainder of this section is divided into the individual components of the Recommended Strategic Case, in the following order:

1. Overall Resource Mix
2. Greenhouse Gas Emissions
3. Once-Through Cooling
4. Coal Replacement
5. Energy Efficiency
6. Renewable Portfolio Standard
7. Local Solar
8. Electrification of the Transportation Sector
9. Demand Response
10. Energy Storage
11. Smart Grid

2.4.1 Overall Resource Mix

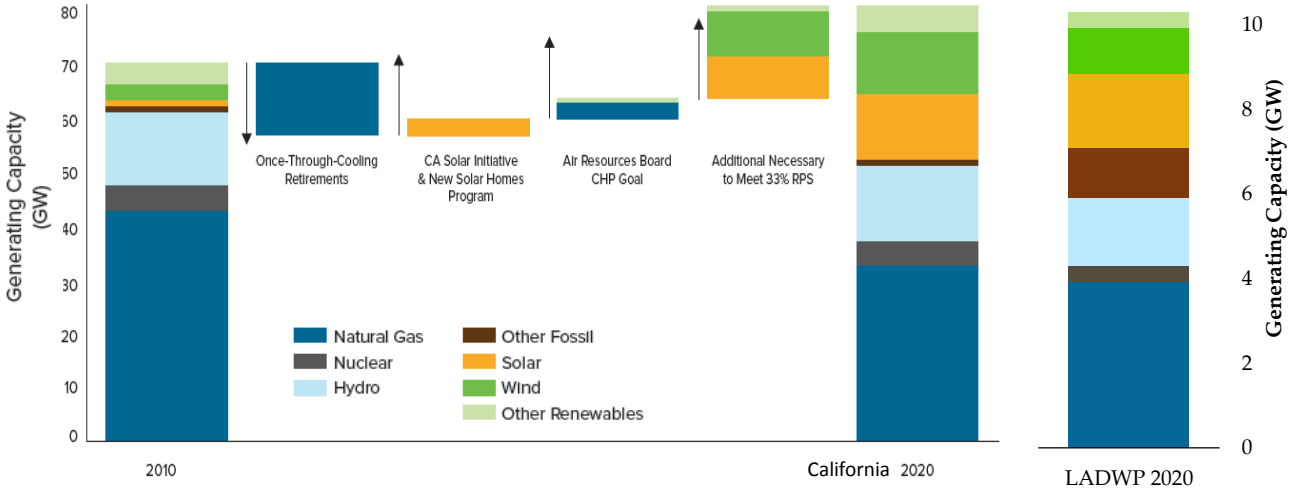
In 2013, LADWP was slightly ahead of California as a whole in terms of renewable energy, but still relied heavily on coal for its power supply (Figure 2-9). Figure 2-10 shows the change in generation capacity expected to occur across the state by 2020. These changes to installed capacity apply largely to LADWP and are reflected in LADWP's projected energy mix as well, though with a lag due to Los Angeles' dependence on coal-fired generation, which will not be entirely replaced until 2025 according to the Recommended Strategic Case.

Figure 2-9. 2013 Energy Mix Comparison, LADWP and California



Sources: LADWP 2015 Briefing Book and California Energy Commission[55]
Note: LADWP mix excluding energy efficiency. California in-state generation is reported generation from units 1 MW and larger, data from QFER and SB 1305 Reporting Requirements.

Figure 2-10. 2020 Generating Capacity Comparison, California and LADWP

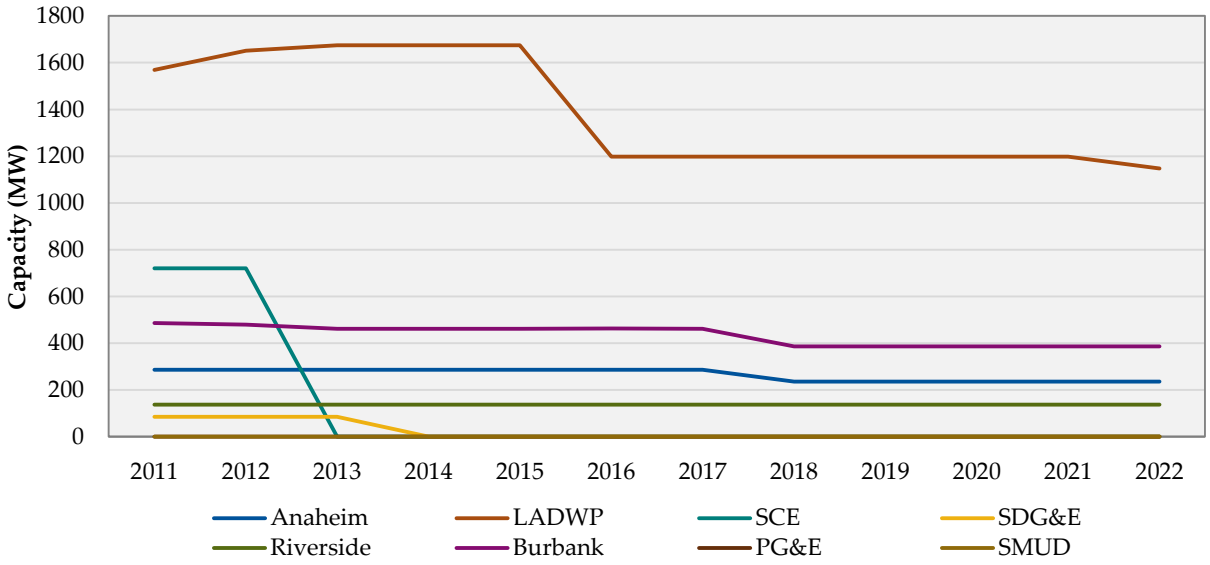


Sources: Rocky Mountain Institute,[56] *LADWP 2014 IRP, LADWP IRP model data*

[55]Total Electricity System Power, Energy Almanac, California Energy Commission (energyalmanac.ca.gov/electricity/total_system_power.html).
[56]"Net Energy Metering, Zero Net Energy and the Distributed Energy Resource Future," Rocky Mountain Institute, 2012 (www.rmi.org/Content/Files/RMI_PGE_NEM_ZNE_DER_Adapting_Utility_Business_Models_for_the_21st__Century.pdf.pdf).

However, the 2014 IRP eliminates coal completely by 2030 and recommends a higher RPS. The 2030 resource mix reasonably represents LADWP's interest in becoming a leader in clean energy without deviating dramatically from the rest of the state. Other California utilities historically used less coal-fired capacity, and some–like SCE–divested sooner than LADWP (Figure 2-11).

Figure 2-11. California IOU and Large POU Coal Capacity



Source: California Energy Commission Power Almanac[57]
Note: LADWP's coal capacity includes the maximum capacity authorized from the Intermountain Power Project.

However, several of the POUs are close or equal to LADWP's coal percentage in terms of energy generation. Burbank and Anaheim each have coal-fired generation making up approximately 35 percent of the portfolio. Like LADWP, the IPP coal plant supplies these utilities and they are in the same contract situation; coal power in California will decrease dramatically when IPP is no longer used for coal.

2.4.2 Greenhouse Gas Emissions

The California Global Warming Solutions Act of 2006 requires LADWP to reduce GHG emissions to 1990 levels by 2020.

In the 2014 IRP, LADWP reports having already accomplished the goal of reducing its GHG emissions below 1990 levels; specifically, 20 percent lower than 1990 levels with emissions of 14.3 MMT in 2013 (compared to 17.9 MMT in 1990). Achievements so far are credited to the elimination of power from the Mojave and Colstrip coal plants and the completed repowering of units at the Haynes and Valley generation stations, as well as the increase in renewable generation.

2.4.2.1 Approach to Greenhouse Gas Emissions

One of the major focus areas of the 2014 IRP is evaluating multiple resource strategies to reduce GHG emissions. There are no alternate cases for GHG emissions reduction targets because they are mandated

[57]Electricity Supply Forms (S-2 and S-5) submitted by Load Serving Entities for the California Energy Commission 2009, 2011, and 2013 Integrated Energy Policy Reports available at: energyalmanac.ca.gov/electricity.

by state law. Accordingly, the resource cases are designed to help achieve the long-term GHG emissions reduction target (the near-term target has already been met). The Recommended Strategic Case is considered to be the scenario that makes the most progress towards the 2050 target while maintaining reasonable costs and system reliability.

2.4.2.2 Greenhouse Gas Emissions Outlook

The 2015 Briefing Book reports that LADWP has now achieved CO_2 emissions 23 percent below 1990 levels and expects to be 55 percent below 1990 levels in 2025 and 60 percent below 1990 levels by 2030. Although LADWP's 2013 emissions were slightly higher than a targeted emissions allowance from the California Air Resource Board (CARB), the IRP Recommended Case reduces emissions below the allowance in 2015 (largely due to divesting from Navajo Generating Station). If LADWP is able to promote the electrification of the transportation sector and receive the associated GHG savings credit, by 2034 it theoretically could be within less than 1 MMT of meeting the 2050 goal. This depends in large part on the rapid electrification of the transportation sector, which is not the most robust foundation for GHG projections at this time.

The Recommended Case is similar to the IRP Case 4 (early Navajo divestiture in 2015, early IPP replacement in 2025, 40 percent RPS, advanced energy efficiency, and high electrification of the transportation sector), which is shown in the 2014 IRP to approach the 80 percent below 1990 emissions goal rapidly before 2026, but then cease to improve (and even increase slightly). In later years, the IRP does not lay out a plan yet to bridge the remaining emissions reduction. One missing element is the lack of energy efficiency improvements beyond 2020. Fortunately, there is ample time to create a plan for the full 80 percent reduction that should be reflected in future IRPs.

2.4.3 Once-Through Cooling

Once-through cooling (OTC) is regulated by the Environmental Protection Agency (EPA) Clean Water Act section 316(b) and administered in California by the California State Water Resources Control Board (State Water Board). LADWP is required to eliminate OTC in its coastal power plants by 2029 (Scattergood Generating Station in Playa Del Rey, Haynes Generating Station in Long Beach, and Harbor Generating Station in Terminal Island).

Additionally, the SCAQMD issued a Stipulated Order for Abatement[58] that requires LADWP to reduce local air emissions through repowering of its less efficient in-basin generating facilities (Haynes and Scattergood Generating Stations). Repowering is being conducted in-sync with the elimination of OTC.

2.4.3.1 Approach to OTC

Like the GHG emissions mandate, LADWP has only one allowable OTC scenario and did not model alternatives in the 2014 IRP.

The State Water Board implemented the "Use of Coastal and Estuarine Waters for Power Plant Cooling" policy, effective on October 1, 2010, which established technology-based standards to reduce the harmful

[58]A Stipulated Order for Abatement requires a company operating out of compliance to take specific actions or to shut down its operations. This has the same legal effect as a regular Order for Abatement, with two differences: the Hearing Board is not required to find a violation of any rule or regulation, and the conditions of the order are agreed upon in advance by the parties (www.aqmd.gov/home/about/hearing-board/about-orders-for-abatement).

effects associated with cooling water intake structures on marine and estuarine life.[59] The policy was amended to include existing power plants on June 18, 2013.[60] The Clean Water Act Section 316(b) originally required the elimination of OTC by 2020, while LADWP had sought a deadline of 2045 based on its preferred replacement cycle. The schedule was negotiated to adapt to the Department's unique system configuration and reliability requirements (no unit can be removed from service before its replacement is online, necessitating a step-wise process), which resulted in an extension to 2029 under the following schedule:

Table 2-9. LADWP's Once-Through Cooling Reduction Schedule

Station Units	Year	OTC Reduction
Haynes 5, 6	2013	42%
Scattergood 3	2015	56%
Scattergood 1, 2	2020	68%
Haynes 1, 2	2023	82%
Harbor 1, 2, 5	2026	87%
Haynes 8, 9, 10	2029	100%

Note: Percentage reduction is compared to 1990 levels. The percentage is eliminated OTC generation as a percentage of total OTC generation; 100 percent denotes full compliance.

The Power System internally tracks OTC and repowering projects in detail according to this schedule. It also reports to the State Water Board on how the schedule and progress is expected to impact grid reliability.

2.4.3.2 OTC Outlook

So far, the Department reports being on schedule. Haynes Units 5 and 6 began commercial operation in June 2013. The Haynes Generating Station Repower Project replaced two older, inefficient large electric generating utility boilers (Units 5 and 6) with six smaller, more efficient gas turbines, along with OTC elimination (before the OTC compliance date of December 31, 2013). From FY 2012-13 to FY 2013-14, LADWP did a commendable job of finishing the project under budget.

Scattergood 3 broke ground in June 2013 and is expected to reach substantial completion on schedule in December 2015. The Scattergood Generating Station Repower Project will replace the existing 460 MW boiler generator Unit 3 (in operation since 1974) with a new, more efficient gas turbine system which will also reduce the generating capacity of the existing boiler. The project will be equipped with the Best Available Control Technology (BACT) air pollution control equipment. The SCAQMD issued its notice of intent to issue permits for the Scattergood Repower Projects on December 17, 2012.[61] The Unit 3 project, along with OTC elimination, is scheduled for December 31, 2015 with final commissioning in January 2016.[62] Budget information provided by LADWP indicates the project is below the original budget so far (possibly based on procurement and labor schedule modifications).

[59] www.swrcb.ca.gov/water_issues/programs/ocean/cwa316

[60] www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_2014.pdf

[61] Notice of Intent to Issue Permits Pursuant to AQMD Rules 212, 1710, 1714, and 3006. South Coast Air Quality Management District, December 17, 2012.

[62] "L.A.'s Power Transformation." 2014 Integrated Resource Plan Public Outreach Presentation. Los Angeles Department of Water and Power, October/November 2014.

2.4.4 Coal Replacement

SB 1368 requires LADWP to eliminate its two coal plants from the generation portfolio in 2019 and 2027. LADWP's Recommended Strategic Case divests from Navajo Generating Station in 2015 and converts the IPP contract to natural gas by 2025. The 2014 IRP describes the primary considerations for accelerating compliance with SB 1368. LADWP must:

- Resolve contractual issues;
- Evaluate the cost of alternatives and LADWP's ability to cover costs; and
- Address any other legislative and regulatory factors.

The Department has already accomplished the early divestiture of Navajo by finalizing its sale, and has replaced most of its capacity with the natural gas-fired Apex Generating Station. LADWP now faces more potential difficulties in converting IPP from coal to natural gas before 2027.

2.4.4.1 Approach to Coal

The coal cases analyzed in the 2014 IRP consider two replacement sequences. Case 1 analyzes the baseline contract expiration dates of Navajo in 2019 and IPP in 2027. Case 2 (the recommended case) analyzes early divestiture of Navajo by 2015 and replacement of IPP by 2025. Both cases include fuel cost sensitivity analyses as well as alternate RPS, energy efficiency, and local solar cases.

The IRP compares modeled resource shortfalls between the two cases, quantifying capacity deficits over time under each case and coming up with a resource replacement strategy for each. Resource shortfall is not a concern in either case. Navajo Generating Station's capacity has already successfully been replaced by the Apex Generating Station and LADWP has time to ensure adequate resources for IPP replacement under its current or an alternate plan.

Case 2 for early coal elimination incurs higher costs than Case 1. The additional costs include gas-fired generation fuel and operations and maintenance costs; however, the IRP anticipates CO_2 emissions savings will offset this and result in reasonable net costs. And despite Case 1 appearing to be the least-cost option while meeting minimum regulatory mandates, it fails to make significant progress toward LADWP's required reduction of GHG emissions. However, using GHG emissions goals as the basis for case selection begs the question: why not replace IPP sooner than 2025? In the 2014 IRP, LADWP ruled out "IPP by 2020" for various reasons described in the following sub-chapter on IPP.

2.4.4.2 Navajo Generating Station

LADWP previously had a 21.2 percent (477 MW) ownership of Navajo Generating Station.[63] According to a Board of Commissioners presentation from July 2015, LADWP finalized the Navajo sale this year, in line with its Recommended Strategic Case for divestiture in 2015. Navajo Generating Station has been replaced with Copper Mountain 3 Solar (210 MW in service), Moapa Solar (250 MW under construction), and Apex Generating Station (521 MW in-service). Divesting from Navajo is estimated to reduce 5.59 MMTons of CO_2 emissions for LADWP, which will help to reach GHG emissions reduction goals.

Not only does early divestiture of Navajo contribute to GHG emissions goals, but the Department estimates it received a better sales price in 2015 than waiting until the 2019 deadline. LADWP evaluated

[63]2015 Briefing Book. Los Angeles Department of Water and Power.

the offer with Goldman Sachs and had it further reviewed by an independent financial advisory company. LADWP negotiated terms with the Salt River Project (the Operating Agent), and calculated that the transaction would result in the lowest impact on retail electricity rates. In the analysis, LADWP estimated that the power plant sale would result in a 0.5 percent rate increase, whereas selling Navajo power output (the alternative to divesting) would results in a 2 percent rate increase.[64,65]

The 2014 IRP lists a comprehensive set of reasons for the early divestiture of Navajo:

1. A better sales price than waiting until the 2019 deadline.
2. Avoids the risk that pending federal regulations could add expensive mitigation requirements.
3. Better availability of replacement options.
4. Reduced CO_2 emissions.
5. Additional transmission capacity for importing solar and geothermal resources.
6. Maximizes the value of the plant to help pay for renewables and energy efficiency.
7. Provides time to handle contingencies and ensure competition will benefit customers.
8. Provides the opportunity for remaining Navajo owners to close one of the unit by 2019, reducing emissions.

Although the IRP focused on these technical reasons, early divestiture is also aligned with public feedback. Accomplishing the Navajo sale and acquisition of Apex Generating Station in 2015 is a notable accomplishment for LADWP, and thus far LADWP appears to have realized the benefits listed above.

2.4.4.3 Intermountain Power Project

LADWP is currently entitled to 875-1,202 MW capacity from the Intermountain Power Project (IPP). IPP is located near Delta, Utah, has a rated capacity of 1,800 MW, and is owned by 23 municipal utilities in Utah.[66] A total of 36 participants purchase power from IPP, including six Southern California utilities under long-term power purchase contracts that began in 1990 and will expire on June 15, 2027. LADWP receives the majority of the exports (44.6 percent) and has recently been taking its entire 1,202 MW entitlement.

By collaborating with the other participating utilities, LADWP plans to convert IPP to a smaller natural gas generating station by 2025 at the latest, with efforts to begin the transition project by 2020. The small gas plant is also intended to be supplemented by new renewable projects in the area (utilizing the same transmission line). Reducing IPP plant capacity by at least one-third makes this extra transmission capacity into Los Angeles available.[67] With the Navajo sale complete this year, IPP is the last coal-fired plant in Los Angeles' portfolio. Critically, any repowering of IPP requires a comprehensive, joint agreement with all of the participants. LADWP cannot act unilaterally—any changes to the Power Sales Contract require approval by all 36 participants.

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[64]Presentation on Coal Divestiture from Navajo Generating Station, Board of Water and Power Commissioners, May 8, 2015.

[65]Both options results in a rate increase because power prices declined 40 percent while LADWP worked to divest from Navajo. This means that in 2014, the net value of the plant in 2019 went negative. In April 2015, the net value of Navajo in 2018 was -$102 million.

[66]www.ipautah.com/participants/index.asp.

[67] Board Presentation – Intermountain Power Projects Repowering Plan and Renewal Agreements, Board of Water and Power Commissioners, May 28, 2015.

"IPP by 2020" was found infeasible in the 2013 IRP, which concluded there would be an unfavorable high-cost impact of replacing IPP by 2020 (in part, high outstanding debt service obligations). Despite the costs, LADWP could theoretically make earlier IPP replacement a top priority with sufficient support from ratepayers. However, there is a more fundamental issue. Reaching an agreement between all IPP participants was not possible by 2020 based on agreement delays. Finding a replacement resource option on the 2020 accelerated timeline would also have been a challenge.

After ruling out IPP by 2020, according to interviews, the Department calculated that 2023 was the earliest realistic option for eliminating coal from the portfolio. LADWP and other participants are contractually obligated to continue debt payments through 2023. But although LADWP should strive for 2023 replacement, it may be challenged to meet the Recommended Strategic Case of replacement in 2025 for several reasons.

According to interviews, there has been an approximately two-year delay for participants to take action on the contract amendment to allow for IPP to be repowered with natural gas rather than coal. LADWP negotiated the agreement but then had to wait for two years for the other participants' approval. A re-negotiation for the amendment among all parties is expected by the end of the year. Hence, by the end of 2015, the participants are expected be in a position to work on the natural gas option. However, the delay poses a risk for the gas repowering timeline (e.g., having adequate time to build a natural gas pipeline to the site).

The Department has considered solutions other than natural gas repowering as well, such as using an alternate power plant altogether, but it would reportedly take 10 years to build transmission to a new site. Generally, LADWP considers a 10-year window to be the minimum timeframe to plan for any alternate solution to converting IPP. Ideally, engineering work would begin in 2017 followed by financing in 2018. Alternate options considered by Power System leadership include:

- Build two more units at Apex Generating Station. This location has sufficient land and right-of-way. However, this option would still likely require new transmission capacity and negotiations for water supply.
- Build a new natural-gas fired generation plant at the Mojave Station, which would also require negotiations for water supply.
- Build a new power plant along the Victorville-L.A. path.

Alternatively, LADWP could purchase wholesale power. However, purchasing power from the California Independent System Operator (CAISO) could result in significant costs and expose the Department to wholesale energy price fluctuations, while purchasing from the Pacific Northwest using the Pacific DC Intertie would increase the Department's largest contingency. And as mentioned, LADWP has also begun to consider renewable additions to the smaller natural gas-powered IPP, including innovative replacement options such as compressed air energy storage to store intermittent wind energy, but the final replacement mix has not yet been determined.

Choosing the optimal IPP replacement strategy and exit date requires complex and highly nuanced analysis. Navigant recommends that, now that the Navajo solution is complete, LADWP turn its resources to focus on IPP replacement solutions and formulate a final preferred strategy. The City and LADWP should also consider retaining an independent expert to assist in the analysis and modeling of all alternatives.

2.4.4.4 Coal Outlook

Because contract revisions are already underway for natural gas and the site has existing transmission capacity, Navigant agrees that natural gas repowering of IPP is a reasonable replacement plan. But if participants somehow cannot move forward on repowering, the coal contract will be in place until 2027 and the participants will have to implement alternative non-coal plans at that time. LADWP has wisely considered various contingency plans and has additional time to continue to evaluate them. It should now focus on fully outlining these alternative plans and, now that Navajo's divestment is concluded, take a closer look at a 2023 replacement date. Because the Department will ideally begin engineering work on the IPP replacement in 2017, the 2016 IRP should include its proposed best replacement plan and timeline.

2.4.5 Energy Efficiency

The 2014 IRP Recommended Strategic Case for energy efficiency is that 15 percent of Los Angeles' electric needs will be met through customer energy efficiency measures by the end of 2020. The 2014 IRP establishes energy efficiency as a key element in planning efforts, recommending the "advanced" energy efficiency case. In the 2014 IRP the goal is also presented in the Fiscal Year calendar as 14.8 percent energy savings by FY 19-20 compared to a FY 2010-11 baseline.

The Department is required to report its current 10-year energy efficiency target to the California Energy Commission, and so the Recommended Strategic Case includes savings of 13.7 percent from FY 2013-14 to FY 2022-23. This is equivalent to energy savings of 3,596 GWh and exceeds the AB 2021 state target of 10 percent. During the current 10-year period, energy efficiency programs will be accelerated so that the majority of total savings is achieved before the end of 2020; these energy savings will be added to savings already achieved from 2010 to 2013 to achieve the 15 percent goal in 2020.

2.4.5.1 Approach to Energy Efficiency

LADWP's Efficiency Solutions group oversees the design and implementation of both energy and water efficiency programs. Efficiency Solutions owns the whole energy efficiency portfolio including budget, but shares water efficiency responsibilities with the Water System. In addition to the energy efficiency sections of the 2014 IRP, the Efficiency Solutions group prepares an Efficiency Solutions Portfolio Business Plan, which provides more specifics on guiding principles behind the program, as well as portfolio and program-level funding and energy and emissions impacts.

The basis for the energy efficiency Recommended Strategic Case in the 2014 IRP is the 2013 Energy Efficiency Potential Study, which provides a number of scenarios compliant with AB 2021. From these scenarios, LADWP sought one that yielded a high level of total savings across the ten-year planning period while maintaining reasonable estimated expenditures. The basic scenarios were "low" (10.2 percent by 2020), "moderate" (12.2 percent by 2020), "high" (13.2 percent by 2020), "advanced" (14 percent by 2020 or an accelerated 15.8 percent by 2020), and "extreme" (14.3 percent by 2020 or an accelerate 17.5 percent by 2020). The savings potential encompasses residential, commercial, institutional, and industrial customer sectors in Los Angeles.

The Department selected a specially optimized scenario which became the 2014 IRP recommended "advanced energy efficiency" case for 15 percent by 2020. For the entire 20-year period of the 2014 IRP (2014-2034), energy efficiency measures are expected to reduce energy consumption 4,283 GWh.

However, according to interviews, estimates are only really accurate through 2020 because the 2013 Energy Efficiency Potential Study did not study the period after 2020 and another study has not yet been conducted.

The Department has guiding principles for its approach to energy efficiency above and beyond energy savings targets:

- Promote energy efficiency programs for all customer sectors.
- Target "hard-to-reach" customers (i.e. low-income residents, small businesses).
- Achieve tangible economic benefits for low-income customers.
- Leverage programs to support jobs for local workforce.
- Work collaboratively with partner agencies on outreach and education, and to reach broad and diverse customer base (i.e. Southern California Gas Company partnership).
- Operate transparently and report results regularly.

These principles are motivated by the Department's role as a municipal utility serving the public of Los Angeles. They were developed through an ongoing collaborative stakeholder process and have helped craft an efficiency portfolio that meets the needs of a diverse set of customers. From a pure business perspective, the energy efficiency portfolio would consist solely of industrial and commercial programs; however, through its guiding principles, LADWP has indicated its willingness to achieve larger equity and sustainability objectives.

2.4.5.2 Background on LADWP's Energy Efficiency

LADWP first set an energy efficiency target in response to AB 2021. In December 2011, the Department set an interim energy efficiency goal to reduce 2010 energy consumption by 8.6 percent by 2020. The 8.6 percent goal was determined by a previous energy efficiency potential study that was later determined to have certain methodological issues.[68]

On May 24, 2012, LADWP's Board of Commissioners adopted a goal of 10 percent savings as recommended under AB 2021. According to interviews, at the time the 10 percent goal was adopted on faith because a new energy efficiency potential study had not yet been conducted. But by this time, the Department had recognized that energy efficiency is the least-cost compliance strategy with California regulation and requirements, and will support RPS, GHG emissions, and coal replacement goals.

LADWP conducted the 2013 Energy Efficiency Potential Study to update its goals. The study by Nexant, Inc. presents a number of scenarios compliant with AB 2021 requirements.

2.4.5.3 Energy Efficiency Portfolio Cost-Effectiveness

AB 2021 requires a cost-effectiveness assessment of POU energy efficiency programs. The Total Resource Cost (TRC), Program Administrator Cost (PAC), Ratepayer Impact Measure (RIM), and Participant Cost Test (PCT) are common tests that assess the costs and benefits of a program from different stakeholder perspectives.[69] The primary measurement of energy efficiency cost-effectiveness in California is the TRC. The TRC addresses the total costs of energy in the utility service territory, and compares program

[68]LADWP reported that the 2010 energy efficiency potential study used an obsolete approach, calculating the potential by applying high levels of incentives to measure costs.

[69]www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Cost-effectiveness.htm

administrator and customer costs to utility resource savings (benefit-cost ratio). A TRC of 4.0, for example, shows that overall benefits are four times greater than total cost. [70,71]

The 2013 Energy Efficiency Potential Study found that the Total Resource Cost (TRC) ratio would range from 1.55 for the low scenario (10.2 percent savings by 2020) to 0.9 for the extreme scenario (14.3 percent savings by 2020). However, in its Efficiency Solutions Portfolio Business Plan for FY 2014-15 through FY 2019-20, the Department calculated a TRC score of 2.4. The Efficiency Solutions group determined the TRC score of 2.4 for the portfolio using the E3 calculator provided to POUs by the California Energy Commission, for this purpose (this is a similar, though simpler, tool to the one provided to IOUs by the California Public Utilities Commission).

Any TRC score above 1.0 demonstrates more benefits than costs, hence LADWP's portfolio is cost-effective. A score of 2.4 is also in line with past scores reported to the California Energy Commission in recent years, shown in Table 2-10 below. It is reasonable that program costs increase over time—reflected by a lower TRC score—because the most cost-effective measures are accomplished sooner (the "low-hanging fruit").

Table 2-10. LADWP Reported Total Resource Cost, 2007-2012

Year	2007	2008	2009	2010	2011	2012
TRC	3.72	3.5	3.77	3.12	2.50	2.45

Source: California Energy Commission[72]

On a levelized basis, the Department's planned efficiency portfolio has an estimated cost of $50 per MWh. This is in line with other estimates of the levelized cost of electricity (LCOE) for energy efficiency. As shown in the figure below, Lazard calculates energy efficiency to be the lowest-cost energy resource with an LCOE of $0 to $50 per MWh.

Figure 2-12. Unsubsidized Levelized Cost of Energy in 2014 ($/MWh)

[70] www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

[71] The TRC test calculates the present value of the benefits produced by the programs at the marginal cost compared to the total program and customer costs incurred to invest in the increased levels of efficiency, reflecting the cost-effectiveness of a utility's energy efficiency at the portfolio level. Savings are estimated by multiplying the number of installed measures by an agreed-upon estimate of savings per measure, which is derived from the Database for Energy Efficient Resources (CEC).

[72] Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Cost-Effective Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

Source: Lazard[73]

Energy efficiency has additional value to LADWP in avoided costs for compliance with AB 32 and contributing to a smaller denominator in RPS calculations (less total retail electricity sales). And as mentioned previously, cost-effectiveness is not the only metric by which the Department values its energy efficiency portfolio. Individual programs that are less cost-effective than others are still included in the portfolio when they achieve multiple goals related to the guiding principles (equitable access for all customers, local job creation, etc.), but the investment in those programs is necessarily somewhat limited. Although they are not quantifiable, the guiding principles are discussed in ongoing engagement with the community.

2.4.5.4 Energy Efficiency Implementation

Because LADWP plans to make energy efficiency a significantly more important part of the resource mix going forward, it is important to consider the Department's ability to implement the portfolio. According to interviews and supporting documents, 2009 was a strong energy efficiency year due to several important programs, but was followed by several slow years. Since 2012, the Department appears to have regained its footing, making a more sustained commitment to energy efficiency and ramping up programs. However, there has still been underspending on the energy efficiency program budget since 2012.

The table below shows LADWP's energy efficiency expenditures over the past several years, as reported to the California Energy Commission.

Table 2-11. LADWP Energy Efficiency Total Expenditures, 2006-2012

Year	2006	2007	2008	2009	2010	2011	2012
Budget ($1,000s)	$10,908	$12,550	$35,940	$67,564	$44,451	$49,529	$37,276

Source: California Energy Commission[74]

The above numbers are significantly lower than the planned budget. In 2012, LADWP's energy efficiency annual funding was $138 million.[75] In the California Energy Commission's 2014 Status Report,[76] the Department reported an annual budget $120 million; in the 2015 Status Report,[77] the Department reported an annual budget of $115 million. In part, this is due to inexperience and errors in estimating what the Department could actually spend and staffing issues. It is also part of a larger trend observed by Navigant of underspending and underperforming on capital programs.

Past spending is even more limited compared to future expenditures planned in the Energy Solutions Portfolio Business Plan for FY 2014-15 through FY 2019-20 (below). Promisingly, FY 2013-14 showed a significant improvement from past years, and the year-over-year growth is strong. In the current Fiscal

[73] Lazard's Levelized Cost of Energy Analysis – Version 8.0, September 2014 (www.lazard.com/media/1777/levelized_cost_of_energy_-_version_80.pdf).

[74]Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Cost-Effective Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

[75]Adopted Board Resolution 013 053, September 12, 2012

[76]Energy Efficiency in California's Public Power Sector: A 2014 Status Report. California Municipal Utilities Association. Available at: www.ncpa.com/~ncpa/wp-content/uploads/2015/02/FINAL_SB1037_Report.pdf.

[77]Energy Efficiency in California's Public Power Sector: A 2015 Status Report. California Municipal Utilities Association. Available at: www.ncpa.com/wp-content/uploads/2015/05/2015-FINAL-SB-1037-Report.pdf.

Year, the Efficiency Solutions group hopes to break $100 million. However, the Department will have to maintain an even sharper increase over multiple years to accomplish its energy efficiency goals. Its success will depend in large part on improved staffing, contracting, and program management. Promisingly, interviews indicate that LADWP is prepared to sustain its focus on energy efficiency and providing these resources.

Table 2-12. Efficiency Solutions Portfolio Business Plan Expenditures, 2014-2020

Fiscal Year	FY 2013-14 (Actual)	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
Budget ($1,000s)	$78,000	$101,493	$144,848	$177,779	$193,792	$189,822	$171,872
Savings (%)	3.7%	5.0%	6.8%	8.8%	10.9%	12.8%	14.5%
Savings (GWh)	251.6	310.0	442.0	515.0	541.0	520.0	471.0

Similarly, in the past the Department has set aggressive energy savings goals (in line with its optimistic budgets). From 2007 to 2012, LADWP reported to the California Energy Commission electricity savings of just 49 percent of its target over the period. For comparison, SMUD reported meeting 92 percent of its target—due rather to realistic target-setting than significantly more energy savings (.

Table 2-13).

Table 2-13. Large POU Reported Electricity Savings and Savings Targets, 2007-2012 (MWh)

	2007	2008	2009	2010	2011	2012	Cumulative	% Target
LADWP								
Actual Savings	61,641	115,519	287,574	147,963	127,246	89,487	**845,991**	**-**
Savings Target	275,000	315,000	300,000	280,000	255,000	252,000	**1,677,000**	**49%**
SMUD								
Actual Savings	95,950	114,662	148,028	155,651	170,641	162,381	**932,276**	**-**
Savings Target	70,000	107,000	145,000	196,000	200,000	205,000	**923,000**	**92%**

Source: California Energy Commission, 2014.[78]

Nevertheless, there have also been significant gains in energy savings: the Department achieved approximately 60 percent more savings in FY 2012-13 than FY 2011-12 and 27 percent more energy savings in FY 2013-14 than in FY 2012-13.[79] Overall, LADWP has doubled its energy efficiency attainment in the last several years.

In terms of program performance, there is a range of success across LADWP's portfolio. Typically, about 20 percent of the programs account for 80 percent of the savings. This is because of the balance between social equity objectives and implementing a cost-effective portfolio that saves the most energy. Portfolio performance for FY 2014-15 is summarized in the table below.

[78]Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

[79]57 percent for FY 2012-13 vs. FY 2011-12 according to a presentation in 2013 (David Jacot. "Next Century Power: Energy Efficiency for LA." Los Angeles Department of Water and Power, October 7, 2013. Available at: www.labusinesscouncil.org/files/LADWP.pdf).

Table 2-14. LADWP Efficiency Solutions FY 2014-15 Status

Program	FY 2014-15 Goal	FY 2014-15 Accomplishment (April 2015)
Mass Market	82.51 GWh	49.56 GWh
	$35.21 million	$32.36 million
CII	88.16 GWh	71.0 GWh
	$26.80 million	$15.55 million
Crosscutting	69.34 GWh	79.02 GWh
	$7.79 million	$4.70 million

Source: LADWP – Efficiency Solutions Fiscal Year 14-15: Cumulative and Monthly Status.
Note: General program support is over-budget at $6,881,420 of the $2,341,667 budgeted through April 2015.

Certain energy efficiency programs have performed particularly well, including the Small Business Direct Install Program[80] which is expecting to double its annual savings accomplishments and introduce a second contractor to operate the program to introduce additional competition in procurement. In addition to the Small Business Direct Install Program, the Home Energy Improvement Program,[81] CII Custom Performance Program,[82] and Commercial Lighting Incentive Program[83] received the most funding in FY 2013-14 and will continue to receive the most going forward. The Codes, Standards and Ordinances cross-cutting program[84] has been hugely successful in terms of cost-effective energy savings, as has the Refrigerator Turn-in & Recycle Program.[85]

The Technical Assistance Program has had tremendous customer demand but has yet been unable to meet its potential. This program is an intake to the CII Custom Performance Program, by way of completing a deep energy audit for customers. Because throughput capacity has not been able to keep up with the level of interest, the Efficiency Solutions group is working to streamline some program requirements.

The Efficiency Solutions group also has a noteworthy partnership with Southern California Gas Company for joint electric and gas saving programs. The partnership operates under a Master Utility Agreement which makes collaboration much simpler, since task orders for new programs are issued under the existing umbrella agreement. There are 12 joint programs in place currently, with 2-3 more rolling out. The partnership has been viewed as a great success, bringing down costs through economies of scale, rounding out some programs, and receiving regional and national attention.

2.4.5.5 Energy Efficiency Outlook

According to interviews and Navigant's analysis, the Efficiency Solutions group is on track to come back from a period of underspending and underperforming and make good progress towards goals going forward. The primary barrier to ramping up LADWP's energy efficiency programs has been a lack of

[80]Retrofits the existing lighting of qualifying business customers to new, high efficiency lighting systems.
[81]Offers residential customers energy efficiency and water conservation upgrades by qualified Department staff.
[82]Offers savings-based incentives for the installation of energy savings measures, equipment or systems that exceed Title 24 or minimum industry standards.
[83]Provides menu-based rebates for energy efficiency lighting technologies.
[84]A resource program that conducts advocacy activities to improve building and appliance efficiency regulations, with the principal audience of L.A. City Department of Building Safety and the L.A. City Council.
[85]Provides free pick-up and recycling of old, inefficient refrigerators, along with a cash incentive.

resources other than funding. Specifically, hiring staff and contracting have been challenging for the Efficiency Solutions group (several years ago, the civil service list for the group expired). Now, the hiring issue has mostly been resolved; however, the Department should ensure that the group has adequate resources to roll out programs to achieve 15 percent savings by 2020. Fundamentally, the group appears to have a well-designed structure that promotes synergies between all customer efficiency solutions including electricity, gas, and water; further, LADWP has reportedly realized that energy efficiency is the least-cost compliance strategy for California regulations and is firmly in favor of expanding it.

Several near-term activities by the Efficiency Solutions group include a new residential service for consumer electronics and upstream LEDs, as well as further advancements in the water-energy nexus. The group has quantified embedded energy in water for the LADWP system (resulting in a blended city-wide 611 kWh per acre-foot) and has a current engagement to provide more granular locational values.

In the longer term, SB 350 calls for doubled building efficiency by 2030. This will impact the Department's energy efficiency targets after 2020, which should now be developed and included in the next IRP. For future goals, it is also important to distinguish between traditional loads and nontraditional loads. Traditional loads include buildings, processes, etc. Nontraditional loads include the electrification of the transportation sector, which is expected to double demand. The Efficiency Solutions group is aware of this and should include it in future work.

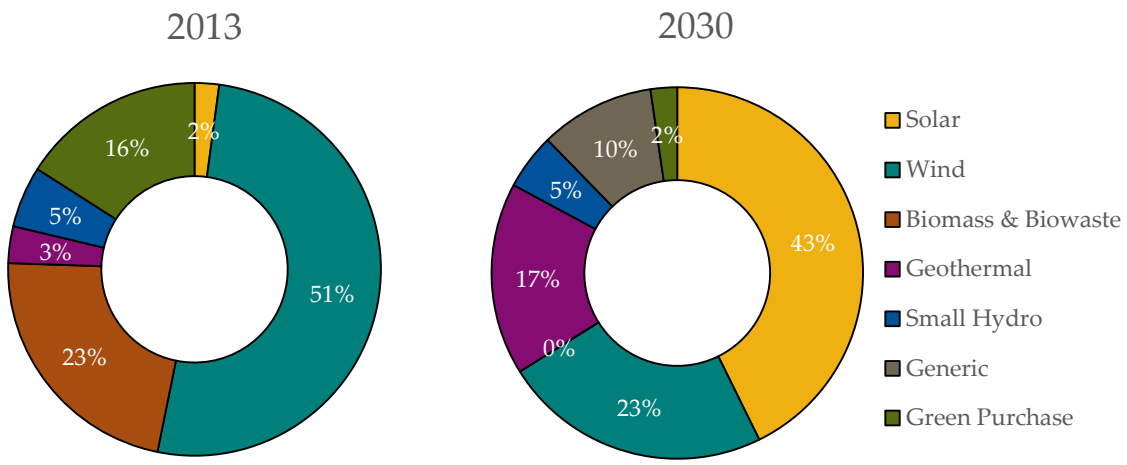
2.4.6 Renewable Portfolio Standard

The 2014 IRP Recommended Case calls for a 40 percent RPS by 2030, after achieving 33 percent by 2020 as mandated under SBX1-2. Although LADWP achieved 20 percent RPS by 2010 (earlier than the requirements for 20 percent RPS over 2011-2013), the Department acknowledged that significant challenges lie ahead for increasing renewable penetration to 33 and then 40 percent.

LADWP achieved 23 percent renewable electricity sales in 2014 (up from only 3 percent in 2003). As part of this, the Department relied on wholesale renewable energy purchases to maintain its renewable Power Content Label above 20 percent.[86,87] Purchases will also be needed going forward to manage LADWP's RPS eligible renewable energy resources portfolio effectively based on prevailing wholesale practices; however, this is expected to decrease in the future. The figure below shows the development of LADWP's recommended renewable energy mix from 2013 to 2030.

[86]AB 162 and SB 1305 require retail electricity suppliers to disclose information about the energy resources used to generate the electricity they sell (www.energy.ca.gov/sb1305/power_content_label.html).
[87]LADWP's Power Content Label: www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-powercontentlabel?_adf.ctrl-state=az3oc3vey_4.

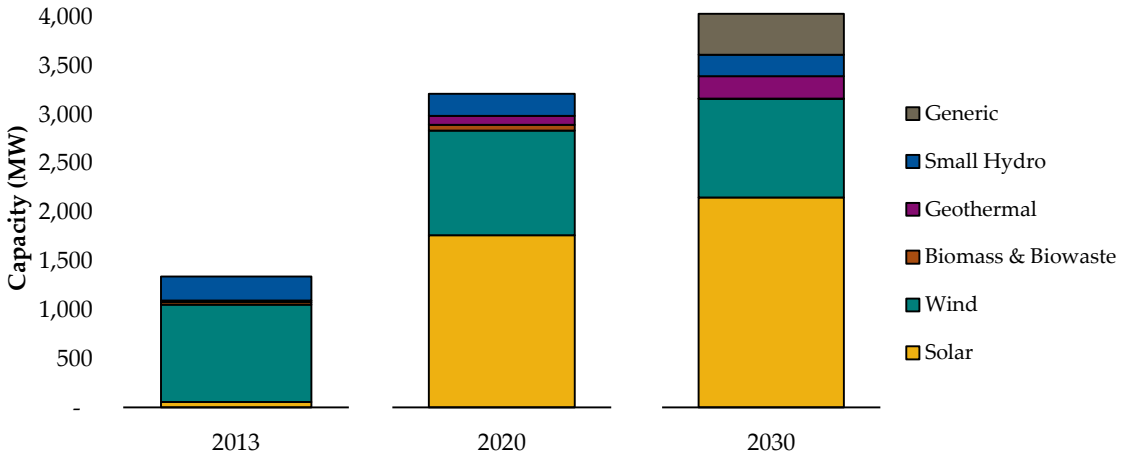
Figure 2-13. LADWP 2014 IRP Recommended Renewable Energy Mix



Sources: Navigant analysis of 2014 IRP Appendix D, 2014 IRP model data

In terms of installed capacity (shown in Figure 2-14, below), wind power dominated the Department's portfolio in 2013, followed by small hydroelectric plants. Because of relatively low capacity factors (more variability in resource availability), wind and small hydroelectric resources make up a larger percentage of installed capacity than they do electricity generation (the opposite applies to biomass & biowaste and geothermal which serve as baseload generation resources).

Figure 2-14. LADWP 2014 IRP Recommended Renewable Portfolio Capacity



Sources: Navigant analysis of 2014 IRP Appendix F, 2014 IRP model data

During the 2014-2030 period, LADWP intends to add over 1 GW of new solar power purchase agreements (PPAs) for large-scale utility solar and nearly 800 MW of new local solar – the majority of new renewable capacity, despite the low historical percentage of solar. This dramatic ramp-up of solar

energy is clearly apparent in Figure 2-14. Resources that are required for the 40 percent RPS but have not yet been planned are labeled "generic" resources.

2.4.6.1 Approach to RPS

The 2014 IRP includes LADWP's plan to ramp up to required levels of renewables: 25 percent renewable energy in 2016 and 33 percent in 2020. The resource cases in the IRP then 1) maintain 33 percent RPS through 2030, 2) increase to 40 percent RPS by 2030, and 3) increase to 50 percent RPS by 2030. LADWP selected the Recommended Strategic Case of 40 percent based primarily on compliance with AB 32 and in response to public feedback.

Modeling the cases for the IRP involves determining resource adequacy for the power system. Based on the percentage of renewable energy required for each scenario, modelers plot available generation capacity and discount renewable capacity at an assumed rate (due to variability). Actual planned renewable projects are factored in, as well as projected new capacity that will be needed to meet the RPS. Renewable wholesale purchases are included on a limited basis to meet small generation deficits. The 40 percent RPS met the Department goals above, and was determined by the IRP model to be relatively economical and meet resource adequacy requirements with little overgeneration.

2.4.6.2 Background on LADWP's RPS

On June 29, 2004, the Los Angeles City Council (City Council) passed Resolution 03-2064-S1 requesting that the Board adopt an RPS Policy of 20 percent renewable energy by 2017, setting applicable milestones to achieve this goal, and incorporating it into a future Integrated Resource Plan. On May 23, 2005, the Board adopted the RPS Policy that established the goal of increasing the amount of energy LADWP generates from renewable power sources to 20 percent of its energy sales to retail customers by 2017, with an interim goal of 13 percent by 2010. On June 29, 2005, the City Council approved the LADWP RPS Policy.

On April 11, 2007, the Board amended LADWP's RPS Policy by accelerating the goal that 20 percent of retail sales be generated from renewable resources, with a new target date of December 31, 2010. In addition, the amended policy established a Renewable Resource Surcharge and also established renewable energy procurement ownership targets. The Board subsequently approved an RPS Policy, as amended in April 2008, which included an additional RPS goal of requiring that 35 percent of energy sales to retail customers be generated from renewable resources by December 31, 2020, expanding the list of eligible renewable resources, and providing new energy delivery criteria. In 2010, LADWP achieved its RPS goal of 20 percent.

The RPS Policy was amended and subsequently adopted in December 2011 as a result of the adoption of the California Renewable Energy Resources Act (Act or SB 2 [1X]) and its requirement for the governing boards of local publicly owned electric utilities (POUs) to adopt "a program for the enforcement of this article" on or before January 1, 2012, for 25 percent RPS by 2016 and 33 percent RPS by 2020. On August 30, 2013, the California Office of Administrative Law approved the regulations, which became effective as of October 1, 2013.[88] In 2011, the Board adopted the RPS procurement targets in the Act, under its Renewables Portfolio Standard Policy and Enforcement program. LADWP and the Southern California

[88]Renewables Portfolio Standard Policy and Enforcement Program. Los Angeles Department of Water and Power, amended December 2013.

Power Authority, of which LADWP is a member, have issued multiple Requests for Proposals since 2001 for renewable resources.

LADWP also has a power content label goal, to achieve over 20 percent RPS on the power content label. This means that on years that have no state mandate, LADWP prioritizes obtaining 20 percent renewable power. When cost-effective, the Department purchases wholesale renewable power (for example, the large purchase in December 2014), but expects fewer and fewer of these purchases going forward as more large-scale renewable generation projects come online.

2.4.6.3 Current RPS Projects

LADWP has installed primarily wind capacity in the past, with some small hydro, geothermal, and biowaste resources as well. It has also relied on renewable energy wholesale purchases for the required 20 percent RPS from 2011-2013 and to maintain the 20 percent renewable Power Content Label in 2014. The monthly RPS Board of Commissioners update from May 14, 2015 shows that monthly renewable energy from LADWP's generation resources fluctuates between 10 and 23 percent over the year. In December 2014, the Department made a major wholesale market purchase to achieve 45 percent renewable energy for the month, to close out 2014 with renewables above 20 percent for the year. LADWP will likely continue to make cost-effective wholesale renewable power purchases going forward as it did in 2014, however, this will decrease as there is significant new renewable capacity ahead.

Based on RPS reports, there appear to be sufficient projects to meet the 2016 requirement of a 25 percent RPS. From projects on LADWP's RPS Master Project List in May 2014, there are reportedly finalized contracts for an RPS of 30.64 percent in 2020. Projects still under negotiation at this time are expected to make up another 5.7 percent in 2020, for a projected total of 36.3 percent. 11.8 percent will be owned by LADWP, 12.8 percent will have an option to own, and 11.7 percent will be contracted under power purchase agreements. LADWP expects to have no problems obtaining contracts for projects "under negotiation" since approximately 300 projects entered the PPA queue.

In order to support new large-scale renewable projects, the Department is building and/or upgrading new transmission capacity, specifically the Barren Ridge Renewable Transmission Project. According to a capital budget report provided by LADWP, this project has been very significantly underspending for the past three years, which merits an additional status report for explanation.

Recent accomplishments according to LADWP's 2015 Briefing Book are listed in the following table, followed by in-progress and planned projects to meet the recommended RPS. Navigant was unable to verify progress on a number of these projects without project status updates versus original capital budgets and schedules. However, in interviews, LADWP leadership reported that major projects are on schedule. The Department is confident that the 33 percent RPS will be met by 2020.

Table 2-15. LADWP's Recent RPS Project Accomplishments

Project Name	Description	Completion Date
Adelanto Solar Project	10 MW in Victorville, California	July 2012
Pine Tree Solar Power Project	8.5 MW co-located with the Pine Tree Wind Farm in the Tehachapi Mountains	March 2013
Manzana Wind	39 MW 10-year PPA in Kern County	May 2013 (approved)
Don A. Campbell Geothermal Power Plant	14 MW in Mineral County, Nevada	January 2014

Sempra Copper Mountain 3 Solar Project	210 MW PPA in Boulder City, Nevada	April 2015

Table 2-16. LADWP's In-Progress RPS Projects

Project Name	Size	Description and Status	Planned COD
Moapa Southern Paiute Solar Project	250 MW	LADWP will receive energy under an approved PPA. The project requires LADWP to buy several miles of transmission. The project developer is still working to finance the project and construction is on schedule.	June 2016
Beacon Solar	250 MW	Construction began in early 2015 and appears to be over the budget so far – possibly ahead of the schedule.	July 2016
Springbok I Solar	100 MW	Project was approved in September 2014; no other update available.	September 2016
Barren Ridge Solar I	60 MW	Construction began in 2014; no other update available.	End of 2016
Heber I Geothermal	34 MW	PPA from an existing geothermal plant in Imperial County.	December 2016

Table 2-17. LADWP's Planned RPS Projects

Project Name	Size	Description	Modeled COD
Solar Projects 2016	197 MW	Undetermined solar PPAs. Springbok II Solar (150 MW) may make up the majority of this, based on an approved contract for COD in December 2016.[89]	January 2017
Geo PPA 2016 OD	16 MW	Undetermined geothermal PPAs.	January 2017
WSHydro	4 MW	Undefined small hydro.	July 2018
Pine Canyon Wind	70 MW	To begin development in 2016.	January 2019
Geo-Imperial	25 MW	LADWP is exploring the geothermal potential in Imperial Valley.	2020-2023
Owens Community Solar	194 MW	Large-scale community solar concept.	2021-2024
Geo_Generic	100 MW	Undetermined geothermal.	2022-2024
Geo-Imperial_Ext	50 MW	If the initial exploration is successful, 50 MW more is targeted.	2025-2028
Solar_Projects	98 MW	Undetermined solar.	January 2026
Wind_STS	200 MW	Undefined wind.	January 2027
Generic_RPS	419 MW	Undetermined renewable resources.	2027-2034

Note: Projects do not include local solar (Solar Incentive Program, feed-in tariff, or local community solar).

As LADWP develops its projects, preference is given to those located within the City of Los Angeles or on City-owned property and owned and operated by LADWP. As of January 1, 2011, a minimum of 75 percent of all new eligible renewable energy resources procured by LADWP is required to either be owned or procured by LADWP through an option-to-own (either directly or indirectly) until at least half of the total amount of eligible renewable energy supplied is owned by LADWP. In short, LADWP's goal is to own (either directly or jointly) at least 50 percent of its eligible renewable energy resource portfolio. LADWP prioritizes ownership in order to maintain control over its assets and to protect customers from

[89]Presentation to the LADWP Board of Water and Power Commissioners, May 19, 2015.

market price fluctuations. The 50 percent target is expected to be met in 2015 and exceeded moving forward (approximately 68 percent of projects are expected to be LADWP-owned in 2020).

In part, the market has driven opportunities for LADWP ownership versus third-party PPAs. The Department identifies various locations that would not make sense for ownership, like the Pacific Northwest. The Eastern Sierras, on the other hand, are attractive because Department water and power crews already operate there. Generally, the Department looks to cluster LADWP-owned projects together in areas where they make the most sense. The Department is also adding the option to curtail generation under PPA contracts; otherwise it would be required to buy the agreed amount of electricity at all times. Especially for projects working on creative financing strategies that take more time and effort, LADWP had been able to negotiate increased curtailable rights.

Navigant recommends an independent review be conducted to look at the economics of the LADWP ownership strategy as fully loaded costs may be creating unnecessary rate and cost issues, for both RPS and non-RPS projects.

One concern from LADWP and other electric utilities operating throughout the U.S. is the possible expiration of the Federal Investment Tax Credit (ITC) in 2016. The 30 percent tax credit is scheduled to expire, which will drive up PPA prices for a time. Currently, LADWP reports being able to obtain solar PPAs in the $50 per MWh range and below, especially in remote regions. PPA prices would likely be higher for several years, which would impact the cost of renewable procurement to meet the RPS.

2.4.6.4 Reliability Impacts of Renewables

Integrating the amount of renewable resources required for a high RPS is expected to pose a number of challenges for electric utilities and grid operators. LADWP must prepare for the 33 percent RPS by 2020 and now for a 50 percent RPS by 2030 (according to SB 350). This section begins to address the following critical questions:

1. How does variable and localized generation impact the power system and what are the key challenges for LADWP?
2. What is the cost associated with variable and localized generation?
3. What is the Department doing to address these challenges?

The information included here is intended to frame the issue and provide a high-level evaluation of the Department's activity in this area. It is not an exhaustive literature review or analysis of work done in this area, as the subject is extremely complex and is currently the focus of numerous technical and policy papers and ongoing utility studies.

How does variable and localized generation impact the power system and what are the key challenges for LADWP?

The impacts to the power system discussed here include the following topics:

- Generation requirements and system flexibility
- Overgeneration and curtailment
- Transmission and distribution capacity

LADWP is required to meet the operational, planning reserve and reliability criteria, and resource adequacy standards of WECC and NERC. Resource adequacy is the procurement of sufficient flexible demand or generation capacity to meet future loads, or the availability of generation resources to meet

energy needs plus reserves.[90] The Department's dominant renewable resources going forward—wind and solar—are variable and therefore their full capacities cannot be counted towards dependable generation. The dependable capacity of wind is assumed to be 10 percent of nameplate capacity and that of solar PV to be 27 percent of nameplate capacity.[91] This affects the makeup of the generation portfolio as well as its operation.

A resource's flexibility or "dispatchability" is very important to resource planning and grid operation. According to the CAISO, dispatchability is determined by how fast the power plant can ramp up or down, how long it can sustain an upward or downward ramp, how quickly it can change its ramp direction, how far it can reduce output and not encounter emissions limitations, how quickly it can start, and how frequently it can be cycled on and off. Dispatchability is desirable because it enables generation to match the load profile. Continuously matching the demand for electricity with supply is critical for maintaining reliability. Large amounts of variable energy resources present operational challenges because they cannot be dispatched.

Wind and solar power, as variable energy resources, are not dispatchable (unless paired with energy storage), and neither is run-of-river hydropower. Geothermal and biomass operate continuously and are therefore also not dispatchable. Hence, the system requires additional flexible generation and quicker ramp-up and ramp-down times for conventional dispatchable resources. CAISO and the CPUC are working to develop specific requirements for flexible generation capacity needed to integrate increasing amounts of intermittent renewable generation into the system. In early 2014, the CAISO Board approved a proposed tariff filing regarding flexibility requirements and resource adequacy capacity, intended to help ensure that there is sufficient flexible capacity to address the added variability and uncertainty of variable energy resources.[92,93]

Overgeneration is another challenge resulting from a high penetration of renewables. Overgeneration occurs when "must-run" generation (which includes non-dispatchable renewables, combined heat and power, nuclear, run-of-river hydro, and thermal generation needed for grid stability) is greater than system loads plus exports. A large portion of the generation fleet is inflexible and cannot respond quickly to dispatches or adjust output levels, and many power plants have contractual obligations limiting how often they can be curtailed, ramped, started, or stopped. As more renewables interconnect to the grid, there is a greater the risk that at times they will cause overgeneration.

To manage persistent overgeneration, the system operator must curtail production. Curtailment, or curbing renewable generation to limit overgeneration, means that more natural gas-fired power plants may have to ramp up and down, negating some of the greenhouse gas reduction that would otherwise result from increased renewable capacity. A recent study on the effect of increasing the RPS in California by Energy and Environmental Economics, Inc. (E3)[94] found that the largest integration challenge is

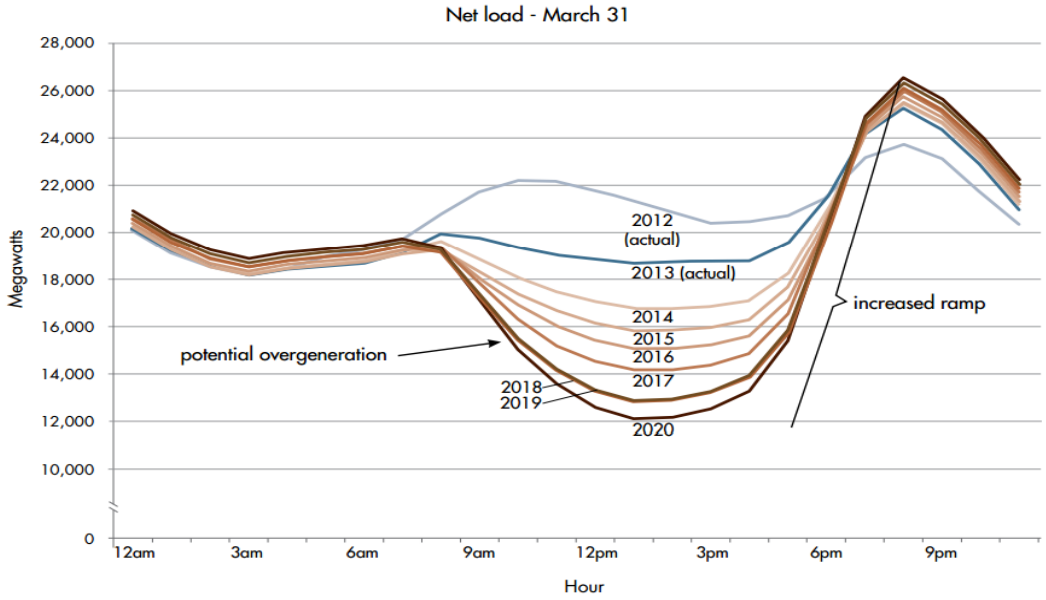
[90]Mass Market Demand Response and Variable Generation Integration Issues: A Scoping Study," Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, October 2011 (eetd.lbl.gov/sites/all/files/publications/lbnl-5063e.pdf).
[91]Ibid.
[92]More information available at: publications.caiso.com/StateOfTheGrid2014/GridResiliency.htm.
[93]"Flexible Resource Adequacy Criteria and Must-Offer Obligation," California ISO, February 7, 2014 (www.caiso.com/Documents/DraftFinalProposal-FlexibleResourceAdequacyCriteriaMustOfferObligation.pdf).
[94]"Investigating a Higher Renewables Portfolio Standard in California Executive Summary." Energy and Environmental Economics, Inc., January 2014.

overgeneration. From this study, overgeneration occurs even at a 33 percent RPS, especially when the portfolio is dominated by solar resources. For a 40 percent RPS large solar case,[95] 1.8 percent of renewable energy is overgeneration and occurs in 8.6 percent of the hours in a year. In the 50 percent RPS large solar case, 8.9 percent is overgeneration and occurs in 23 percent of the hours in a year.

Increased curtailment of renewables puts meeting RPS requirements at risk despite how much renewable capacity is installed, because the standard is based on the percent of utility retail sales served. Procurement of a more diverse portfolio of renewable resources, which includes less solar and disperses the renewable generation over more hours of the day, is expected to reduce daytime overgeneration.

CAISO agrees that the occurrences of overgeneration events increase under a higher RPS scenario. The CAISO's "duck curve" shows overgeneration from renewables and other resources during the middle of the day, followed by a massive ramp from traditional power plants in the late afternoon in the absence of renewables (mostly solar). Wind and solar forecasts must be incorporated into scheduling in order for utilities to manage these ramping needs, and uncertainty in forecasts will require the additional commitment of spinning reserves.

CAISO "Duck Curve" for Renewable Overgeneration and System Ramping



Source: California Independent System Operator[96]

Large-scale wind and solar are also often remote from load centers, requiring new or upgraded transmission capacity. The new transmission capacity will have to be suited for resources with low capacity factors. Distributed generation (e.g. local solar) also has the potential to put stress on the transmission and distribution systems. Assembly Bill 528 requires the California Public Utilities Commission to submit to the legislature a biennial report on the impacts of distribution generation on California's transmission and distribution systems. Black & Veatch developed the latest report on this

[95]Meets a 50 percent RPS in 2030 by relying mostly on large, utility-scale solar PV resources.
[96]publications.caiso.com/StateOfTheGrid2014/RenewablesIntegration.htm

topic in May 2013.[97] Expected impacts would occur first on the distribution system and then roll up to the transmission system as penetration increases. However, impacts have not yet been fully quantified. At current penetration levels for most utilities, the interconnection process and requirements by utilities have mitigated effects.

Quantifying impacts is difficult in part because they are highly locational. A report by the Rocky Mountain Institute highlights the fact that distributed generation in the right place at the right time can create significant value, while additional electricity supply in the wrong place at the wrong time could result in added costs to the system.[98] Each distribution circuit has a different capacity to accommodate distributed generation, so impacts are highly dependent on the local feeder configuration and loading level.

The Black & Veatch report recommends further detailed investigation of the current and future impacts and benefits of distributed generation on the electric grid. Transmission system impacts from customer-side distributed generation installations have not been observed yet, but are expected to appear at higher penetration levels. To further quantify these impacts as customer-sided distribution generation increases, utilities will need to monitor, evaluate, and associate impacts with distributed generation systems.

What is the cost associated with variable and localized generation?

Addressing the challenges posed by variable renewable generation to system operators requires additional resources and often more complex control systems, which incur additional costs. These are typically called renewable integration costs. There are costs associated with each of the impacts summarized above. Additional flexibility required from conventional generation and additional spinning reserves will increase capital and operations and maintenance costs. New and upgraded transmission lines to large solar and wind projects will be costly and have some additional costs associated with the need to accommodate low capacity factors. Costs related to upgrading to the distribution system for distributed generation may also be required.

The study by E3 on the effect of increasing the RPS in California calculates the total cost and average retail rate for 50 percent RPS scenarios, but does not include grid operating costs. Higher RPS scenarios result in an increase in average electric rates, and rate impacts are expected to be significantly higher under than 50 percent RPS scenario than the 40 percent RPS scenario. The 40 percent RPS scenario could lead to an additional 0.7 percent rate increase over the 33 percent scenario, and the 50 percent RPS scenarios could increase rates by 5.8-11.3 percent relative to the 33 percent scenario. Revenue requirements could increase 3.2 percent under the 40 percent RPS scenario and 9.1-23.4 percent under the 50 percent RPS scenarios.

Distributed generation typically incurs higher costs than remote, large-scale renewables. The E3 study found that small solar and rooftop solar scenarios are found to be costlier than the large solar and "diverse" scenarios. Although transmission costs are reduced relative to larger systems located in remote

[97]Biennial Report on Impacts of Distributed Generation, California Public Utilities Commission, May 2013 (www.cpuc.ca.gov/NR/rdonlyres/BE24C491-6B27-400C-A174-85F9B67F8C9B/0/CPUCDGImpactReportFinal2013_05_23.pdf).

[98]"Net Energy Metering, Zero Net Energy, and the Distributed Energy Resource Future: Adapting Electric Utility Business Models for the 21st Century," Rocky Mountain Institute, March 2012 (www.rmi.org/Content/Files/RMI_PGE_NEM_ZNE_DER_Adapting_Utility_Business_Models_for_the_21st__Century.pdf.pdf).

areas, distribution costs are higher. All scenarios assume that significant investments and upgrades to both the California electrical grid and the state's fleet of thermal generators have already occurred between 2013 and 2030 (including the development of a newer, more flexible fleet of thermal generation), which helps make the integration of remote, large-scale renewables less expensive.

A report for the California Energy Commission[99] explores the cost impacts cited by Southern California Edison for integrating 4,800 MW of distributed generation in a study from May 2012. The study concluded that the cost of integrating 4,800 MW of distributed generation depended highly upon locational factors; this makes sense given the locational nature of the system impacts discussed above. Southern California Edison defined two cost components associated with distributed generation. The first is the cost of interconnection (new lines and equipment to connect to the utility distribution system) and the second is system upgrades, which include enhancements of the existing system or applicable mitigation measures designed to remedy deficiencies or violations. In that study, total integration costs for distributed generation ranged from $190 per kilowatt to $270 per kilowatt.

Although good progress has been made to quantify costs in these studies and others, renewable integration costs have still not been fully quantified and will vary by individual service territory.

What is the Department doing to address these challenges?

LADWP addressed several of the above impacts and costs in its 2014 IRP, and then determined the recommended 40 percent RPS scenario to have manageable impacts on the grid. However, there are a number of impacts that are not yet understood. The Department acknowledges the importance of understanding these impacts and states that this will be a key issue to be addressed in the 2015 update to the IRP.[100] Additionally, California has now adopted a 50 percent RPS under SB 350 which will need to be included in the next Recommended Strategic Case.

The area that LADWP analyzed in the most detail in the 2014 IRP is overgeneration. It calculated the amount of overgeneration expected from the recommended 40 percent RPS case to be 155 GWh in 2030 (1 percent) and 587 GWh from a 50 percent RPS (3.5 percent). The base RPS case of 33 percent is expected to be manageable with the Department's current resource mix. LADWP expects its overgeneration to be lower than for other California utilities due to developing an RPS portfolio with a diverse mix of renewable resources and having the Castaic Pumped Storage Plant; this expectation is reflected in the 1 percent overgeneration calculation compared to the 1.8 percent calculation by E3 for California overall.

LADWP calculates that overgeneration under the 40 percent RPS case will potentially result in $16 million increased costs by 2030. The analysis spot-checked forecasted daily generation in all seasons of 2020, with preliminary results indicating that generation will exceed system load during certain hours, especially in the spring season. However, the Department reports that it is conducting more detailed studies to determine what percentage of hours of overgeneration are forecasted to occur overall. Potential solutions to overgeneration discussed at a high level include managed energy curtailment (demand response, energy storage, etc.) and the flexibility of new repowered gas units.

The 2014 IRP mentions that greater amounts of regulating and spinning reserves will be needed to help integrate high levels of variable energy resources, and that further study will also be required for this

[99]Shlatz, Eugene, Nathan Buch, and Melissa Chan. 2013. *Distributed Generation Integration Cost Study: Analytical Framework*. California Energy Commission. Publication Number: CEC-200-2013-007-REV.
[100]LADWP 2014 IRP, Preface.

topic. Overall, a detailed reliability analysis has yet to be performed to determine whether higher levels of RPS can be supported. Interviews with Department staff indicate that a study on the maximum renewable generation that can be added to the grid in terms of generation resources is underway with an outside consultant. The Department has also begun studying the impact in terms of distribution system capacity. The 2015 update and 2016 IRP should show progress and results for these studies. Interviews report that most of the modeling activity is complete and the Department expects to issue drafts in the October 2015 timeframe. This is a very important element for discussing the 40 percent and especially 50 percent RPS going forward. Until the full costs of integration are fully understood, any future rate increase related to new generation resources should be tied to the results of such studies and increases should be phased based on the strategies adopted and progress against them.

One other area to investigate is coordination between increasing renewables under the recommended RPS scenario and the Power System Reliability Program (PSRP). LADWP must thoroughly understand distributed renewable impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort to ensure its system upgrades meet multiple Department goals (for both renewables and reliability). The timeline for PSRP upgrades may impact the timeline for allowable levels of renewable integration in certain areas of the distribution system. Local solar installations may impact PSRP priorities on an evolving basis as interconnection applications are received, and other renewables may dictate which new forms of infrastructure replace aging assets. The Department's planned substation automation is one step toward integrating distributed generation; however, otherwise there is simply a "hope" among Department leadership that PSRP activities will catch up in time to support the higher RPS and local distributed generation. Rather, this should be an explicit plan with coordinated costs and schedules in the next IRP.

LADWP is far from being alone in its work to better understand the reliability impacts of renewables on the grid. There are similar ongoing studies in California by the IOUs, research institutions, and CAISO and the CPUC. In the Distributed Resource Plans required by the CPUC, the IOUs included timelines for additional studies evaluating capacity and load forecasting scenarios, determining optimal locations for distributed energy resources, deploying communications infrastructure, and other activities. Outside of California, most utilities with increasing amounts of renewable energy and distributed generation are increasingly looking to better understand the amounts that can be accommodated and at what costs. LADWP does not appear to be behind peers in this regard, but it is no less critical to find answers to the important reliability questions.

2.4.6.5 RPS Outlook

According to interviews, LADWP is on track to meet the 33 percent RPS in 2020, based on existing contracts in development and project under construction, as well as upcoming contract awards. Because many projects are currently ongoing without comprehensive status tracking, the Department should provide an updated RPS project completion report in the 2015 IRP update and 2016 IRP. The 2016 IRP should also show that LADWP has met the required 25 percent RPS. As a rule, the IRP report should more clearly present progress on RPS projects and institute clear project metrics.

Critically, Senate Bill 350 recently instituted a 50 percent RPS in 2030. According to interviews, LADWP explored various options for complying with the 50 percent requirement in anticipation of the bill's approval. LADWP has prepared the groundwork for meeting the new standard by including the 50 percent RPS case in the 2014 IRP, although it is not the Recommended Strategic Case. In the next IRP, 50

percent must be the Recommended Strategic Case. Completing the ongoing renewable integration reliability studies is even more critical for the Department to be able to achieve a 50 percent RPS by 2030.

2.4.7 Local Solar

The Recommended Strategic Case for local (distributed) solar is a slightly modified Case 4 in the IRP, including 800 MW local solar by 2023 rather than 1,000 MW. However, recommending this case does not preclude expansion to 1,000 MW or 1,200 MW by 2029 (the highest cases). Expanded local solar could account for the "generic RPS" category left in the resource plan to allow greater flexibility. LADWP's Recommended Strategic Case for local solar is the following:

- 310 MW customer net metered solar (including the Solar Incentive Program) by 2020;
- 450 MW feed-in tariff solar (375 MW more than required under SB 32), with 150 MW by 2018 and the expanded 300 MW program by the end of 2023; and
- 40 MW community solar on city-owned properties by the end of 2020.

2.4.7.1 Background on Local Solar

California has a long history of encouraging the development of smaller generation facilities that connect directly at the distribution level of the electricity system (distributed generation). For example, in response to the 2001 energy crisis the CPUC initiated the Self-Generation Incentive Program (SGIP), which provides incentives to qualifying distributed energy systems and at the time, included solar PV.[101] In 2007 due to SB 1, state support for solar PV shifted to the Go Solar California campaign,[102] which encompasses the California Solar Initiative (CSI) program for IOU customers, the New Solar Homes Partnership specifically for new homes in IOU areas, and various programs under POUs like LADWP. The overarching goal is for Californians to install 3,000 MW of distributed solar by the end of 2016.

As of 2011, PG&E had installed 558 MW, SCE had installed 297 MW, and SDG&E had installed 111 MW of customer solar PV. Together, the POUs had installed 110 MW of customer solar PV; LADWP with 32 MW and SMUD with 31 MW.[103] LADWP has shown significant improvement since that time and currently offers two local solar programs: the long-standing Solar Incentive Program and a newer Feed-in Tariff (FiT) Program. The expansion of local solar is primarily based on comments received in public workshops indicating that local solar should be a priority in LADWP's renewables procurement strategy, but will also contribute to meeting LADWP's RPS goal.

2.4.7.2 Solar Incentive Program

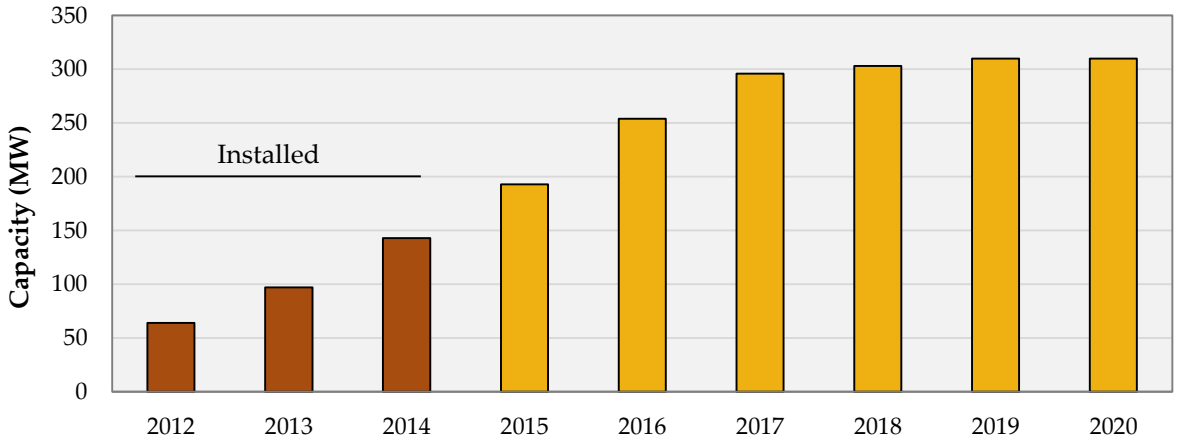
Customer net metered solar installations from 1 kW to 1 MW in size qualify for the Solar Incentive Program.[104] As of June 22, 2015, the Solar Incentive Program Dashboard reported approximately 135

[101]Summary of the Self-Generation Incentive Program available at: www.cpuc.ca.gov/PUC/energy/DistGen/sgip.
[102]www.gosolarcalifornia.ca.gov.
[103]"Biennial Report on Impacts of Distributed Generation," California Public Utilities Commission, May 2013. www.cpuc.ca.gov/NR/rdonlyres/BE24C491-6B27-400C-A174-85F9B67F8C9B/0/CPUCDGImpactReportFinal2013_05_23.pdf.
[104]LADWP Feed-in Tariff Master Conditional Use Permit. City Planning Commission, February 26, 2015.

MW, or 16,000 customer systems.[105] According to the 2014 IRP, LADWP has 143 MW total net-metered solar installed as of March 2015 (including the current Solar Incentive Program installations). The program has a goal to provide 280 MW in total by 2016 and 310 MW by 2020, which is reflected in the IRP Recommended Case. Although incentive funding is likely to be fully allocated to projects by 2016, there is significant interest from LADWP customers in net metering and solar developers are not expected to be put off by the lack of local incentives once program funding runs out.

The Solar Incentive Program experienced rapid growth over the 2009-2011 period and maintained capacity growth of approximately 20 MW per year for FY 2011-2012 through FY 2013-2014. The 2014 IRP plans for net-metered local solar to reach 193 MW cumulative installed capacity by the end of 2015; with 143 MW installed as of March 2015 the Department is approaching this target. The RPS report to the LADWP Board in April 2015[106] gives a total of 33.05 MW confirmed reservations and 23.05 MW installed by the beginning of May 2015 for FY 2014-15. If all of the confirmed reservations are installed before the end of the year, the Department is likely to meet it 2015 goal. Overall, recent installation data reflects that LADWP is on track to reasonably meet its goals in the next few years, as depicted by the figure below.

Figure 2-15. 2014 IRP Cumulative Net-Metered Solar, Historical and Projected (MW)



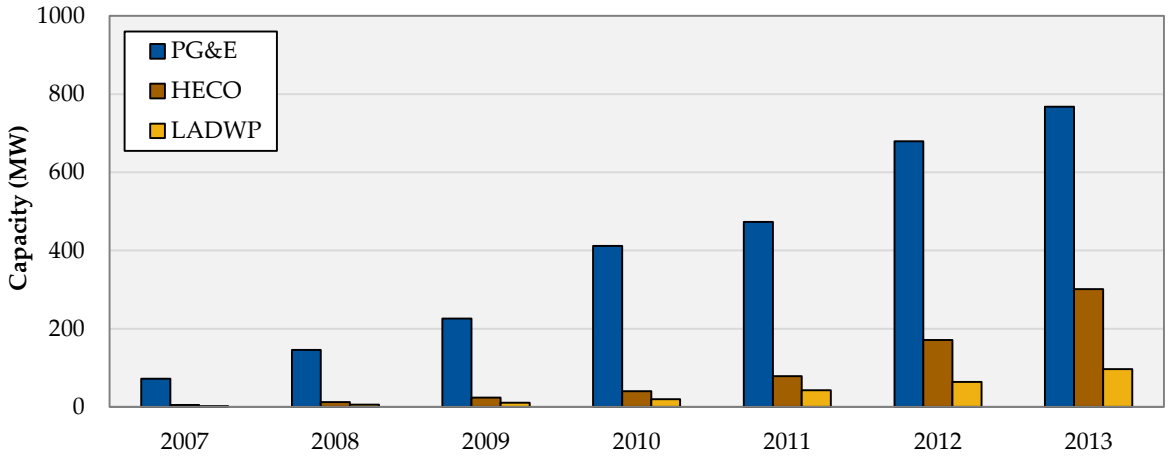
Source: 2014 IRP, Appendix N

Compared to two of the leading U.S. utilities for distributed customer solar, Pacific Gas & Electric (PG&E) and Hawaiian Electric Companies (HECO), LADWP's increase in net-metered customer solar is moderate. The figure below shows data from HECO and the California Solar Initiative for PG&E:

[105]Solar Incentive Program Dashboard available at: www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB395923&RevisionSelectionMethod=LatestReleased.

[106]Renewable Portfolio Standard (RPS) Projects Update – April 2015 from May 14, 2015.

Figure 2-16. Cumulative Installed Customer Net-Metered Solar Comparison



Sources: LADWP 2014 IRP, LADWP SIP Report (April 2015), California Solar Initiative,[107] and HECO[108]

In terms of growth rate, PG&E's installed customer net-metered solar capacity increased by more than a factor of 10 over the six-year period from 2007 to 2013. Dramatically, HECO's installed customer net-metered solar capacity increased by more than a factor of 150 over the same period. While this resulted in a number of complications for the Hawaiian grid, LADWP is not planning for such rapid growth. The Department's projected increase is less than a factor of five over the six-year period from 2012-2018, while HECO underwent similar growth in MW in one-third of the time (two years from 2011-2013). And given the high LCOE of local distributed solar compared to utility-scale solar, it makes sense to not more dramatically ramp up the more expensive resource.

LADWP's anticipated increase in customer net-metered solar is also reasonable given the motivation for solar developers to install projects before 2016 when the residential Investment Tax Credit (ITC) is scheduled to be reduced from 30 percent to 10 percent and the commercial ITC is scheduled to expire. Hence, the forecast in Figure 2-15 increases through 2017, when projects receiving the ITC are completed, and then levels out for the next several years. Additionally, the Solar Incentive Program funds are expected to have mostly been exhausted by that time.

The program has undergone several process improvements including proactively monitoring applications, restructuring the inspection group, simplifying inspections, and increasing call center staff. The total time of for customers participating in the program (including reservation, construction and permitting, inspection, and payment) decreased significantly over 2014 and the beginning of 2015, from 59 weeks in February 2014 to 22 weeks for the first half of April 2015. Without including customer construction and permitting, times went from 46 weeks to 18 weeks.[109]

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[107] Program Totals by Administrator, Go Solar California, July 29, 2015 (www.californiasolarstatistics.ca.gov/reports/agency_stats/).

[108] "Rooftop PV enjoys another strong year in Hawaii," HECO, January 22, 2014 (www.heco.com/heco/_hidden_Hidden/CorpComm/Rooftop-PV-enjoys-another-strong-year-in-Hawaii?cpsextcurrchannel=1).

[109] Solar Incentive Program: Update on Process Improvements. Presentation to LADWP Board of Water and Power Commissioners, May 5, 2015.

2.4.7.3 Feed-in Tariff Program

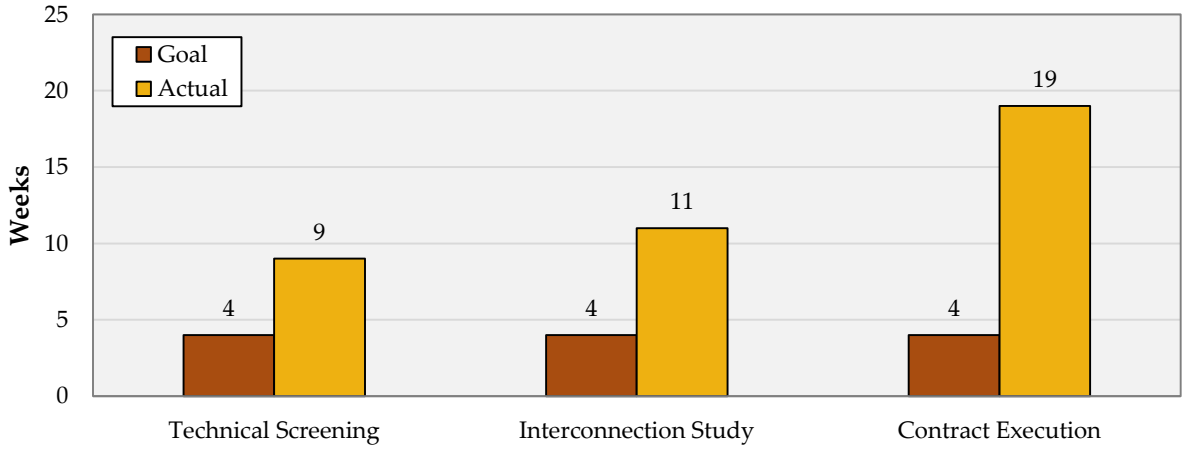
SB 1332 requires LADWP to offer a 75 MW feed-in tariff (FiT) program; in the 2014 IRP, the Department has gone significantly above this amount based on contribution to its recommended RPS and community feedback in support of local solar. LADPW's Recommended Case includes 450 MW under from feed-in tariff projects by 2023. Projects are 30 kW to 3 MW in size under 20-year contracts.

The Department's current FiT was launched in three segments: a 10 MW demonstration program, a 100 MW set-pricing program, and a 50 MW program that bundles small local solar installations with a large-scale solar project on LADWP-owned land in the Mojave Desert (Beacon Solar).[110] The "FiT 100" program is currently underway, though near its end. The program was designed with a declining price tier system in five allocations. The base price for energy is the following:

- Large capacity projects (150 kW-3 MW): Prices decline by $0.01 from $0.17/kWh to $0.13/kWh
- Small capacity projects (30-150 kW): Prices decline by $0.01 from $0.17/kWh to $0.15/kWh
- Time-of-delivery multipliers are applied to the above prices

The fifth FiT 100 allocation for 25 MW opened on March 16, 2015. As of June 4, 2015, the program had received nine applications for 5.6 MW. For the FiT 100 as a whole, 14 projects totaling 7.1 MW have been commissioned and 28 projects totaling 11.25 MW are awaiting construction. 53 MW are "active" of the 85 MW offered through the program in the demonstration phase and the 1st through 4th allocations.[111] The program dashboard, LADWP's public-facing tracking tool,[112] reports these statistics and also that the program has suffered from a high rate of project cancellations and delays in reaching installed targets. Delays are illustrated in the figure below.

Figure 2-17. LADWP Feed-In Tariff Processing Durations



Source: LADWP FiT Dashboard

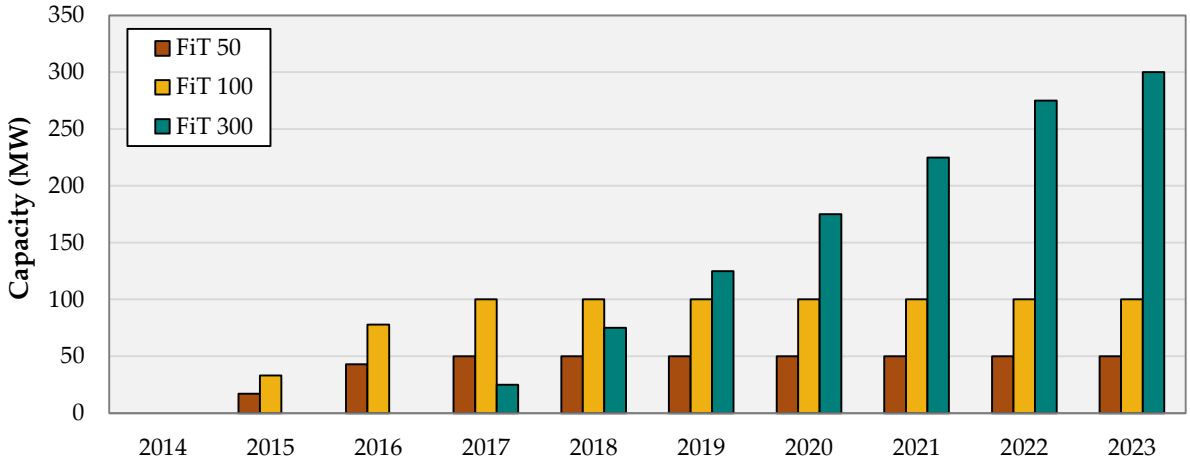
[110]The "FiT 50" was approved by the Board in early 2013 and has awarded two contracts to SunEdison and Hecate for 22 MW and 28 MW, respectively.

[111]Feed-in Tariff, 5th Allocation, Board of Water & Power Commissioners, February 17, 2015 (www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB423806&RevisionSelectionMethod=LatestReleased).

[112]FiT program dashboard: www.ladwp.com/ladwp/faces/wcnav_externalId/r-gg-fitp-dashboard?_adf.ctrl-state=1c6htvhmzb_17.

The expanded 300 MW program is projected to reach 300 MW by 2023 and cost $52 million per year.[113] The program forecast is shown below, and has total installed FiT capacity reach 450 MW in 2023.

Figure 2-18. 2014 IRP Cumulative Feed-In Tariff Program Capacity



Source: 2014 IRP, Appendix N

Navigant predicts that the FiT program will continue to be a significant challenge if additional resources are not provided. The Recommended Strategic Case of 450 MW of FiT projects by 2023 will require approximately 50 MW of FiT installations per year (since the current 150 MW program has only 7 MW complete). Despite the FiT 150's low installation rate and issues with delays, the FiT 300 had been expected to be launched in 2015.[114] Instead, the program will likely begin in 2016. FiT program issues were the subject of a report last spring and have garnered some media attention.[115]

To help streamline the process, the Department obtained a Master Conditional Use Permit (MCUP), reduced the allowed construction period to 12 months, and added administrative support to expedite review.[116] LADWP submitted an application for the MCUP on December 11, 2014 after consulting with the Department of City Planning. The MCUP allows rooftop and carport projects in multifamily, commercial, public facility, and industrial zones to be permitted by administrative clearance.[117] Results from this improvement have not yet been documented.

LADWP also recently cleared inactive projects from the wait list, resulting in the program being under-subscribed. The Department should now evaluate pricing improvements and other ways to attract more participants. Overall, it is unclear how the Department will approach the expanded FiT 300 program while attempting to install the vast majority of the previous program's installation target. Navigant recommends that, after addressing current project pipeline challenges, LADWP should institute a project management office to help improve performance.

[113]"Growing Local Solar Through Expanded Feed-In Tariff." LADWP Management Report, December 2, 2014.
[114]Ibid.
[115]"Report: LADWP's Rooftop Solar Energy Program Failed to Meet Goals," CBS Los Angeles, March 27, 2015 (losangeles.cbslocal.com/2015/03/27/report-ladwps-rooftop-solar-energy-program-failed-to-meet-goals).
[116]More information available at: www.ladwp.com/FiT
[117]LADWP Feed-in Tariff: Master Conditional Use Permit. City Planning Commission, February 26, 2015.

2.4.7.4 Community Solar Program

The Community Solar Program is still under development. The goal for community solar in-basin projects is for a total 40 MW aggregated over various LADWP and City of Los Angeles properties to be installed by 2020. The Board of Commissioner's May 2015 RPS status report mentions that LADWP is currently evaluating over 100 different properties and will aggregate the best 40 MW for the portfolio. The search for land and city agency property opportunities is still underway.

The program is intended for customers who are otherwise unable to share the benefits of solar energy.[118] Projects will be owned by the Department and community solar participants will buy into the project. Customers will lock in a subscription fee for a "block" of solar energy produced from the community array and receive a proportionate energy credit on their electric bill. LADWP plans to use the Customer Care and Billing system for program tracking and reporting.

LADWP has drafted a business plan outlining next steps for the program. Initially, the Department will offer 2 MW by 2016 as a pilot program.

- Q3-Q4 2015: Finalize Community Solar Program documentation.
- Q4 2015-Q1 2016: IT programming for the Customer Care and Billing System.
- Q2-Q3 2016: Seek Board and Council approval of the program.
- Q3 2016: Offer initial phase of the program.

The plan discusses program eligibility, subscription details and preliminary costs, and challenges. This shows good preparation for the pilot program, but little information has been provided on customer interest and outreach thus far. When the Community Solar Program is finalized, it should also include a recruitment strategy and confirmation that the program can be handled through the Customer Care and Billing System.

The program will be a good step forward in aligning LADWP with greater City of Los Angeles goals; for example, those described in the Mayor's pLAn. As a POU, LADWP values the Community Solar Program for reaching low income customers and other Los Angeles residents who cannot participate in other local solar opportunities. According to NREL, POUs have taken the lead in deploying community solar projects to serve member- or citizen-customers. In its overview of utility solar business models, NREL found that utility-sponsored community solar projects typically involve customers contributing a payment to support the project and then receiving a payment or credit on their electric bill that is proportional to 1) their contribution and 2) how much electricity the solar array produces.[119]

Sacramento Municipal Utility District was an early adopter of community solar with its SolarShares program, in which customers pay a fixed monthly fee based on the amount of the solar subscription and their average electricity consumption, and receive monthly energy credits for the output of the solar subscription. The first 1 MW program was fully subscribed with approximately 700 residential customers and SMUD has plans to expand up to 25 MW in the next few years.[120] Generally, this model is similar to LADWP's plan. One difference is that SMUD contracted with a solar developer under a power

[118]Low income customers, Lifeline customers, renters, multi-family units, and any other residential customers. LADWP anticipates allowing low income and Lifeline customers to use the current subsidy for participation.
[119]"A Guide to Community Solar: Utility, Private, and Non-profit Project Development," National Renewable Energy Laboratory, November 2010 (www.nrel.gov/docs/fy11osti/49930.pdf).
[120]Ibid.

purchase agreement for a single 1 MW array, whereas LADWP plans to build a number of smaller projects itself, possibly leading to higher costs.

2.4.7.5 Local Solar Outlook

Overall, customer net-metered solar capacity and the related Solar Incentive Program appear to be growing in line with expectations. However, the FiT program is facing implementation challenges and a low installation rate to-date. On the positive side, LADWP reports on FiT progress transparently with the online dashboard. And importantly, it has also undertaken several process improvements. The Solar Incentive Program has also undergone several process improvements, which will be helpful as customer net-metered solar must increase significantly to meet its goals, even though it appears to be on track at this time. Hopefully, the FiT program will see at least as much progress going forward with additional pricing analysis, process improvements, and project management.

One interesting aspect of the FiT program is that customers who have already participated in the Solar Incentive Program can also use any excess roof or property space to participate in the FiT. This could be an attractive business case for many large entities in Los Angeles and may be an outreach channel for the program going forward.

The Community Solar Program is limited in scale and has not yet opened to customers, so updates on this new program should be featured in the 2015 IRP update (regarding final program design) and the 2016 IRP (regarding the status of Board approval and customer outreach).

2.4.8 Electrification of the Transportation Sector

The 2014 IRP Recommended Strategic Case includes high transportation electrification equivalent to 2,344 GWh added sales by 2030, or 290,000 electric vehicles in Los Angeles by 2020 and 580,000 by 2030.

2.4.8.1 Approach to Electrification

The California Energy Commission's Integrated Energy Policy Report (IEPR) forecasts over 1,300 GWh of plug-in electric vehicle load in California in 2034. LADWP used this report to deduce 127,000 plug-in electric vehicles by 2020 and 290,000 by 2030 in the Los Angeles. This is equivalent to an annual electricity demand of 1,172 GWh in 2030.

The IRP Advisory Committee approved a base case (the IEPR forecast), medium case (1.5x the IEPR forecast or 435,000 electric vehicles), and high case (2x the IEPR forecast or 580,000 electric vehicles). In the 2014 IRP the base, medium, and high electrification cases were paired with the 33 percent, 50 percent, and 40 percent RPS levels, respectively. The 2013 IRP recommended the base case, whereas in the 2014 IRP, the Recommended Case is for 580,000 electric vehicles by 2030. LADWP used a production cost model to determine that the high case would have a beneficial effect in lowering electricity rates through increased sales while reducing GHG emissions. In addition to approval by the Advisory Committee, the high case was supported by public feedback.

The high forecast was cross-checked against a Navigant Research Report on Electric Vehicle Geographic Forecasts for North America (Q2 2014). The Navigant Research forecast is still only approximately 80 percent of LADWP's high forecast for the comparison year 2023, but the Department considers the high scenario to be reasonable based on aggressively incentivizing and promoting electric vehicle charging.

2.4.8.2 Background on Electrification

The State of California achieved a cumulative 118,000 plug-in electric vehicles in 2014, with approximately 11,000 in Los Angeles. The United States reached 250,000 electric vehicles in 2014.[121] The City of Los Angeles contains approximately 10 percent of California's population, so the penetration of electric vehicles is proportional to the population.[122]

LADWP provided an electric vehicle program update to the City of Los Angeles in May 2015,[123] reporting on the Department's two-year EV program ("Charge Up LA! EV Home Charger Rebate Program") that began in April 2011 and provided customer rebates up to $2,000 towards the purchase and installation of EV home charging systems. After the first program ended in June 2013, LADWP implemented a second two-year year program in July 2013. The "Charge Up LA! Home, Work and On the Go" program expands charging infrastructure for businesses and all other customer sectors. According to the LADWP 2015 Briefing Book, as of December 2014, the Department paid over $2 million in EV home charger rebates for 1,300 chargers. Currently, the program offers $750-1,000 for the purchase of a Level 2 charger and a $250 credit toward electricity for installing a separate time-of-use meter.

LADWP has also retrofitted and installed over 300 legacy chargers on City Property, including LADWP, City Hall, Convention Center, LAX, and City parking structures. It is also installing 17 DC fast chargers in Los Angeles (13 installed as of May 2015).

2.4.8.3 Electrification Outlook

The California Energy Commission's forecast for electric vehicles supports Governor Brown's Executive Order which calls for infrastructure development to support one million zero emission vehicles in California. Governor Brown's final goal is 1.5 million electric vehicles by 2025; proportionally, this would result in approximately 150,000 electric vehicles in Los Angeles. In comparison, LADWP's case of 290,000 electric vehicles in 2020 and 580,000 in 2030 appears aggressive since it is double the California Energy Commission forecast.

However, LADWP is not alone in making a high forecast. In addition to the referenced 2014 Navigant Research Report on Electric Vehicle Geographic Forecasts, the Southern California Plug-in Electric Vehicle Readiness Plan[124] predicts a relatively similar number for Los Angeles with a high forecast of 278,207 electric vehicles by 2022. The Mayor's pLAn is similarly calls for 10 percent of cars and light-duty trucks to be plug-in electric vehicles by 2025, equivalent to approximately 250,000 electric vehicles (despite only 0.06 percent plug-in electric vehicles in March 2014).

Although the forecast may prove ambitious, it was created with appropriate consideration of other sources and modifications based on the Department's goals. However, to meet its forecasted numbers, LADWP must significantly expand certain capabilities. So far, the Department has not outlined a plan to

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[121]California Plug-In Electric Vehicle Collaborative 2014 Annual Report (www.pevcollaborative.org/sites/all/themes/pev/files/CPEV_annual_report_web.pdf).

[122]The annual estimate of the resident population of California in 2014 was 38.8 million and the annual estimate of the resident population of the City of Los Angeles in 2014 was 3.9 million (U.S. Census Bureau).

[123]"LADWP's Electric Vehicle Charger Program Update," All City Meeting, Los Angeles Department of Water and Power, May 11, 2015.

[124]Southern California Plug-in Electric Vehicle Readiness Plan, UCLA Luskin School of Public Affairs, December 2012 (www.pevcollaborative.org/sites/all/themes/pev/files/docs/reports/SouthCoast_PEV_Readiness_Plan_Main.pdf).

effectively incentivize electric vehicle charging to encourage and then manage the massive projected growth. As of May 2015, LADWP had only 1,000 plug-in electric vehicles on a time-of-use discount rate. Further, 89 percent of electric vehicle charging is done at home and 80 percent is done at off-peak times.

The Department recognizes that it needs a new rate design to send the proper price signals to customers and encourage electric vehicle charging at valuable times, but requires significant additional work on this topic. Electric vehicle program tracking, reporting, and project management will also be critical to managing both increasing electric vehicle penetration and expectations. Without these foundations, LADWP's electric vehicle integration vision is mostly conceptual. LADWP has just begun to look at these matters in its Smart Grid Demonstration Project (2.4.11).

The conceptual vision is in line with the State of California. In its Electric Vehicle Program Update, the Department communicates a far-reaching vision of the future: technology integration of plug-in electric vehicles with on-site solar PV, demand response, load shifting, outage mitigation, and energy storage. According to the 2013 Update to the Integrated Energy Policy Report by the California Energy Commission,[125] greater attention to vehicle and electric grid integration will be needed in the future. The California Energy Commission agrees that electric vehicles have the potential to benefit the grid by using their batteries to help manage electricity loads throughout the day to help integrate renewable solar and wind energy, with smart charging that incorporates the flexibility to communicate with customers and electric utilities.

2.4.9 Demand Response

The Department's demand response plan calls for 506 MW of capacity by 2026 (481 MW dispatchable), with 208 MW by 2020.

2.4.9.1 Approach to Demand Response

Demand response is an important energy management tool that facilitates the reduction in energy use over a given time period in response to a price signal, financial incentive, or other triggering mechanism (compared to energy efficiency, demand response reduces load for a targeted peak period while energy efficiency reduces the overall load shape). One key objective of demand response programs is to cost-effectively reduce the summer peak and thereby avoid long-term investment in natural gas power plants designed to operate at system peaks.

LADWP published its Demand Response Strategic Implementation Plan in 2013, which serves as the near and long-term plan for developing the demand response portfolio. The Department's vision is to "enroll a realistically achievable quantity of a dispatchable, demand-side resource within LADWP's service territory that is both reliable and cost-effective." LADWP plans to handle its demand response program ramp-up internally, operating out of the Energy Control Center managed by the Power System. Demand response will be treated as a resource and the Demand Response Strategic Implementation Plan is supposed to be updated each year and incorporated in the IRP.

[125] *2014 Draft Integrated Energy Policy Report Update*, California Energy Commission, CEC-100-2014-001-CMF, 2015 (www.energy.ca.gov/2014publications/CEC-100-2014-001/CEC-100-2014-001-CMF.pdf).

The Department also intends to integrate demand response with the billing and customer information systems. One goal is for demand response to be customer-friendly, meaning an easy enrollment process, flexibility to change participation, transparent incentives and rates, and inclusive of all rate classes.

2.4.9.2 Demand Response Strategic Implementation Plan

The following programs will be the principal sources of load curtailment:

- Commercial, Industrial, and Institutional (CII) Curtailable: Participants receive monthly capacity payments for guaranteed load reduction of at least 100 kW when requested.
- Residential & Small Commercial Direct Load Control (DLC): Participants with less than 30 kW peak load receive an annual payment that varies based on reducing power consumption from equipment including air conditioning, pool pumps, etc.
- Critical Peak Pricing: Participants of all classes and sizes given a dynamic time-of-use (TOU) rate that includes a high "critical peak" price during periods of high energy prices, high customer demand, or emergencies.
- Electric Vehicle Rider: Participants will have an EV charging station with a separate meter installed. During a demand response event, usage may be curtailed in exchange for a discounted charging rate.
- Alternative Maritime Power (AMP): CARB is requiring large vessels docked at the Port of Los Angeles to be connected to electric power through LADWP's grid to reduce emissions from diesel generation. In cases of emergencies, system operations may temporarily disconnect AMP customers.

The benefits of the Demand Response Pilot Program, as identified by LADWP are the following:

- Defer generation capacity investments.
- Provide local transmission and distribution support.
- Provide ancillary services – contingency reserves, regulation reserves, and load following.
- Facilitate renewable integration.
- Reduce power production and/or wholesale power purchase costs.

For the Pilot 1 program, 26 of 30 site walk-throughs were reported complete in a May 2015 executive update.[126] Additionally, customers had been engaged to sign the pilot program agreement, and the Billing and Rates group had been engaged on the incentive rate process. At that time, the program was on track to launch operations in June 2015. Black & Veatch technical services for the program were begun in January 2015 and are expected to run through July 2016, with 27 of work percent complete as of the May 2015 update. URS services began in December 2014 and are expected to run through June 2016, with 64 percent of work complete as of the update. All of the main tasks for Pilot I are reported to be "On Track" or "Completed" in the latest update.

Pilot 2 is scheduled to roll out in 2016 with residential A/C load control technology and customer perception, with approximately 200 participants. Pilot 3 is scheduled for 2017 with a residential Time-of-Use (TOU) rate for approximately 500 participants.

[126]Demand Response Pilot Program Executive Update. Los Angeles Department of Water and Power, May 2015.

However, LADWP is behind the IOUs by approximately four years in terms of rolling out pilot programs. The IOUs and SMUD have already implemented Automated Demand Response (Auto DR) programs, while LADWP is piloting its CII Curtailable Load Program in 2015 and including an Auto DR component in 2016. LADWP's incentive rates[127] are comparable with other utilities but may be too low to bring enough customers on board to meet the aggressive 208 MW by 2020 goal.

2.4.9.3 Demand Response Outlook

LADWP has taken good first steps by laying out a detailed implementation plan with the help of an outside consultant and contracting with technical service providers to launch a pilot program.

So far, the Pilot I is reported to have received high interest from customers, timely and informed guidance from the Program Manager, candid feedback, good web support for data, and support from Premiere Account Leads and Representatives. Challenges have included unattractive incentives, a manual Rates & Billing process, and customer curtailment process integration (semi-auto and manual).

However, despite Pilot I successes, going from zero MW of demand response in 2014 to 200 MW in 2020 and 506 MW in 2026 will be a challenging undertaking. LADWP is currently behind other utilities, particularly the IOUs, in implementing demand response. Further, incentive levels may be too low to attract sufficient customers to meet goals and should re-evaluated in an update to the Demand Response Strategic Implementation Plan. In particular, the Department should define the incentive it will provide to customers installing Auto DR enabling technology. The current Demand Response Strategic Implementation Plan states that LADWP will help reimburse Auto DR Program participants but does not yet determine the incentive level. For example, PG&E's Auto DR Program provides an upfront[128] $200-$400/kW incentive based on the amount of load reduction controlled by the technology. The Department should ensure these updates are included in the 2016 IRP.

In the future, California's Title 24 Building Energy Efficiency Standards will also impact on demand response capabilities. Title 24 Standards are updated on an approximately three-year cycle. The 2013 Standards were effective July 1, 2014, with a requirement for Auto DR readiness.[129,130] On January 1, 2017, the updated 2016 Building Energy Efficiency Standards will go into effect.[131] Advanced Auto DR can also help integrate renewables by enabling customer loads to respond to fluctuations in the output of variable energy resources. The Department should continue to investigate these applications (in the near term, this will be under its Smart Grid program).

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[127]$5/kW-month capacity payments for the CII Curtailable Load Program and $8/kW-month for Auto DR. HECO's incentive for Fast Demand Response is also $5/kW-month, while PG&E's Base Interruptible Program provides incentives of $8-9/kW-month (however, this program also has a penalty for failing to participate in an event, unlike LADWP's program).

[128]60 percent upon successful verification of equipment installation and 40 percent upon verification of performance in the DR season (www.pge.com/en/mybusiness/save/energymanagement/adrp/index.page).

[129]2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, California Energy Commission, May 2012 (www.energy.ca.gov/2012publications/CEC-400-2012-004/CEC-400-2012-004-CMF-REV2.pdf).

[130]Any new building larger than 10,000 square feet and any existing building replacing 10 percent or more of existing luminaries must enable lighting fixtures to be controllable by a building management system capacity of receiving Auto DR signals via the internet. HVAC in non-critical zones must also be responsive to Auto DR signals.

[131]More information on Title 24 available at: www.energy.ca.gov/title24.

2.4.10 Energy Storage

Under AB 2514, LADWP is required to set energy storage procurement targets for 2016 and 2021. The 2014 IRP Recommended Case includes the targets adopted under the Department's Energy Storage Development Plan[132] for 24 MW by the end of 2016 and an additional 154 MW by the end of 2021.

2.4.10.1 Approach to Energy Storage

To conform to AB 2514, LADWP developed a framework to calculate appropriate energy storage targets with two approaches:

1. Selected Location Energy Storage Evaluation: Identifies a specific location in the power system when energy storage may be the most useful (targets for 2016). LADWP contracted with Black and Veatch and the Electric Power Research Institute, and consulted with the Southern California Public Power Authority.
2. Whole Power System Energy Storage Evaluation: Investigates whether energy storage can be integrated at all levels of the power system (targets for 2021). At the time of the Plan's publication, LADWP has issued study task scopes to third parties and studies are expected to be complete by the end of 2015.

After each evaluation, the Department will conduct further cost-benefit and feasibility assessments. This is a reasonable approach and can be commended for working closely with parties and perspectives external to LADWP; innovation in this area should be encouraged by collaborating outside the utility.

2.4.10.2 Energy Storage Development Plan

The primary components of the plan are as follows:

Table 2-18. LADWP Energy Storage Procurement Targets

System	Storage Technology	Location	Capacity	Applications	Schedule
Generation	Pump Hydro Storage	Castaic Power Plant	21 MW	• Expand capacity of existing large system providing peak load	Complete in 2013
	Thermal Energy Storage	Valley and Apex Generating Stations	60 MW	• Increase output during hot weather • Peak shifting • Defer or eliminate new plant • Ramping capability	2017-2019
Transmission	Battery Energy Storage	Beacon Solar and Q09 Solar Projects	50 MW	• Ramping capability • Solar output leveling • Peak shaving	2020
Distribution	Battery Energy Storage	Distribution and Receiving Stations	4 MW	• Peak shifting • Distributed solar PV integration	2019-2020

[132] Los Angeles Department of Water and Power Energy Storage Development Plan, September 2, 2014; shared with Navigant Consulting on June 10, 2015.

				• Defer distribution infrastructure	
Customer	Thermal Energy Storage	LAX	3 MW	• Load shifting • Peak shifting • Defer distribution infrastructure • Support Demand Response	2016
	Thermal Energy Storage	Large Customers on 34.5 kV	40 MW		2020
LADWP	Battery Energy Storage	John Ferraro Building Parking Lots	1 MW	• Peak shaving • Peak shifting • Incorporate Energy Management System • EV charging stations • Solar output leveling	June 2015

Note: Thermal energy storage uses conventional air conditioning equipment and a storage tank to shift the majority of electricity used for space cooling in customer facilities from peak to off-peak periods.

Castaic Power Plant is a seven-unit Pump Storage Hydroelectric plant owned and operated by LADWP with a 1,500 MW nameplate capacity. The Castaic 21 MW in the table above designates an upgrade on one 250 MW unit of the plant.

LADWP also has two small pilot projects for battery energy storage. One is a 25 kW project called the "Garage of the Future" located at UCLA, and the other is a 50-200 kW project called "La Kretz Innovation Campus Project" located in downtown Los Angeles.

2.4.10.3 Energy Storage Outlook

LADWP's plan includes a diverse mix of storage technologies and applications resulting from detailed evaluations. Energy storage for increasing the reliability of the grid with a high penetration of renewables is an especially important application that is being investigated and implemented on the transmission system. The 50 MW at Beacon Solar and additional future utility-scale solar plants, found to be cost-effective by Black and Veatch, is a good first step in this direction.

The 2015 IRP update and 2016 IRP should show progress toward achieving the first energy storage procurement target in 2016, with status updates for the projects listed in the current plan. For example, results of the system studies for planned generation and transmission sited storage from the LADWP Energy Storage System Roadmap.

2.4.11 Smart Grid

The 2014 IRP discusses LADWP's smart grid strategy and lists smart grid program implementation as one of its goals. Generally, the smart grid will assist in the procurement and integration of technology to support energy forecasting and scheduling, customer metering, high speed communication and information systems, and energy storage. It is also intended to help increase system efficiency, reduce losses, improve outage response, and enable better management of the Power System. These advancements will also facilitate the integration of local solar generation and other variable renewable resources.

2.4.11.1 Approach to the Smart Grid

The Department has established a comprehensive smart grid strategy through an implementation roadmap, architecture, and supporting business plan. It has defined "smart grid" as intelligent data gathering and advanced two-way digital communication overlaid on electric distribution networks to provide real-time data that enhances the utility's ability to optimize energy use. The Smart Grid Investment Program, as described in the 2014 IRP, is the foundation of LADWP's smart grid strategy. In addition to this, LADWP is participating in a grant-enabled Smart Grid Regional Demonstration Program (Smart Grid L.A.).

LADWP summarizes the drivers for the smart grid program as the following:

- Increasing costs impacting customer rates;
- Customer choice and experience;
- Outage management capability;
- Increasing solar, other distributed energy resources, and electric vehicles impacting reliability;
- Managing peak energy demand; and
- System efficiency and energy losses.

The smart grid strategy appears to be well thought out and in line with current smart grid advancements in California and the U.S. For example, according to the National Energy Technology Laboratory, a smart grid must meet six essential goals by achieving the following:[133]

- A more reliable grid that provides power in the manner and of the quality demanded by customers.
- A more secure grid that is more resilient to physical and cyber attacks from both natural and intentional causes.
- A more economic grid that facilitates real-time pricing and adequate supplies.
- A more efficient grid that optimizes investments for reduced operating costs, fewer instances of electric loss, and improved asset utilization.
- A safer grid that reduces harm to the public and grid workers.
- A more environmentally friendly grid that reduces the impacts of electricity generation, transmission, distribution, and consumption on the environment.

From LADWP's plan, described further below, it appears that Los Angeles' smart grid is on track to be designed to meet goals similar to these. Additionally, the California Independent System Operator (CAISO) similarly considers electric vehicles an important opportunity to leverage smart grid technologies to support grid reliability throughout the west. Along with other California entities, CAISO published the *Vehicle-Grid Integration Roadmap: Enabling Vehicle-Based Grid Services* in 2013 which identifies pathways for electric vehicles to benefit grid reliability.[134] For LADWP, this is a particular focus of Smart Grid L.A.

[133] www.sce.com/NR/rdonlyres/EAEDC3E5-F596-40E7-8075-349840F24546/0/Smart_Grid_Development_Vision.pdf
[134] publications.caiso.com/StateOfTheGrid2014/SmarterGrid.htm

2.4.11.2 Smart Grid Investment Program

The Smart Grid Investment Program (SGIP) consists of 12 projects planned over a period of 10 years. One particularly important effort, which is necessary to the deployment of several SGIP projects, is Advanced Metering Infrastructure (AMI). The Department is undertaking the procurement and installation of the AMI components necessary to provide smart grid metering functions. AMI will initially be deployed on a limited scale (to both power and water customers) as a demonstration project, and there is not yet a plan for rolling it out to all customers.

Table 2-19. Smart Grid Projects Dependent on Advanced Metering Infrastructure

	Program	Description
Customer Service	Customer pre-payment	Customers pre-pay for electric and water service; LADWP is able to send automated messages and provide account balance and usage data.
	Demand response for small customers	Residential and other small customers earn benefits by reducing load during peak load situations.
	Electric vehicle charging management	Electric vehicle charging is controlled/optimized during periods of high demand or reliability programs; potential to use electric vehicles as a source of energy storage and ancillary services in the future.
Grid Management	Distributed generation monitoring and management	Interval and voltage measurements provide LADWP with data at the distribution-system level that assists in measuring distribution generation impacts.
	Advanced Voltage, Power Quality, and Volt/VAR Control	Meter data provides LADWP with a detailed view of the voltage profile of distribution lines, providing greater visibility at high penetration levels of solar and other distributed energy resources.
	Distribution modeling and planning	Meter data provides LADWP with detailed information about the distribution system, used to improve transformer utilization, forecast load growth, and manage circuit loading.

Source: LADWP 2014 IRP, Section 2.4.5.1

SGIP projects that do not depend on AMI include the following:

- Large customer demand response: Commercial and industrial customers with greater than 100 kW demand are dispatchable and visible resources to LADWP system operators.
- Enhanced system operations: Enables existing energy management system to provide power system operators with more detailed, accurate, and real-time information about power flow.
- System voltage/VAR control: Distribution automation devices improve the measurement and control of voltage and VAR (Precursor to the AMI-dependent project).
- Asset condition monitoring: Advanced sensors and communication devices provide information on the health of assets in the power system.
- Enhanced forecasting of renewable generation: Mature weather forecasting tools provide localized data for generation scheduling and the control and dispatch of solar and wind generation.

In October 2013, the Power System Engineering Division prepared a deployment plan for the smart grid program (Appendix L of the 2014 IRP), in which it calculates a total implementation cost of $1.19 billion. By far, the largest individual projects are the initial AMI effort at $650.7 million and the small customer

demand response project at $324 million. Net benefits are more difficult to quantify than costs, due to qualitative environmental and customer benefits, but the Department includes a benefit analysis as well, featuring the following benefits over a 20-year period:

- Up to $363.5 million in revenue enhancement
- Up to $144.1 million in avoided capital costs
- Up to $1.066 million in demand response benefits
- Up to 4.25 million efficiency labor hours
- 3.7M metric tons GHG emissions reduction
- 8,660.3 GWh electricity savings
- Customer incentives of up to $221.4 million

2.4.11.3 Smart Grid Regional Demonstration Program

The Smart Grid Regional Demonstration Program, or Smart Grid L.A., is a demonstration led by LADWP and conducted by a group of local research institutions. The program was awarded a five-year, $60 million Department of Energy grant (matched by LADWP) in 2009 through the American Recovery and Reinvestment Act. The program includes pilot projects in five interrelated areas: AMI, demand response, consumer behavior, cybersecurity, and electric vehicle integration. LADWP's research partners are the University of Southern California, University of California Los Angeles, and NASA Jet Propulsion Laboratory.

According to the 2015 Briefing Book, the Department has installed 51,000 two-way digital meters (smart meters) in three communities in Los Angeles – the areas around UCLA and USC, and Chatsworth – as part of Smart Grid L.A.

2.4.11.4 Smart Grid Outlook

Although strategically well-directed, the Department's plan is behind other utilities on smart grid implementation; specifically, the installation of advanced metering infrastructure. In 2012, 74 percent of California IOU customers already had advanced metering infrastructure installed.[135] Additionally, although the Smart Grid Program Deployment Plan illustrates the project sequentially from Year 1 to Year 10, there is no calendar year associated with the timeline. LADWP needs to present its plan such that progress can be more easily tracked against dates and milestones. Because the 2014 IRP focuses so much on the electrification of the transportation sector, the vehicle-to-grid integration aspect of the demonstration program is especially critical and should have regular updates going forward.

A good initial effort has been made to quantify benefits; LADWP should continue to refine its estimates as the Smart Grid Regional Demonstration Program makes new advances and as it rolls out projects in the Smart Grid Investment Program. An update to costs and benefits should be provided in the next IRP.

[135] "Net Energy Metering, Zero Net Energy and the Distributed Energy Resource Future," Rocky Mountain Institute, March 2012.

3. Conclusion

3.1 Accomplishments

LADWP's 2014 IRP is a strong planning document based on Navigant's assessment of goals against regulatory mandates and policy objectives and the comparison of planning and modeling procedures to industry practices. Further, the Department has achieved a number of key accomplishments in line with its goals and the Recommended Strategic Case, described below.

- The 2014 IRP created a stakeholder Advisory Committee and three public outreach workshops, in line with best practice for IRP stakeholder engagement.
- The Department reports being on schedule for the elimination of OTC at in-basin plants. Haynes Units 5 and 6 began commercial operation in June 2013, and Scattergood Unit 3 broke ground in June 2013 and is still expected to be complete by the end of 2015.
- In 2014, LADWP had reduced GHG emissions 23 percent below 1990s levels, already meeting the AB 32 mandate for 2020.
- The Department achieved pre- contract end date divestiture from Navajo Generating Station (coal) in 2015 and replaced it with Apex Generating Station (natural gas), reducing 5.59 MMTons of CO_2 emissions.
- The Efficiency Solutions group achieved 60 percent more energy savings in FY 2012-13 than FY 2011-12 and 27 percent more energy savings in FY 2013-14 than FY 2012-13, has increased staff levels, and is close to meeting current annual targets.
- The energy efficiency partnership with Southern California Gas Company for joint electric and gas saving programs has received positive regional and national attention.
- Contracts for a 30.64 percent RPS in 2020 are already in place.
- As of March 2015, LADWP had 143 MW of customer net-metered solar.
- Both the Solar Incentive Program and the feed-in tariff have undergone process improvements to speed up project processing times.
- The demand response Pilot I program is underway reported to be on track.
- The Department has installed 51,000 smart meters as part of Smart Grid L.A.

3.2 Areas of Improvement

Certain programs do need further definition and refinement in future IRPs. For example, the plan to replace the coal-powered Intermountain Power Project (IPP) has encountered challenges due to contractual issues with other participants. After Navajo, LADWP must now take the opportunity to focus on IPP and make it a high priority to overcome these challenges with more creative replacement plans. Additionally, the Community Solar Program, demand response, and smart grid-related initiatives are early-stage programs that must be further developed. As they are, LADWP should actively communicate with stakeholders about the direction and status of the programs.

Despite the strength of the 2014 IRP as a planning document, implementation may prove to be a challenge. There are complex issues at the heart of LADWP's renewable energy and grid modernization efforts which will require careful management by the Department and City. Potential issues include maintaining power system reliability with a high penetration of renewables; requiring additional staffing resources, contracting ability, and project management; and lacking clear project metrics and oversight tying performance to rates. These areas have the potential to be significant risks.

The reliability impact of a high penetration of renewables is not yet fully understood. Goals for a high RPS and increased local solar are potentially at odds with the core objective to maintain power system reliability–at least, without careful implementation and specific, well-executed plans. The Department is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. LADWP must thoroughly understand distributed generation impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort with the PSRP. It is critical that any recommendations from these studies be implemented to ensure system operational reliability.

Most of the plans laid out in the 2014 IRP describe significant program ramp-ups over the next several years. This is also the case for the PSRP, which is discussed in the Power Infrastructure Report, Part B. However, the Department has struggled with capital underspending, reportedly due to staffing and contracting issues. Several programs have failed to achieve annual targets in recent years. These trends are a concern for LADWP's growth plans. Without sufficient support for struggling programs, there is little evidence the Department will be able to establish and maintain aggressive growth. Specifically, the Power System should meet needed staffing levels and adopt a more rigorous project management approach or hire a project management firm to support project contracting, execution, and tracking. Additionally, the Department would benefit from a review and redesign of its procurement practices. Navigant found proof of the ability to grow in the Efficiency Solutions group, which has increased staffing and spending towards the program budget—this should be emulated in other areas of the Department. Overall, the program escalation challenge is a Department-wide issue and is further discussed in the Governance report.

Capital program underspending is further complicated by opaque reporting of results and the restatement of project and annual budgets. In a number of cases, Navigant observed a lack of clarity in reporting on program progress toward specific goals and around the use of leftover funds from underspent capital programs. Complete information on the whole lifecycle of a project, including comparisons to original budgets, is often not readily available. Because achieving the clean energy transformation will come at a cost and LADWP's funding requirements will continue to increase, it is especially important to track program metrics on performance and spending. Tying progress and achievements to rates in some way would establish more transparency and accountability for the Department's budgets and plans. This would trigger more open discussions between the City and LADWP around program success and funding. For example, until the full cost of renewable integration is fully understood, future rate increases related to new renewable generation resources should be tied to the results of such studies and phased based on the strategies adopted and progress against them.

3.3 Recommendations

Based on these findings, Navigant makes the following recommendations. Some are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Formalize current IRP practices and link the IRP more closely to rates, requiring by ordinance an update to the IRP to be submitted with proposed rate actions and annual written updates to be submitted to the rate-approving authority reporting on key performance metrics for IRP programs and goals. Establish specific milestones for programs to be reflected in the reported metrics. In this way, the IRP will remain an engineering document produced by the Power System but be more effectively leveraged for rate decisions.
- Prepare for a significantly higher level of activity and spending in capital programs by:
    3. Ensuring that Power System divisions have the necessary staffing and contracting resources. LADWP should follow Navigant's recommendations regarding the structural changes to hiring processes made in the Governance report.
    4. Adopting a more sophisticated project management business discipline with project management specialists reporting more detailed and transparent project metrics to key stakeholders on a monthly basis. Enhance tools and processes to centrally and comprehensively manage programs throughout procurement, construction, and commissioning.
- Place a high priority on completing the renewable integration reliability studies and implement critical recommendations from these studies. The Department should continuously update these studies, assess the resulting impacts on the Power System, and identify potential policy changes. Each IRP should incorporate the latest results.

Medium Priority Recommendations

- Include additional IPP replacement scenarios and updated timelines in the next IRP. LADWP should conduct an in-depth assessment of alternative non-coal scenarios, evaluate pros and cons, and present its best proposed strategy for complete IPP replacement in the 2016 IRP.
- Form a new, longer-term energy efficiency goal now that there is guidance from SB 350. Coordinate IRP modeling efforts with the Efficiency Solutions group to improve energy efficiency estimates past 2020 over the timeframe of the IRP, backed by an updated Energy Efficiency Potential Study as needed.
- Continue to prioritize finalizing new customer-focused programs (community solar, demand response, and smart grid-related programs) and as they are developed and refined, actively communicate with and hold discussions among stakeholders. Regularly communicate costs and benefits, timelines, and program milestones and include updates in each IRP.

- Conduct an assessment of the solar feed-in tariff program and make changes to support installation targets. As part of this, analyze pricing and program attractiveness to participants as well as streamline the program with process improvements.
- Create a preliminary rate design to send price signals to customers with electric vehicles. LADWP's plan to eliminate renewable overgeneration issues with electric vehicle charging will require new rates that incentivize customers to align their vehicle charging time with peak output from renewable generation. IRPs should include this work as it develops.

Low Priority Recommendations

- Include additional sensitivity and risk analysis in IRP modeling beyond fuel price scenarios and the natural gas hedging program; specifically, incorporate a load forecast sensitivity analysis with high and low scenarios, a wholesale electricity price sensitivity analysis, hydroelectric generation risk scenarios based on water availability, and unplanned thermal outage risks.
- Add a scenario optimization model to the IRP process to determine the least-cost portfolio.
- Conduct an independent third-party review of the economics of the LADWP project ownership strategy for all generation resources to determine the most cost-effective approach. For example, assess LADWP-built utility-scale solar PV projects versus third-party PPAs.
- Establish a preliminary strategy in the next IRP to reduce GHG emissions fully 80 percent below 1990 levels by 2050 and refine this strategy during annual IRP updates as conditions change.

Appendix A. List of Interviews

Name	Title/Topic	Interview Date
Michael Webster	Oversight of Fuel and Power Purchase Division, Power Planning and Development, Power Integrated Support Services, and Power Engineering	July 9th
Minh Le	Interim Director – Fuel and Power Purchase	July 29th
John Dennis	Director - Power Planning and Development	July 16th and 28th
Michael Coia	Director - Power Integrated Support Services	July 29th
Marvin Moon	Director - Power Engineering	July 27th
Andrew Kendall	Oversight of Power Transmission & Distribution, Power Construction and Maintenance, and Power Supply and Operations	July 29th
Jay Puklavetz	Interim Director - Power Transmission & Distribution	July 29th
Robert Gonzalez	Assistant Director - Power Construction and Maintenance	July 30th
Kenneth Silver	Director - Power Supply and Operations	July 31st
David Jacot	Director – Efficiency Solutions	July 30th
Jan Lukjaniec	2013 Power System Reliability Program	July 30th
John Hu	2014 Long-Term Transmission Assessment	July 30th
Mukhlesur Bhuiyan	2013 Power System Reliability Program and Long-Term Transmission Assessment	July 30th
Loren Nguyen	2013 Power System Reliability Program	July 30th
Matt Hone	2013 Power System Reliability Program	July 30th
Faranak Sarbaz	2014 Long-Term Transmission Assessment	July 30th
Bingbing Zhang	2014 IRP modeling	July 31st

Appendix B. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are summarized as the following and listed in detail below.

- 2014 Integrated Resource Plan
- Power System Reliability Program
- Ten-Year Transmission Assessment
- Presentations and reports to the Board of Water and Power Commissioners
- Program business plans
- Program status reports
- Fiscal Year budgets

Documents Provided by LADWP	
1	2014 Power Integrated Resource Plan (December 2014)
2	2014 IRP Public Outreach Presentation - L.A.'s Power Transformation (October/November 2014)
3	2015 Briefing Book
4	Presentation on Coal Divestiture from Navajo Generating Station (May 8, 2015)
5	Los Angeles Department of Water & Power Efficiency Solutions Portfolio Business Plan FYs 2014/15-2019/20 (May 18, 2015)
6	LADWP - Efficiency Solutions Fiscal Year 14-15 - Summary of Programs (May 2015)
7	Renewable Portfolio Projects Update - April 2015 (May 14, 2015)
8	LADWP's Electric Vehicle Charger Program Update (May 11, 2015)
9	2014 IRP Electric Vehicle Recommended Case - Methodology (August 5, 2015)
10	LADWP Solar Incentive Program (SIP) Dashboard (June 1, 2015)
11	Mayor's Dashboard - LADWP Feed-in Tariff (FiT) Program (June 4, 2015)
12	Community Solar Program (CSP) - In-Basin Projects (40 MW) (June 3, 2015)
13	LADWP Community Solar Program Quick Overview- Draft (August 5, 2015)
14	Demand Response Pilot Program Executive Update (May 2015)
15	Energy Storage Development Plan Summary (September 16, 2014)
16	Proposed Resolution for the Haynes Generating Station Units 5 and 6 Repowering Project (April 2, 2010)
17	Proposed Resolution for the Scattergood Generating Station Unit 3 Reporting Project (April 25, 2012)
18	2013 Power System Reliability Program [Data Room]
19	2014 Long-Term Transmission Assessment (December 5, 2014) [Data Room]
20	Comprehensive PSRP Evaluation and Benchmarking Report (December 16, 2013)
21	Power System Reliability Program Board Presentation (September 16, 2014)
22	PSRP Meeting Materials (June 1, 2015)
23	2015-16 Power System Capital Priority List (May 2015)
24	Power Revenue Fund - Capital Improvement Program 2015-2016
25	LADWP FY 15-16 Final Budget (May 19, 2015)

26	Department of Water and Power of the City of Los Angeles Power System Revenue Bonds - 2015 Series A
27	Natural Gas Hedging Program Status Update - Proposed Five-Year Stair Step Plan (September 16, 2014)
28	Overhead Power Distribution Construction Standards - Aluminum Conductors (February 23, 2012)
29	Overhead Power Distribution Construction Standards - Areas Requiring Polymer Silicone Insulators (January 31, 2012)
30	Underground Power Distribution Construction Standards - DWP Electrical Lines Crossing Railroad, Light Rail and Busway (May 20, 2013)
31	Power Distribution Division Construction Standards - Material List for Padmount Switchgear Unit (Rev. January 12, 2009)

Volume II

Power Infrastructure – Part B

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Power Infrastructure Report, Part B
Volume II

Prepared for:
The City of Los Angeles

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Executive Summary

Objectives & Approach

This report presents Navigant's findings on Power Infrastructure, Part B for the IEA Survey. Power Infrastructure is particularly important as LADWP enters a major transition period as it endeavors to simultaneously reduce greenhouse gas emissions and realize a cleaner energy future, repower in-basin units to eliminate once-through cooling, and deliver reliable electricity while supplying power to its customers at competitive prices. For the focus of the IEA Survey, Power Infrastructure encompasses:

- Power Generation Infrastructure (Part A)
- Power Transmission and Distribution (T&D) Infrastructure (Part B)

Power Generation Infrastructure: Power Generation Infrastructure comprises Part A of the Power Infrastructure focus area and is featured in a separate report. In the report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio. In particular, Part A provides more context and discussion on the changing generation mix, including coal replacement, increasing renewable generation, and new demand-side resources.

Power Transmission and Distribution (T&D) Infrastructure: Part B (this report) focuses primarily on LADWP's asset management and the Power System Reliability Plan. LADWP, as it strives to make dramatic steps forward, is contending with aging infrastructure, sub-optimal contracting processes, a dysfunctional hiring and retention process, and budget pressures. Additionally, it must plan and manage the integration of increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges all put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function in the Power System.

Asset management can be characterized as making the smartest decisions possible to achieve desired asset performance through sound maintenance, repair, and replacement programs while minimizing unwarranted costs from failing to maintain and optimize the asset portfolio.

Navigant assessed the Department's T&D asset management function against industry best practice and stated objectives, identified gaps, and provided recommendations for improvement. Navigant leveraged its proprietary Asset Management Diagnostic Tool which explores 39 subject areas categorized in the following six asset management groups:

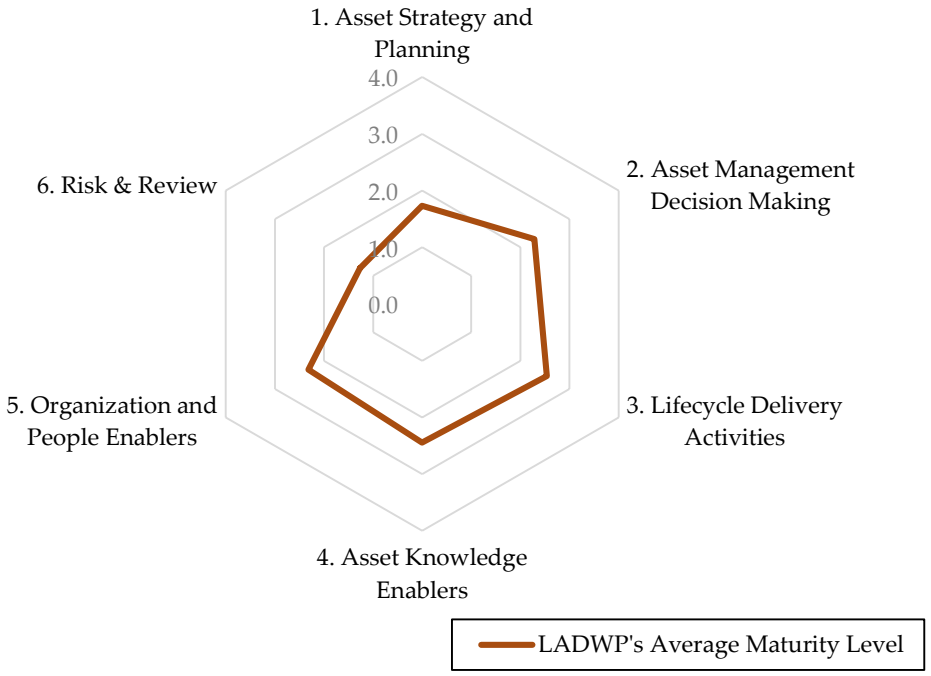
1. Asset Strategy and Planning
2. Asset Management Decision Making
3. Lifecycle Delivery Activities
4. Asset Knowledge Enablers
5. Organization and People Enablers
6. Risk and Review

The evaluation was conducted using the 2013 Power System Reliability Program (PSRP) and 2014 Long-Term Transmission Assessment, and was supported by interviews with LADWP leadership and subject matter experts, supporting documents, and Navigant's industry experience.

Asset Management Diagnostics

While not achieving what would be considered industry best practice, the Department's T&D asset management function appears to be in generally line with other U.S. utilities and provides sufficient governance and direction for LADWP to maintain, replace, and repair its aging infrastructure, while addressing the key challenges it faces. Results from the Asset Management Diagnostic Tool are shown below.

Figure E-1. Assessment of LADWP's maturity level in six key aspects of Asset Management



One strength of the Department is the way the organization makes operational decisions relative to its assets. LADWP is very good at situational awareness and managing operational risk, as are most utilities, and over the years has been implementing system enhancements to improve situational awareness. LADWP also appropriately forecasts the demand that it will place on T&D assets. The Department's planning process is mature and conservative, and takes into account all aspects of the business from generation to delivery.

One key achievement of the Department was the development of the 2013 PSRP. The PSRP outlines the Department's plan for the management of its generation, transmission, and distribution assets, with the objective of maintaining a high level of electric power service reliability and complying with North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) standards. Navigant's review of the PSRP shows that it represents a comprehensive plan for the management of the Department's generation, substation, transmission, and distribution assets, is well

aligned with the Department's stated objectives and to the organizational structure, and has been communicated well to stakeholders.

Finally, the Department appears to have a number of appropriate asset management processes in place. Areas addressed by LADWP's asset management processes include:

- Governance of asset maintenance and operation during the delivery phase of the life cycle.
- Maintenance and calibration of critical tools.
- Follow-up regarding failure or unexpected operation of assets.

Navigant also identified a number of areas of improvement requiring immediate attention. Key areas of improvement include the need for a formal asset management and continuous improvement framework, improvements to asset life estimates, the implementation of an outsourcing strategy, changes to the procurement process, and the development of a robust plan to address expected staff attrition. In particular:

- The Department has not formalized its asset management strategy. Furthermore, while risk is considered throughout the PSRP (mostly from a traditional utility perspective) risk and risk mitigation are not well documented in a manner consistent with best practices. LADWP should develop an asset management strategy document and implement a risk management framework, along with risk registers and mapping risk to objectives and mitigations across all areas of its asset management function.
- LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this generally serves LADWP well, it often does not include many of the more structured approaches of asset management to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, there has not been a formal process for asset management function audits. LADWP should develop a more formal, best practice asset management framework such as ISO 55000 and embed in it a structured continuous improvement process.
- The Department has a number of asset management processes in place; however, some may not be fully documented. LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge in a time of a rapidly changing workforce resources.
- LADWP's asset life estimates are largely based on age. Some of the age models, while sensible, do not align with best practice and may understate the expected lifespan of assets. Navigant recommends that LADWP evolve towards accurate end-of-life standards based on asset condition monitoring and improved end-of-life estimating techniques, including the development of asset health indices for each asset class.
- The PSRP does not fully consider the future requirements of assets, development of technology, or implementation of smart grid devices on the system. LADWP should assess the impact of changing smart grid technologies and include the implementation of those challenges in a roadmap that considers the requirements and timelines for updating the SCADA, OMS, EMS, and DMS systems, and outlines that implementation strategies for online monitoring and

distribution automation. The impacts on workforce and skills requirements should also be considered in the roadmap.

- While the PSRP will help LADWP better manage the middle and end-of-life of assets, too much emphasis is put on the lowest initial asset cost rather than whole life cycle cost. This approach is partly due to the characteristics of LADWP's procurement process, which focuses on the selection of the lowest cost bid at the time of acquisition as opposed to the lowest cost bid for the life cycle of the asset. This is a common issue for public power agencies and it tends to raise a utility's overall cost structure over time. Best practice recommends the implementation of a procurement process for "lowest evaluated cost" which properly considers the entire life cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs.
- While LADWP has had success in its current limited outsourcing, neither the PSRP nor the Human Resources Plan incorporates a stated contracting strategy. LADWP should define a stated outsourcing strategy as part of its workforce resource planning.
- Much of the Department staff's operational knowledge is gained through experience and training. With the expected large staff attrition, LADWP needs to formalize its processes and focus on capturing the institutional knowledge of retiring employees.
- LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the Department are governed by seniority through the civil service system; therefore, it is not always clear that there are opportunities to introduce new skills and approaches from outside the company so that the most qualified person holds each position. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially closed systems, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible.
- More attention on LADWP's implementation of the PSRP may be required. Even though it is a strong planning document supported by experienced staff, it appears to have been constrained by other factors that led to underspending and underperforming on the capital program. Like other important programs, the City should consider staging rates on PSRP achievements.

The implementation of these recommendations will require dedication and focus from the Department and possibly a culture change. However, as mentioned previously, LADWP is facing a number of challenges and addressing these challenges while minimizing the associated costs to ratepayers will require a transition to the implementation of best practices in asset management.

PSRP Performance

Despite the PSRP's merits as a strong planning document, Navigant heard feedback and found evidence of underspending on the capital program. This is a critical issue particularly because managing the PSRP is essential to advancement towards the Recommended Strategic Case in the 2014 IRP, as the Power System must be able to support a high penetration of renewables, distributed generation, storage, demand response, and smart grid technologies.

Navigant finds that in FY 2012-13, the PSRP spent of 72.7 percent of its budget; in FY 2013-14, the PSRP spent 69.8 percent of its budget; and in FY 2014-15, the PSRP spent 87.4 percent of its budget (table below). FY 2014-15 spending was $318.2 million, which is also a higher dollar amount than the two previous fiscal years. While this is a positive development, Navigant recommends giving additional attention to PSRP performance going forward—overall, actual expenditures were only 77 percent of the approved budget for the three-year period. Notably, the Transmission program spent only 56 percent of its approved budget over the period.

Table E-1. LADWP PSRP Capital Budget and Actuals ($ thousand)

Program	FY 12-13 Approved	FY 12-13 Actual	FY 13-14 Approved	FY 13-14 Actual	FY 14-15 Approved	FY 14-15 Actual	% Variance
Generation	15,280	18,317	14,284	16,772	1,358	2,175	121%
Distribution	149,874	110,129	163,774	122,629	166,208	180,782	86%
Substation	74,830	66,143	73,432	55,612	87,092	58,125	76%
Transmission	39,385	13,604	97,058	51,5644	94,900	64,9610	56%
Info Appl. Sys.	19,514	9,152	18,629	9,873	14,658	12,145	59%
Total	**298,882**	**217,345**	**367,177**	**256,451**	**364,216**	**318,189**	**77%**

Source: Power Capital Budget and Actuals, August 19, 2015.

It also appears that the largest underspent items are related to contracting services and the purchase of materials (procurement). Specifically, 15 percent of the budget for construction services was spent over the three-year period and 46 percent of the budget for materials and supplies. The program also spent only 81 percent of its regular labor budget. These items highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

The Department should report more clearly to the Board on progress against well-defined milestones and outline a plan to ramp up program implementation effectively. This will likely require additional resource planning, including improvements to staffing and procurement processes which were reported to be obstacles. Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from the City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs.

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1. Introduction

Utilities in California and across the United States are faced with the need to comply with stringent regulatory mandates, transition to a greener generation portfolio, replace aging infrastructure, and improve system performance while continuing to supply customers with low cost energy. These objectives are often seen as being at odds, creating unique challenges for any utility. The challenge of consistently improving system performance is addressed through active asset management, the systematic and coordinated set of activities and practices through which an organization optimally manages its physical assets and associated performance, risks, and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan. More simply put, asset management is making the smartest decisions possible to achieve desired asset performance through sound maintenance, repair and replacement programs.

Additionally, public power companies such as the LADWP are focused on optimizing value to ratepayers by appropriately balancing capital and O&M expenditures.

As part of its effort to improve reliability and take a more proactive role in maintenance in general, the Department launched the Power System Reliability Program (PSRP). The program was seen as a significant first step in addressing LADWP's aging infrastructure and a critical component of improving overall system reliability. The PSRP takes an end-to-end viewpoint of the power system that includes generation, transmission, substation, and distribution systems. Example target areas include failing lead cable, deteriorating poles, and overloaded pole-top transformers. The program also focuses on other aspects such as replacement of deteriorating vaults and power transformers.

Another key document driving LADWP's asset management function is the 2014 Long-Term Transmission Assessment, which evaluates transmission needs for the next 10 years and includes compliance studies on North American Electric Reliability Corporation (NERC) requirements.

This report provides an assessment of the Power System's asset management function against best practice, identifies gaps, and provides recommendations for improvement. Navigant's findings were informed by a detailed review of the PSRP and 2014 Long-Term Transmission Assessment documents, numerous interviews with LADWP's subject matter experts, as well as Navigant's extensive expertise and experience in utility asset management strategies and programs.

This report is organized as follows:

- A description of Navigant's approach and methodology.
- An assessment of the Power System's management of its assets against best practice and a discussion on gaps and recommendations for improvement.
- A review of LADWP's recent performance under the PSRP.
- Conclusion.

2. Approach and Methodology

2.1 Approach

Navigant conducted a thorough evaluation and review of all the data and documents provided by the Department related to power system assets, including the PSRP and 2014 Long-Term Transmission Assessment documents. In addition, Navigant conducted a total of eight interviews with multiple LADWP staff focused exclusively on the asset management topic.

Insights derived from the review of key documentation and interviews were then compiled using Navigant's Asset Management Diagnostic Tool, which is described in detail in the next section. Navigant completed a gap analysis identifying specific areas of focus for the Department going forward and provided recommendations to support LADWP's transition towards best practice in asset management.

In addition to analyzing the strength of LADWP's asset management function, Navigant performed a high-level evaluation of the implementation of the PSRP. No matter the strength of the plan, the Department must be able to complete the plan according to set targets and manage risks around program implementation.

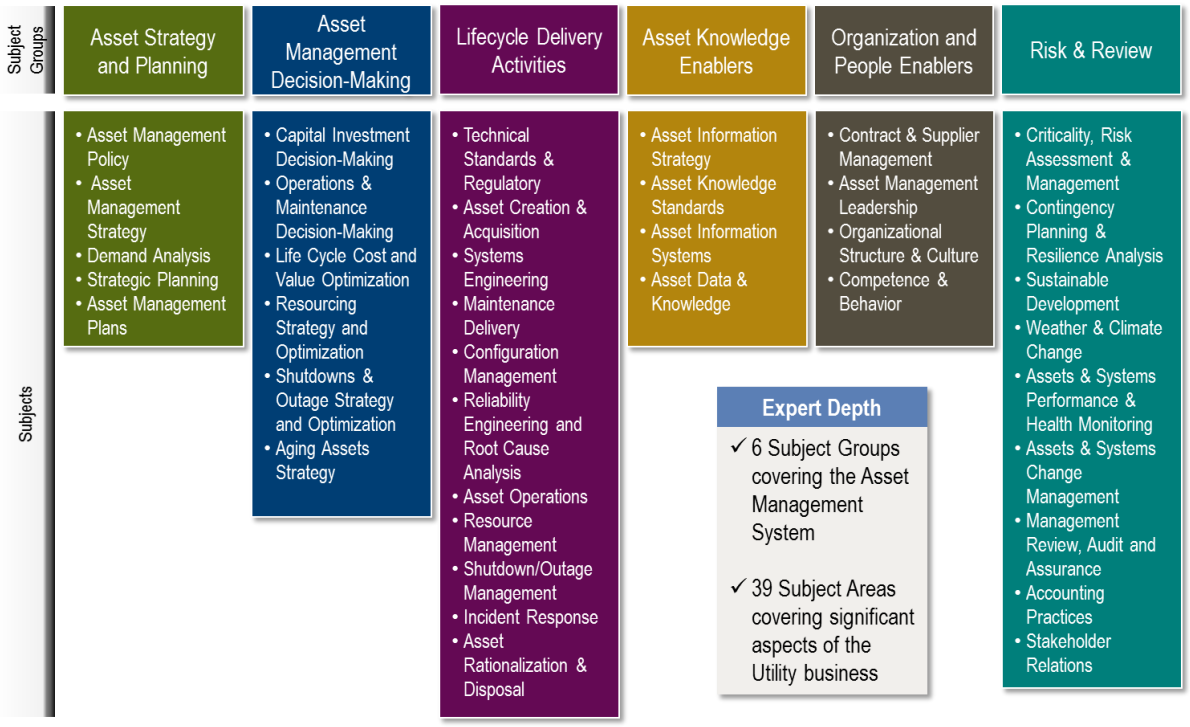
The remainder of this section includes a presentation of Navigant's Asset Management Diagnostic Tool and a description of the PSRP and 2014 Long Term Transmission Assessment documents.

2.2 Navigant's Asset Management Diagnostic Tool

Navigant used its Asset Management Diagnostic Tool to evaluate LADWP's asset management practices against stated objectives and industry best practices. The Diagnostic Tool explores 39 subject areas in six Asset Management groups as described in Figure 2-1. N. The six Asset Management groups include:

1. Asset Strategy and Planning
2. Asset Management Decision Making
3. Lifecycle Delivery Activities
4. Asset Knowledge Enablers
5. Organization and People Enablers
6. Risk and Review

Figure 2-1. Navigant's Asset Management Diagnostic Tool Groups & Subject Areas



The Diagnostic Tool contains over 300 questions that are specifically designed to assess a utility's business processes against industry best practices. Answers to the 300 questions were developed from insights aggregated from interviews, documentation review, and Navigant's deep expertise in Asset Management. LADWP's performance against best practice in the 39 subject areas was then plotted on a spider chart (Figure 3-1), clearly highlighting areas of good performance and areas requiring improvement.

The findings derived from the Diagnostic Tool are discussed in detail in Section 3.

2.3 Key Documentation Reviewed

2.3.1 Power System Reliability Program

The Department intends to maintain a high level of electric power service reliability through implementing the PSRP. LADWP goals for reliability are driven in part by NERC and WECC regulations regarding system reliability. The PSRP is an expansion of LADWP's Power Reliability Program (PRP), which addressed issues in the Distribution System only. The objectives of the PSRP are to:[1]

[1]Presentation – Power System Reliability Program – Board Meeting of August 5, 2014. Board of Water and Power Commissioners.

- Investigate and propose corrective actions designed to prevent future outages within the major functions of the electric power system, namely the distribution, substation, transmission, and generation systems.
- Analyze and evaluate LADWP's current asset replacement programs, their reliability improvement solutions, and effectiveness.
- Expand on the PRP program.

The PSRP focuses mostly on the management of the following type of assets: distribution transformers, poles, underground cables, and substructures. Equipment such as poles and underground cables is aging rapidly and will require increasing investment going forward. For example, the majority of LADWP's power poles were installed during the city's rapid growth from the 1940s through the 1960s: the majority of the Department's power poles are over 50 years old, with more than 40,000 poles or 12.9 percent of the total portfolio older than 80 years.[2,3]

The program's generation component comprises capital improvements at existing generation facilities. For instance, the replacement of a burner at an old in-basin natural power plant required to ensure operating reliability is addressed under the PSRP.

The Department has also already conducted an independent third party assessment of the PSRP, the "Comprehensive PSRP Evaluation and Benchmarking Report" by IEC Corporation in December 2013. Navigant also reviewed this report, which benchmarks the PSRP against industry best practices for levels of expenditure committed to the four major functions of the power system. At a high level, Navigant's review is aligned with the IEC's benchmarking report; however, it does not cover all of the issues described in detail in the benchmarking report.

2.3.2 Ten-Year Transmission Assessment

The 2014 Long-Term Transmission Assessment focuses primarily on assessing transmission needs for the next 10 years and the impact on transmission assets from LADWP's plan to eliminate coal from its generation portfolio by 2025. The assessment also describes the methodology, issues, and recommendations of NERC requirements compliance studies.

[2]LADWP's distribution system includes a total of 321,516 utility poles.
[3]2015 Briefing Book. Los Angeles Department of Water and Power.

3. Asset Management Diagnostics

Navigant leveraged its Asset Management Diagnostic Tool in order to compare LADWP's asset management function to industry best practice. The Diagnostic Tool provides an assessment of the Department's maturity level against the tool's six asset management groups and 39 subject areas, using maturity levels ranging from 0 to 4. A maturity level of 0 signifies that the organization is not considering the subject area in question, while a maturity level of 4 signifies that organization's processes surpass standard requirements and are likely a best practice, if performed cost-effectively.

The chart below presents LADWP's average maturity level for each of the six asset management groups.

Figure 3-1: Assessment of LADWP's Maturity Level in Six Key Aspects of Asset Management

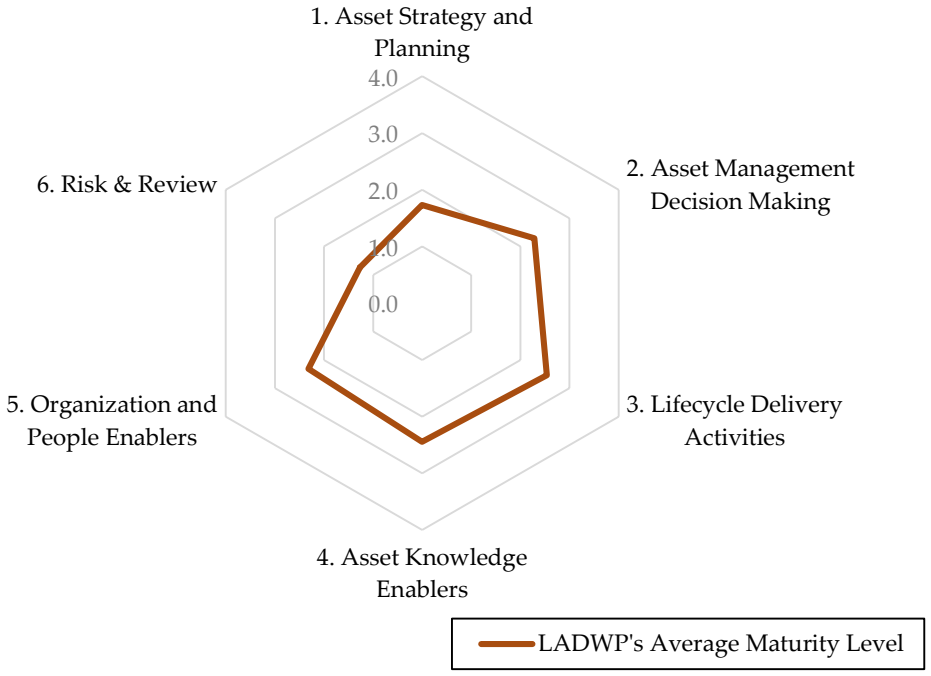


Figure 3-1 shows that the Department does not achieve best practice (maturity level 4) in any of the six asset management groups but performs relatively well in Asset Management Decision Making, Lifecycle Delivery Activities, Asset Knowledge Enablers, and Organization and People Enablers. However, there is room for significant improvement in the Asset Strategy and Planning and Risk and Review groups. Key findings related to these groups include:

- There is no documentation outlining the Department's asset management strategy and objectives and the associated risk management framework.
- There is no continuous improvement framework in LADWP's asset management processes.

- The PSRP identifies work to be performed but does not consistently outline or refer to implementation strategies.
- There is no common risk-based asset management prioritization framework across all aspects of the company.
- The PSRP does not fully consider future requirements of assets, development of technology, or a plan for implementing smart grid devices on the system.
- The approach and methodologies for managing assets are documented according to typical utility practice. However, as compared to best practices, several gaps exist in documentation of methodologies and there are different approaches in each asset class.
- The asset management strategy has been periodically reviewed in the past but, similar to many utilities, the scope and frequency appear to be somewhat ad-hoc.

The following sections outline Navigant's findings related to each of the six asset management groups and identify specific recommendations for improvement.

3.1 Asset Strategy and Planning

Navigant's review of LADWP's Asset Strategy and Planning primarily focused on the following areas:

- Documentation of asset strategy and planning
- Continuous improvement
- Prioritization
- Improvements to the PSRP

A maturity level of 1.7 highlights a number of areas where the Department should make immediate changes. Most importantly, LADWP must create a robust asset management strategy document including risk, continuous improvement, and prioritization frameworks. Additionally, the Department should make several improvements to the strategic direction of the PSRP. Navigant's findings are discussed in detail in the following subsections.

3.1.1 Documentation of Asset Strategy and Planning

LADWP performs well on documenting the demand analysis for its assets and Navigant's review shows that LADWP appropriately forecasts the demand on its T&D assets. The Department's demand planning process appears to be mature and conservative, and takes into account all aspects of the business from generation to delivery.

Other Asset Strategy and Planning documentation requires more attention. The Department has documented its asset management objectives in the 2015 Power Infrastructure Plan, the PSRP, and publicly through Board of Commissioners meeting presentations. While these documents are comprehensive and provide direction and guidance to the Department, they should not be used as substitutes to a robust asset management strategy document. Additionally, interviews revealed that the Department's asset management documents have been periodically reviewed and updated in the past; however, like many utilities, the scope and frequency of the reviews appear to be somewhat ad-hoc. It is

of a paramount importance that LADWP create a comprehensive asset management strategy document and conduct a regular and structured review process.

In the Department's plan, the approach and methodologies for managing assets are documented according to typical utility practice. However, as compared to best practices, several gaps exist in documentation of methodologies and there are differences in the approach for each asset class. LADWP should develop a more formal, best practice asset management framework such as ISO 55000.

Interviews have also revealed that individual divisions have an undocumented set of working tasks that are appropriate and required for the implementation of the PSRP. All tasks required for the implementation of the PSRP should be documented.

Finally, while risk is considered throughout the PSRP (mostly from a traditional utility perspective), risk and risk mitigation are not documented in a manner consistent with best practices. As LADWP develops its asset management strategy document, it should also implement a risk management framework with risk registers and mapping risk to objectives and mitigations across all areas of its asset management function. Risk will be further discussed in the Risk and Review section.

3.1.2 Continuous Improvement

The Department should also focus on continuous improvement. Currently, the continuous improvement of underlying business processes is scattered; for example, the PSRP includes some elements of continuous improvement but other elements are informally present in individual parts of the organization. This arrangement appears to be extremely time-consuming. LADWP should adopt and embed a structured continuous improvement framework in its complete asset management plan.

3.1.3 Prioritization

LADWP appears to prioritize portions of the PSRP within organizational silos, but the prioritization is often informal and does not represent a common risk-based prioritization framework. The Department should adopt such a framework across all aspects of the company. That framework would initially value the priority and risk of generation, substation, transmission, and distribution assets. It should later be expanded to supporting infrastructure, IT systems, and customer operations.

In addition to a consistent risk-based prioritization framework, the Department should implement a consistent condition-based prioritization framework for corrective and emerging maintenance.

3.1.4 Strategic Improvements to the PSRP

The PSRP is the comprehensive plan for the management of the Department's generation, substation, transmission, and distribution assets, and as such merits specific strategic recommendations. Although the PSRP is aligned with the Department's stated objectives and with the organizational structure, and has been communicated well to stakeholders, there are a number of areas for improvement.

- In some cases, the alignment between the Department's stated objectives and the PSRP is not obvious. Future versions of the PSRP should clearly spell out the strategy, objectives, and the direct alignment of the program with the Department's objectives.

- The current version of the PSRP has not been fully funded by LADWP's leadership or the Board of Commissioners. The PSRP should be updated to reflect the current funding authorization along with an analysis of risks posed due to differences between the original plan and the authorized plan.
- The PSRP identifies work to be performed but does not consistently outline or refer to implementation strategies. LADWP should expand the PSRP to include implementation strategies as well as specific annual deliverables and metrics.
- While the PSRP identifies needs within the individual silos and has included a Human Resources Plan, cross-cutting coordination is not always apparent and IT challenges are not discussed in the document. As LADWP's asset management system matures, LADWP should strengthen the analysis of cross-cutting issues to optimize efficiency.
- The PSRP does not fully address a comprehensive long-term technology roadmap for the system, including the future requirements of assets, integration of new technology, and a plan for implementation of smart grid devices aligned with the Smart Grid Investment Program. LADWP should consider the requirements and timelines for updating the SCADA, OMS, EMS, and DMS systems and outline the implementation strategies for online monitoring and distribution automation. It should also consider impacts on workforce and skills requirements.

3.2 Asset Management Decision Making

Navigant's review of LADWP's Asset Management Decision Making processes primarily focused on the following areas:

- Repair, maintenance, and replacement of T&D assets
- Capital project selection process
- Contracting strategy
- Outages management

With a maturity level of 2.3, the Department's Asset Management Decision Making is considered to be adequate; however, a number of improvements would bring LADWP closer to best practice. Specifically, LADWP should explicitly consider condition-based maintenance best practices and the life cycle costs of assets, develop a common portfolio framework for capital project selection, define a stated outsourcing strategy, and use written switching instructions. These findings are discussed in additional detail below.

3.2.1 Repair, Maintenance and Replacement of T&D Assets

LADWP's T&D asset management decision making is primarily governed by the PSRP. The PSRP provides replacement targets and focuses on management of end-of-life of asset categories, representing a great effort from the Department to move towards best practice in asset management. However, LADWP's asset life estimates are largely age-based and some of the age models, while sensible, do not align with best practice and may understate the expected lifespan of its assets. Navigant recommends that LADWP move towards accurate end-of-life standards based on asset condition and improved end-of-life estimating techniques including the development of asset health indices for each asset class.

LADWP appropriately considers the condition of assets in some maintenance decisions but, like most utilities, the maintenance program is largely time-based. In comparison, best practice has maintenance performed under a hybrid Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM) systems. LADWP should periodically review its maintenance program and move towards the best practice approach. Notably, several aspects of substation maintenance at LADWP are very good examples that other areas of the company could emulate.

Additionally, while the PSRP will help LADWP better manage the middle and end-of-life of assets, too much emphasis is put on the lowest initial asset cost rather than whole life cycle cost. This approach appears to result from LADWP's procurement process, which focuses on the selection of the lowest cost bid at the time of the acquisition as opposed to the lowest cost bid for the life cycle of the asset. This is a common issue for public power agencies and tends to raise a utility's overall cost structure over time. Best practice recommends the implementation of a procurement process for "lowest evaluated cost" which properly considers the life cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs.

3.2.2 Capital Selection Process

Interviews and the review of key documentation has shown that LADWP has a well-defined capital projects selection process but there may be some inconsistencies between segments of the business. These inconsistencies may have contributed to underspending in the Department's capital programs. LADWP should work towards a best practice common portfolio framework for capital project selection.

3.2.3 Contracting Strategy

While LADWP does appear to use contractors effectively, neither the PSRP nor the Human Resources Plan incorporate a stated contracting strategy. Additionally, many internal functions are continued without review. LADWP should define an explicit outsourcing strategy as part of its workforce resource planning in order to consistently implement and optimize its strategy.

3.2.4 Outages Management

Outages are coordinated in advance and the risks facing the power system are well-understood. However, LADWP does not use the industry best practice of written switching instructions when performing switching work.[4] LADWP should move towards the use of providing any field employee who is performing switching with written switching orders that are created, reviewed, and approved in advance. This means that, because of the complexity of switching in a metropolitan utility, any planned switching follows the following process:

1. Switching orders are either stored in a library from previous experience or are developed for the particular case at hand,
2. Switching orders are reviewed and approved by a second person in the operations center,
3. Switching orders are provided to the dispatcher and the field personnel at the time or on the day of the switching operations, and

[4]Switching represents the process of isolating and making a section of network safe before work is carried out.

4. Dispatchers direct each step of the switching operations.

Unplanned switching generally is dispatched step at a time over the radio or telephone. The use of written switching orders is a common practice across North America. Major metropolitan utilities that use written switching orders include New York and Chicago.

3.3 Life Cycle Delivery Activities

Navigant's review of LADWP's Life Cycle Delivery Activities primarily focused on the following areas:

- Asset management processes
- Preventative and corrective maintenance
- Effective planning, design, performance, operations and maintenance
- Alignment with regulatory requirements

With a maturity level of 2.5, the Department's Life Cycle Delivery Activities are generally on track. However, Navigant identified several improvements for LADWP in this asset management group, including better documenting formal asset management processes, standardizing preventative maintenance actions, implementing a structured methodology to leverage root-cause analysis for incidents, and improving communication and collaboration between divisions on maintenance issues.

3.3.1 Asset Management Processes

Navigant's review shows that the Department has a number of good asset management processes in place; however, some of them may not be fully documented. Areas addressed by LADWP's asset management processes include:

- Governance of asset maintenance and operation during the delivery phase of the life cycle
- Maintenance and calibration of critical tools
- Follow-up regarding failure or unexpected operation of assets

LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge, which is increasingly important in the context of a rapidly changing workforce.

3.3.2 Preventive and Corrective Maintenance

Asset condition tracking, which informs preventive and corrective maintenance plans, is an area of focus for the Department. LADWP could further improvement its asset condition assessment by leveraging online monitoring of real time assets and replicating its condition-based approach found in substations in other areas of the organization.

LADWP does implement preventive maintenance actions that consider cost, risk, and performance and include linkage to asset management plans, timescales, and optimization consistent with the asset management objectives and strategy. However, these processes can vary between areas in the company and the Department should work towards standardizing those processes.

Corrective maintenance is prioritized but inconsistencies exist in the prioritization process. LADWP should implement a consistent risk-based prioritization and condition-based framework for corrective or emergency maintenance.

Finally, LADWP does follow up on incidents as demonstrated by its root-cause analysis (RCA) reports completed by the Department for key assets. However, LADWP may not fully leverage RCA as a structured methodology to drive results. LADWP should implement its RCA process as part of a larger continuous improvement process and train employees accordingly.

3.3.3 Effective Planning, Design, Performance, Operations and Maintenance

LADWP has policies, practices, and procedures in place to integrate the planning, design, operations, and maintenance functions. However, at times the downstream divisions are not satisfied with planning and design decisions and the upstream divisions do not understand maintenance and operations issues. LADWP should continue to improve the collaboration and communication between divisions. As a best practice, this is often accomplished through the implementation of end-to-end work management processes.

3.3.4 Alignment with Regulatory Requirements

The asset management policies are aligned with regulatory requirements. However, the Department should better incorporate its smart grid roadmap in order to implement policy regarding smart grid and distributed resources.

3.4 Asset Knowledge Enablers

Navigant's review of LADWP's Asset Knowledge Enablers focused on the following areas:

- Asset data and knowledge
- Asset information systems
- Asset knowledge standards

With a maturity level of 2.4, the Department is adequately addressing the above areas. Navigant's recommendations, detailed below, are generally aligned with LADWP's current efforts to formalize and document processes and recommend the continuation of those activities.

3.4.1 Asset Data and Knowledge

LADWP has processes in place in order to capture current asset information, and appropriate asset management information appears to be available to relevant employees and stakeholders. In addition, the Department has documented the procedures in place for critical operations. However, it has been reported that adequate document retention processes for certain legacy information such as wiring diagrams, blueprints, and instructions may not be in place.

The records necessary to document conformance with asset management practices exist in an early stage of maturity, with many processes being informal or institutional in nature. LADWP should continue to formalize and document its strategies, plans, processes and asset data.

3.4.2 Asset Information Systems

The records requirements for asset management information are embedded in the Department's tracking systems and LADWP is updating its MAXIMO version for improved functionality. These actions should

help determine what the Department's asset management information system should contain, how it is maintained, and how it is kept relevant.

3.4.3 Asset Knowledge Standards

LADWP has document retention requirements in place according to best practice. The Department appropriately secures its asset management information.

3.5 Organization and People

Navigant's review of LADWP's organization and people (in an asset management context) focused on the following areas:

- Asset management leadership
- Competence and behavior
- Contract and supplier management
- Organizational structure and culture

With a maturity level of 2.3, LADWP is performing adequately in a number of areas but would benefit from several improvements to bring the organization closer to best practice in asset management. The Department appears to be doing well with the definition of duties and responsibilities, direction from leadership, training, and staff competency. To improve, LADWP could focus on identifying skills for changing technologies, formalizing knowledge transfer and resource allocation processes, clearly stating a contracting strategy, and encouraging a culture of continuous improvement. These findings are discussed in the following subsections.

3.5.1 Asset Management Leadership

Top management duties are well defined at the Department and responsibilities are appropriately delegated. LADWP's asset plans are reviewed and approved at the highest level, which helps tie the plans together. However, ties between plans are not made clear in the current version of the PSRP. As mentioned previously, future versions of the PSRP should clearly reflect how the organization's strategies, objectives, and plans are interconnected.

LADWP's senior leadership has developed direction and expectations for the organization. However, the direction is somewhat fluid resulting from changes in top management staffing. Several top managers were observed to hold "acting" positions. LADWP should strive to implement best practices in asset management leadership, including fully enabling top management through their appointment to full positions.

3.5.2 Competence and Behavior

Much of the operational knowledge of Department staff is gained through experience and training, so LADWP should continue to formalize its processes and focus on capturing the institutional knowledge of retiring employees.

LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the

Department are governed by seniority through the civil service system; therefore, it is not always clear that there are opportunities to introduce new skills and approaches from outside the company so that the most qualified person holds each position.. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employee to industry changes and bringing in outside influences when possible.

The PSRP and the training program address workforce competencies to a significant degree. However, the PSRP has not contemplated an optimized contracting strategy or changes in skills requirements that will be required with the ongoing changes in technology. LADWP should incorporate its clearly stated contracting strategy and its expectation of changing skills needs into the plan.

Finally, interviews revealed that the Department has an effective training process.

3.5.3 Contract and Supplier Management

Contracting controls are in place and LADWP shares relevant information with contracted parties. Outsourced asset management activities are generally controlled through time and expense contracts and reviewed by LADWP staff. However, LADWP does not have a clearly stated contracting strategy. LADWP should state a defined contracting strategy with contract requirements that selectively incent best performance by contractors through quality and safety standards, performance incentives, and performance penalties.

3.5.4 Organizational Structure and Culture

LADWP's senior leadership effectively considers the impact of the asset management processes on the organization and the impacts of the organization on asset management. Case-by-case evidence of continuous improvement at the Department exists, and many changes have occurred slowly over a long period of time. To improve upon this, LADWP should adopt a culture of continuous improvement and work towards accelerating asset management optimization.

Through its planning processes and PSRP, LADWP is improving its resource allocation capability. However, most resource allocations are determined through informal processes such as discussions and deliberation from middle management through the executives and the Board. LADWP should develop a consistent risk-based decision process that drives planning and then determines resource allocation.

3.6 Risk and Review

Navigant's review of LADWP's risk and review for asset management focused on the following areas:

- Accounting practices
- Assets and systems change management
- Assets and systems performance and health monitoring
- Contingency planning and resilience analysis
- Criticality, risk assessment and management
- Management review, audit and assurance
- Stakeholder relations
- Strategic planning

- Sustainable development
- Weather and climate change

With a maturity level of 1.3, Risk and Review is the asset management group most in need of improvement. Navigant's critical recommendations relate closely to those made for the Asset Planning and Strategy group. Developing a more formal, best practice asset management framework such as ISO 55000 and embedding a continuous improvement framework and risk assessment framework is extremely important for managing risk as well as defining the Department's strategy. The risk framework should include risk registers and mapping of risk to objectives and mitigations across all areas of the asset management system.

LADWP will also better manage risk with tighter coordination between objectives, plans, and strategies. In the long term, the Department may minimize risk by creating a comprehensive long term technology roadmap for the electric system and by adjusting for more severe weather.

3.6.1 Accounting Practices

At LADWP, costs are generally tracked at the department or line item level. There are significant allocated costs and each budget contains some amount of contingency. In comparison, best practice is to minimize allocated costs and to hold contingency budgets at the corporate level rather than at the line item level.

3.6.2 Assets and Systems Change Management

LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this generally serves LADWP well, it often does not include many of the more structured approaches of asset management to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, there has not been a formal process for asset management function audits. As mentioned previously, LADWP should develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process.

There has been no opportunity during this study to observe the LADWP's behaviors for ensuring that risks to asset management activities associated with changing organizational structures, roles, or responsibilities are managed.

3.6.3 Assets and Systems Performance and Health Monitoring

LADWP primarily monitors asset health indirectly through system performance. Condition monitoring is used in substations and the protection system. LADWP should emulate Condition Based Maintenance programs in other areas and implement a condition monitoring program and make more use of online monitoring.

LADWP's metrics are generally output based. Best practice would include performance monitoring frameworks, balanced scorecards, etc., and management meeting minutes and reports. The Department should continue to improve its measurement of asset management though the implementation of balanced scorecards and management reviews.

There are informal controls over processes and several examples of formal controls through processes and procedures; however, quality assurance and quality control requirements have not been formally defined in many aspects. Quality Assurance and Quality Control requirements should be defined for primary processes.

3.6.4 Contingency Planning and Resilience Analysis

LADWP assesses response plans on a post-event basis with some evidence that other periodic reviews are conducted. LADWP should tighten these processes to ensure consistent review and proactive updates that take into account industry best practice.

3.6.5 Criticality, Risk Assessment and Management

It appears that there is some recognition in the Department that asset management is tied to risk. However, risk assessment appears to be incomplete and inconsistent at the company level. LADWP assesses risk across the organization through largely informal processes, and although there is some formal risk assessment as well, LADWP does not formally perform risk assessments in an asset management sense.

LADWP does inherently provide for many elements of risk in its procedures and policies. Daily operational risk is assessed according to good utility practice through typical operational processes. Risk assessment is regularly performed for requested and planned system outages, and there is evidence that LADWP performs risk assessments for some asset management functions. Additionally, some level of risk assessment is available in the PSRP.

Management fully considers routine risks in routine decision-making. Because LADWP largely identifies risks through management attention to emerging issues and resulting actions become part of the routine work plan, they appear to be ad-hoc.

Best practice would include increased forward-looking risk-based decision processes and a more formal risk assessment framework. LADWP should implement a risk management framework along with risk registers and mapping of risk to objectives and mitigations across all areas of the asset management system.

3.6.6 Management Review, Audit and Assurance

LADWP has a process for the regular review of processes and procedures and evidence exists that regular review occurs; however, LADWP does not have an asset management audit plan.

Asset Management practices are fairly well inked to policies and strategies though high level management review. However, there are gaps resulting from not having a formal asset management framework.

3.6.7 Stakeholder Relations

It appears that LADWP provides adequate communication by regularly communicating its plans and results internally in the Department and with the Board at meetings. LADWP also communicates the results of its asset process reviews and results. However, as mentioned previously, the organization's

direction appears somewhat fluid because of changes in top management staffing. Appointing top management to full positions will help clarify direction.

3.6.8 Strategic Planning

LADWP has held considerable internal conversations and received external assistance where appropriate in developing its asset plans.

LADWP also has good processes in place to ensure the appropriate arrangements are made for the implementation of the asset management plans, but has not fully considered the most efficient and cost effective asset management processes in many cases. Examples include optimizing maintenance cycles, optimizing procurement of assets, optimizing crew size, and implementing a robust continuous improvement process. Again, LADWP should develop a more formal, best practice asset management framework.

3.6.9 Sustainable Development

Historically, LADWP has reviewed its asset management objectives on a periodic basis. Best practice would indicate that LADWP should move towards tighter coordination between objectives, plans, and strategies.

LADWP has long term plans in place for its transmission system and the PSRP provides mid-term guidance for the remainder of the electric system. However, the PSRP has not been fully funded and has not been revised to account for the decreased funding. LADWP should update its PSRP to reflect the approved funding levels.

The Department also has not developed a comprehensive long term technology roadmap for the electric system. The current 10-year Smart Grid Investment Program should be developed in coordination with other long term plans for the electric system, and ongoing reliability studies for the impact of a high penetration of renewables should also be incorporated.

3.6.10 Weather and Climate Change

LADWP has updated some of its specifications to account for more severe weather and has used lessons learned from Hurricane Sandy to update its emergency response plan, but these changes appear to have been made on a case-by-case basis. The Department should take a holistic approach to preparing for climate change. For example, it should consider conducting a study on how changing macro conditions will impact assets.

4. PSRP Performance

In addition to assessing LADWP's approach to asset management though the PSRP, Navigant also reviewed documents regarding performance and expenditure for the program. This is critical because the PSRP is the Department's guide to rebuilding and modernizing the aging power grid, which is necessary not only for maintaining reliability under normal circumstances, but especially in the context of a changing power supply with more variable renewable energy resources, two-way power flows with distributed generation and electric vehicle integration, and smart grid enhancements planned in the 2014 IRP. Success depends not only on having a robust asset management planning function, but also being able to carry out program activities according to the plan.

An important finding, first identified through stakeholder interviews, is that LADWP has and continues to struggle with a pattern of underspending on the capital programs in the PSRP. This casts some uncertainty on the Department's ability to perform the planned program ramp-up described in the recently released 2015-2016 rate action and achieve its goals. Navigant has been provided with financial data to fully confirm this finding for the past three years, and a discussion of the following information should prove useful for identifying issues and monitoring performance going forward.

Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs. The 2014 IRP states, "As funding priorities constantly shift, especially from the demands of mandated regulatory programs, competition for the remaining limited pool of resources necessitates an expanded reliability program and planning process."[5] LADWP must ensure that it does not shift priorities away from the PSRP.

4.1 Past Performance – PRP

The PSRP originates from the Power Reliability Plan (PRP) established in 2007 to address reliability concerns. The implementation of the PRP followed a significant increase in the number of outages on the Department's power system. Between 2003 and 2006, the annual number of outages escalated from 4,193 to 5,915, representing a 41 percent increase. The implementation of the PRP was a success in that it took the Department only two years to decrease the number of outages back to 2003 levels, with 4,296 outages in 2009. However, since 2009 the number of outages has only slightly decreased, with 3,956 outages recorded in 2013 (a 7.9 percent decrease).

According to the 2014 IRP, in FY 2013-14 1,617 poles, 1,944 transformers, and 41 miles of underground cable were replaced. In 2013, the Department's SAIFI and SAIDI scores benchmarked favorably against the California IOUs.

The Department has stated that funding constraints have prevented further progress in the reduction of the number of outages in recent years. In addition, in interviews Department staff explained that the existing one-year funding window had imposed an inconvenient cutoff on contracts required to complete PRP related projects. In 2014, LADWP expanded its PRP program into the PSRP, and indicates

[5] 2014 IRP, ES-13.

that it plans to address funding constraints through its latest rate increase proposal. However, if LADWP has not spent previously allocated budgets on the PSRP, funding constraints may not be the primary barrier and more oversight is needed to ensure increased funds go to the program and are not reallocated based on shifting priorities.

4.2 Implementation Status

Navigant requested a status update on PSRP performance versus targets in its IEA Survey data request. Per Commissioner Noonan's request, a report on the same topic was scheduled to be provided to the Board on July 21, 2015 or the 1st Board meeting of August 2015. The PSRP progress report to the Board actually occurred on September 22, 2015, and contained some PSRP implementation updates discussed here. Navigant also received one sample internal PSRP report from June 1, 2015 (June 2015 Report), which reports on FY 2014-15 and includes expenditures and some information on the progress of projects.

The following tables outline LADWP's planned replacement activities in each of the four primary functions of the Power System covered by the PSRP. Although the proposed annual increases are not as large as the recommended target in the PSRP (which disregards cost according to the purpose of the PSRP report), they still reflect an aggressive ramp-up.

Table 4-1. Generation System Proposed Annual Ramp to 2013 PSRP Replacement Target

Generation Asset	Total Count	FY 14-15 (Current)	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	PSRP Target
Generator Step-Up Transformer	76	1	1	1	2	2	2	8
Generator Station Transformer	92	1	1	1	2	2	2	2
Major Inspection (Thermal)	24	1	4	4	4	4	4	5
Major Inspection (Hydro)	22	1	2	2	2	2	2	2
Major Inspection (Pump)	7	1	1	1	1	1	1	1
San Fernando Plant	2	0	0	1	0	1	0	1

Source: LADWP Board Presentation[6]

Table 4-1 above shows that the Department intends to quadruple the number of major thermal inspections and double to the number of major hydro inspections that occur from FY 2014-15 to FY 2015-16. In its September 22nd report to the Board, the Department reports that it has not met the FY 2014-15 target for the first five generation assets in the table above (no mentioned is made of the San Fernando Plant)—in other words, zero transformer replacements and major inspections occurred. Unhelpfully, the

[6]Presentation – Power System Reliability Program – Board Meeting of September 16, 2014. Board of Water and Power Commissioners.

internal June 2015 Report has a single line item for generation that would require further explanation from the Department.[7]

Table 4-2. Transmission System Proposed Annual Ramp to 2013 PSRP Replacement Target

Transmission Asset	Total Count	FY 14-15 (Current)	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	PSRP Target
138 kV UG Circuit	17	1	1	2	2	2	2	2
138 kV Stop Joints	31	2	5	5	5	5	5	5
Maintenance Hold Restraints	238	10	20	30	40	40	40	48

Source: LADWP Board Presentation

Table 4-2 shows two of the three transmission system replacement activities at least doubling in the current fiscal year, and the doubling of the third activity next year. However, the September 22nd Board Report shows that two of the three items in the table above did not meet targets in FY 2014-15. Only the 138 kV Stop Joints were completed above target, with five installations. For the 138 kV Circuits, the Department is working to complete the purchase of materials. Generally, the June 2015 Report for transmission includes comments on delays and one instance of budget cutting from the budget office.

Table 4-3. Substation System Proposed Annual Ramp to 2013 PSRP Replacement Target

Substation Asset	Total Count	FY 14-15 (Current)	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	PSRP Target
High Side Transformer (RS)	70	1	1	1	1	1	1	1
Load Side Transformer (RS)	88	1	1	1	1	1	1	3
Local Substation Transformer (DS)	930	6	18	18	18	18	18	50
Substation Transmission Breakers	612	2	6	6	6	6	6	25
34.5 kW Substation Circuit Breaker	1,878	2	10	15	20	20	20	95
4.8 kW Substation Circuit Breaker	2,406	10	20	30	40	40	40	200
Substation Battery Banks	640	10	64	64	64	64	64	200
Substation Automation	196	3	8	12	12	12	12	25

Source: LADWP Board Presentation

Table 4-3 shows similar aggressive increases as the previous tables: substation transformer and transmission breaker replacements are supposed to be tripled this fiscal year, substation automation should more than double, and substation battery bank replacements should increase by more than a

[7]The line item is 1,339.7 percent of its individual budget and comprises nearly the entire Generation expenditure, at 150.1 percent of the total Generation budget in this report.

factor of six. However, the September 22nd Board Report shows that four of the first six items listed in the table above did not meet FY 2014-15 targets, and does not mention the battery and substation automation activities. The June 2015 Report also reports various delays leading to budget and schedule slippages.

On the positive side, the six DS transformers for FY 2014-15 are either in service or under construction, and one had the bank delivered but not started construction. According to the September 22nd Board Report, four of the six were fully completed by the end of FY 2014-15. Better, the Department exceeded its targets for Load Side Transformers and 34.5 kV Circuit Breakers (completing three and 10, respectively). This shows that when certain projects are delayed by procurement or contract issues, the Department is sometimes able to move ahead of schedule on other projects.

Table 4-4. Distribution System Proposed Annual Ramp to 2013 PSRP Replacement Target

Distribution Asset	Total Count	FY 14-15 (Current)	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	PSRP Target
Poles	321,780	1,560	4,000	5,000	6,000	6,000	6,000	8,966
Crossarms	1,287,120	4,500	7,000	8,000	10,000	10,000	10,000	28,492
Lead Cables	1,918 mi.	28	48	48	48	48	48	48 mi.
Synthetic Cables	1,679 mi.	10	12	12	12	12	12	12 mi.
Transformers	126,000	450	600	700	800	800	800	3,214
Substructures	54,099	7	12	16	20	20	20	100

Source: LADWP Board Presentation

Finally, the Distribution System has proposed more than doubling pole replacements and significant increases in the other areas as well. The May 2015 budget presentation to the Board reported having replaced or upgraded 3,953 transformers since FY 2013-14. It also reported having replaced 2,108 poles during FY 2014-15, which would be a good achievement and ahead of the target.[8] However, the September 22nd Board Report shows that LADWP met targets for all items except pole replacements, with only 881 poles replaced. This number does not meet the target, is notably different from the budget report, and requires a dramatic increase for next year's target. Otherwise, LADWP has made good progress on distribution projects and appears to be in line with FY 2015-16 expectations.

In addition to challenges in dealing with the aging infrastructure itself, challenges cited in interviews for the four functional areas include procurement and staffing shortages rather than funding.

4.3 Program Budget & Expenditures

In FY 2012-13, the PSRP spent of 72.7 percent of its budget. In FY 2013-14, the PSRP spent 69.8 percent of its budget, with a total dollar amount less than the "power supply replacement program" and "power system support/general" categories (tables below). In FY 2014-15, spending improved to 87.4 percent of the budget. Over the three-year period, overall actual expenditures were 77 percent of the approved budget. Notably, the Transmission program spent only 56 percent of its approved budget over the period.

[8]FY 15-16 Final Budget, May 19, 2015. Board of Water and Power Commissioners.

Table 4-5. LADWP PSRP Capital Budget and Actuals ($ thousand)

Program	FY 12-13 Approved	FY 12-13 Actual	FY 13-14 Approved	FY 13-14 Actual	FY 14-15 Approved	FY 14-15 Actual	% Variance
Generation	15,280	18,317	14,284	16,772	1,358	2,175	121%
Distribution	149,874	110,129	163,774	122,629	166,208	180,782	86%
Substation	74,830	66,143	73,432	55,612	87,092	58,125	76%
Transmission	39,385	13,604	97,058	51,5644	94,900	64,9610	56%
Info Appl. Sys.	19,514	9,152	18,629	9,873	14,658	12,145	59%
Total	**298,882**	**217,345**	**367,177**	**256,451**	**364,216**	**318,189**	**77%**

Source: Power Capital Budget and Actuals (August 19, 2015)

However, in the future, the PSRP is supposed to have the highest budget of LADWP's major programs and a significantly higher dollar amount by FY 2015-16 ($516 million), as shown in the table below.

Table 4-6. LADWP Proposed Program Capital Expenditures ($ million)

Program	FY 13-14 Actual	FY 14-15 Approved	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20
PSRP	256	364	516	603	582	553	541
Power Supply Replacement	456	592	425	283	310	437	502
Power System Support / General	295	309	339	358	333	323	356
Customer Opportunities	109	137	199	215	208	207	192
Operating Support	71	52	91	112	90	67	55
Customer Service	27	23	23	20	11	6	7

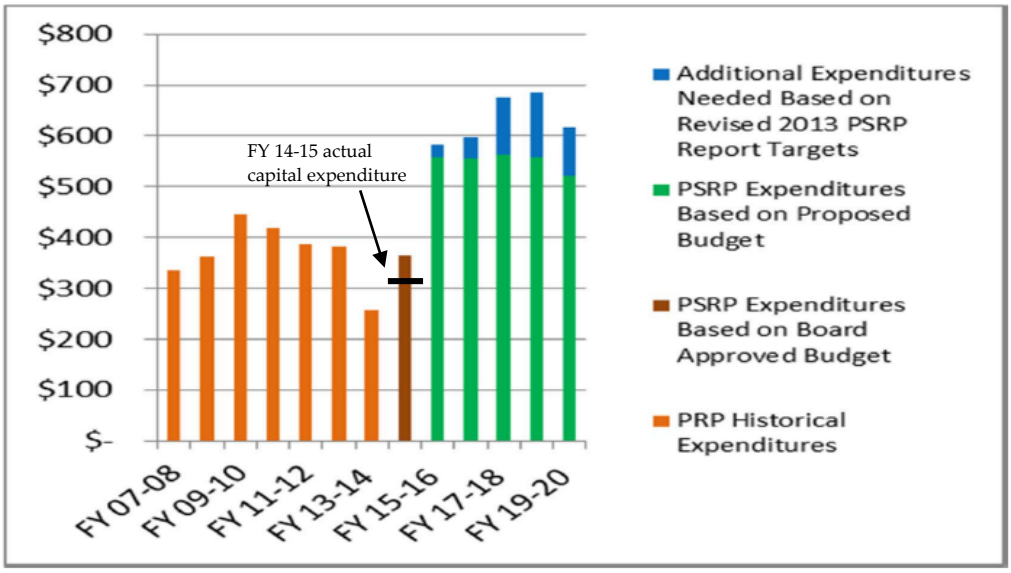
Source: LADWP Board Presentation[9]

LADWP should further explain the large switch that occurs during FY 2015-16 and FY 2016-17, with increased budget for the PSRP and decreased budget for power supply replacement. The total budget does not change significantly over those two years, so this will require a shift in Department priorities and runs the risk of budget being re-purposed back to popular power supply projects. This ramp-up in budget and activity warrants a careful review in the upcoming rate review.

The May 2015 budget presentation further estimated that in FY 2014-15, LADWP would spend $342.6 million of the approved $364.2 million approved budget. However, according to financial data provided by LADWP, in FY 2014-15 the approved capital budget was $376.4 million and yet the Department spent only approximately 87 percent, or $318.2 million. Compared to this underspend, the proposed capital budget as illustrated below includes an even more abrupt increase. It is also unclear where the data for FY 2012-13 was obtained, as it does not agree with the financial data in Table 4-5. This may be a remnant of the transition from the PRP to the PSRP.

[9]FY 15-16 Final Budget, May 19, 2015. Board of Water and Power Commissioners.

Figure 4-1. Historical and Proposed PSRP Funding ($ millions)



Source: Navigant analysis of PSRP Report[10] and Power Capital Budget and Actuals (August 19, 2015)

The higher spending in FY 2014-15 appears to be primarily attributable to increased spending on the distribution functional area, while the substation and transmission areas remain significantly underspent with regard to capital. In distribution, at least, this could start a positive upward trend.

Based on data provided by the Department, it also appears that the largest underspent PSRP items are related to contracting services and the purchase of materials (procurement). Specifically, only 15 percent of the planned construction services budget (a variance of $165.3 million) and 46 percent of the planned materials and supplies budget (a variance of $132.8 million) were spent over the three-year period. The program also underspent on its regular labor budget, at 81 percent (a variance of $44.2 million). These are significant amounts of money, and highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

4.4 Program Outlook

Based on interviews and evidence of underspending in capital budget reports, the PSRP is faced with challenges in procurement and staffing more than in funding. The Department must create a realistic plan to meet targets in order to begin ramping up the program and regularly report achievements and milestones.

Related to this, LADWP has not updated the PSRP to reflect actual approved funding levels and has not evaluated any risks of not fully funding the PSRP or of underspending on its capital programs. And, as mentioned previously, the PSRP does not incorporate a forward-looking plan or roadmap for the implementation of new technology (including smart grid technologies outside of demonstration programs) except for the isolated case of planning for substation automation. The Department should

[10]Ibid.

update the PSRP to reflect these realities. Overall, these changes would provide more transparency into the PSRP and use of funds.

5. Conclusion

Navigant leveraged its Asset Management Diagnostic Tool in order to assess the Department's T&D asset management function against industry best practice and stated objectives, and conducted a preliminary review of PSRP performance and expenditures. While not achieving industry best practice, the Department's T&D asset management function appears to be in line with other U.S. utilities and provides sound governance and direction for LADWP to maintain, replace and repair its aging infrastructure, and address the key challenges it faces.

LADWP showcased a number of strengths, including a well-developed PSRP that represents a comprehensive plan for the management of the Department's power assets that is well aligned with the Department's stated objectives and to the organization structure. Other strengths include the way the organization makes operational decisions relative to its assets and very good situational awareness and management of operational risk.

However, Navigant identified a number of areas of improvement requiring immediate attention. Key areas of improvement include the need for a more formal asset management and continuous improvement framework, improvements to asset life estimates, the implementation of an outsourcing strategy, changes to the procurement process, and the development of a robust plan to address expected staff attrition. The implementation of Navigant's recommendations will require dedication and focus from the Department and possibly a change of culture. However, as mentioned previously, LADWP is facing a number of challenges and addressing these challenges while minimizing the associated costs to the ratepayers will require a transition to the implementation of best practices in asset management.

Navigant's complete list of asset management recommendations is shown in Table 5-1, below.

Table 5-1. Asset Management Recommendations

	Group	Recommendations
Asset Strategy and Planning	Documentation of Asset Strategy and Planning	LADWP should develop an Asset Management Strategy document and implement a risk management framework along with risk registers and mapping of risk to objectives and mitigations across all areas of its Asset Management function. The Asset Management Strategy should be reviewed following a regular and structured process.
		LADWP should develop a more formal, best practice Asset Management framework such as ISO 55000.
	Continuous Improvement	LADWP should adopt and embed a structured continuous improvement framework into its Asset Management processes.
	Improvements to the PSRP	Future versions of the PSRP should clearly spell out the strategy, objectives, and the direct alignment of the Plan with the Department's objectives
		LADWP should expand its PSRP to include implementation strategies as well as specific annual deliverables and metrics.
		All tasks required for the implementation of the Plan should be documented in the PSRP.
		LADWP should include specific continuous improvement elements in the PSRP that are designed to better optimize results and cost.

		As LADWP's Asset Management system matures, LADWP should strengthen the analysis of cross-cutting issues.
		LADWP should assess the impact of changing smart grid technologies on its system and include the implementation of those challenges in a smart grid road map.
	Prioritization	The Department should adopt a common risk-based prioritization framework across all aspects of the company.
		LADWP should implement a consistent condition-based framework for corrective and emerging maintenance.
Asset Management Decision Making	Repair, Maintenance and Replacement of T&D Assets	LADWP should evolve towards accurate end-of-life standards based on asset condition and improved end-of-life estimating techniques including the development of asset health indices for each asset class.
		The Department should have its maintenance performed under a hybrid Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM) system.
		LADWP should implement a procurement process for "lowest evaluated cost" which properly considers the entire life-cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs.
	Capital Selection Process	LADWP should work towards a best practice common portfolio framework for capital project selection.
	Contracting Strategy	LADWP should define a stated outsourcing strategy as part of its workforce resource planning in order to consistently implement and optimize its strategy.
	Outages Management	LADWP should evolve towards the use of written switching orders that are created, reviewed and approved in advance.
Life Cycle Delivery Activities	Asset Management Processes	LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge in a time of a rapidly changing workforce.
	Preventive and Corrective Maintenance	The Department should leverage on-line monitoring of real time assets and replicate its condition-based approach found in Substations in other areas of the organization.
		LADWP should standardize its preventive maintenance processes.
		LADWP should implement a consistent risk-based prioritization and condition-based framework for corrective or emergency maintenance.
		LADWP should implement a robust RCA process as part of a larger continuous improvement process and train employees accordingly.
	Effective Planning, Design, Operations and Maintenance	LADWP should continue to improve the collaboration and communication between the planning, engineering and operations divisions.
Asset Knowledge Enablers	Asset Data and Knowledge	LADWP should continue to formalize and document its strategies, plans, processes and asset data.

Organization and People	Asset Management and Leadership	LADWP should strive to implement best practices in asset management leadership, including fully enabling top management through their appointment to full positions.
	Competence and Behavior	LADWP should continue to formalize its processes and focus on capturing the institutional knowledge of retiring employees.
		LADWP should attempt to counter the fact that there are few opportunities to introduce new skills and approaches from outside the company (due to the civil service system) through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible.
		LADWP should state a defined contracting strategy with contract requirements that selectively incent best performance by contractors through quality and safety standards, performance incentives, and performance penalties.
	Organizational Structure and Culture	LADWP should adopt a culture of continuous improvement and work towards accelerating Asset Management optimization.
		LADWP should develop a consistent risk-based decision process that drives planning and then determines resource allocation
Risk and Review	Accounting Practices	Best practice, towards which LADWP should aspire, is to minimize allocated costs and to hold contingency budgets at the corporate level rather than at the line item level.
	Asset and Systems Performance and Health Monitoring	The Department should continue to improve its measurement of Asset Management though the implementation of balanced scorecards and management reviews.
	Asset and Systems Performance and Health Monitoring	Quality Assurance and Quality Control requirements should be defined for primary processes.
	Contingency Planning and Resilience Analysis	LADWP should tighten its resiliency processes to ensure consistent review and proactive update that take into account industry best practice.
	Weather and Climate Change	The Department should take a holistic approach to preparing for climate change and consider conducting a study on how changing macro conditions will impact assets.

Finally, despite the PSRP's merits as a strong planning document, Navigant heard feedback on and found evidence of underspending on the capital programs. This is a critical issue particularly because managing the PSRP is essential to the advancement towards the Recommended Strategic Case in 2014 IRP, as the Power System must be able to support a high penetration of renewables, distribution generation, storage, demand response, and smart grid technologies.

In FY 2012-13, the PSRP spent of 72.7 percent of its budget. In FY 2013-14, the PSRP spent 69.8 percent of its budget. Recent budget information provided by LADWP in August 2015 indicated that FY 2014-15 spending was $318.2 million, or approximately 87 percent of the budget and a higher dollar amount than the two previous Fiscal Years. While this is a positive development, Navigant recommends giving additional attention to PSRP performance going forward.

It also appears that the largest underspent items are related to contracting services and the purchase of materials (procurement). Specifically, 15 percent of the budget for construction services was spent over the three-year period and 46 percent of the budget for materials and supplies. The program also spent only 81 percent of its regular labor budget. These items highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

The Department should report more clearly to the Board on progress against well-defined milestones and outline a plan to ramp up program implementation effectively. This will likely require additional resource planning, including improvements to staffing and procurement processes which were reported to be obstacles. Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs.

Volume III

Water Infrastructure

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Water Infrastructure Report
Volume III

Prepared for:
The City of Los Angeles

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Executive Summary

Objectives & Approach

The City of Los Angeles ("the City"), by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative (IEA) Survey ("the Survey") of the Los Angeles Water and Power Department ("the Department" or "LADWP"). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. ("Navigant") to conduct this study.

The primary objective of the Survey is to determine how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at an appropriate cost. One key area of focus for the 2015 Survey is the assessment of LADWP's plan to maintain, repair and replace its aging water and power infrastructures.

This report presents Navigant's assessment of the Department's water infrastructure. Although LADWP's Water System Organization (WSO) is nationally known for excellence, water infrastructure has become an important focus area as the WSO faces a number of challenges that will require significant capital and operations and maintenance (O&M) expenditures related to the maintenance and renewal of its aging infrastructure and compliance with stringent regulatory mandates. These are urgent issues that are confronting many water utilities in the United States. The scope of the 2015 IEA primarily focuses on assessing the Department's plans with regards to:

- *Water Supply and Storage*: While LADWP's existing mix of water supplies has been a key factor in the Department's ability to provide its ratepayers with high quality, reliable, and cost competitive water, there is a need for significant changes. LADWP has been heavily relying on water purchases from the Metropolitan Water District (MWD) for many years. MWD water represents the second most expensive water source in California and its pricing is outside the direct control of the Department. The current drought further exposes the Department to MWD's high costs, as supply of lower cost water from the Los Angeles Aqueduct (LAA) has been very limited. LADWP plans to address these issues and reduce its reliance on MWD water through an increase in local water supply. In particular, the Department's plan includes increased water supply from stormwater capture, groundwater, recycled water, and conservation.
- *Water Distribution Infrastructure*: The WSO is contending with severely aging infrastructure. A significant number of its physical assets, including mainlines, trunk lines and large valves have already reached the end of their useful life. Ensuring system reliability in the current context of rapidly aging infrastructure requires a robust asset management function supported by efficient and effective processes, adequate staffing levels, and up to date technology.

Navigant's review of LADWP's water infrastructure is primarily based on insights gathered from interviews, industry experience, and supporting documentation provided by the Department. The report

is organized according to the two main topic areas above, with an additional section for the discussion of the WSO's overall water strategy.

Water Supply and Storage

For most California water utilities, the Urban Water Management Plan (UWMP) is the primary water resources planning document, and includes the utility's demand and water supply forecasts. Since LADWP is in the midst of developing the 2015 iteration of its UWMP, Navigant had to rely on the 2010 version of the UWMP and additional documentation, as well as insights gathered from interviews with key personnel to review of the Department's Water Supply and Storage plans.

Given the current drought conditions facing LADWP's service area and most of California, Navigant evaluated the Department's demand forecasts against what is currently the most influential water demand driver: conservation. While further analysis would be required to fully vet the Department's demand forecasts once the 2015 UWMP is released, Navigant's review shows that LADWP's water supply projections appear to be compliant with existing conservation mandates.

Similarly, LADWP's water supply, storage and demand management strategies appear to be robust and sound. The WSO is doing a commendable job to maintain and enhance its water supplies, and achieve the City's and the Department's shared overarching goals of increasing local water supply, reducing LADWP's reliance on water purchases from MWD, and expanding its conservation efforts. In addition, given that long-term demands may decline due to a reduced per capita demand, there appears to be no need to pursue other, more costly water supply options such as seawater desalination.

However, the Mayor's goal to reduce water imports by 50 percent may prove challenging to achieve during dry years. While achieving this goal during normal and wet years is very likely, an analysis completed by Navigant shows that cutting in half MWD water purchases by 2025 during dry years (using FY 2014 as the baseline) would require a 850% increase in water supply from conservation and recycled water compared to FY2014-15 levels to meet the supply demand. Such an increase in conservation and usage of recycled water is not supported by the Department's current plans.

Finally, this report includes a discussion on the potential impact of climate change on LADWP's water supply. The WSO has completed an analysis of the potential climate change impact on the LAA System in 2011 showing that impacts may not be significant enough to adjust projected supply estimates from the LAA in the short and medium-term. However, the impact of climate change may be non-negligible beyond the 2040 planning horizon and a discussion addressing this issue is expected to be included in the 2015 UWMP.

Water Distribution Infrastructure

Asset Management Program

Asset Management Strategy

Over the last several years, the WSO has made significant improvements to its asset management function. The creation of an Asset Management group within Water Engineering Technical Services (WETS) was a major step, as has been the drafting of several asset management plans for critical asset

classes. Additionally, the WSO recently initiated a training program that seems to be increasing support across the organization for a more comprehensive approach to asset management. Several days of asset management training were conducted for WSO managers and the training was quite detailed and discussed a number of specific steps that need to be taken to implement a comprehensive asset management function.

The WSO's efforts to dive into the details of asset management represent great progress from the Department. However, the WSO lacks a stated asset management strategy or policy, and there is limited to no agreement among the senior staff as to the need for a formalized asset management function. Further, asset management objectives and goals are not clearly stated for all asset classes.

Over the last several years, there has been a significant international effort to develop standards for asset management programs. The result of this effort is the recent approval of International Standards Organization (ISO) 55000, 55001, and 55002. These standards provide excellent guidance on the essential elements of an asset management program. The WSO should consider developing a strategic asset management plan consistent with these standards. Many of the elements are already in place, and with the full involvement and support of the WSO's top management, this effort could be completed rapidly. Upon completion, the Department could potentially use the WSO's asset management plan as a template for the Power System and Joint Services.

When developing its asset management strategy, the WSO should address the following issues:

- While there are a number of examples that demonstrate consideration of continuous improvement from the WSO, there is no formalized process to ensure that continuous improvement is reflected in the WSO's asset management objectives and plans.
- Moving forward, one of the key asset management strategic policies that the WSO should consider is defining levels of service for each asset class. Even if the target level of service is not currently achievable, the asset management plan for a particular asset class should set a timeline to achieve that level of service and establish a program to meet the objective. Level of service definitions will drive action and will help define and allocate the resources required to meet the objective.
- There is some recognition in the WSO that asset management is tied to risk. The mainline replacement prioritization methodology constitutes a good example. However, there are other asset classes, such as pump stations and regulator stations for which limited risk evaluations have been performed. Risk assessment appears to be incomplete and inconsistent across the WSO's asset classes. Best practice would include a more formal risk assessment framework applied to all asset classes and driven by the asset management strategy.

Asset Management Plans

As mentioned previously, the WSO has made substantial progress in drafting asset management plans for a number of critically important asset classes. However, all of these asset management plans are in draft form, despite some dating back to 2010. These plans should be finalized to ensure that their findings are formally considered in future asset renewal strategies.

In addition, there are a number of asset classes for which asset management plans have not been developed. The WSO should consider developing plans for these assets to effectively manage water infrastructure priorities.

Condition Assessments

Given the aging infrastructure of the WSO, it is critical that the condition of the assets be regularly and comprehensively assessed. The WSO supplied Navigant with several asset management plans that discuss the condition of various assets; however, these reports do not constitute complete condition assessments, as they do not include critical data such as actual field condition information, or, for larger asset such as major trunk lines, findings from non-destructive inspections. Further, the WSO does not seem to have a consistent approach to condition assessment, and there is limited field data to support conclusions for a robust asset renewal strategy.

It is critical that the WSO develop comprehensive condition assessments for all its asset classes and regularly update them. The Department should use qualified contractors/consultants to support this effort as Navigant found that there are currently insufficient staff resources to complete these projects in a timely manner.

Asset condition data retention appears to be another challenge. Interviews have revealed that the WSO's staff has a solid understanding of the condition of many of the major water system assets. However, this information does not appear to have been fully documented and many of the experienced staff are currently or soon to be eligible for retirement. LADWP should continue to formalize its processes to capture the institutional knowledge of retiring employees. Collecting this information and data through additional field investigations will be more costly to the WSO than ensuring this knowledge does not leave the Department when the experienced staff depart.

Emergency Preparedness[1]

The WSO has emergency response and continuity of operations plans in place and has proven to be very effective and efficient in responding to emergency leaks and breaks. However, critical details appear to be missing from the plans, training is incomplete – especially in Incident Command System (ICS) – and terminology and responsibilities are not universally understood. Further, while the WSO has shared that some emergency drills have been completed, they were limited in scope and purpose. Combined, these issues may cause confusion when responding to major incidents, such as a major earthquake.

Current State of LADWP's Water Infrastructure

Utilities across the United States are facing increasingly aging infrastructure replacement needs as many physical assets reach the end of their useful lives. Although LADWP has yet to feel the full impact of water infrastructure failures, the UCLA trunk line break serves as one example of the damage that may occur in the future.

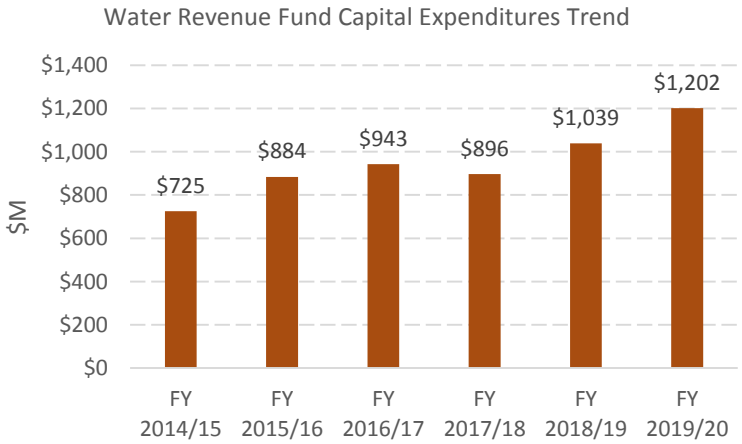
[1] This topic is addressed in detail in a separate IEA report.

To address this challenge, the Department has significantly ramped up its asset renewal[2] efforts and the recently proposed rate increase is based primarily on funding plans for a substantial acceleration of these efforts.

For instance, the WSO's current plan is to double its mainline (pipelines with diameters equal or smaller than 20 inches, excluding service lines) renewal rate from 150,000 feet/year to 300,000 feet/year. A replacement rate of 300,000 feet/year would reduce the System's replacement rate from a 235 to a 120-year cycle - which brings the rate closer to the average useful life for mainlines which ranges from 60 to 120 years. While this increase will go a long way toward reducing the projected amount of mainlines that will reach the end of their nominal useful life in the short-term, it will not be enough to address the challenges LADWP will be facing beyond 2020. At an annual renewal rate of 300,000 feet, the amount of pipe exceeding its useful life will nearly double within 15 years. If the proposed rate were to continue for decades, the amount of pipe exceeding its useful life would increase fivefold to approximately 8 million feet, or 23% of the total amount of mainline pipe. Consequently, the risk of pipe failures and the WSO's ability to meet reasonable levels of service will be greatly affected. While representing a great improvement, it is clear that a mainline replacement rate of 300,000 feet/year will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required.

This recommendation also applies to large valves. The WSO's current plan is to replace 5 large valves per year, which equates to a 460 year replacement cycle. Based on the nominal useful life of large valves that ranges from 50 to 100 years (depending on the type of valve and its particular application) this rate appears to be well below what is needed to maintain a reasonable replacement schedule. This concern was also shared by LADWP staff during interviews with the Navigant team.

Replacing LADWP's aging infrastructure and ensuring system reliability will come at a cost to the ratepayers. According to the latest rate proposal, capital expenditures will increase from $725 million in FY 2014/15 to over $1.2 billion in FY 2019/20, representing a 66% increase.[3]



[2] "Asset renewal" refers to any major repair, rehabilitation or replacement.

[3] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

LADWP's capital programs related to the renewal of its water infrastructure are ambitious and costly, but needed. Overall, the Department has sound plans to move forward on these programs but Navigant has concerns that it does not have the capacity to implement them – even though the WSO was able to spend 100% of its approved budget in FY 2014/15 - due to expected significant attrition, difficulties in hiring new staff and contracting out, and inefficient procurement processes. It is critical that LADWP addresses these issues in the short-term. The Department should:

- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of its procurement processes to increase efficiency and effectiveness, and to drive business process ownership and accountability.

Advanced Metering Infrastructure

The WSO lags behind other California utilities in its efforts to implement Advanced Metering Infrastructure (AMI), which includes remote meter reading capabilities. LADWP is in a position to combine both remote electric and water metering using a single AMI architecture; however, based on staff interviews, it appears the Power System is piloting AMI that does not currently have water metering capability. If the Power System moves ahead with this decision, this opportunity for integration and the associated implementation cost savings will be lost, unless the selected vendor develops a water metering capability. Navigant strongly recommends a combined implementation of AMI for the Water and Power Systems.

Water System Strategy

Navigant observed several factors that may be limiting the WSO's ability to cost-effectively and efficiently respond to the challenges noted above. Chief among these is the lack of a single corporate strategic planning document guiding the WSO's efforts.

The WSO and the City have already developed a number of insightful strategic planning documents, including the 2008 Water Supply Action Plan, the 2009 Sustainability Plan, the One Water L.A. 2040 Plan and the 2014 pLAn. However, there is still no single, coherent Strategic Business Plan.

The existing strategic documents lay out strategies, principles, initiatives, and goals and objectives that currently drive the WSO. Taken together, these documents could provide a robust foundation for the WSO's Strategic Business Plan. However, most of the plans focus on water supply and water conservation, with limited attention paid to infrastructure. Given the current challenges related to infrastructure maintenance, renewal and enhancement, additional efforts should be devoted to developing a strategy that addresses infrastructure.

WSO leadership should initiate a process to create a Strategic Business Plan which can be started by combining and aligning many of the existing strategic documents and developing a strategy to drive infrastructure replacement efforts.

Conclusion

This review of LADWP's water infrastructure has revealed that there are still a number of factors that may limit the WSO's ability to cost-effectively and efficiently respond to the challenges it faces. However, the WSO's overall approach to replacing, maintaining and repairing its aging infrastructure, and addressing the other challenges it faces appears to be robust and sound.

Navigant's major concerns are related to the expected mainline replacement rate, and the WSO's capacity to ramp up and implement its capital programs. This study shows that the proposed mainline renewal rate will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required. Multiple factors led to the selection of the proposed replacement rate but one of the key objectives was to determine a renewal rate that would limit the required rate increase while still providing acceptable system reliability levels in the short-term. This strategy may not be in the best interest of the ratepayers in the medium and long-term as it may create a backlog of mainlines needing replacement that is not sustainable, which ultimately may lead to more leaks, additional repair costs, and even higher rates.

The expected significant attrition, existing difficulties in hiring new staff and contracting out, and inefficient procurement processes constitute the other top priority challenges the WSO should immediately address in order to be able to implement a significant ramp up of its capital programs.

Navigant's list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Increase mainline and large valve renewal rates.
- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of LADWP's procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.
- Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees.
- Create a single, coherent strategic business plan by combining and aligning many of the existing strategic documents already used by the WSO.
- Establish an asset management strategy and document it in a strategic asset management plan by leveraging best practice asset management framework such as ISO 55000. Specific consideration should be given to adopting structured continuous improvement and risk frameworks, defining levels of service for the WSO's assets, and including an overarching policy governing the repair, maintenance and replacement of all the WSO's asset classes.
- Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake.

Medium Priority Recommendations

- Complete comprehensive condition assessment reports of all asset classes.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Integrate Power and Water System AMI.
- Address the impact of climate change on LADWP's water supply, and in particular the LAA.
- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Continue to formalize and document the WSO's strategies, plans, processes and asset data.
- Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.

Low Priority Recommendations

- Leverage Navigant's findings to improve failure analysis reports.
- Create a long term investment plan that extends beyond the 10 year capital planning horizon.

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1. Introduction

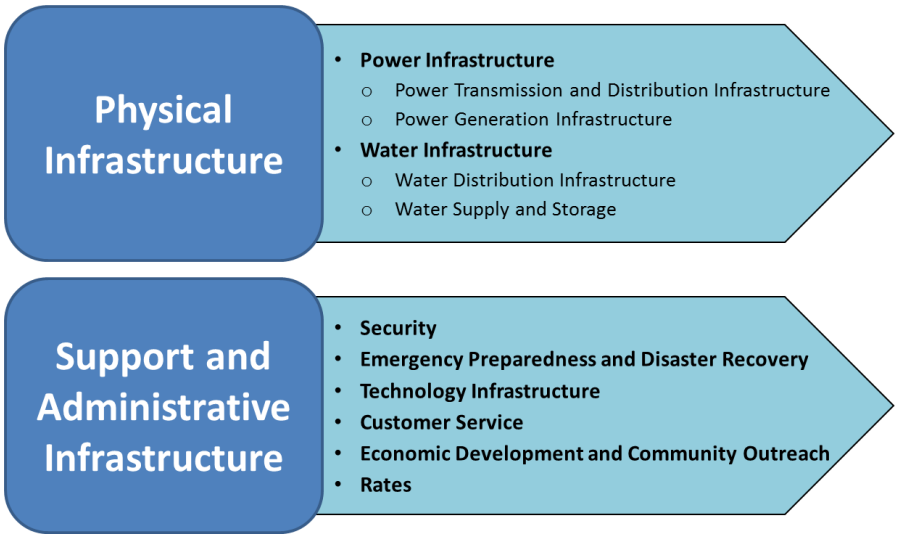
1.1 Study Objectives

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct the IEA Survey of LADWP. For the 2015 edition, the City Controller has retained Navigant to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared the Department is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

Figure 1-1. Focus Areas of the 2015 IEA Survey



This report focused on the review of LADWP's Water Infrastructure.

1.2 Approach

Information for this report was derived from several sources:

- Interviews with LADWP Water System staff.
- Documents collected and reviewed across the Water System including reports, presentations, budgets, model outputs, and other data provided in response to Navigant's data request.
- A literature review of California regulation, ISO standards, and peer utility publications on relevant Water System topics.

- Navigant's experience with LADWP's prior reports and practices.

Navigant conducted 15 interviews over a period of four weeks. The interviewees included the Senior Assistant General Manager of the Water System, the Executive Liaison, all five Division Managers, several direct reports to the Division Managers, and some section and group managers. See Appendix B for a full description of the interviews conducted. The documents produced by the Department are listed in Appendix C.

1.3 Report Organization

This report is organized as follows:

- Water System Strategy: A summary of the mission, vision, values, strategies and other overarching policies and principles guiding the work of the WSO.
- Water Supply and Storage: An assessment of LADWP's current and planned future water demand and water supply.
- Water Distribution Infrastructure: An assessment of the WSO's efforts to operate, maintain, renew and expand its physical infrastructure.
- Conclusion: A summary of findings including recommendations based on the aforementioned assessments.

2. Water Supply and Storage

Urban Water Management Plans are prepared every five years by urban water suppliers in California in accordance with the Urban Water Management Planning Act. The plans must be submitted to the Department of Water Resources (DWR) and reviewed for compliance with the UWMP Act. The UWMP provides long-term resource planning to ensure that adequate water supplies are available to meet existing and future water demands over a 20-year planning horizon. In addition, each urban water supplier is required by the Water Conservation Bill (2009, SBX7-7) to report its progress on meeting the required 20% reduction in per-capita urban water consumption by the year 2020.

DWR provides a Guidebook for urban water suppliers in advance of the UWMP deadline. The 2015 Guidebook is expected to be released by the end of September 2015.[4]

For most California water utilities, the UWMP is the primary water resources planning document. Although LADWP is in the midst of updating its UWMP, there is limited information available for review without the 2015 Guidebook. Accordingly, Navigant has relied on the 2010 version of the UWMP and insight gathered from interviews with key personnel for much of its water supply and storage review. Updated information has been used when available.

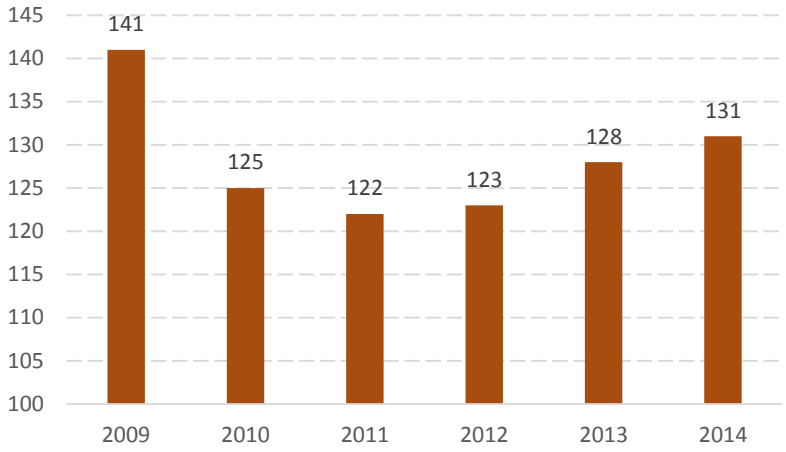
2.1 Water Demand Forecast

One critical component of the UWMP is the water demand forecast. LADWP's forecasting methodology utilizes data such as historical demand by sector (single-family residential, multi-family residential, commercial, industrial, government/institutional and non-revenue), population and other demographic data from the Southern California Association of Governments (SCAG), estimates of economic activity, weather records, and even satellite infrared analysis to estimate outdoor water use.

Given the current drought conditions facing LADWP's service area and most of California, Navigant evaluated the Department's demand forecasts against what is currently the most influential water demand driver: conservation. SBX7-7, also known as 20x2020, was passed in 2009 and requires water utilities to reduce per capita water use by 20% by 2020 on a statewide basis. To achieve this, each water agency was required to establish its baseline water use and choose from one of four options for calculating compliance with the 20x2020 requirements. LADWP has chosen Option 3, which requires the 2020 target per capita demand to be 95% of the Hydrologic Region 4 Target of 149 gallons per capita per day (gpcd). This results in a 2020 target of 142 gpcd, which is higher than LADWP's per capita water demand over the last six years (see Table 2-1), highlighting the Department's early compliance with SBX7-7.

[4] A public draft of the 2015 Guidebook is expected to be released in August.

Table 2-1: LADWP's Historical Per Capita Water Demand (gpcd)[5]



However, the Mayor's Executive Directive No. 5 lays out a goal of reducing per capita water consumption by 20% by the end of 2017, assuming a base year of FY 2013/14. Based on a demand of 131 gpcd, this would result in a maximum water consumption target of 105 gpcd. This is a much more aggressive water demand target than mandated by SBX7-7, requiring further water conservation efforts from LADWP and its ratepayers.

Additionally, on April 1, 2015, Governor Brown directed the California State Water Resources Control Board (SWRCB) to reduce potable urban water use by 25% statewide. Conservation standards vary across urban water suppliers depending on their average residential gallons per capita per day (r-gpcd) consumption for the previous year. Significant conservation efforts over the past six years have limited the Department's conservation standard to 16%, 9% below the statewide average goal. LADWP's latest water conservation numbers are encouraging since residential water use decreased by 21% in July 2015 over July 2014, exceeding both the Mayor's and Governor's goals.

Overall, the Mayors' Executive Directive No. 5 takes precedence for water demand forecasting purposes over Governor's Brown conservation goals, given the associated higher water consumption reduction objective.

Since the 2015 UWMP was not available at the time this report was completed, Navigant used the July 2015 Water System Rate Action Report, which provides total supply projections for the FY 2014-15 – FY 2019-20 period, to assess the Department's demand forecasts.[6]

Using the projections provided in the Rate Action Report, Navigant derived projected water sales by subtracting water losses or "Non-Revenue" supply - estimated at 6.9%[7] - from the total water supply numbers, and then computed the average per capita water consumption assuming a population of 4

[5] Figure 11, Water System Rate Action Report, Chapter 2. Note that 2015 per capita water use was not available as of the writing of this report.
[6] Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.
[7] The 6.9% non-revenue ratio was derived from Exhibit ES-H from 2010 Urban Water Management Plan.

million. Table 2-2 shows that starting in FY 2016-17 the average water consumption will be approximately 105 gpcd, which is in line with the Mayor's conservation goal.

Table 2-2: Projected Water Sales and Average Consumption - FY 2014-15 to FY 2019-2020[8]

Supply (AF)	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
Groundwater Pumping (AF)	67,200	28,708	28,708	28,708	32,711	92,109
LA Aqueduct (AF)	91,070	249,689	256,369	263,049	269,730	261,077
MWD (AF)	374,478	238,942	215,014	191,354	179,356	135,150
Conservation & Recycled Water (AF)	10,368	10,505	10,643	15,311	18,713	19,063
Total Supply (AF)	543,116	527,844	510,733	498,421	500,510	507,398
Estimated Non-Revenue (AF)*	37,475	36,421	35,241	34,391	34,535	35,010
Estimated Sales (AF)	**505,641**	**491,423**	**475,492**	**464,030**	**465,975**	**472,388**
Average Per Capita Consumption (gpcd)	**113**	**110**	**106**	**104**	**104**	**105**
Change Against Mayor's Executive Directive No. 5 Goal of 105 gpcd	**8%**	**5%**	**1%**	**-1%**	**-1%**	**1%**

These water supply projections represent a significant decrease from the water demand forecasts included in the 2010 UWMP but are reflective of the existing conservation mandates. LADWP's latest water supply forecast for 2020 represents a 19% decrease relative to the 2010 UWMP demand forecast.

Table 2-3: Change in Demand Forecasts Between the 2010 UWMP and the 2015 Rate Action

	2015	2020
Demand Forecast with Passive & Active Water Conservation - 2010 UWMP	599,563	622,732
Total Supply Forecast - 2015 Rate Action	543,116	507,398
Change	9%	19%

While further analysis would be required to fully vet the Department's demand forecasts once the 2015 UWMP is released, Navigant's review shows that LADWP's water supply projections appear to be compliant with existing conservation mandates.

Additionally, LADWP's implied assumption that water consumption per capita will not increase over time appears appropriate. Although there is an argument that LADWP's per capita demands could increase should current water shortage rates be lifted, there is also a sentiment that they will not only

[8] Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.

hold below the 2020 target, but may continue to decline. Further, population increases may not offset this decrease, meaning that overall demands may continue to decline, on average. These assumptions should be reflected in the 2015 UWMP, which should differ from previous UWMPs that have shown demands increasing over the 25-year planning horizon.

Finally, the Department is proposing a new water rate structure as part of their latest rate action that would further promote water conservation and validate these assumptions. Under LADWP's new water rate structure, the current two tiered rate structure would be transitioned to four tiers, and changes to water budget allotments for residential customers would be made.[9] Proposed changes to the water budget allotments include:

- Eliminating the household size allotment.
- Setting the tier 1 allotment to 8 HCF to reflect indoor use, which represents an increase for many customers.
- Retaining five lot size groups, but set allotments for lot sizes four and five equal to each other.

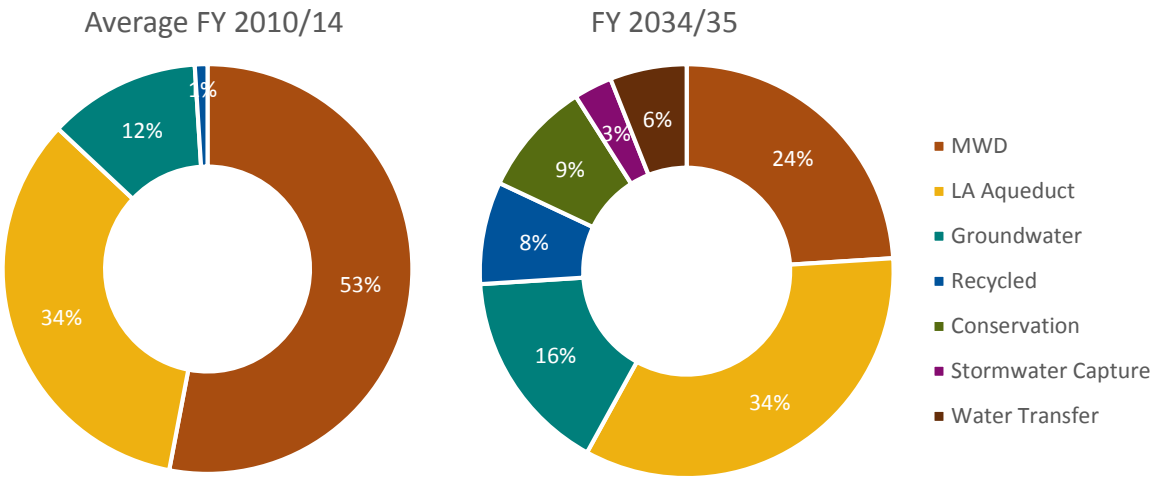
2.2 Water Supply

As mentioned previously, Navigant was not provided with the 2015 UWMP and had to rely on data included in the 2010 UWMP, interviews and other documentation to assess the WSO water supply plan.

Figure 2-1 shows the past and projected mix of water supplies presented in the 2010 UWMP. It highlights a significant reduction in water purchased from MWD, offset by more conservation, and an increase in the use of recycled water, groundwater, stormwater capture and water transfers.

[9] Water System Rate Action Report, Executive Summary Section 1.5.2, July 2015.

Figure 2-1: Average Water Supply by Source[10]



The projected mix of water supplies that will be presented in the 2015 UWMP is anticipated to include major differences from the mix presented in the 2010 UWMP since:

- The pLAN sets a target of capturing 150,000 AF per year of stormwater by 2035[11], which would represent 26% of the Department's total annual water supply, based on Navigant's estimates.[12]
- The Mayor has set a target for imported water purchases to be reduced by 50% by 2025, using the baseline year of FY 2013/14, which translates to a maximum of approximately 220,936 AF per year[13], representing approximately 40% of the Department's total annual water supply. The selection of FY 2014 as the baseline simplifies the Department's task in achieving this goal since FY 2014 was a dry year and MWD water imports were therefore higher than usual, resulting in a higher imported water allowance.
- Overall demands are expected to decrease as a result of the Mayor's targeted decrease in per capita water use to less than 100 gpcd by 2035.
- There is an increased focus on maximizing the use of local water supplies, and this emphasis will include a greater effort to rehabilitate the San Fernando Groundwater Basin and other wellfields.

The Department is making great progress with regards to water conservation as illustrated by a 30 gpcd or 19% drop in residential water consumption between 2004 and 2014 (from 161 gpcd to 131 gpcd). Additionally, the Mayor's goal to decrease the per capita use to less than 100 gpcd by 2035 seems

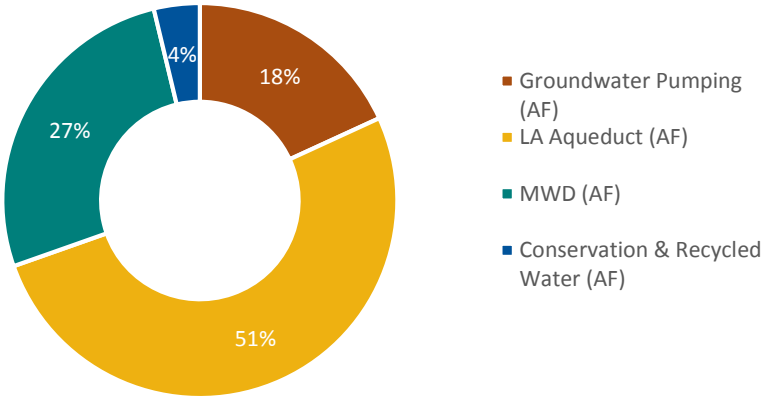
[10] Source: 2010 UWMP.
[11] Source: Sustainable City pLAn, page 20.
[12] Navigant extrapolated the water supply data presented in the Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.
[13] Source: Sustainable City pLAn, page 20. The pLAn refers to 441,871 acre-feet of water imports from MWD during FY 2013/14.

realistic given that the Department's water supply data already shows a decrease in average residential consumption to approximately 104 gpcd by FY2017-18 (see Table 2-2).

LADWP's Stormwater Capture Master Plan, dated July 2015, highlights that the maximum amount of stormwater that could realistically be captured by 2035 ranges from approximately 135,000 AF per year to a maximum of approximately 180,000 AF per year. This range is in line with the pLAn's goal to capture 150,000 AF of stormwater per year by 2035. To achieve this goal the Department plans to capture and use stormwater on-site to offset potable water demand, and to capture and infiltrate stormwater into subsurface groundwater aquifers.[14] Achieving this level of stormwater capture would represent a great achievement for the Department in increasing its local water supply and limiting its reliance on MWD water purchases. Significant progress has already been made in this area and the Department is currently aggressively pursuing the remediation of the San Fernando Groundwater Basin. A team of consultants has recently been retained to provide planning, analysis and design services for the remediation effort.

However, while achieving the Mayor's goal to reduce imported water purchases by 50% by 2025 is very likely during normal and wet years, it may become challenging during dry years. Figure 2-2, which reflects data presented in the latest Water System Rate Action Report, shows the Department's projected water supply mix in FY 2019/20. This chart reveals that more than half of the Department's water supply would originate from the LAA, while it only represented 17% of LADWP's water supply in FY 2014/15 due to the drought.

Figure 2-2: Projected Water Supply Mix - FY2019-20[15] [16]



[14] Source: Stormwater Capture Master Plan, Executive Summary, July 2015.
[15] Source: Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C-2), July 2015.
[16] The share of stormwater capture is included in the "Groundwater Pumping" category.

This considerable difference highlights that LADWP's water supply mix can fluctuate significantly from a dry year to a wet year due to variations in water supply from the LAA, with shortfalls in supply from the LAA being offset by additional water purchases from MWD, and vice versa.
Assuming a dry year in 2025 and the same level of water supply received from the LAA as in FY 2014/15 (91,070 AF), the maximum level of groundwater and stormwater capture attainable by 2025 (125,000 AF[17]), and the maximum MWD imports set by the Mayor (220,936 AF), water supply from conservation and recycle water would have to increase by close to 88,000 AF or 850% compared to FY2014-15 levels to meet the supply demand. This is illustrated by Table 2-4. Attaining this level of conservation and recycled water supply seems unlikely, which suggests that the Mayor's goal will be extremely challenging to meet during dry years. However, Table 2-4 also shows that MWD water imports would be significantly lower during normal and wet years than the maximum allowance set by the Mayor.

Table 2-4: 2025 Scenarios

	FY2014/15 - Actuals	2025 - Normal Year Scenario	2025 - Wet Year Scenario	2025 - Dry Year Scenario	Difference FY2014/15 - Dry Year Scenario
Groundwater Pumping (AF)	67,200	125,000	125,000	125,000	57,800
LA Aqueduct (AF)	91,070	259,983[18]	300,000[19]	91,070	0
MWD (AF)	374,478	139,960	99,943	220,936	-153,543
Conservation & Recycled Water (AF)	10,368	10,368	10,368	98,305[20]	87,937
Total Supply (AF)	543,116	535,311	535,311	535,311	-7,805

This issue related to water supply during dry years may be magnified in the long-term (end of the century) as climate change may play a role in limiting water supply from the LAA. The potential for climate change to impact future water supplies has been of great concern to the WSO. An analysis of the potential climate change impact on the LAA System was completed in 2011.[21] The analysis utilized 16 climate change models and two different greenhouse gas emission scenarios to evaluate the impact of climate change on Eastern Sierra hydrology. The model's hydrologic outputs were entered into the Los Angeles Aqueduct Simulation Model to evaluate LAA operational impacts and to estimate the amount

[17] Source: LADWP's Stormwater Capture Master Plan, dated July 2015.
[18] Average of LADWP's LAA water supply projections for the FY 2015/16 – FY2019-20 period. Source: Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C-2), July 2015.
[19] Navigant's projection of LAA water supply during a wet year based on FY 2010/11 actuals.
[20] The estimate for Conservation & Recycled Water supply for the dry year scenario reflects shortfalls in water supply from the LAA (similar to FY2014/15 actuals), the maximum MWD water import allowance, estimated groundwater supply, and the projected total demand for 2025.
[21] Task G, Los Angeles Aqueduct System Climate Change Study Final Report. June 1, 2011.

of water that can be captured. The results were divided into three timeframes: 2010-2039, 2040-2069, and 2070-2099. The overall conclusion of this report is that "a large fraction of the monthly runoff and flow projections are within historical ranges, although about 10% are expected to be below, and 7% above historical ranges." The report further points out a long-term drying trend for the Owens Valley and Mono Basin, with flow to the City possibly being reduced to zero during years of low runoff. Cumulative runoff over the 21st century was estimated to be 2 million AF less in the Owens Valley and 400,000 AF less in the Mono Basin as compared to the historical runoff from 1950-1999.

While the results of the LAA System analysis are concerning, the major impacts of climate change will not be felt until later this century. Climate change impacts may not be significant enough to adjust projected supply estimates from the LAA in the 2015 UWMP, but some discussion regarding impacts beyond the 2040 planning horizon should be included. The study results also provide a basis upon which to implement long-term changes to how the LAA is operated, including how to take advantage of the Neenach Pumping Facility connection to the State Water Project.

With the added emphasis on stormwater capture, a more thorough analysis of the long-term impacts of climate change on stormwater runoff is also needed, along with its impacts to groundwater. The stormwater capture targets of the City may need to be adjusted in years beyond 2040 as a result of such analysis. The results of a climate change analysis may point toward the need for additional in-basin storage to capture more wet-year runoff.

A water source that is not materially impacted by climate change is recycled water. For this reason, recycled water adds value to the overall supply portfolio as a highly reliable supply and it should constitute one of the Department's focus areas going forward. The 2010 UWMP goal is to increase recycled water use to 59,000 AFY by 2035 while in FY2013-14 the system delivered close to 36,000 AF. This would represent approximately a 64% increase. To achieve this goal, LADWP plans to:

- Expand Non-Potable Reuse (NPR purple pipe network).
- Implement the Groundwater Replenishment (GWR) Project.
- Explore:
    - Satellite treatment options.
    - Injection wells.
    - Direct Potable Reuse.
    - New Treatment Technologies.
- Increase outreach on the City's recycled water program.

The combination of the actions presented above constitutes a sound plan to achieve the 59,000 AFY goal by 2035 and further increase the share of recycled water in the Department's water supply portfolio.

2.3 Adequacy of Water Supply Infrastructure to Meet Future Demands

Navigant's assessment of LADWP's overall water supply shows that the WSO is doing a commendable job to maintain and enhance its water supplies, and to achieve the City's and the Department's shared overarching goals of increasing local water supply, reducing LADWP's reliance on water purchases from MWD and expanding its conservation efforts. In addition, given that long-term demands may decline due to a reduced per capita demand, there appears to be no need to pursue other, more costly water supply options such as seawater desalination.

3. Water Distribution Infrastructure

Navigant has implemented a two-step approach to assess the WSO's current and proposed plans to operate, maintain, and renew LADWP's water infrastructure, and to evaluate its capacity to implement these plans.

The first step focused on a high-level diagnostic of the WSO's asset management function. To complete this assessment, Navigant leveraged its Asset Management Diagnostic Tool which evaluates an organization's asset management function against six asset management groups: asset strategy and planning, asset management decision making, life cycle delivery activities, asset knowledge enablers, organization and people, and risk and review.

The second step focused on a detailed review of the WSO's plan to renew its aging infrastructure, with particular attention paid to current infrastructure investments and the adequacy of existing infrastructure renewal programs.

3.1 Asset Management Diagnostic

Over the last several years, the WSO has made significant improvements to its asset management function. The creation of an Asset Management group within WETS was a major step, as has been the drafting of several asset management plans for critical assets. Recently, the WSO conducted several days of asset management training for WSO managers. This training was quite detailed and discussed a number of specific steps that need to be taken to implement a comprehensive asset management function.

The WSO's efforts to dive into the details of asset management represent great progress from the Department. However, there is still a lack of strategic focus that disrupts detailed efforts at the staff level to implement a comprehensive asset management function, and there is room for improvement in several aspects the WSO' asset management capabilities.

This section of the report presents a high-level assessment of the WSO's asset management function against industry best practice and includes recommendations for improvement. To perform this assessment, Navigant leveraged its Asset Management Diagnostic Tool. The Diagnostic Tool provides an assessment of the Department's maturity level against the tool's six asset management groups and 39 subject areas, using maturity levels ranging from 0 to 4. A maturity level of 0 signifies that the organization is not considering the subject area in question, while a maturity level of 4 signifies that organization's processes surpass standard requirements and are likely a best practice, if performed cost-effectively.

The chart below presents the WSO's average maturity level for each of the six asset management groups, based on Navigant's assessment.

Figure 3-1: Assessment of the WSO's Maturity Level in Six Key Aspects of Asset Management

Figure 3-1 shows that the WSO does not achieve best practice (maturity level 4) in any of the six asset management groups but performs relatively well in Asset Management Decision Making and Lifecycle Delivery Activities. However, there is room for significant improvement in Asset Strategy & Planning, Asset Knowledge Enablers, Organization and People Enablers and Risk & Review.

The following sections outline Navigant's findings related to each of the six asset management groups and identify specific recommendations for improvement. In addition, Appendix A includes the elements of an asset management system as defined by ISO 55001.

A summary of key recommendations is included in below:

Table 3-1: Asset Management Diagnostic - Key Recommendations

Asset Management Category	Recommendations
Asset Strategy and Planning	✓ Establish an asset management strategy and document it in a strategic asset management plan. ✓ Adopt and embed a structured continuous improvement framework in the WSO's formal asset management strategy. ✓ Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan. ✓ Define levels of service for WSO's assets.

Asset Management Category	Recommendations
Asset Management Decision Making	✓ Develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all the WSO's asset classes. ✓ Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
Life Cycle Delivery Activities	✓ Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis. ✓ Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake.
Asset Knowledge Enablers	✓ Continue to formalize and document the WSO's strategies, plans, processes and asset data.
Organization and People	✓ Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy. ✓ Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees.
Risk and Review	✓ Develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process. ✓ Complete comprehensive condition assessment reports of all asset classes. ✓ Define and implement a more formal risk assessment framework that is applied to all asset classes. ✓ Address the impact of climate change on LADWP's water supply, and in particular the LAA.

3.1.1 Asset Strategy and Planning

Navigant's review of the WSO's Asset Strategy and Planning asset management category primarily focused on the following areas:

- Documentation of Asset Strategy and Planning.
- Continuous Improvement.
- Project Prioritization.

A maturity level of 1.7 highlights a number of areas where the Department should make immediate changes. Most importantly, the WSO must define an asset management strategy that should govern continuous improvement and define service levels. This strategy should be documented in a clear and comprehensive strategic asset management plan. Additionally, the WSO should focus on finalizing its existing asset management plans. Navigant's findings are discussed in detail in the following subsections.

3.1.1.1 Documentation of Asset Strategy and Planning

While substantial progress has been made in the WSO Asset Management Program (AMP) since the last IEA Survey was conducted, it has been slow. The WSO has many Asset Management System elements in place or in the process of being developed. These include a robust GIS system and associated databases, a reporting system providing record information for constructed and repaired facilities, a computerized maintenance management system (CMMS) using the MAXIMO platform, several asset management plans, and a well-functioning capital improvement program for new facilities and asset renewal. In addition, an asset management group has been created within WETS.

However, the WSO does not have a stated asset management strategy or policy, and there is limited to no agreement among the senior staff as to the need for a formalized asset management function. Further, asset management objectives and goals are not clearly stated for all asset classes. For instance, there is a clear goal for mainline replacement of 300,000 feet/year that is supported by a robust prioritization methodology, but objectives for other asset classes such as pump stations are not as clearly stated and supported by a plan. In addition, the WSO appears to be lacking a common understanding of the meaning and implications of asset management and the relevant terminology.

As mentioned previously, the WSO has made substantial progress in drafting asset management plans for a number of critically important asset classes including:

- Large Valves.
- Los Angeles Filtration Plant.
- Pressure Regulator Stations.
- Pump Stations.
- Trunk Lines.
- Water Distribution Pipelines, also known as Mainlines.
- Water Storage Facilities.

However, all of these asset management plans are in draft form, despite some dating back to 2010. According to WSO personnel, the plans have not yet been finalized because of a lack of consistency in

the way they were written, and limited attention from the senior management on this matter. These plans should be finalized to ensure that their findings are formally considered in future asset renewal strategies.

In addition, there are a number of asset classes for which no asset management plans have been developed. These asset classes are listed in Table 3-2 and categorized by level of importance. The WSO should consider developing plans for these assets to effectively manage water infrastructure priorities.

Table 3-2: Asset Classes with No Asset Management Plan

Level of Importance	Asset Class
High Importance	✓ Los Angeles Aqueduct and all related facilities such as wells, reservoirs, dams, control and outlet valves. ✓ Open reservoirs (e.g. dams, inlet/outlet structures, control valves, and fencing). ✓ In-city well systems. ✓ Disinfection and water quality monitoring stations. ✓ Cathodic protection systems (e.g. rectifiers, anodes, and test stations).
Medium/Low Importance	✓ Distribution line valves, including valve boxes. ✓ Hydrants, including laterals and shutoff valves. ✓ Water services and meters. ✓ Fire meters and laterals. ✓ Blow-off valves, valve boxes, and associated structures. ✓ Air release and vacuum valves. ✓ Backflow prevention devices. ✓ Recreational facilities. ✓ Equipment and material storage facilities.

Moving forward, one of the key asset management strategic policies that the WSO should consider is defining levels of service for each asset class. For example, the level of service for an individual residential water service might be to have an outage greater than 4 hours occur no more than once every five years, while the level of service for an individual fire hydrant on a single-family residential street might be to have one hydrant out of service on a particular block for no greater than one week and no more frequently than once every 10 years. Even if the target level of service is not currently achievable, the asset management plan for a particular asset class should set a timeline to achieve that level of service and establish a program to meet the objective. Level of service definitions will drive action and will help in defining and allocating the resources required to meet the objective.

Other asset management strategic policies may include:

- Defining the asset classes covered in the asset management function.
- Defining the number of leaks per year that will be considered acceptable.

- Setting an asset class priority system for directing the investment of limited resources.
- Establishing division responsibility for managing each asset class.
- Setting standards for software to be used.

As the Department continues to work towards a documented strategic asset management plan, the aforementioned policies should be addressed.

3.1.1.2 Continuous Improvement

There are a number of examples that demonstrate consideration of continuous improvement from the WSO, particularly with respect to field construction, lessons learned on mainline replacements, and improvements made to the budget estimation process and project management. The WSO's recent implementation of a stage-gate approach for managing projects is a good example of continuous improvement in project management. However, there is no formalized process to ensure that continuous improvement is reflected in the WSO's asset management objectives and plans. The WSO should adopt and embed a structured continuous improvement framework in its formal asset management strategy.

3.1.1.3 Project Prioritization

While not necessarily tied directly to the asset management plans, there is a robust process for selection and prioritization of renewal projects and a well-functioning project management process, with a Project Management Office (PMO) in place. Once decisions are made on the renewal projects to be pursued, responsibility for carrying them out is clear and those responsible have the appropriate level of authority to carry them out. In addition, risk and asset performance are taken into consideration when prioritizing renewal projects.

Key Recommendations - The WSO should:

- Establish an asset management strategy and document it in a strategic asset management plan.
- Adopt and embed a structured continuous improvement framework in its formal asset management strategy.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Define levels of service for its assets.

3.1.2 Asset Management Decision Making

Navigant's review of LADWP's Asset Management Decision Making processes primarily focused on the following areas:

- Repair, maintenance and replacement of WSO's assets.

- Contracting strategy.

With a maturity level of 2.3, the WSO's Asset Management Decision Making is considered to be adequate; however, a number of improvements would bring the WSO closer to best practice. Specifically, the WSO should develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes, and define a stated outsourcing strategy. These findings are discussed in additional detail below.

3.1.2.1 Repair, Maintenance and Replacement of WSO's assets

The WSO appears to have good processes in place for the management of the end of life of its assets, particularly for mainlines and trunk lines, and there is a growing focus on other asset classes. In addition, the decision making process to prioritize renewal projects is robust for mainlines and trunk lines but there is less focus on other asset classes and lifecycle costs are seldom taken into consideration in renewal projects – although some consideration is now given to lifecycle costs for new projects. Replacement efforts have been ramping up for these key assets, but may not be sufficient. These issues are addressed in detail in section 3.2.

Still, the WSO is still lacking an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes.

3.1.2.2 Contracting Strategy

The WSO primarily takes an "insourcing" approach since it can take up to 18 months or more to obtain outside resources. Outsourcing can therefore result in significant delays in the execution of some of the WSO's plans, including various asset renewal plans. This issue could be resolved by incorporating the WSO's outsourcing strategy as part of its workforce resource planning, as opposed to considering outsourcing needs on a project-by-project basis. Having an outsourcing strategy set as part of a workforce plan would provide LADWP with sufficient time to appropriately plan around the abnormally long outsourcing process.

Key Recommendations – The WSO should:

- Develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.

3.1.3 Life Cycle Delivery Activities

Navigant's review of the WSO's Life Cycle Delivery Activities primarily focused on the following areas:

- Asset management processes.

- Plans and procedures to identify and respond to emergency situations.

With a maturity level of 2.2, the Department's Life Cycle Delivery Activities are generally on track. However, Navigant identified several improvements for LADWP in this asset management group, including implementing asset management plans for all asset classes and developing emergency plans that are in line with best practice requirements.

3.1.3.1 Asset Management Processes

The assessment of the WSO's lifecycle delivery activities primarily focuses on the implementation of asset management plans. Such plans need to be comprehensive and well designed, and implemented efficiently for asset management to have any practical meaning. This involves the application of appropriate implementation processes and procedures to ensure cost, risk and asset management performance are appropriately controlled.

The WSO has a number of processes in place for the implementation of asset management plans and control of activities across the creation, acquisition and enhancements of assets. However, the existing processes do not cover all asset classes, and they are not consistently used across all the WSO divisions. Further, interviews with the WSO have revealed that the existing processes are not reviewed on a regular basis, and that in some instance, insufficient information is being collected and stored regarding the condition of assets.

3.1.3.2 Plans and Procedures to Identify and Respond to Emergency Situations

Another key aspect of the assessment of lifecycle delivery activities is to ensure that an organization has robust plans and procedures to identify and respond to emergency situations, and that such plans and procedures are periodically tested. Emergency plans should outline the actions to be taken to respond to an emergency and ensure continuity of critical asset management activities. Furthermore, emergency drills should be performed on a regular basis to ensure that the WSO is adequately prepared for an emergency.

The WSO has emergency response and continuity of operations plans in place and has proven to be very effective and efficient in responding to emergency leaks and breaks. However, critical details appear to be missing from the plans, training is incomplete – especially in Incident Command System (ICS) – and terminology and responsibilities are not universally understood. Further, while the WSO has shared that some emergency drills have been completed, they were limited in scope and purpose. Combined, these issues may cause confusion when responding to major incidents, such as a major earthquake.[22]

[22] This issue is addressed in detail in a separate IEA report.

Key Recommendations - The WSO should:

- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Develop emergency plans that are in line with best practice requirements, and include the completion of emergency drills in response to major incidents, such as a major earthquake.

3.1.4 Asset Knowledge Enablers

The review of Asset Knowledge Enablers primarily focuses on ensuring the organization has:

- Processes in place governing how asset data is stored, maintained, updated and controlled.
- Asset data that is accessible to the relevant staff in the organization.
- Processes in place to document the conformance with asset management practices.

The WSO has processes in place in order to capture current asset information, and appropriate asset management information appears to be available to relevant employees and stakeholders.
The records necessary to document conformance with asset management practices exist in an early stage of maturity, with many processes being informal or institutional in nature. LADWP should continue to formalize and document its strategies, plans, processes and asset data. The current lack of formalized processes within the WSO led to a low maturity level of 1.6.

Key Recommendation - The WSO should:

- Continue to formalize and document its strategies, plans, processes and asset data.

3.1.5 Organization and People

Navigant's review of the WSO's organization and people (in an asset management context) focused on the following areas:

- Asset management leadership.
- Competence and behavior.

With a maturity level of 1.2, the WSO would benefit from several improvements to bring the organization closer to best practice. The WSO's senior leadership should be incentivized to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy and formal processes to capture the institutional knowledge of retiring employees.

3.1.5.1 Asset Management Leadership

While the WSO's senior leadership has developed direction and expectations for the organization with regards to its asset management function, there are varying levels of commitment from the top management to a formalized asset management function, including the development of a formal asset management strategy. Interviews have revealed that some divisions and their leadership are more active in embracing asset management principles, while others question the need or value of an asset management focus. Additionally, the absence of a top management position dedicated to the asset management function has an impact on the organization's commitment to asset management.

3.1.5.2 Competence and Behavior

LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the Department are governed by seniority through the civil service system; therefore, it is not always clear that the most competent person holds each position. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible. The WSO has recently initiated a training program focused on asset management that seems to be increasing support across the organization for a more comprehensive approach to this topic.

Much of the operational knowledge of Department staff is gained through experience and training, so LADWP should continue to formalize its processes to capture the institutional knowledge of retiring employees. This recommendation is critical given the high level of workforce attrition expected in the short-term. Additionally, the WSO is developing a written plan that will identify required financial resources, equipment, training, and facilities needed to address the expected attrition and support the renewal of the WSO's infrastructure. Finalizing this plan should remain one of the Department's immediate priorities in the short-term.

Key Recommendations - The WSO should:

- Incentivize its senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.
- Continue to formalize its processes to capture the institutional knowledge of retiring employees.

3.1.6 Risk and Review

Navigant's review of LADWP's risk and review for asset management focused on the following areas:

- Accounting practices.
- Assets and systems change management.
- Assets and systems performance and health monitoring.

- Contingency planning and resilience analysis.
- Criticality, risk assessment and management.
- Stakeholder relations.
- Strategic planning.
- Weather and climate change.

With a maturity level of 1.3, Risk and Review is one of the asset management groups most in need of improvement. Navigant's critical recommendations relate closely to those made for the Asset Planning and Strategy group. Developing a more formal, best practice asset management framework such as ISO 55000 and embedding a continuous improvement framework and risk assessment framework is extremely important for managing risk as well as defining the Department's strategy. In addition the WSO should complete comprehensive condition assessment reports of all asset classes, and address the impact of climate change on LADWP's water supply in the 2015 UWMP.

3.1.6.1 Accounting Practices

The WSO tracks costs to activities in a way that provides the tools necessary to optimize costs. In addition, the WSO has recently improved its budget process with more accurate estimates which has helped the organization spend 100% of its approved budget for FY 2014-15.

3.1.6.2 Assets and Systems Change Management

LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this approach has generally served LADWP well, it has limited the development of more structured asset management approaches to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, the Department does not have a formal process for asset management function audits. As mentioned previously, LADWP should develop a more formal, best practice asset management framework such as ISO 55000 that includes a structured continuous improvement process.

3.1.6.3 Assets and Systems Performance and Health Monitoring

Given the aging infrastructure of the WSO, assets should be regularly and comprehensively assessed as part of the development of relevant asset management plans. The WSO supplied several asset management plans that discuss the condition of the various assets; however, these reports are not complete condition assessments. To provide more complete condition assessments, actual field condition information should be included. For example, general soil corrosivity estimates based on a broad understanding of the types of soil in an area are helpful, but specific field measurements will provide a better understanding of the soil conditions impacting the longevity of specific pipelines and other buried facilities. For larger facilities, such as major trunk lines, non-destructive inspection techniques should be used as they can provide a wealth of information on the actual condition of a pipeline. This field information will provide a greater level of confidence in estimating remaining useful life and reducing the risk of major blowouts.

In addition, Navigant was provided two trunk line reports from 1996 and 1998 in response to its request for any and all condition assessment reports.[23] These reports were also not full condition assessments due to their limited analysis of actual field conditions. While more complete condition assessments may have been done, these reports were not made available to Navigant.[24] Based on these limited reports, Navigant found that the WSO does not have a consistent approach to condition assessment, and there is limited field data to support conclusions for a robust asset renewal strategy.

Individual staff appear to have a solid understanding of the condition of many of the major water system assets. However, this information does not appear to have been fully documented. With many of the experienced staff currently or soon to be eligible for retirement, a concerted effort to document this information before it leaves the WSO is critical. Collecting this information and data through additional field investigations will be more costly to the WSO than implementing robust knowledge transfer processes to ensure this knowledge does not leave the Department when the experienced staff depart.

3.1.6.4 Contingency Planning and Resilience Analysis

Similar to condition assessments, comprehensive failure analysis reports constitute a key component of a water utility's asset management function, especially in the area of contingency planning and resilience analysis.

A complete analysis of a failed asset should first include a determination of the step-by-step mechanism for how the asset failed. The second component is to determine why the asset failed. Lastly, the report should include ways of preventing future failures in similarly situated assets. This last aspect of a failure analysis is the most important because it can lead to investigations of comparable assets to determine if there are similar failure mechanisms that can be removed to prevent additional failures.

Navigant reviewed the failure analysis report for the 2014 pipe failure at Sunset/UCLA. This report describes the type and condition of the failed pipe section. Several primary failure mechanisms were considered, and the following conclusion was reached:

> "The various factors contributing the failure are likely a combination of age of pipe, erosion corrosion, pitting corrosion resulting in reduced wall thickness, and galvanic corrosion between old and new pipe. The geometric shape, poor quality of Wye connector weld and installation may have also contributed to the failure. […] Catastrophic overload failure of already deteriorated pipe steel material could have been triggered by high water pressure in the system."[25]

The report adequately investigates the material properties and condition of the steel pipe; however, a more complete description of all observations would be helpful. For example, there are bulleted points listing observations and pictures, but there is not sufficient description of each point to fully convey the condition of the pipe. Moreover, the report does not fully discuss why the corrosion occurred and the

[23] Trunk Line Condition Assessment Program, First Phase (1996) and Second Phase (1998).
[24] See Pump Station Asset Management Plan Report 2010, page 14, which states, "Condition assessments for the pumping stations were initially completed in July of 2006 under the Asset Management Pilot Program.
[25] Failure Analysis Report of Pipe Failure at Sunset/UCLA, 10-2-14.

failure pieces that were removed from the break location were sent to different storage locations, which limited the ability of the investigators to conduct a full analysis.

Most asset failures will not warrant the effort to complete a full failure analysis. For those critical or key assets, or for particular failures seen for the first time, a failure analysis can be highly cost-effective by alerting staff to other potential failures in the water system. When an asset failure merits further analysis, Navigant recommends that the WSO:

- Ensure that all pieces of removed pipe (or other asset) are carefully cataloged and moved to a single location that is protected from the elements. Despite the urgency to restore service, care should be taken to preserve evidence for future analysis.
- Include more detail in failure analyses, including pictures with indicator arrows.
- Adopt a consistent failure and forensic analysis format and task a group of in-house technical experts to lead and manage the investigation.
- Determine the precise failure mechanisms and causes (for instance, describe what instigated the initial corrosion, which produced pitting at X location where the coating had poor adhesion which led to a sufficiently large loss of steel that hoop stresses could not be supported and failure propagated along the longitudinal weld at Y location).
- Develop a consistent mechanism to transfer lessons learned to those doing condition assessments to look for particular conditions for the purpose of preventing similar failures.

3.1.6.5 Criticality, Risk Assessment and Management

There is some recognition in the WSO that asset management is tied to risk. The mainline replacement prioritization methodology constitutes a good example. However, there are other asset classes, such as pump stations and regulator stations for which limited risk evaluations are performed. Risk assessment appears to be incomplete and inconsistent across the WSO's asset classes. Best practice would include a more formal risk assessment framework that is applied to all asset classes.

3.1.6.6 Stakeholder Relations

It appears that the WSO provides adequate communication by regularly communicating its asset management plans and results internally, and with the Board of Commissioners. The WSO also communicates the results of its asset process reviews and results.

3.1.6.7 Strategic Planning

The WSO's recent efforts to dive into the details of asset management represent great progress from the Department. However, there is still a lack of strategic focus that impedes detailed efforts at the staff level to implement a comprehensive asset management function.

3.1.6.8 Weather and Climate Change

The WSO has completed an analysis of the potential climate change impact on the LAA System in 2011. While climate change impacts may not be significant enough to adjust projected supply estimates prior

to 2040, they should be considered beyond the 2040 planning horizon. Additionally, climate change impacts should be considered for the stormwater capture program.

Key Recommendations - The WSO should:

- Develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process.
- Complete comprehensive condition assessment reports of all asset classes.
- Define and implement a more formal risk assessment framework that is applied to all asset classes.
- Address the impact of climate change on LADWP's water supply and in particular the LAA.

3.2 Current State of Infrastructure

3.2.1 Current Infrastructure Investment Plans

The WSO has extensive plans to both add new infrastructure and renew its existing infrastructure. The capital program is large and ambitious. According to the latest rate proposal, capital expenditures will increase from $725 million in FY 2014/15 to over $1.2 billion by FY 2019/20, representing a 66% increase (see Figure 3-2).[26]

In addition to the Water Infrastructure Program, major investments include local water supply projects, groundwater remediation, projects related to meeting safe drinking water quality regulations and compliance with Owens Valley regulatory requirements. Accordingly, priorities for infrastructure investment must be balanced against available staff and financial resources. Given the criticality of the WSO's aging physical assets, each infrastructure investment should be evaluated individually with respect to risks, costs, and benefits, and then incorporated into an overall, long-term plan extending well beyond the current 5-10 year capital-planning horizon.

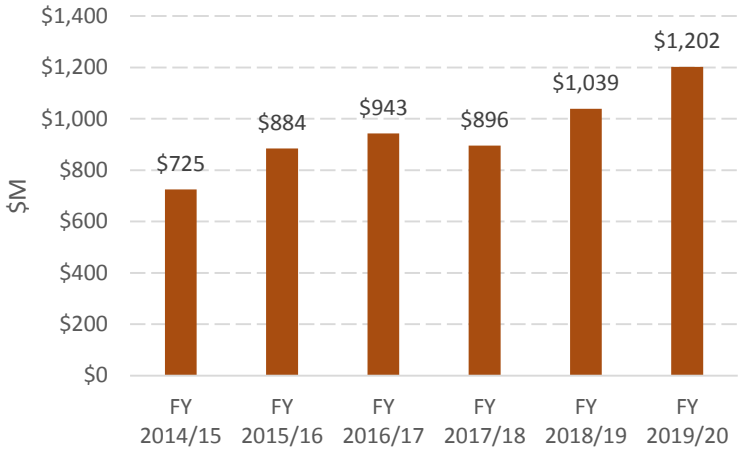
Current major capital investments planned for the next 5-10 years include:

- Construction of a number of projects to maintain compliance with current water quality regulations.
- Continuing with the Owens Valley dust mitigation.
- Rehabilitation of the San Fernando Groundwater Basin and other wellfields.
- Increasing the rate of mainline replacement to approximately 300,000 feet per year.
- Increasing the renewal rate for large valves.
- Continuing with pump station and pressure regulator station renewal.

[26] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

- Continuing with the trunk line renewal program.
- Continuing with selected renewal projects on the LAA.

Figure 3-2: Water Revenue Fund Capital Expenditures Trend[27]



The WSO has stated during interviews with Navigant that the latest rate increase proposal would be sufficient to support the expected significant increase in capital expenditures. In addition, the WSO has demonstrated significant progress in its ability to spend its budget. Table 3-3 shows that in FY2012/13 the WSO spent only 77% of its approved budget while this ratio increased to 100% in FY2014/15. This improvement is primarily due to more accurate initial budget estimates and the implementation of a stage-gate approach for managing projects.

However, Navigant has concerns that the Department does not have the capacity to face the projected significant ramp up in capital expenditures due to expected staff attrition, difficulties in hiring and contracting out, and inefficient procurement process. It is critical that LADWP addresses these issues in the short-term. The Department should:

- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of its procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.

[27] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

Table 3-3: WSO Approved Budget vs. Actuals - FY2012/15 period[28]

FUNCTION	FY 12-13 Approved Budget	FY 12-13 Actuals	% Change	FY 13-14 Approved Budget	FY 13-14 Actuals	% Change	FY 14-15 Approved Budget	FY 14-15 Actuals	% Change
Safe Drinking Water Program	$215,423	$194,409	90%	$234,215	$270,956	116%	$172,513	$161,712	94%
Water Infrastructure Program	$161,843	$152,985	95%	$192,435	$194,990	101%	$226,700	$187,674	83%
Local Water Supply Program	$103,326	$59,864	58%	$173,561	$80,780	47%	$118,126	$137,671	117%
Regulatory Compliance - Owens Valley	$104,619	$40,139	38%	$123,209	$83,595	68%	$167,745	$183,846	110%
Operating Support	$30,758	$20,502	67%	$36,072	$33,227	92%	$29,349	$36,699	125%
Customer Service	$19,093	$18,951	99%	$9,455	$17,088	181%	$7,592	$11,555	152%
Grand Total	**$635,061**	**$486,849**	**77%**	**$768,946**	**$680,635**	**89%**	**$722,024**	**$719,157**	**100%**

3.2.2 Adequacy of Infrastructure Renewal Plans

3.2.2.1 Mainline Replacement Program

As mentioned previously, one of the key challenges facing LADWP is the replacement of its aging infrastructure. A significant number of mainlines – pipelines with diameters equal or smaller than 20 inches, excluding service lines – have already reached the end of their useful lives and this number will continue to grow rapidly if the Department does not increase its mainline replacement rate.

LADWP has started ramping up its mainline replacement program over the past few years but the current replacement rate has proven to be insufficient. The mainline replacement goal for FY 2014-15 was 150,000 feet/year. With a replacement rate of 150,000 feet/year, the Water System replacement cycle is about 235 years, while the useful life for mainlines ranges from 60 to 120 years. Additionally, the backlog of mainlines that are at least 100 years old, which is currently at one million feet, will continue to grow significantly at the current replacement rate. This clearly highlights the urgent need for the Department to greatly increase its pipeline replacement rate to ensure system reliability in the years to come.

[28] Source: Data provided by LADWP.

The WSO's current plan is to double its renewal rate from 150,000 feet/year to 300,000 feet/year starting in FY 2015/16. A replacement rate of 300,000 feet/year would reduce the System's replacement rate to a 120-year cycle, which is greater than the average useful life of the ductile iron pipe used for replacing most mainlines. While this increase will go a long way toward reducing the projected amount of mainlines that will reach the end of their nominal useful life in the short-term, it will not be enough to address the challenges LADWP will be facing beyond 2020. As can be seen in Figure 3-3, at an annual renewal rate of 300,000 feet, the amount of pipe exceeding its useful life will more than double within 15 years. If the proposed rate were to continue for decades, the amount of pipe exceeding its useful life would increase fivefold to approximately 8 million feet, or 23% of the total amount of mainline pipe[29]. Consequently, the risk of pipe failures and the WSO's ability to meet reasonable levels of service will be greatly affected. While representing a great improvement, it is clear that a mainline replacement rate of 300,000 feet/year will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required.

Figure 3-3: Mainline Replacement Based on Current Rate Proposal[30]

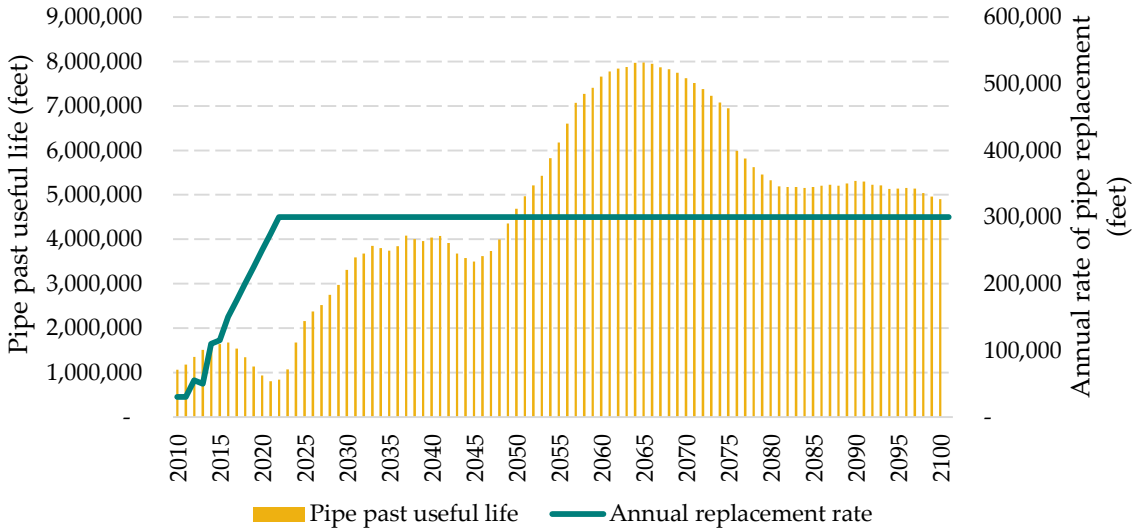
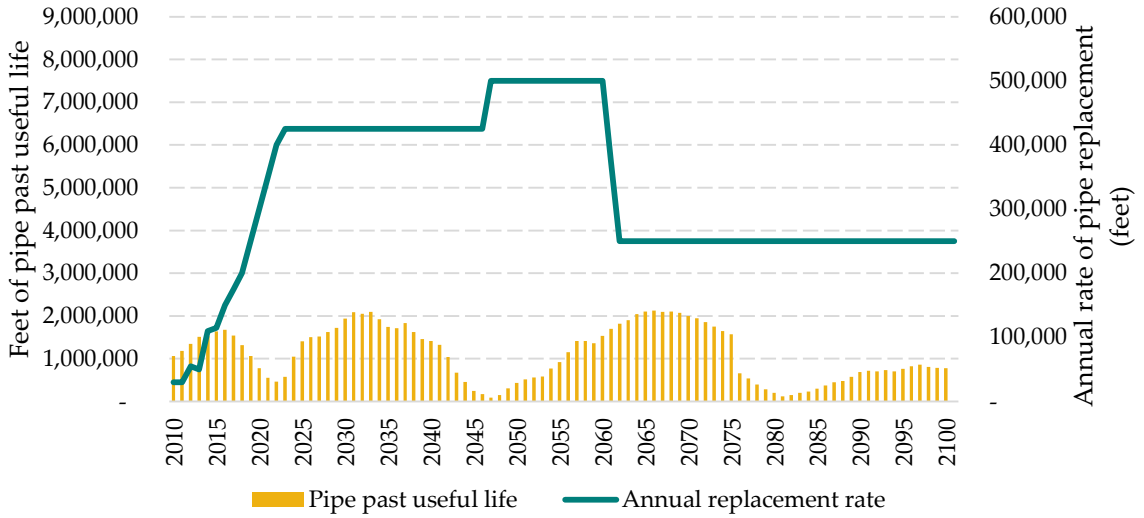


Figure 3-4 presents an alternative replacement rate scenario developed by Navigant and shows the impact of increasing the rate to 425,000 feet/year by 2023 and holding it to this level for approximately 20 years, then increasing it to 500,000 feet/year for another 15 years. In this scenario, the percentage of mainlines operating past their average useful lives would be less than six percent at its peak. While such replacement rates will help to significantly reduce the backlog of mainlines needing replacement, the associated costs may be prohibitive. Determining the appropriate mainline replacement rate, the associated additional costs, and the impact levels of service and on rates will require further analysis from the WSO.

[29] The City of Los Angeles experienced significant territorial expansion in 1950 through 1970 when multiple piping systems were added to the Water System by annexation. The replacement cycle for these piping systems is projected to have a large impact on the WSO's overall mainline replacement program by 2050.

[30] Navigant analysis of mainline data provided by LADWP.

Figure 3-4: Accelerated Mainline Replacement[31]



In addition to funding, securing sufficient capacity to transition to a greater mainline replacement rate will be a significant challenge for the Department. In addition to facing significant workforce attrition in the short-term, LADWP has inefficient procurement processes and cannot quickly hire new staff or contract out. Furthermore, the Water Distribution Division currently only has 22 mainline installation crews which is insufficient to support such a program. To implement a 300,000 feet/year mainline replacement rate, the Department estimates that 39 crews will be required, which is a 77% increase in crew personnel. To address this issue, the WSO is developing a written plan that will identify required financial resources, equipment, training, and facilities to support the renewal increase. Finalizing this plan should remain one of the Department's immediate priority in the short-term.

3.2.2.2 Mainline Replacement Prioritization Methodology

In order to prioritize mainline replacement project, WSO assesses the likelihood of failure and the consequence of failure for each mainline in the system.

To assess a mainline likelihood of failure, the WSO takes into account multiple parameters, including age, leak rate, area topography, soil corrosivity, material type, mainline diameter, pressure, traffic loading and elevation. A Likelihood of Failure Score (LFS) is computed for each individual mainline to determine its level of deterioration against the aforementioned parameters. Finally, each mainline is assigned a grade based on the LFS score it was given. Grades range from "A" to "F" with "A" representing a low likelihood of failure and "F" representing a high likelihood of failure. LADWP's 2011 Water Distribution Pipeline Asset Management Report indicates that 49% of the Water System's mainlines were graded "C" – moderate likelihood of failure – while 29% were graded "D" and 1% were graded "F".

[31] Navigant analysis of mainline data provided by LADWP.

The consequence of failure characterizes the level of impact a mainline failure would have on its surrounding environment, population, and customers. Key consequence of failure parameters include:

- The type of customer served. Service to critical customers such as hospitals or airports should not be interrupted.
- Pressure. Potential mainline failures that could cause significant damages to other parts of the System due to significant pressure fluctuations should be addressed in priority.
- Street Designation. Significant disruptions to traffic due to mainline failures should be prevented.

Similar to the likelihood of failure grade, each mainline is given a consequence of failure grade ranging from "A" to "F", representing very low to very high consequences of failure. LADWP's 2011 Asset Management Report shows that only 7% and 0.5% of the Department's mainlines were graded "D" and "F", respectively.

By combining the likelihood and consequence of failure grades, the WSO is able to determine a Business Risk Exposure (BRE) metric that identifies mainlines with the highest likelihood of failure and with the greatest risks to the Department and its customers. A similar "A" to "F" grading system is used for the BRE. Overall, only 6% and 0.3% of the Department's mainlines have a BRE grade of "D" and "F", respectively.

In a few instances, the Department may deviate from the methodology described above in prioritizing its mainline replacement program. For example, priority is always given to existing leaks regardless of their BRE grade. In addition, "D" and "F" mainlines that were not originally scheduled for replacement but are located near leaky pipes are replaced with the leaky pipes. This approach decreases mobilization costs and yields a higher replacement rate per crew.

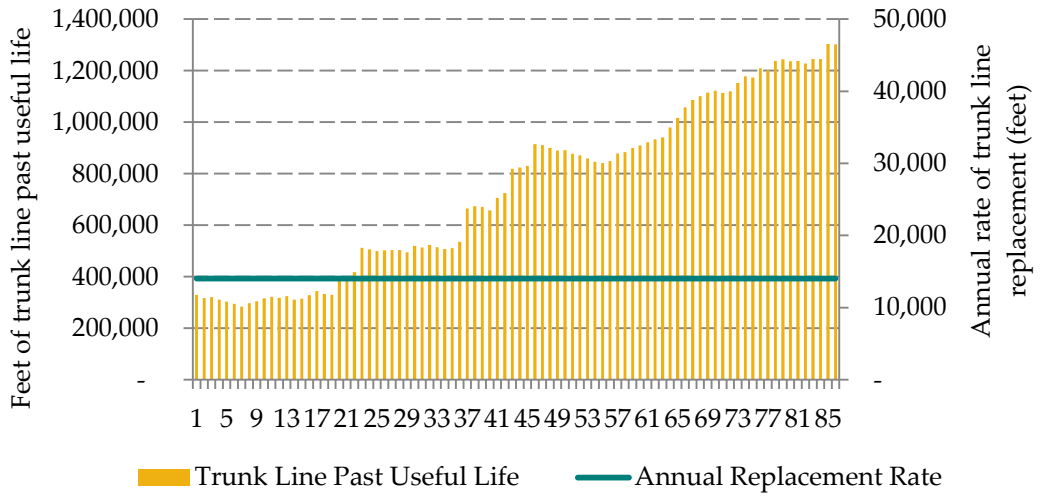
Overall, the WSO's mainline replacement prioritization methodology appears to be sound and comprehensive, and appropriately takes into consideration and addresses the potential risks to LADWP's customers and its Water System.

3.2.2.3 Trunk Lines, Large Valves, Pump Stations and Storage Facilities Replacement Programs

The current approach for trunk line renewal is partially driven by the complexity of the construction and the need to limit operational disruptions of the existing trunk lines. The average trunk line replacement rate over the last 10 years is approximately 14,000 feet/year, which is equivalent to a replacement rate cycle of almost 210 years, while a trunk line average useful life is 100 years[32]. Figure 3-5 shows that at a rate of 14,000 feet/year, 315,000 feet per year of LADWP's trunk lines would be past their useful life until 2033, representing 12% of the total portfolio. However, these numbers would start to increase significantly past 2033, reaching 848,000 feet/year in 2070, or 31% of the total portfolio.

[32] WETS – Asset Management Group – Trunk Lines, March 2015 report provided by LADWP.

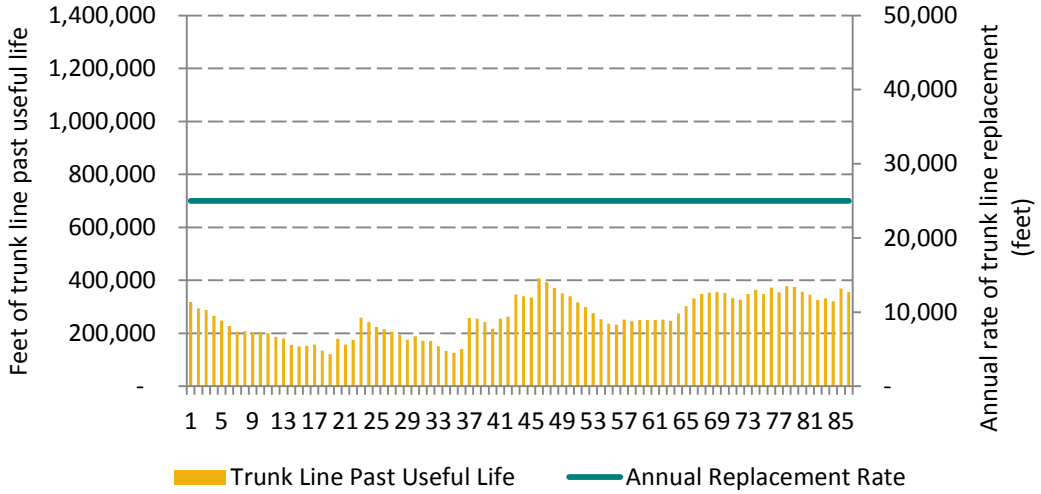
Figure 3-5: Trunk Line Replacement Based on Historical Replacement Rate[33]



If the WSO does not increase its trunk line replacement rate, it will face challenges similar to those it is facing with the current mainline replacement efforts. Interviews have revealed that the Department has recently significantly increased its replacement rate and it will be reaching at least 25,000 feet/year in the coming years. Figure 3-6 shows that this replacement rate would allow the Department to limit the backlog of trunk lines needing replacement to approximately 260,000 feet per year until 2100, representing 10% of the total portfolio. Based on this information, no further action to increase the rate of trunk line renewal is recommended at this time. However, a much larger effort should be placed on assessing the condition of all trunk lines approaching or beyond their expected useful lives, particularly those that are not planned for replacement within five years. This information can be critical in determining trunk line replacement priorities. Condition assessments of all facilities associated with the trunk lines, such as valves, appurtenances and vaults, should also be completed at the same time.

[33] Navigant analysis of mainline data provided by LADWP.

Figure 3-6: Trunk Line Replacement Based on LADWP's Replacement Rate Goal



With respect to large valves, the current plan is to replace five large valves per year, which equates to a 460 year replacement cycle. Based on nominal useful life of 50 to 100 years for large valves – depending on the type of valve and its particular application - this rate appears to be well below what is needed to maintain a reasonable replacement schedule. This concern was also shared by LADWP staff during interviews with the Navigant team. Furthermore, there are a number of valves that are defective or that are not being operated out of concern that they will not fully close or may become defective. Given that many valves are already past their nominal useful lives, Navigant recommends that the renewal rate for large valves be increased to reduce the backlog.

The ideal time to renew these large valves is when their associated trunk lines are being renewed because of the operational impacts related to shutting down the associated pipelines. Accordingly, detailed large valve renewal plans should be coordinated with the trunk line replacement program and the large valve minimum size should match the trunk line minimum size to optimize this coordination. . The WSO considers valves equal to or greater than 16 inches in diameter to be large valves. Since pipelines equal to or greater than 20 inches are considered trunk lines, the WSO should consider redefining its large valves size cutoff to match the dividing line between mainlines and trunk lines. In addition, the large valves less than 20 inches are being replaced at the same time that 16 and 18 inch mainlines are being replaced, which supports the idea of redefining the size cutoff. While we recognize the WSO is coordinating large valve and trunk line renewal, the rate of valve renewal is still low and valves may need to be renewed before their associated pipelines are renewed.

Given approximately 25% (24 stations) of the Department's pump stations were commissioned prior to 1960, these assets are not as old as some of LADWP's other assets, such as mainlines. Accordingly, pump station and pressure regulator station renewal plans appear to be adequate for many of the mechanical systems. However, further effort should be placed on the renewal of switchgear and control systems, as well as an examination of inlet and outlet headers.

Water storage facilities (tanks and reservoirs) are not a major cost component of the capital investment plan and no additional action is recommended beyond the current long-term plans, which include

regular condition assessments. Renewal plans can be made in response to the findings of these condition assessments.

3.2.3 Automated Meter Infrastructure

Many utilities in California have installed or are in the process of implementing AMI, which combines the ability to read meters remotely with communication systems and software to receive and analyze the meter data. Examples include:

- Burbank Water and Power has installed over 75,000 smart electric and water meters.
- Glendale Water and Power has installed over 120,000 smart meters. Glendale estimates a payback period of six years in operational savings alone.[34]
- San Francisco Public Utilities Commission has installed nearly 175,000 smart water meters.[35]

The benefits of AMI are numerous and include, among others:

- Reduced operating costs through the elimination of manual meter reading.
- Enhanced customer service through the availability of detailed usage data.
- Heightened conservation through the provision of feedback to customers on their usage.
- Improved operational understanding of the system through aggregated usage data.
- Increased sustainability by reducing the number of trucks dispatched.

While a number of California utilities have transitioned to AMI, the Department has been looking into AMI for a number of years, but it does not appear to be close to implementing a program, nor does it have a schedule to do so. Water Distribution personnel stated that new service meters are installed with the capability of remote reading; however, the WSO is still in the initial stages of investigating AMI vendors. Current plans are to replace 125,000 small meters over the next five years[36], representing nearly 20% of the total small meter inventory of sizes 2 inches and smaller.[37]

Interviews with Department personnel also revealed that the Power System is close to implementing AMI, but the prospective meter vendor does not have a comparable capability for water meters. Coordinating the AMI installation for both the Water and Power Systems by selecting a vendor that has water and power capabilities represents a significant opportunity for LADWP to minimize implementation costs. However, if the AMI elected for the Power System is not compatible with the AMI for the Water System, the opportunity for integration may certainly be lost. AMI implementation efforts should be coordinated between the Water and Power Systems, and all opportunities to minimize implementation costs should be investigated.

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[34] Glendale Water & Power's Wireless Network Provides Smart Grid Foundation, May 01, 2012, by Glen Steiger, General Manager. Article in Electric Power & Light.
[35] Municipal Utilities' Investment in Smart Grid Technologies Improves Services and Lowers Costs, October 2014. US Department of Energy.
[36] Water System Rate Action Report, Executive Summary, page 4, July 2015.
[37] Based on meter counts found in the Water Loss Audit and Component Analysis Report, September 2013.

4. Water System Strategy

Navigant observed several factors that may be limiting the WSO's ability to cost-effectively and efficiently respond to the challenges it faces. Chief among these is the lack of a single corporate strategic planning document guiding the WSO's efforts. However, the WSO and the City have already developed a number of insightful strategic planning documents that, if taken together could provide a robust foundation for the WSO's Strategic Plan.

The California Urban Water Management Planning Act requires that every urban water supplier prepare and adopt the UWMP every five years. LADWP released its last UWMP in 2010 and is in the process of preparing its 2015 UWMP. The UWMP forecasts future water demand and supply under average and dry years, identifies future water projects, summarizes water conservation best management practices, and provides a multi-dry year management strategy. The 2010 UWMP provides strategic guidance to the WSO, and highlights the following strategies: [38]

- Significantly enhance water conservation, stormwater capture and recycling projects to increase supply reliability.
- Implement treatment for San Fernando groundwater supplies.
- Ensure continued reliability of the water supplies from MWD through active representation of City interests on the MWD Board.
- Maintain the operational integrity of the LAA and in-City water distribution systems.
- Meet or exceed all Federal and State standards for drinking water quality.

In addition to the UMWP, LADWP and the Los Angeles Office of the Mayor have issued a number of strategic water documents that relate to water supply. These include the Water Supply Action Plan, the Sustainability Plan, the Water Integrated Resources Plan, the One Water L.A. 2040 Plan, and the Los Angeles Mayor's Sustainable City pLAn.

This section of the report identifies all the key strategic objectives included in these documents with the goal of facilitating the development of the WSO's future Strategic Plan.

4.1 Water Supply Action Plan & Sustainability Plan

The Department released its Water Supply Action Plan in May 2008 to address various water reliability issues and new requirements under the Urban Water Management Planning Act. The plan contains the following five strategies:

- Increase water conservation.
- Maximize water recycling.
- Enhance stormwater capture.

[38]Urban Water Management Plan, Los Angeles Department of Water and Power, 2010.

- Accelerate clean-up of the San Fernando groundwater basin.
- Expand groundwater storage.

The following year, LADWP prepared its Sustainability Plan pursuant to Mayoral Executive Directive No. 10, issued on August 20, 2009. The Sustainability Plan restated these five strategies and summarized the efforts being done to pursue each one. Both plans are consistent with and act as predecessors to the 2010 UWMP's first two strategies involving water conservation, recycling, stormwater, and groundwater.

4.2 One Water L.A. 2040 Plan

The One Water L.A. 2040 Plan is being developed in two phases, with Phase 1 focused on bringing all stakeholder City departments, regional, state, and federal agencies together to coordinate efforts toward a sustainable water future for Los Angeles beyond 2020. The effort is being jointly led by the Bureau of Sanitation, Department of Public Works, and LADWP.[39]

To date, with the input of over 300 stakeholders, the One Water L.A. initiative has developed a vision statement, objectives, and a set of guiding principles (Table 4-1). The initiative proposed the following vision statement:

> *One Water LA is a collaborative approach to develop an integrated framework for managing the City's water resources, watersheds, and water facilities in an environmentally, economically and socially beneficial manner.*
>
> *One Water LA will lead to smarter land use practices, healthier watersheds, greater reliability of our water and wastewater systems, increased efficiency and operation of our utilities, enhanced livable communities, resilience against climate change, and protection of public health.*

[39] One Water LA 2040 Plan – Guiding Principles Report, May 4, 2015

Table 4-1. One Water LA Guiding Principles Aligned to Objectives

Objective	Guiding Principle
Integrate management of water resources and policies by increasing coordination and cooperation between City departments, partners and stakeholders.	✓ Build on the success of the City's Water Integrated Resources Plan and other Mayor and City Council supported water resources plans to advance water sustainability. ✓ Recognize that water is integral to the actions of City departments and create a framework for integration and collaboration between departments and City Hall. ✓ Enhance the coordination and partnerships with regional water, transportation, education and other public agencies. ✓ Engage elected officials and governing boards to support coordination and cooperation to promote integrated management of water resources and policies. ✓ Enhance coordination with Non-Governmental Organizations, Neighborhood Councils, and other stakeholders to inform integrated planning and broaden community involvement. ✓ Understand the water balance that summarizes rainfall, runoff, water demands, wastewater flows, and ocean discharges to consider the potential for stormwater capture, water conservation and reuse. ✓ Continue coordination between City Departments during construction of the City's infrastructure.
Balance environmental, economic, and societal goals by implementing affordable and equitable projects and programs that provide multiple benefits to all communities.	✓ Evaluate a "no action" alternative that considers imported water costs, regulatory requirements, water supply reliability, infrastructure reliability, climate change, and other associated risks. ✓ Develop a transparent process that identifies opportunities for inter departmental collaboration and cost-sharing based on benefits that are aligned with departmental missions. ✓ Analyze financial merits of programs using standard financial methodologies. ✓ Emphasize multi-benefit projects based on measures of social, environmental and economic benefits. ✓ Partner with academia and private interests to advance measurement of social and environmental benefits and to evaluate new technologies. ✓ Incorporate environmental justice into decision-making on where projects are implemented and focus on increasing benefi5ts in underserved communities. ✓ Consider water demands, supply availability, population, regulatory requirements, climate vulnerability, and environmental goals to establish triggers, where appropriate, to plan, implement and/or defer projects. ✓ Explore private, local, state and federal funding opportunities to implement multi-benefit projects.

Objective	Guiding Principle
Improve health of local watersheds by reducing impervious cover, restoring ecosystems, decreasing pollutants in our waterways, and mitigating local flood impacts.	✓ Emphasize upstream solutions in order to mitigate downstream impacts, challenges and costs. ✓ Support strategies included in LASAN's Enhanced Watershed Management Program (EWMP) Plans and look for opportunities to integrate with LADWP's Stormwater Capture Master Plan, Bureau of Engineering's Flood Management Plan, Green Streets Program, and related updates in order to improve water quality, ecosystem restoration and flood mitigation. ✓ Align Mayor or City Council supported plans and projects for the Los Angeles River and other significant tributaries within the City with watershed health and other water resources goals. ✓ Support multi-purpose strategies for reducing impacts of localized flooding, with an emphasis on natural systems and green infrastructure over traditional gray infrastructure.
Improve local water supply reliability by increasing capture of stormwater conserving potable water, and expanding water reuse.	✓ Support recommendations from LADWP's Stormwater Capture Master Plan, LASAN's EWMP Plans, and related updates to increase stormwater capture for water supply. ✓ Consider findings from LADWP's Water Conservation Potential Study and related updates to reduce the City's demand for potable water. ✓ Improve water sustainability, including water efficiency, water reuse, and stormwater capture, at City facilities and buildings. ✓ Explore the use of graywater systems and develop appropriate guidelines for implementation. ✓ Support recommendations from the City's Recycled Water Master Planning Documents and related updates to increase non-potable reuse; and indirect potable reuse; and conduct necessary technical, scientific and regulatory evaluations for assessing the potential for direct potable reuse. ✓ Recognize the importance of remediating and maintaining the health of the City's groundwater basins and consider recommendations of LADWP's groundwater program.
Implement, monitor, and maintain a reliable wastewater system that safely conveys, treats and reuses wastewater, while also reducing sewer overflows and odors.	✓ Optimize the use of existing City assets and infrastructure and explore opportunities for distributed solutions in order to safely convey, treat and reuse wastewater. ✓ Optimize water reuse from the City's wastewater system, with particular emphasis on the Hyperion Wastewater Treatment Plant. ✓ Optimize recovery and use of nutrients from wastewater and biosolids, and recovery and use of biogases. ✓ Seek ways to operate wastewater treatment plants with energy independence.

Objective	Guiding Principle
Increase climate resilience by planning for climate change mitigation and adaptation strategies in all City actions.	✓ Identify citywide metrics for greenhouse gas emissions and climate change adaptation and mitigation that are used to assess project viability. ✓ Consider water-energy-land use nexus (climate adaptation) in the City's General Plan and development zones. ✓ Raise the priority of water issues in relevant City plans that impact sustainability, climate adaptation/resiliency, and emergency preparedness. ✓ Maximize available state funding and explore financial incentives to reduce greenhouse gas emissions and increase resiliency. ✓ Coordinate with regional agencies on water-related climate change mitigation and adaptation strategies.
Increase community awareness and advocacy for sustainable water by active engagement, public outreach and education.	✓ Explore strategies on how to increase public awareness and education for all water resources issues, with a specific focus on influencing individual behaviors around water use. ✓ Expand on current public education programs for water to include climate change impacts and importance of mitigation, adaptation and resiliency. ✓ Communicate to neighborhood councils, community groups, and other stakeholders the water related roles, responsibilities, functions, and success stories of each City department. ✓ Empower communities and citizens to implement distributed (parcel-scale) solutions within their control to help achieve water sustainability objectives.

Adoption of the vision, objectives and guiding principles by the various stakeholder agencies will set the stage for Phase 2, during which extensive planning studies will be undertaken. The concept is to analyze the various water-related opportunities, particularly for stormwater and wastewater, to perform technical and cost-benefit analyses, to prioritize projects and to incorporate the results into the master plans of the stakeholder departments and agencies. The current schedule is to complete the Phase 2 work by early 2017.

4.3 The pLAn: Transforming Los Angeles

The Mayor's Office released the Sustainability City pLAn which identifies both near-term and long-term outcomes related to the WSO.

- Short Term Outcomes (by 2017):
    - Secure additional funding for the San Fernando Groundwater Basin cleanup.
    - Reduce average per capita potable water use by 20 percent.
    - Establish a Water Cabinet to implement key aspects of local water policy.
    - Expand recycled water production by at least 6 million gallons per day.

- Replace 95 miles of water pipe infrastructure[40]

- Long Term Outcomes:
  - Reduce DWP purchases of imported water by 50 percent by 2025 (FY 2013-14 baseline)
  - Increase locally sourced water to 50 percent of the supply by 2035.
  - Reduce per capita water use by 22.5 percent by 2025 and 25 percent by 2035.

More importantly, the pLAn contains a set of strategies and priority initiatives for the WSO.

Table 4-2. pLAn Strategies and Initiatives

Strategy	Priority Initiative
Create an integrated water strategy for Los Angeles	✓ Create a Water Cabinet ✓ Develop an integrated, stakeholder-driven "One Water Plan," a comprehensive water strategy for Los Angeles.
Ensure a safe, secure, and reliable drinking water supply and system	✓ Clean the San Fernando Groundwater Basin ✓ Ensure L.A. gets its fair share of water bond funding ✓ Prioritize water system funding for local water supply development and infrastructure reliability ✓ Improve pipe infrastructure quality ✓ Expand recycled water production, treatment, and distribution to incorporate Indirect or Direct Potable Reuse (IPR/DPR) ✓ Educate public on need/benefits of IPR and DPR

[40]This is one of the few references to renewal of existing infrastructure as a strategic issue.

Strategy	Priority Initiative
Reduce per capita potable water use and increase recycled water	✓ Execute key conservation steps in Mayor's Executive Directive #5 ✓ Expand scope and financing of DWP's turf replacement incentive program ✓ Implement and expand other DWP conservation incentives ✓ Educate and engage residents and businesses through on going awareness, social media, and action campaigns ✓ Benchmark customer use and recognize innovative water-reduction initiatives ✓ Develop more water and wastewater rate tiers to encourage conservation ✓ Ensure private buildings are retrofitted with high-efficiency, water-conserving fixtures ✓ Revise building code to encourage water use reduction, on-site water reuse, and recycling ✓ Produce at least six MGD of advanced reuse recycled water at Terminal Island facility ✓ Expand customer use of recycled water and expand purple pipe infrastructure
Increase storm water capture and protect marine life	✓ Identify funding mechanism(s) to implement the Enhanced Watershed Management Plans necessary for MS4 permit compliance ✓ Expand use of permeable pavement in large infrastructure projects (e.g. LAX) ✓ Expand number of green infrastructure sites and green streets (e.g., bioswales, infiltration cut-outs, permeable pavement, and street trees) ✓ Expand Rain Barrel Program ✓ Eliminate Once Through Cooling (OTC) to improve local water quality and protect marine life
Lead by example through increased municipal water conservation	✓ Increase municipal conservation through actions in Mayor's Executive Directive #5

All of the pLAn initiatives are worthwhile and represent an ambitious agenda. The combination of water supply enhancements, new supply initiatives, conservation programs and educational outreach will significantly increase the City's resilience by diversifying its water supply portfolio and reducing overall water demand.

4.4 Strategy Conclusions

Taken together, these documents could provide a robust foundation for the WSO's Strategic Plan. However, most of the water related strategic documents focus on water supply and water conservation. With so much of the WSO annual budget focused on new capital projects and on infrastructure renewal, Navigant recommends that strategic documents put greater emphasis on water infrastructure. Our recommendation is for senior WSO leadership to initiate a process to create a Strategic Business Plan which can be started by combining and aligning many of the existing strategic documents already being used by the WSO.

5. Conclusions and Recommendations

This review of LADWP's water infrastructure has revealed that there are still a number of factors that may limit the WSO's ability to cost-effectively and efficiently respond to the challenges it faces, including the lack of a single corporate strategic planning document and an asset management strategy guiding the WSO's efforts.

However, the WSO's overall approach to replacing, maintaining and repairing its aging infrastructure, and addressing the other challenges it faces appears to be robust and sound. The major concerns Navigant has are related to the expected mainline replacement rate, and the WSO's capacity to ramp up and implement its capital programs.

The latest rate increase proposal includes funding for a mainline renewal rate of 300,000 feet/year, representing a 100% increase compared to the current rate. While this would represent a great improvement, this study has shown that such replacement rate will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required. Multiple factors led to the selection of a 300,000 feet/year replacement rate but one of the key objective was to determine a renewal rate that would limit as much as possible the required rate increase while still providing acceptable system reliability levels in the short-term. This strategy may not be in the best interest of the ratepayers in the medium and long-term as it may create a backlog of mainlines needing replacement that is not sustainable, which ultimately may lead to more leaks, additional repair costs, and even higher rates.

The expected significant attrition, existing difficulties in hiring new staff and contracting out, and inefficient procurement processes constitute the other top priority challenges the WSO should immediately address in order to be able to implement a significant ramp up of its capital programs.

Recommendations

Based on the findings developed in this report, Navigant makes the following recommendations. Some actions are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Increase mainline and large valve renewal rates.
- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of LADWP's procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.
- Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees.
- Create a single, coherent strategic business plan by combining and aligning many of the existing strategic documents already used by the WSO.
- Establish an asset management strategy and document it in a strategic asset management plan by leveraging best practice asset management framework such as ISO 55000. Specific consideration should be given to adopting structured continuous improvement and risk frameworks, defining levels of service for the WSO's assets, and including an overarching policy governing the repair, maintenance and replacement of all the WSO's asset classes.
- Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake.

Medium Priority Recommendations

- Complete comprehensive condition assessment reports of all asset classes.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Integrate Power and Water System AMI.
- Address the impact of climate change on LADWP's water supply, and in particular the LAA.
- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Continue to formalize and document the WSO's strategies, plans, processes and asset data.
- Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.

Low Priority Recommendations

- Leverage Navigant's findings to improve failure analysis reports.
- Create a long term investment plan that extends beyond the 10 year capital planning horizon.

Appendix A. Typical Asset Management System

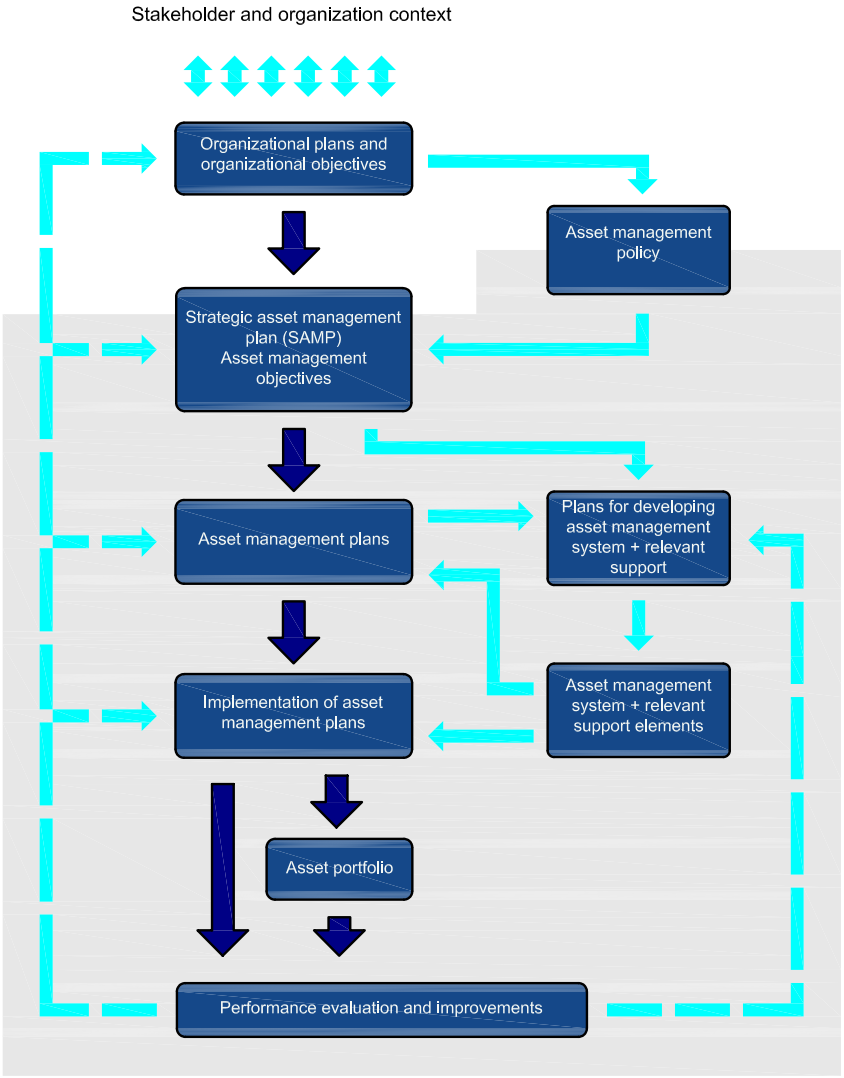
Figure 5-1 displays the elements of an asset management system as defined by ISO 55001. These elements start with and flow from overall organizational plans and objectives.

The first major element of an asset management system is a strategic asset management plan (SAMP). The SAMP establishes the organization's asset management policy, defines the scope of the asset management system, and sets out the asset management objectives. The scope establishes the boundaries of the asset management system and identifies the assets for which asset management plans will be developed. The SAMP also establishes standards for data structures and systems that will be used to support the asset management system.

Individual asset management plans (AMPs) are then developed for each asset class (e.g., large valves) using the SAMP as a guide. The AMPs feed into implementation plans, including operation and maintenance activities, construction of new assets, and retirement or renewal of existing assets. Further, the organization balances the objectives for the strategic and individual asset management plans against available resources, stakeholder interests, and other issues of concern.

In older utilities, a complete and accurate inventory of all the assets for each asset class is critical. Following, or sometimes concurrent with, the creation of the asset inventory, each of the inventoried assets should have a condition assessment. For newer assets, this may be little more than stating the asset is "new" or "as new." For older assets, especially those that are at or near the end of their useful lives, the condition assessment should be as detailed as practicable. The condition assessment information will provide a basis for determining the remaining useful life and establishing renewal schedules.

Figure 5-1: Elements of an Asset Management System



Source: ISO 5000
Note: The grey highlighted box designates the boundary of the asset management system.

Appendix B. Lists of Interviews

Name	Title/Topic	Interview Date
Marty Adams	Assistant General Manager - Water System	August 5th
Greg Ammon	Manager - Water GIS Systems	August 7th
Evelyn Cortez-Davis	Manager - Special Projects & Groundwater Planning	August 3rd
Craig Davis	Manager - Trunk line Design Group	August 5th
Albert Gastelum	Director - Water Quality	July 9h
Richard Harasick	Director - Water Operations	July 10th
Delon Kwan	Waterworks Engineer	August 3rd
Charles Ngo	Waterworks Engineer - Asset Management & Capital Improvement Group	July 31st
David Pettijohn	Director – Water Resources	July 31st
Susan Rowghani	Director – Water Engineering and Technical Services	July 9th and August 7th
Julie Spacht	Executive Liaison	July 16th
William Van Wagoner	Manager - Water Planning	July 20th
Keith Sessions	Director – Water Distribution	July 16th
Stephan Tucker	Project and Construction Management Section Manager	July 31st

Appendix C. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

	Documents Provided by LADWP
1	Central City Association, Water System Update, October 2014.
2	Estimate at Completion (EAC) Report – CIP Projects, 2014 – 2015.
3	CIP Executive Report, April 2015.
4	Water Operations Division – Metro Section, IEA Response, July 13, 2015.
5	Report of Progress on the Capital Improvement Program, April 2015.
6	Project Reporter, Water System Active Capital Improvement Projects, April 2015.
7	Distribution Mainline Asset Management Strategy, March 2015.
8	Trend Analysis Report by Responsible Organization, July 2, 2015.
9	Main Breaks, CPS Task Counts, 2014 – 2015.
10	Project Goals and Planned Accomplishments by Yard.
11	Northern Aqueduct Engineering Project Status Report, June 24, 2015.
12	CIP Prioritization List, FY 2014-15.
13	LA County Supervisory District 3 Briefing of CIP Projects, May 2015.
14	LA Filtration Plant Asset Management Report, 2010.
15	LADWP 2015 Briefing Book.
16	Large Valves Asset Management Report, 2011.
17	Leak Graph, 2003-2015.
18	Owens Valley Annual Report, 2015.
19	Project Reporter for Water System CIP Projects, April 2015.
20	Pump Station Asset Management Summary, March 2015.
21	Quarterly Budget and Schedule Update Report for CIP, May 2015.
22	Regulator Station Asset Management Plan, 2012.
23	Regulator and Relief Stations Asset Management Summary, March 2015.
24	Sunset – UCLA Trunk Line Break Board Presentation, August 6, 2014.
25	Trunk Line Asset Management Summary, March 2015.
26	Valley Alliance of Neighborhood Councils Presentation of CIP Projects, April 2015.
27	Water Distribution Mainline Replacement Analysis, August 2014.

	Documents Provided by LADWP
28	Water Distribution Pipeline Asset Management Report, 2011.
29	Water Storage Facilities Asset Management Report, 2010.
30	Water System Overview Book, July 2013.
31	Water System Ten-Year Capital Improvement Program, FY 2010-2019.
32	WETS Goals Tracking Report, FY 2014-15.
33	Water System 10 Year Capital Improvement Program, 2010-2019.
34	Drinking Water Public Health Goals Report, 2013.
35	Water System Seismic Resilience and Sustainability Program Summary Report, September 2014.
36	LADWP Recycled Water Annual Report, FY 2013-14.
37	Stormwater Capture Master Plan, Interim Report, January 2015.
38	Urban Water Management Plan, 2010.
39	LADWP Water Loss Audit & Component Analysis Final Report, FY 2010-11.
40	Purchase Order for System Water Supply to be Provided by MWD, November 2014.
41	LAA Deliveries 10 Year Running Total.
42	Professional Services Agreement for San Fernando Basin Groundwater Remediation Facilities.
43	Groundwater System Improvement Study Remedial Investigation Update Report.
44	San Fernando Groundwater Basin Remediation Owner's Agent Contract Board Presentation.
45	Mainline Attributes.
46	Mainline Model Builder.
47	One Water LA 2014 Plan.
48	Sunset – UCLA Pipe Failure Analysis Report.
49	Water GIS Pipe Location Report Process
50	Davis, Craig A., "Los Angeles water supply impacts from a M7.8 San Andreas Fault earthquake scenario", *Journal of Water Supply: Research and Technology*, 2010.
51	Pump Station Attributes.
52	Regulator and Relief Station Attributes.
53	Stormwater Capture Plan Executive Summary, July 2015.
54	Water Quality Area Map.
55	Tank Attributes.
56	LAA System Climate Change Study Final Report, June 2011.
57	Trunk Line Condition Assessment Program

Documents Provided by LADWP	
58	Trunk Line Attributes.
59	Water Infrastructure Plan, January 2015.
60	Water GIS Oracle Spatial Object Model.
61	Water GIS Domains.
62	LADWP Asset Management Training Presentations, July 2015.
63	Water Quality Division Dashboard Goals and KPIs, 2015.
64	Water Supply Assessments, LADWP Board Presentation, July 2015.

Volume IV

Governance

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Governance Report
Volume IV

Prepared for:
The City of Los Angeles

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NAVIGANT

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Executive Summary

Objectives and Approach

An important addition to the scope of the 2015 IEA Survey is the topic of governance. Although this topic was not originally included in Navigant's scope of work, stakeholder interviews made it clear that governance concerns are of great interest and deserve focused attention. Hence, the Joint Administrators authorized a chapter focused exclusively on the governance of LADWP.

A utility's governance structure is defined as the framework that articulates policy, decision-making, and leadership roles within the utility and between the utility and key stakeholders. It is also the framework for operational and financial oversight and management. For the Department, adequate, efficient governance is critical to the successful execution of the Power and Water Systems' strategic and operational plans and to the effectiveness of the Joint Systems. Critically, it defines the overall strategic and operational readiness of LADWP.

Navigant conducted an assessment of LADWP's governance structure based on information from multiple interviews, peer research, a review of prior City initiatives and studies focused on improving LADWP's governance, and our experience. To fully inform the discussion, we also reviewed alternative municipal utility governance structures to identify examples of existing structures that, if applied to LADWP, might resolve or alleviate some of the problematic effects of the current structure. Finally, we created a high-level process roadmap to facilitate further study and decision-making with short and long-term action recommendations.

The overarching goal of the governance chapter is to assist the City, and LADWP, and its customers on a path towards a governance structure with the following important characteristics:

- Clarity of leadership,
- Accountability,
- Transparency,
- Adequate oversight and controls,
- Consistency, and
- Efficiency.

Readers should note that during the course of the IEA Survey, City and Department stakeholders overwhelmingly expressed openness to different governance structures, indicating that now is the time to make a change.

Governance Challenges

Every stakeholder is dissatisfied with the status quo. While dissatisfaction is an important consideration, of even more concern is the financial and execution risk the City faces as a result of current governance issues. Navigant synthesized findings and feedback into the following governance challenges:

- **Decentralized City Authority:** As mentioned previously, there are several layers of governance including various highly political bodies which bring politics into all facets of LADWP. However, no single entity has enough insight into or authority over Department operations and finances to hold it fully accountable or effectively support best practices and long-term goals.

- **Inadequate Hiring Process:** Human Resources is one area in which the Department does not benefit from centralized City authority. The current hiring process does not meet the utility's need to be more responsive and nimble. Moreover, it does not adequately address the aging workforce challenge. It is cited as a major impediment to every program initiated by the Department and has a significant impact on basic operations. It is a critical issue that, if not addressed, could prevent the Department from meeting its goals.
- **Lack of External Reporting, Transparency, and Trust:** For many years, the Department has not sufficiently communicated consistent and reliable metrics on major programs and performance against goals to key decision makers in the City and to the public at large. Only when requesting rate increases or other financial decisions requiring City Council approval does the flow of information from LADWP increase. Failure to clearly communicate key performance indicators has created distrust and confusion among citizens and City leadership, who find the Department's operations and finances to be opaque. Without increased transparency through clear reporting, it will be difficult for LADWP to earn back the public trust and carry out its agenda. Particularly, rate-setting processes that are unsupported by clear information, appropriate financial practices, and open discussion are likely to be less efficient and less useful. LADWP has increased transparency into its strategic objectives over the past few years, particularly due to the improved Power Integrated Resource Plan and public outreach efforts, but significant progress is still needed—particularly in financial and key metric performance.
- **Decentralized Internal Authority:** Navigant also identified a lack of central authority and controls within LADWP, specifically with respect to finance, security, and emergency preparedness. Overall, LADWP would benefit from centralized internal controls that establish defensible decision-making processes and higher standards of accountability. In particular, the Department lacks appropriate, centralized oversight and reporting on budgets and the movement of funds between programs and projects within the Water and Power Systems.
- **Ambiguous Role of the Office of Public Accountability:** The OPA would benefit from further refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. The office faces continuous political pressure from the Department, elected officials, and City Management. Hence, it is stuck in a "no man's land" as it is neither a regulator nor a truly independent advisor. The City should—in concert with all involved parties—revise the OPA's mission to clarify its authority and independence in the Charter. This may require the City to make a choice between a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

Past Studies and Progress

By now, LADWP's governance challenges are well-understood by City stakeholders and Department leadership. Various efforts to study and reform the governance of LADWP have been undertaken but met with limited success, which highlights the complexity of the challenge.

In 1999 at LADWP's request, Rand Corporation undertook a broad governance study of the Department motivated by electricity deregulation and restructuring developments in California. Overall, the Rand study found LADWP's governance structure to be "complex, divided, and cumbersome." The study also

offers several options for modifying the governance structure. The first option is to create a city-owned corporation, which is considered to be more flexible, efficient, and responsive than the existing structure. The second option is to create an independent city agency with a strong governing board, which is similarly considered to be more flexible and efficient. The third option would focus on streamlining approval processes and limit political involvement in business matters, but is considered to be the least effective solution of the three because it would maintain the existing structure. Since the report was issued, none of the options were adopted by the City.

In the 2009 IEA Survey, PA Consulting found that the governance and decision-making process in place is not adequate to successfully address the Department's "mission critical" decisions. The governance framework does not facilitate efficient decision-making and clouds accountability for key decisions among a variety of stakeholders. This finding is closely aligned with the Rand study; however, the 2009 IEA Survey similarly does not appear to have provided sufficient stimulus to act.

In early 2010, City Council introduced a series of governance reform motions proposing the creation of a Ratepayer Advocate/Inspector General position and several other changes to LADWP's governance, as a result of a conflict between the Council and the Department regarding proposed modifications to the Energy Cost Adjustment Factor (ECAF) component of utility rates. The ultimate result of this process was the creation of the Office of Public Accountability with the Ratepayer Advocate and new budget and City Transfer reporting requirements. Several motions also suggested the re-composition of the Board of Water and Power Commissioners, but this was the most controversial governance change and did not make it onto the ballot. Because two motions were passed, this process was a moderate success.

Finally, in 2013 the City Council President requested the 2020 Commission to study and report on fiscal stability and job growth in Los Angeles. Like previous studies, the 2020 Commission found that LADWP is subject to too much political interference and, as a consequence, high leadership turnover. The 2020 Commission recommended creating a Los Angeles Utility Rate Commission to be an independent regulator and the ultimate rate-setting authority for the utility; however, this recommendation is not currently advancing through the City Council committee hearing process.

Review of Alternative Governance Structures

To identify examples of governance structure options for LADWP, Navigant reviewed the governance arrangements of other U.S. municipal utilities. To synthesize our findings, we grouped the case studies into three general forms of governance: elected board governance, city council governance, and appointed board governance. We also analyzed the strengths and weaknesses of these structures in the context of LADWP's applicable governance challenges; specifically, decentralized city authority and the lack of external reporting, trust, and transparency.

<u>Elected Board Governance</u>

Sacramento Municipal Utility District (SMUD) is a good example of an elected board governance structure as a municipal utility district. SMUD is governed by a seven-member Board of Directors who are elected by customers from each of the seven geographic areas within the company's service area. The Board of Directors appoints the General Manager, approves the budget, and approves rate changes. To financially support the local government, SMUD customers in the City of Sacramento pay a utility tax of 7.5 percent and customers in the unincorporated area of Sacramento County pay a tax of 2.5 percent.

The potential strengths and weaknesses of an elected board governance structure are highlighted by SMUD's experience. According to interviews, in 2003-2004 the utility was struggling with a number of governance challenges, despite structurally being the same municipal utility district as today. However, at the time the board was becoming too tied up in the details of decision-making processes, particularly in areas where it did not have sufficient expertise. Because this was becoming a significant burden on leadership, SMUD initiated an intensive two-year process to establish clear policy, roles, and expectations for the utility district. At the end of the two years, SMUD had established a strategic direction defined by a number of policies which appear to have been very effective. Overall, stakeholders have expressed high satisfaction with the current SMUD governance model.

Based on the apparent success of SMUD, the municipal utility district model—supported by effective policies—may have the most potential to de-politicize the governance structure by distancing the utility from the primary political bodies and allowing it to function as an independent business organization, while directly serving the citizens of Los Angeles and maintaining financial support for the city.

Table ES 1. Elected Board Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• Elected board acts as a clear central authority • Other City politics no longer relate directly to the utility • Focused attention on utility matters at all times • More shared responsibility between the board and utility executives	• Direct reporting channel established between utility leadership and board • Candidate qualifications impact election results, encouraging nominees with relevant expertise • Decision making is likely to be based on firm business principles
Does Not Address	• Opportunity for politicization around election of board members • Opportunity for too much board involvement in utility operations (though this could be mitigated by well-defined policies)	• Elected board members may have limited experience (though this could be mitigated by training and a dedicated advisory staff) • Potential for controversial elections to lead to public distrust

City Council Governance

Seattle City Light (SCL), Austin Energy, and Colorado Springs Utilities (CSU) are all examples of the city council governance structure, in which the utility reports directly to council or, in the case of CSU, to a board solely comprising council members. In theory, the city council model of governance provides clarity of leadership by simplifying and centralizing control; however, the case study utilities highlight several weaknesses associated with city council governance.

For example, an expert panel in 2006 noted that the city council model leaves SCL vulnerable to "political winds." For Austin Energy, the Electric Utility Commission recommended the Austin City Council transfer management and control of the utility to an independent board of trustees in order to increase transparency and accountability, improve efficiency, clarify leadership, remove political interference, and provide a mechanism by which all Austin Energy customers would be represented. Colorado Springs Utilities has faced even more scrutiny. Since becoming an enterprise of the municipal

government in 1993, four separate studies have examined a change in governance structure, each recommending CSU establish an independent board of directors. Despite recommendations, SCL and Austin Energy have maintained city council governance structures. Currently, CSU is in the midst of a Governance Structure and Governance Process Review.

LADWP's transition to full City Council authority would reduce the number of City stakeholders and centralize responsibility for LADWP; however, as found in Seattle, Austin, and Colorado Springs, the utility would likely remain highly prone to political influence and may continue to experience transparency and accountability issues.

Table ES 2. City Council Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• City Council acts as a clear central authority	• Direct reporting channel established between utility leadership and City Council
Does Not Address	• Inherent politicization of decision making • Interest in utility matters influenced by election cycles • Appointed utility executives more vulnerable than City Council to blame for utility missteps	• Without a dedicated advisory staff, City Council has limited expertise and bandwidth for utility issues • Utility is vulnerable to public distrust of politics • Decision making based on political whim rather than firm business principles

Appointed Board Governance

The San Francisco Public Utilities Commission (SFPUC), CPS Energy (CPSE), and Jacksonville Energy Authority (JEA) serve as examples of various appointed board governance structures. SFPUC is governed by five commissioners who are nominated by the Mayor and approved by the San Francisco Board of Supervisors. CPSE is governed by a five-member Board of Trustees, which includes the Mayor (ex-officio) and four other representatives from the four geographical quadrants of San Antonio who are selected by majority vote of the remaining members and confirmed by City Council. JEA is governed by a seven-member Board of Directors that is appointed by the Mayor and confirmed by City Council.

Appointed board governance offers many of the strengths seen with an elected board. Clear leadership by a central authority with subject matter expertise and dedicated attention simplifies operations and provides the professional oversight necessary to create an atmosphere of accountability and support long-term goals based on firm business principles. However, board appointment re-exposes the process to city-wide politics and sometimes obscures accountability. For example, in 2009 CPSE was involved in a $32 million lawsuit to exit a nuclear deal, partly as the result of CPSE executives withholding critical financial information from the Mayor and City Council regarding a $4 billion increase in expected construction costs. Additionally, JEA is currently facing serious governance and legal issues with the Sunshine Law: the Board was discovered to be preparing scripted talking points in advance of meetings.

The problems encountered by CPSE and JEA argue that, if the same structure were adopted, LADWP may be at higher risk of a communication breakdown between various layers of authority. One option for LADWP could be to simplify the structure by involving City elected officials and executives directly

in the board. A board comprised of five City stakeholders would clarify and centralize roles and responsibilities while allowing multiple City offices to have direct input.

Table ES 3. Appointed Board Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• Appointed board acts as a clear central authority • Focused attention on utility matters at all times • More shared responsibility between board and utility executives	• Direct reporting channel established between utility leadership and board • With board member expertise requirements, members will have necessary skillset and knowledge to run the utility • Decision making likely to be based on firm business principles
Does Not Address	• City-wide politics may influence board appointments (mitigated by fixed terms and limited reappointments)	• Reporting channel between the board and the City not clearly established • Without requirements for board member expertise, members may lack necessary skillset and knowledge to run the utility • Because the board is not directly accountable to the public, it is potentially less transparent

Roadmap for Change

Creating a new governance structure to address LADWP's current governance challenges is no small undertaking. If the City of Los Angeles chooses to pursue fundamental governance changes as discussed in this chapter, it will be embarking on a complex, multi-year journey. Navigant recommends that the City initiate a process by which it can ultimately propose specific governance reforms on the 2017 ballot.

In the near term, increased transparency through reporting is one of the simpler solutions to several of LADWP's governance issues. Improved reporting on key metrics would help address the lack of transparency, accountability, and oversight. However, this is unlikely to achieve a permanent improvement, nor does it address every governance challenge. The governance issues described should provide sufficient motivation for revisions to the City Charter by ballot measure, as part of a long-term change process. However, significant additional work must be completed before those revisions are determined. Navigant's recommendations below outline a framework for the City to approach fundamental long-term changes.

Near-Term Recommendation

Navigant recommends that LADWP tie financial and performance metrics to rates by ordinance. This would mean defining and reporting a set of key metrics to decision makers on a specific schedule, in order to inform annual rate adjustments via the adjustment factors. Specifically, for each major Department program and initiative, the ordinance would require agreed-upon metrics (including budget targets and actuals, milestones, etc.) to be reported to the Office of Public Accountability, Board of Water and Power Commissioners, and City Council (Energy and Environment Committee).

Long-Term Recommendation

The City of Los Angeles should take the following steps for its governance reform process:

- City Council introduces a motion forming a committee to examine governance reforms for the LADWP, with the explicit task of reporting on its findings and recommending a measure for the 2017 ballot.
- City Council forms a hybrid committee including representatives from the Mayor's office, City Council Energy & Environment Committee, CAO, CLA, Controller, City Attorney, Office of Public Accountability, Board of Water and Power Commissioners, the general manager of LADWP, and IBEW Local 18. Navigant recommends that the CAO, CLA, and an outside third-party facilitator be assigned the role of facilitators (additional detail on facilitation in full report).
- The committee defines the governance issues it seeks to address via ballot measure.
- The committee conducts an in-depth study of solutions to the specified governance issues, including multiple opportunities for public input.
- The committee reaches consensus on a solution and submits a final report with a proposed ballot resolution to City Council, in time for the 2017 ballot according to a schedule set by the CAO, CLA and City Attorney.
- City Council requests the City Attorney, with the assistance of the CAO and CLA as necessary, to prepare a ballot title and finalize the resolution for placement on the 2017 ballot.

The final result of this process should be a measure that the committee in good faith believes will address LADWP's current governance issues.

1. Introduction

This report addresses the governance structure of LADWP. Here, the governance structure is defined as the framework that articulates policy, decision-making, and leadership roles within the Department and between the Department and key stakeholders. It is also the framework for operational and financial oversight and management. Adequate, efficient governance is critical to the successful execution of the Power and Water Systems' strategic and operational plans and to the effectiveness of the Joint Systems. Critically, it defines the overall strategic and operational readiness of the utility. Although this topic was not originally included in Navigant's scope of work for the 2015 IEA Survey, stakeholder interviews made it clear that governance concerns are of great interest and deserve focused attention. Hence, the Joint Administrators authorized this report to describe challenges with the Department's current governance structure, provide a set of alternatives via case studies, and prepare the way for the City of Los Angeles to explore and implement appropriate solutions.

Previously, the topic of governance was raised in the 2009 IEA Survey. PA Consulting identified governance as one of two major issues that could impede the ability of LADWP to effectively and efficiently conduct day-to-day operations as well as meet long-term objectives. PA Consulting found that the framework for governance at LADWP "does not facilitate efficient decision-making and clouds accountability for key decisions."[1] Specifically, PA Consulting considered the complexity of relationships between the Department and various stakeholders—including the Board of Commissioners, City Council, City Executives, Mayor's Office, and others—to be a fundamental issue that undermines clarity of policy leadership. These findings are still true today, as the governance structure is extremely difficult to alter and has not changed. In the current IEA Survey, Navigant also identified issues around financial management practices and reporting at the Department that lack appropriate governance and accountability, which will be further discussed in this report.

After identifying the governance challenges facing the Department, Navigant conducted an assessment of LADWP's governance structure based on information from multiple interviews, peer research, a review of prior City initiatives and studies focused on improving LADWP's governance, and our experience. To fully inform the discussion, we also reviewed alternative municipal utility governance structures to identify examples of existing structures that, if applied to LADWP, might resolve or alleviate some of the problematic effects of the current structure. As part of this review, we evaluated possible positive and negative outcomes for each structure in the unique environment of Los Angeles.

We recognize that the governance alternatives discussed in this report are significantly different from the status quo and would require major changes to the City of Los Angeles Charter. To help the City decide on and pursue a course of action, at the end of this report Navigant provides a high-level process roadmap to facilitate further study and decision-making with short and long-term action recommendations. Readers should note that during the course of the IEA Survey, City and Department stakeholders overwhelmingly expressed openness to different governance structures, indicating that now is the time to make a change. This momentum should not be lost.

[1] Industrial, Economic, and Administrative Survey of the Los Angeles Department of Water and Power. PA Consulting Group, February 1, 2009 (Page iii).

The overarching goal of this report is to assist the City, and LADWP, and its customers on a path towards a governance structure with the following important characteristics:

- Clarity of leadership,
- Accountability,
- Transparency,
- Adequate oversight and controls,
- Consistency, and
- Efficiency.

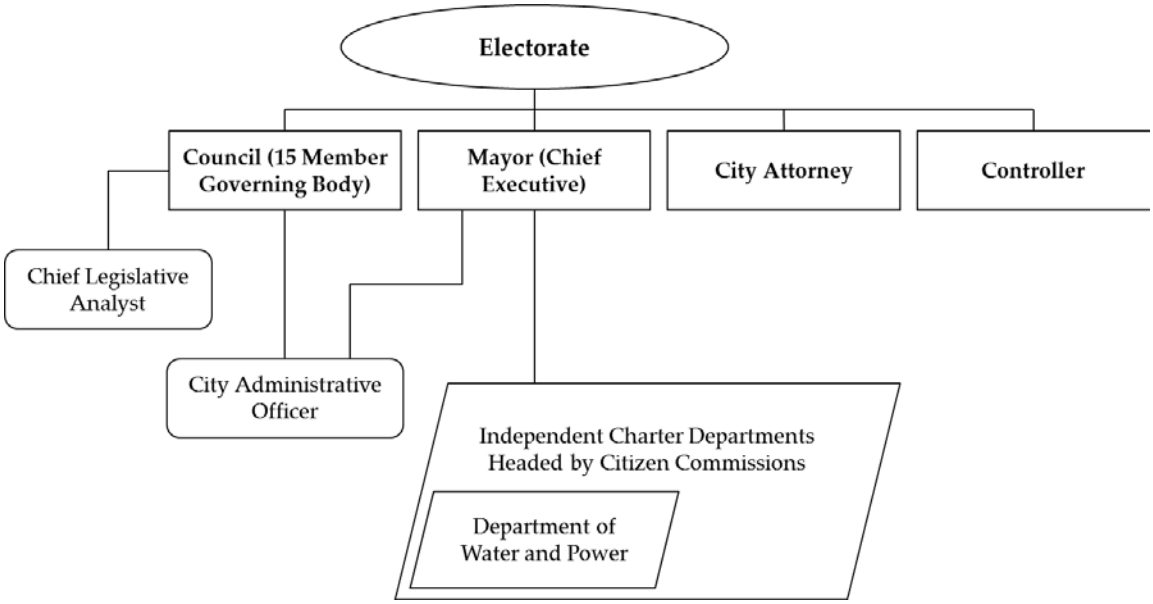
In Los Angeles, this means minimizing politicization of key issues, fully educating and informing decision-makers, and facilitating business operations and best practices. Moving in this direction will likely also help to regain the public trust, which has suffered lately due to recent infrastructure failures, billing system issues, and increased media scrutiny. The report is organized into the following sections:

1. Current Governance Structure
2. Governance Challenges
3. Past Studies and Progress
4. Review of Alternative Governance Structures
5. Roadmap for Change

2. Current Governance Structure

The Los Angeles City Charter created LADWP as one of three proprietary departments of the City (City Charter Sections 600-610[2]) in addition to Los Angeles World Airports and the Port of Los Angeles. Specifically, LADWP is a revenue-producing, independent proprietary department of the City of Los Angeles with a citizen commission (Figure 2-1). Although it is semi-autonomous, LADWP is governed by the City as well as its citizen commission and transfers a portion of its annual estimated electric revenues to the Los Angeles General Fund via the City Transfer.

Figure 2-1. Organization of the City of Los Angeles Related to LADWP



Source: Navigant simplification of the City of Los Angeles organizational chart.[3]

Founded in 1902, LADWP is the largest municipal utility in the U.S., employing 8,800 staff and delivering water and power to 3.9 million residents and businesses of the City (674,000 water customers and 1.4 million electric customers). The Power and Water Systems supply more than 25 million megawatt-hours of electricity and 191 billion gallons of water each year to the City's residential and business customers.[4] Governance of such a large municipal utility is naturally complex; however, LADWP's current structure is unnecessarily so, with negative repercussions.

Governance of LADWP is shared among the Board of Water and Power Commissioners, the Mayor's office, the City Council, and the City Attorney. The Controller, City Administrative Officer (CAO), and Chief Legislative Analyst (CLA) are also important stakeholders. Finally, a relatively new department, the Office of Public Accountability (OPA), was established in 2011 to be an independent analyst of LADWP's rates. Among these positions, no single entity has enough insight into or authority over

[2] The Official City of Los Angeles Charter text is available at: law.resource.org/pub/us/code/city/ca/LosAngeles/snapshots/revision-27/LAAC.html.
[3] Available from the Controller's Office at: cao.lacity.org/misc/LAorgchart.pdf.
[4] 2015 Briefing Book, Los Angeles Department of Water and Power.

Department operations and finances to hold it fully accountable or effectively support utility best practices and long-term goals. These leadership roles are described in more detail in the following subsections.

2.1 LADWP Leadership

LADWP functions independently from the City of Los Angeles for most day-to-day operations. Business operations are under the direction of the General Manager, who is appointed by the Mayor and confirmed by City Council. One consequence of the appointment of general managers by the Mayor is that the position has seen high turnover over the last decade as mayoral administrations change (specifically, eight general managers in the last 15 years from 2000 to the present). This creates a relatively high degree of instability in Department leadership and hinders progress towards establishing consistent long-term action plans. Reporting expectations and other important protocols also vary with each new General Manager. Under the General Manager, the Water and Power Systems are led by Senior Assistant General Managers who currently have a significant amount of operational independence.

The General Manager reports to a five-member, volunteer citizens Board of Water and Power Commissioners (the Board) established by the Los Angeles City Charter Sections 670-6844. The Board is responsible for setting policy and controlling finances, although final rate decisions go to City Council. Board-approved finances include: revenues, operational budgets, fuel, purchased power, purchased water, bonds, and notes (LADWP's operations are financed solely by the sale of water and electric services and capital funds are raised through the sale of bonds).

The Board of Water and Power Commissioners does not function as a regulator like the California Public Utilities Commission,[5] nor as a truly governing utility board like the Sacramento Municipal Utility District (SMUD).[6] The Board is under the authority of several City elected entities. Members are appointed by the Mayor and confirmed by City Council for a term of up to five years. City Council also has contract approval authority and the power to review and overturn any financial decisions made by the Board. As political appointees without requirements for subject matter expertise in water and power, the Board relies heavily on LADWP itself for analysis and direction. At the same time, it receives policy direction from the Mayor's office and—in recent years—opinions on rates from the Office of Public Accountability.

2.2 City Leadership

The Mayor and City Council have the important responsibilities to appoint the General Manager and the Board and approve rates, respectively. The City Attorney provides legal counsel to LADWP and the

[5] The CPUC regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. It is designed to protect customers of utility services and infrastructure and preserve reasonable rates while supporting the California economy. There are five Governor-appointed Commissioners (confirmed by the Senate) with a large professional staff as well as an independent arm to represent consumers in commission proceedings, the Office of Ratepayer Advocates. The CPUC has full plenary authority over the state's three investor-owned electric utilities, and sets rates for these as well as the largest 10 investor-owned water utilities through General Rate Cases. (www.cpuc.ca.gov/NR/rdonlyres/7EA9B970-6827-4C89-9D2C-38DD8DE50428/0/CPUCRegulatoryResponsibilities0414.pdf).

[6] SMUD is featured in Section 5 Review of Alternative Governance Structures.

City's Personnel Department handles civil service workforce hiring. In turn, the Mayor's office and City Council rely on legal and financial advisory services from the appointed offices of the Chief Legislative Analyst and City Administrative Officer, both of whom therefore influence Department oversight and rate-setting. The City Controller is also responsible for oversight of the City's departments through audits such as the IEA Survey effort. City duties are further outlined below.

- ***Mayor's Office:*** In the Los Angeles charter (Sections 230-234), the elected Mayor has management authority over the city government and is the chief executive officer of the city. One of the Mayor's duties is appointing heads of departments and members of commissions. This applies to LADWP's General Manager as well as the Board of Water and Power Commissioners. Importantly, the Mayor's office influences much of LADWP's policy (as it does with other City departments). Under Executive Directives 3 and 4 from Mayor Villaraigosa in 2005,[7] the Department submits to the Mayor's office all significant policy and financial matters and all matters requiring City Council consideration.
- ***City Council:*** The Los Angeles City Council has 15 members elected by individual districts for four-year terms (Charter Sections 240-254). Rates needed to support the Water and Power businesses are approved by ordinance by the City Council. The City Council also confirms general managers and boards appointed by the Mayor, has contract approval authority under Section 674 of the Charter, and the right to review and overturn any decisions made by the Board of Water and Power Commissioners under Section 245 of the Charter,[8] among other responsibilities. LADWP is one focus area of the Council's Energy and the Environment Committee.
- ***City Attorney:*** The City Attorney is the city government's lawyer and a criminal prosecutor for misdemeanor violations in the city, and approves ordinances in terms of form and legality (Charter Sections 270-275). The City Attorney's Municipal Counsel Branch acts as the lawyer for departments including LADWP, elected officials, and city commissions.[9]
- ***Controller:*** The elected controller is the City's chief accountant and works closely with the treasurer and CAO, together forming Los Angeles' financial oversight system (Charter Sections 260-266). The Controller also conducts performance audits of the departments and is leading the IEA Survey.
- ***City Administrative Officer (CAO):*** The CAO is appointed by the Mayor with approval by City Council (Charter Sections 290-293). The CAO's office serves as a central research staff for both the Mayor and City Council, producing many reports on every aspect of city business and helping to prepare the annual budget. The CAO is the chief financial adviser supervising the implementation of the budget and the lead labor negotiator, and also functions as the City's chief risk management officer.[10]

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[7] Executive Directive 3: lacity.cityofla.acsitefactory.com/sites/g/files/wph281/f/mayorvillaraigosa331283117_10202005.pdf; Executive Directive 4: lacity.cityofla.acsitefactory.com/sites/g/files/wph281/f/mayorvillaraigosa331283118_10202005.pdf.

[8] Within the next five meeting days of the Council convened in regular session, after an action by a board of commissioners, City Council has the power to veto the board action (by two-thirds vote). Also referred to as "Prop 5."

[9] Raphael J. Sonenshein. "Los Angeles: Structure of a City Government." League of Women Voters of Los Angeles, 2006 (www.lwvlosangeles.org/files/Structure_of_a_City.pdf).

[10] Ibid.

- ***Chief Legislative Analyst (CLA):*** The CLA is appointed by the council as a support function, providing technical support for committees, summarizing city measures, and developing the city's legislative program (Administrative Code Section 20.100-111).

For the 2015 IEA Survey, Navigant interviewed stakeholders from each of the entities listed above with the exception of the City Attorney. Like the previous IEA Survey, Navigant considers the many stakeholders and multiple layers of bureaucracy that have been folded into LADWP's governance structure to cause confusion around roles and responsibilities. Furthermore, relationships in a politically-charged environment are often fraught, especially when multiple distinct, highly political entities have significant authority over the utility. On the other hand, actual oversight is fairly limited. Various offices have different levels of financial oversight, and only one office (the Controller) has performance oversight—which is stretched thinly across all City departments.

2.3 Office of Public Accountability

The Office of Public Accountability (OPA) is a relatively new City department established by Charter Amendment I adopted on March 8, 2011 (Section 683).[11] The office was founded in order to "provide public independent analysis of department actions as they relate to water and electricity rates"; specifically, the OPA analyzes proposed increases in water and power rates. The Ratepayer Advocate is the executive director of the office appointed by a citizen selection committee. The current—and first—Ratepayer Advocate was selected in early 2012 for a five-year term. By ordinance, City Council established provisions for the OPA, including reporting requirements and consumer protection and complaint procedures.

Because the OPA is a new office that has the potential to provide much needed, independent analysis and potentially oversight, Navigant also investigated the role of the Ratepayer Advocate and how it fits into the governance of LADWP.

2.4 Employee Unions

In addition to the various government stakeholders across the City, the role of several unions must be considered when evaluating the current and future governance structure of the Department. With approximately 95 percent of its workforce covered by union agreements, the Department and City depends on strong ongoing relationships with union leadership. Six unions currently represent the employees of LADWP:

1) The International Brotherhood of Electrical Workers (IBEW) Local 18
2) The Service Employees Union, Local 721
3) The LADWP Dispatchers Association
4) The DWP Management Employees Association (MEA)
5) The Association of Confidential Employees
6) The Los Angeles/Orange counties Building and Construction Trades Council

These unions generally work under five (5) year agreements, the specific nature of which are determined through collective bargaining. These agreements have a major long-term impact on Department

[11] City Charter Amendment for the OPA available at: opa.lacity.org/html/charterAmendment.htm.

operations inasmuch as they define the work rules, wages, benefits, cost of living increases, and work classifications of Department personnel.

The current relationship between the employee unions and the City has had mixed results, with no party feeling that trust and effectiveness are at the level desired by all stakeholders. This is not a union problem, where one side should change its behavior and not the other; rather, it is an opportunity for the City and the unions together to move towards a more productive relationship. To fully address governance issues and increase the agility and flexibility of LADWP as an organization a partner-based model in which goal setting and decision-making are collaborative processes should be pursued. This must be accomplished within the appropriate context with the full involvement of union leadership.

One step towards greater collaboration would be to include a seat for union leadership on the governance working group, described in Section 6 of this report (Roadmap for Change). The perspective of the union into the current governance challenges is a valuable source of information, and we believe it is essential to include in a successful reform effort.

3. Governance Challenges

Navigant's assessment, based on analysis and interviews with the IEA Survey's Joint Administrators, LADWP executive management, key City leaders, and union leadership revealed a number of concerns with LADWP's current governance structure. In short, every stakeholder is dissatisfied with the status quo. And while dissatisfaction is an important consideration, of even more concern is the financial and execution risk the City faces as a result of these issues. Navigant synthesized findings and feedback into the following governance challenges, which are covered in further detail in this section.

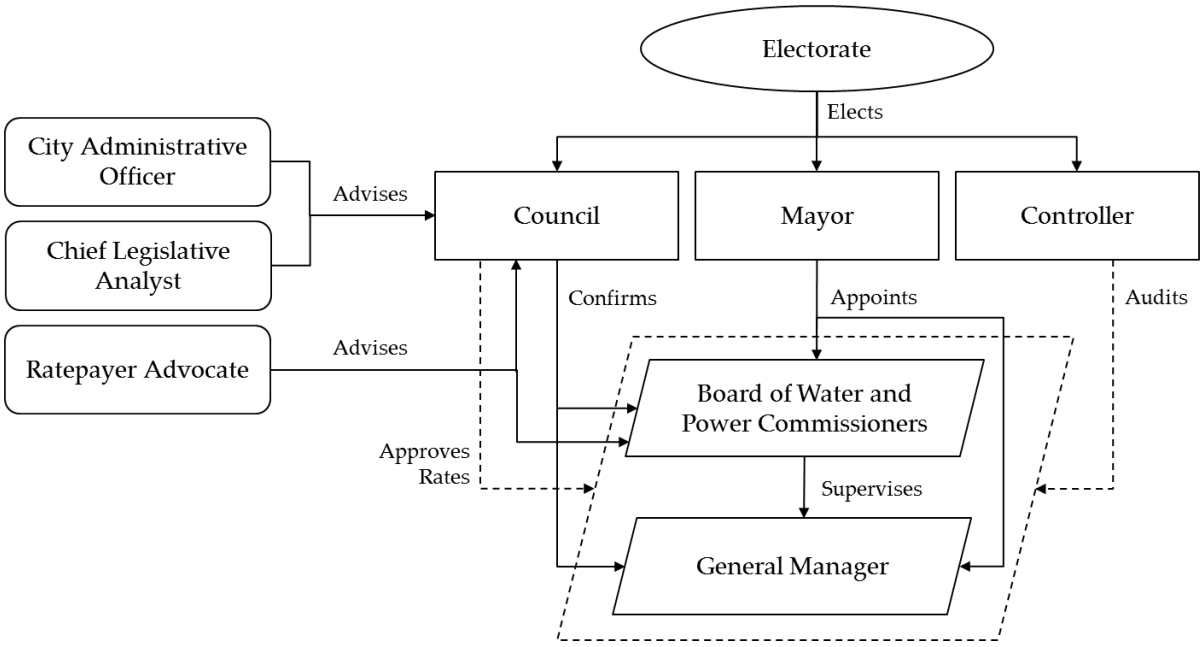
- **Decentralized City Authority:** As mentioned previously, there are several layers of governance including various highly political bodies which bring politics into all facets of LADWP. However, no single entity has enough insight into or authority over Department operations and finances to hold it fully accountable or effectively support best practices and long-term goals.
- **Inadequate Hiring Process:** Human Resources is one area in which the Department does not benefit from centralized City authority. The current hiring process does not meet the utility's need to be more responsive and nimble. Moreover, it does not adequately address the aging workforce challenge. It is cited as a major impediment to every program initiated by the Department and has a significant impact on basic operations. It is a critical issue that, if not addressed, could prevent the Department from meeting its goals.
- **Lack of External Reporting, Transparency, and Trust:** For many years, the Department has not sufficiently communicated consistent and reliable metrics on major programs and performance against goals to key decision makers in the City and to the public at large. Only when requesting rate increases or other financial decisions requiring City Council approval does the flow of information from LADWP increase. Failure to clearly communicate key performance indicators has created distrust and confusion among citizens and City leadership, who find the Department's operations and finances to be opaque. Without increased transparency through clear reporting, it will be difficult for LADWP to earn back the public trust and carry out its agenda. Particularly, rate-setting processes that are unsupported by clear information, appropriate financial practices, and open discussion are likely to be less efficient and less useful. LADWP has increased transparency into its strategic objectives over the past few years, particularly due to the improved Power Integrated Resource Plan and public outreach efforts, but significant progress is still needed—particularly in financial and key metric performance.
- **Decentralized Internal Authority:** Navigant also identified a lack of central authority and controls within LADWP, specifically with respect to finance, security, and emergency preparedness. Overall, LADWP would benefit from centralized internal controls that establish defensible decision-making processes and higher standards of accountability. In particular, the Department lacks appropriate, centralized oversight and reporting on budgets and the movement of funds between programs and projects within the Water and Power Systems.
- **Ambiguous Role of the Office of Public Accountability:** The OPA would benefit from further refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. The office faces continuous political pressure from the Department, elected officials, and City Management. Hence, it is stuck in a "no man's

land" as it is neither a regulator nor a truly independent advisor. The City has not made a choice between a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

3.1 Decentralized City Authority

Although City stakeholders hold final decision-making authority for many critical matters at LADWP, the City is not actively managing the utility. The various City entities are not currently required to be in charge of monitoring performance or finances at LADWP. Because of the definitions in the City Charter, no one group has a formal oversight role tied to decision-making (to an extent that would be truly effective). And due to Charter-defined constraints and the numerous difficulties of monitoring a large and complex utility, no one is able to voluntarily undertake this role, either. However, to properly carry out its responsibilities in the current governance structure, the City must increase its knowledge and oversight of the Department. Figure 3-1 (below) illustrates some of the many different roles and interactions.

Figure 3-1. Decentralized Governance of LADWP



Source: Navigant

Oversight is more clearly assigned to the Board of Water and Power Commissioners. However, Board members receive information on budget matters and the use of funds from LADWP directly, often without professional third-party analysis. Additionally, the Board has not focused on instituting reform at LADWP. This may be due to the part-time volunteer nature of the citizen Board, which restricts deep dives into topics of interest or concern, or because of the authority of City government entities.

LADWP faces inherent politicization due to governance by multiple elected entities. For example, the general manager position is politicized by direct appointment and approval—and removal—by the Mayor's Office and has seen high turnover. And at times, political influences may inadvertently cloud practical discussions of utility issues. For example, the emphasis on low rates may appeal on the surface

to citizen-ratepayers but actually diverts attention from the important construction and maintenance activities the Department must undertake to support the power and water infrastructure of Los Angeles. Because of these political influences, LADWP is put in the difficult position of showcasing low rates and asking for limited funding, while setting ambitious goals. This has and will continue to lead to underperformance on goals, although the City does not currently track this in a comprehensive manner.

Overall, there is no single outside entity or coordinated group to set policy, provide specific goals and metrics, monitor performance, and hold LADWP accountable. It is this vacuum that creates and sustains an environment that allows suboptimal performance and fosters undesirable situations.

3.2 Inadequate Hiring Process

Although LADWP is a City department, it runs autonomously for day-to-day operations. However, it can only hire civil service employees through the central City Personnel Department, which serves all Los Angeles government civil service hiring. This has proven to be a laboriously slow and costly process that is unable to keep pace with LADWP's needs. For example, even if the Power or Water System has enough funding to make significant progress on a capital program in a given year, lately it has not had the staff to manage the work. This is a growing problem, because with an aging workforce the number of vacancies at the Department will continue to increase. Additionally, the Department has not been able to quickly address emergency staffing needs such as those required by Customer Service.

This issue is relatively well-understood by City stakeholders, and there is interest in allowing LADWP to have its own expedited Humans Resources organization. LADWP and the rest of the proprietary departments are unique, and could reasonably run independent personnel units. Navigant recommends that LADWP have a Human Resources function within the organization that is not dependent on city resources. Additionally, LADWP should have more civil service exempt positions with expertise in utility operations. As a dynamic business entity, the Department should be far more nimble in this respect.

According to interviews, the City expects to roll out a solution to address the aging workforce issue, which affects all City departments. The Personnel Department intends to have eliminated the hiring backlog and to have completed its succession planning within two to 2.5 years. This is a promising development; however, the issue would likely be better addressed within each department independently, with its better understanding of changing employee skills and requirements. Also, given the amount of ratepayer money LADWP is proposing to spend over the next 3 years, it would be imprudent to wait on a potential City-wide solution.

Creating a Human Resource function within LADWP would most likely require a Charter change, because under the current City Charter Section 514, the Mayor and City Council cannot transfer powers related to duties and functions of the Proprietary Departments. However, whether by ordinance or Charter change, this is an important issue that—if resolved—will have significant benefits.

3.3 Lack of External Reporting, Transparency, and Trust

LADWP faces particular challenges due to distrust among Los Angeles citizens and City leadership. The lack of centralized authority with formal oversight of the Department compounds this issue because operations and finances are often opaque to anyone outside of the utility. City leadership does not have enough insight into certain Department processes and decisions to feel comfortable, and the public has

been presented with various recent missteps and system failures via the media, often without context or an understanding of the infrastructure and other issues facing the utility.

The Department is not currently operating in a way that supports transparency, although it has made and is in the process of making some improvements. However, LADWP is not required to externally account for its performance against budgets. Once rates are approved (rates that are historically requested based on what is estimated to be palatable to City Council and its staff), LADWP's finances are largely internal. Because the Department generally shows only selected, macro-level progress made each year without properly including budgetary impacts and changes, City authorities essentially have to take its word on what funding is needed for the next fiscal year and what LADWP might accomplish with new rates. Navigant also found that LADWP's current financial budget and reporting practices are not consistent with best practice to prudently manage the significant sums of money spent by the Department (discussed further in the next subsection).

The City is sometimes aware of the fact when LADWP is unable to spend its budget on programs considered to be priorities, even when the money is theoretically available. However, outside stakeholders are often not fully informed on the reasons why or the solutions taken within the Department in response. This opacity leads to the perception that LADWP cannot manage its money, and consequently, reluctance to give it more. This directly affects rate cases. In fact, stakeholders currently seem to be less concerned with actual rate increase numbers—within reason—than they are with hearing the case for why the Department really needs an increase and what will be done with it. Certain stakeholders need more robust justification for the size of the increase, but others simply need more assurance that LADWP can manage significant program ramp-ups using the requested rates.

Building trust is especially important because of its impact on the Department's ability to meet and improve upon its long-term goals—not only in terms of rates, but also enabling LADWP to be a stronger leader in the power and water utility service industries. LADWP would likely be able to take a better leadership role in efforts such as water conservation and recycled water, renewable energy, and electric grid modernization when it has clear support and its decisions and requests are fully understood by the public and key stakeholders.

The Department's current efforts in terms of increased transparency include "DWP Stat" which will report on a number of key performance indicators. The Controller's Utility Panel is another step forward for reporting to the City, containing public key financial data about LADWP in a central location online. The OPA is another step. In the long term, transparency and communication within the Department and especially to City stakeholders could further improve though a clearly defined, central oversight function with robust reporting and controls for key performance metrics.

3.4 Decentralized Internal Authority

Previously, Navigant asserted that no single entity in the City of Los Angeles has enough insight into Department operations and finances to hold it accountable or effectively support best utility practices, and that the lack of transparency into LADWP is due in part to having no centralized City authority with oversight of the Department. This subsection address a similar issue within the Department itself, which affects several important areas identified during the IEA Survey. In the issues discussed below, LADWP would benefit from centralized internal controls establishing defensible decision-making processes and higher standards of accountability.

3.4.1 Financial Accounting

Throughout the 2015 IEA Survey, Navigant identified underspending on several capital programs at LADWP. Given the lack of financial documentation and continuous, accessible reporting, it was initially unclear what happened to the remaining funds that had been budgeted for these programs, and also how the Department generally conducts its accounting activities and reporting when capital underspending occurs. To illuminate this aspect of LADWP's operations, Navigant conducted interviews with employees in the Financial Services Organization (FSO) and the Power and Water Organizations.

3.4.1.1 Funds

During each rate cycle, the Department makes the business case for rate increases based on specific programs. However, Navigant found that LADWP does not necessarily use rates for the programs included in the original business case, and that there is not a proper review process for moving money from program to program. This is a poor business practice.

There are various reasons for moving funds between programs under normal and abnormal circumstances. On one hand, it is accepted that large construction projects typically undergo budget changes as the work progresses. Navigant also understands that in certain cases, the original budget was created with an expected rate increase in mind which did not occur. If the rate action does not occur until halfway through the year, and provides less funding than expected, then the FSO must work to reallocate and re-budget programs. But on the other hand, procurement and contracting delays, overruns on projects, and undercollection (recently, the CIS-related undercollection) are undesirable situations that lead to the reallocation of funds. Although some of these reasons are understandable and in some cases unavoidable, the funding reallocation should always be reported and clearly explained internally to the FSO, to the Board, and to Council with regard to rate-setting. Currently, it is not.

Given LADWP's Debt Service Coverage ratio requirements, not spending cash is actually desirable for LADWP at times. When base rates are collected, the Department may elect to use those funds to support the Debt Service Coverage ratio. Supporting the Debt Service Coverage ratio is a strategic imperative at the Department because so much of its spending is debt-financed. Hence, when LADWP collects base rates for a specific program but is unable to spend the funds that year, it is motivated to sit on the cash portion. This too should be adequately explained to stakeholders when it occurs. On a positive note, when LADWP underspends on a program that would have been debt-financed, the FSO simply reduces borrowing (does not issue debt), which is a good practice. Additionally, LADWP has made a good effort to catch up on historically underspent programs.

The Department's current practices result in opaque budgeting, rate requests that are not held accountable to program accomplishments, and underspending that leads to delays in capital programs. Importantly, the Department should establish controls and reporting activities related to the internal allocation of funding, as discussed in the next subsections.

3.4.1.2 Controls

There is no defined process at the Department for re-purposing funding on a program-by-program basis. Navigant found that the Water and Power Organizations appear to make these decisions on an ad-hoc basis, with some consultation with the FSO and the Chief Financial Officer (CFO).

LADWP's budget controls have varied over the years, in some cases based on the preferences of the general manager at the time. In past years, there was an aggressive budget review period conducted by the FSO. The FSO would flag budget matters to go to the general manager and conduct a back-and-forth question and answer exchange with the Water and Power Organizations. At present, the two organizations have significant autonomy. The CFO helps compile budgets but has less control than in the past, and does not formally review budget matters with the general manager. Water and Power often work collaboratively with the FSO to determine budgets; however, this is not controlled by formal procedures. Effectively, the FSO is a good resource for the Water and Power Organizations and stays informed on budget-related matters in order to maintain the overall annual budget and issue debt, but is not necessarily involved in the decision-making process for re-allocating budgets as projects advance (or stall) throughout the year.

Navigant recommends establishing (or re-establishing) a formal, centralized budgeting process through the FSO. While the Water and Power Organizations act largely as independent businesses, all budget and spending matters should be supervised by the CFO on a Department-wide basis to add a layer of control, facilitate communication with utility leadership, and better support rate cases.

3.4.1.3 Tracking and Reporting

More reporting occurs for overspending on capital projects than for underspending. The FSO tracks program budgets on a 10-year basis down to each job level to show where funds are allocated and make sure there are available funds in the contracts. If there are not sufficient funds, the Power or Water Organization must identify offsets within its budget. But if the budget is underspent, the organization can use that money elsewhere without communicating with the FSO (according to interviews, they do only spend it in the same "bucket" or category of program but this is not monitored externally).

Within the Water Organization, there appears to be a reasonable level of internal tracking using project management software and rigorous internal budget meetings attended by the FSO. The Power System does not use a similar tool, but has two monthly meetings to track budget and performance for PSRP and capital program priorities. Although there are various progress reports, this appears to be a less robust approach.

The Department revises initial budget estimates as projects progress, which happens in every capital-intensive firm and is not considered to be an issue. However, communicating these changes and the reasons for them to management and the City appears to be a greater problem. Navigant encountered different levels of understanding and awareness of LADWP's finances among stakeholders. The City and LADWP should have a healthy, ongoing conversation around project funding and adequate explanations for the phases of a project's lifecycle and its costs.

At present, there appears to be no formal process to report key program financial milestones to leadership, including the general manager, except when contracts go to the Board. The Department is beginning to address this issue through discussions of performance-based budgeting and through the Corporate Performance group's activities. Navigant recommends the FSO own program budgets, budget changes, and reasons for the changes. Reports should be compiled in a central location, where issues and questions can be flagged and raised to higher levels of authority.

3.4.2 Security

As part of the IEA Survey, Navigant conducted a security assessment of the Department which is detailed in the separate Security Report. Several findings that relate to a lack of sufficient internal, centralized controls and authority are also summarized here.

As with program spending decisions discussed in the previous subsection, the Water and Power Organizations are also autonomous in terms of cybersecurity. In particular, the cybersecurity of the Water System is completely isolated from the rest of the Department. Navigant also found that there is limited communication and reporting among Water, Power, and Joint Services on cybersecurity. The security teams in Joint Systems have little visibility into the Water and Power security systems. And as might be expected with separate systems and poor communication, there is no consistency to the cybersecurity policies across the organizations. Like budget re-allocation activities within the organizations, Navigant found that many processes surrounding cybersecurity are also ad-hoc.

Additionally, LADWP does not have comprehensive planning activities for Physical Security, as the Security Planning group, which plans and manages physical security projects, has been moved around the Department in recent years. As a result, Physical Security does not have the authority or processes in place to ensure that facility managers in the Power and Water Organizations prioritize physical security.

Navigant recommends the Department develop an overarching security policy that identifies the processes necessary to communicate security vulnerabilities, mitigation efforts, and risk assessment on a corporate level. A corporate security plan is essential to providing the Department with sound policies, programs, and project management. The plan should be approved by the General Manager and enforced within each organization. Having central authority and planning will ensure that corporate resources are used in a productive way and will allow for visibility into the Water and Power Organizations. For increased transparency, Navigant recommends that LADWP also establish processes to regularly monitor and report physical and cybersecurity efforts.

LADWP should also consider creating senior executive-level positions for security and risk. Specifically, Navigant recommends that LADWP create a new senior executive position that would report directly to the General Manager and own the corporate security policy with overall physical and cybersecurity responsibility.

3.4.3 Emergency Preparedness

During the IEA Survey Navigant also conducted an assessment of the Department's emergency preparedness, which is detailed in the separate Emergency Preparedness Report. The finding that is relevant here is that emergency preparedness activities have been fully decentralized at the Department. The Department's enterprise emergency preparedness function serves in a very high-level coordination role, but is not charged with leading an enterprise-wide business continuity effort, which would identify and assess the risks that would disrupt service delivery and prioritize and routinely test the LADWP response to a material disruption event. Navigant recommends creating a standardized, corporate-level emergency preparedness and business continuity program, which will provide a clear method of managing any significant disruption to service delivery and restore the Department's ability to supply its critical products and services to an agreed level. As with security, we recommend that accountability for Emergency Preparedness reside in a centralized enterprise risk management function with a dedicated senior executive.

3.5 Ambiguous Role of the Office of Public Accountability

Navigant found that the OPA would benefit from refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. Hence, the Office is stuck in a "no man's land" as it is neither a regulator nor a truly independent advisor and is still searching for relevancy in the current governance structure. In many cases, the OPA does not have a clear place in protocols and processes. Under these circumstances, the office has begun to issue opinions but has not found a secure niche. Increasing its oversight role—particularly in program performance, metric review, and rate matters—would benefit all stakeholders. As the current rate ordinances are being revised while this report is being completed, there is a clear and present opportunity to address this issue.

The Ratepayer Advocate should also be cognizant that the office must communicate with ratepayers in a clear and easily understandable manner. Given the highly technical information handled by the office, it must report digestible financial information and key takeaways rather than focus on too many financial details up front. One solution would be to create the role of a Public Information Officer, who could serve as a spokesman and facilitate the preparation of clear and concise communication media.

One of the challenges for the OPA has been to illuminate critical issues at LADWP in a constructive way that increases discussion while recommending performance and process improvements. For example, in the past several years the OPA has become familiar with the lack of financial transparency at LADWP but has not been able to offer process-related solutions. This is partly complicated by its direct reporting line to the Board as well as limited staff resources, and limitations of the office related to operational oversight.

While it is appropriate for the Ratepayer Advocate to report to the Board, City stakeholders, and City Council, it must be clearly separate from decision makers and not become conflated with political interests. Importantly, the RPA is not a decision maker and should not necessarily try to please City decision makers or take direction from them. As with most aspects of LADWP's current governance structure, within the existing structure the OPA faces continuous political pressure from the Department, elected officials, and City Management. The City should—in concert with all involved parties—work on revisions to the OPA's mission to clarify its authority and independence in the Charter. This may require the City to make a choice between having a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

4. Past Studies and Progress

Most of LADWP's governance challenges are not new. By now, they are well-understood by City stakeholders and Department leadership. Various efforts to study and reform the governance of LADWP have been undertaken but met with limited success, as described below. This highlights the depth and complexity of the challenge.

4.1 2001 Rand Study

In 1999 at LADWP's request, Rand Corporation undertook a broad governance study of the Department.[12] The study was motivated by electricity deregulation and restructuring developments in California. It describes the complexity of the shared governance structure of the Department, including the governing roles of the Mayor, City Council and staff, and the City Attorney, as well as the key roles of the Controller, CAO, and CLA. At the time, there were also recent City Charter amendments (adopted in June 1999).

The Rand study analyses alternative municipal utility structures in the U.S. and offers three primary options for modifying the governance structure. Because of the multiple parallels with our report—and many of the same governance challenges—the following sections briefly outline the Rand Corporation's findings. In later sections of this report, Navigant conducts a similar analysis but with updated utility information, without specific structural recommendations, and with an explicit roadmap for the City to use in pursuing governance reform.

4.1.1 Decision-Making and Operational Problems under the Current Structure

Overall, the Rand study found LADWP's governance structure to be "complex, divided, and cumbersome." Although the system was originally put in place to provide checks and balances on the Department, even at the time of the Rand study, the business needs of a changing industry were already outstripping the ability of disparate City authorities to effectively manage the utility.

The complex and divided reporting structure was found to limit the general manager and executive staff in their ability to make and implement operational decisions in a timely way. Additionally, hiring was found to be complicated by the fact that nearly all the Department's employees fall under the city's civil service system. Very few positions are exempt from civil service rules, and still require mayoral and council approval. Delays in hiring were viewed as especially problematic when trying to hire technically skilled workers. To the detriment of LADWP, workers who are in demand from other employers often do not wait to qualify under the city's civil service rules. The study's authors found that utilities under similar union agreements but not civil service rules could hire people with similar skills within a few weeks—much more quickly than the Department.

Other issues related to legal counsel, procurement, and negotiating customer contracts are also discussed, but the study ultimately refers back to complex governance as causing or exacerbating the other problems. In particular, because of the multiple layers of governance, the Department felt like it could not be entrepreneurial nor operate efficiently.

[12] Report available for download at: www.rand.org/pubs/monograph_reports/MR1189.html.

Today, the Department is still required to elevate many decisions to the various layers of the Board and City for approval and is still inhibited by slow hiring processes (as described in Sections 3.1 and 3.2). At the same time, it is operating in a way that restricts transparency into its programs and internal financial decisions (as outlined in Section 3.3) and lacks sufficient internal controls (as outlined in Section 3.4). Effectively, the well-intentioned "checks and balances" of the governance structure neither facilitate the operation of the utility nor result in increased oversight, trust, or transparency. This issue is particularly critical as problems that could be contained before they spiral into major performance or cost issues are without transparent reporting and controls. All too frequently, issues or incidents in the current structure develop into very public and expensive situations that harm all stakeholders.

4.1.2 Other Governance Models for Municipal Utilities

The Rand study looked at five different municipal utility governance structures with a total of eight case studies, several of which Navigant also examines in this report. The five structures from the Rand study are summarized in the following list along with a brief snapshot of the study's analysis.

- **Municipal utility reporting to city council:** Simplifies governance with a direct reporting line, and seems to work well in small cities with utilities of modest size. Rand concludes that this model would not be as appropriate for LADWP because it is larger and more complex.
- **Independent city agency:** Has an independent governing board with full governing authority, appointed by city officials. The model is designed to distance utility operations from city politics, and the study opines that it works quite well.
- **City-owned Corporation:** LADWP's assets and operations would be transferred to a new California non-profit corporation governed by a board of directors with the city as sole shareholder (by charter amendment). The Mayor and City Council would appoint board members.
- **Municipal Utility District:** The elected board has broad authority over the district and the utility has much more autonomy than a city department. The study notes that converting LADWP into a municipal utility district would require closely coordinated support and legislation at the city, county, and state levels.
- **Joint Powers Agency (JPA):** The board of directors whose members represent participating agencies would be formed under a Joint Powers Agreement. The study finds that a JPA could be more flexible and have more independence from local politics, but may be problematic for a utility offering retail as well as wholesale services based on California JPA rules.

Navigant also presents municipal utility case studies in Section 5, but uses different categorizations and updated information to draw our own conclusions.

4.1.3 Governance Options for LADWP

To address problems under the LADWP structure, Rand Corporation recommends procedural changes in the near term to improve decision-making and oversight. It also recommends that the City seriously consider more streamlined governance structures in order to be a competitive utility in the market. The study recommends three alternatives to the status quo:

1. Create a city-owned corporation to provide utility services.

2. Create a more independent city agency governed by a strong board or commission.
3. Modify the existing structure to improve DWP governance.

A municipal utility district and JPA are ruled out—in the Rand study—because of legislative hurdles at both the city and state level. The first option (city-owned corporation) is considered to be more flexible, efficient, and responsive than the existing structure. To address concerns, the charter amendment could be written to maintain the City Transfer and prevent eventual privatization. The second option (independent city agency with strong governing board) is similarly considered to be more flexible and efficient than the existing structure, and governance would be relatively similar to the city-owned corporation. The third option would focus on streamlining approval processes and limit political involvement in business matters, but is considered to be the least effective solution of the three because of maintaining the existing structure. Since the report was issued none of the preferred options were adopted by the City.

4.2 2009 IEA Survey

In the 2009 IEA Survey, PA Consulting found that the governance and decision-making process in place is not adequate to successfully address the Department's "mission critical" decisions. The governance framework does not facilitate efficient decision-making and clouds accountability for key decisions among a variety of stakeholders. This is closely aligned with the Rand study. Clearly defining roles, responsibilities, and the limits of authority was—and is—a critical recommendation of the Survey.

As an example of ill-defined leadership roles, PA Consulting identified a cycle of "activist" and then less involved Boards depending on the membership, finding that the proper relationship of the Board to the Department was not clear. Additionally, PA found that an absence of independent analysis around policy decisions could lead to the politicization of LADWP by City political offices. Overall, PA found that the complex relationship between the Department and various stakeholders was a fundamental issue that undermined clarity of policy leadership and decision-making authority and accountability.

Like the Rand study, the 2009 IEA Survey does not appear to have provided sufficient stimulus or a concrete way forward for the City. What progress has been made since 2009 is largely attributable to other causes. For example, the improved relationship between the Board and the Department's executive team was due to personnel changes, and the creation of the Office of Public Accountability and the Ratepayer Advocate was a response to a ratemaking conflict between the Department and City Council. The latter development is detailed in the next section.

4.3 2010 Governance Reform Motions

In early 2010, City Council introduced a series of governance reform motions proposing the creation of an Ombudsperson/Ratepayer Advocate/Inspector General position and several other changes to LADWP's governance, as a result of a conflict between the Council and the Department regarding proposed modifications to the Energy Cost Adjustment Factor (ECAF) component of utility rates.[13]

[13] Information on the ECAF debate from the City Controller is publicly available at: controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_010463.pdf.

Because two of the motions were, in some form, passed by ballot in the following election, this process was a moderate success.

The CLA and CAO reported on the Council's reform motions to the Energy and Environment Committee on April 13, 2010,[14] and in August, Council adopted a motion requesting the City Attorney, CLA, and CAO to provide a proposal and to begin the process for placing the proposal on the March 2011 ballot. The Energy and Environment and Rules and Elections Committees jointly held a series of evening meetings throughout Los Angeles to solicit public input on governance changes, which helped inform the report.[15] The original motions related to the governance topics in this report proposed the following changes:

Independent Oversight

- Create a fully independent ombudsperson[16] to provide independent analysis of rate increases. (CF-08-1967)
- Establish a Ratepayer Advocate Position that reports to the Board of Water and Power Commissioners, City Council, and Mayor. (CF 08-1967-S1)
- Request the CAO, CLA, and City Attorney to report on the feasibility of creating an Inspector General position to independently review and report on the operations and management of LADWP. (CF 09-2544)
- Call on the City Attorney, CLA, and CAO to report back on recommendations on a process for public input regarding establishing a ratepayer advocate and prepare a ballot measure for the March 2011 ballot. (CF 08-1967-S2)

LADWP Leadership

- Change appointment of the Board to two Mayoral appointments, two Council appointments, and one Congress of Neighborhoods appointment; require Board appointees to have specific backgrounds; and establish an Inspector General position in LADWP. (10-0586)
- Change appointment of the Board from five Mayoral appointments to one Mayoral appointment, one Council appointment, one Controller appointment, one City Attorney appointment, and one Congress of Neighborhoods appointment. (10-1335)
- Give City Council the authority to remove the General Manager with a two-thirds vote. (10-0583)

Reporting

- Require the LADWP annual budget to be adopted by the Mayor and City Council. (10-0587)
- Establish the definition of "surplus" in the annual LADWP Power Revenue Fund transfer to be based on the balance that existed on June 30th of the prior year. (10-1289)

[14] Report from April 2010 available at: clkrep.lacity.org/onlinedocs/2008/08-1967-s1_rpt_cla_4-13-10.pdf.
[15] Report from October 2010 available at: clkrep.lacity.org/onlinedocs/2008/08-1967_rpt_cla_10-26-10.pdf.
[16] An ombudsperson is a public advocate appointed to represent the interests of individuals by receiving, investigating, reporting on, and helping to settle complaints.

The report found that the public was very supportive of an oversight position and for the re-composition of the Board with alternate appointments. It offered a number of items for placement in the March 2011 ballot, including three options for reforming the LADWP Board composition, a recommendation for the creation of an Inspector General/Ratepayer Advocate, a recommendation regarding Council removal of the LADWP General Manager, and a recommendation regarding the submittal of the budget to Council and the definition of "surplus" in the context of the Power Revenue Fund transfer (City Transfer).

The ultimate result of this process was the creation of the Office of Public Accountability with the Ratepayer Advocate, as described in Section 2.3, and approval of the budget and City Transfer reporting. While the creation of the Ratepayer Advocate was a step in the right direction with the potential to improve oversight and transparency, it has not resolved the underlying issues related to clarity of leadership, accountability, and appropriate controls. As discussed in Section 3.5, the Ratepayer Advocate position itself would benefit from greater clarity regarding its role as either a staff adviser or a full independent customer advocate. Notably, the oversight powers envisioned for the Inspector General position are not embodied in the Ratepayer Advocate (i.e., the power to audit and review programs and operations, investigate complaints, and recommend actions for LADWP).

The proposed re-composition of the Board was the most controversial governance change, and none of the three options ultimately made it onto the ballot—despite initial Council approval—due to a variety of political influences.

4.4 The Los Angeles 2020 Commission

The most recent example of a governance-related initiative is the Los Angeles 2020 Commission. In 2013, the City Council President requested an independent, private commission to study and report on fiscal stability and job growth in Los Angeles.[17] This effort was endorsed by Mayor Villaraigosa and involved leaders from across the community. It found that Los Angeles had a crisis in leadership and direction; however, its findings were apparently met with little enthusiasm or action.[18,19]

The first report published in December 2013 found that Los Angeles was underinvesting in the "competitive modernization" of the port, airport, and LADWP.[20] The second report published in April 2014 included a specific recommendation for the governance of LADWP:[21] create a truly independent oversight and rate-setting body. Like previous studies, the 2020 Commission found that the Department is subject to too much political interference and, as a consequence, high leadership turnover. It concludes that "this leads to instability and constant shifts in direction and policies and ultimately impacts DWP's ability to make good long-term decisions." This echoes PA Consulting in the 2009 IEA Survey, in particular.

[17] Information on the Los Angeles 2020 Commission available at: www.la2020reports.org.
[18] "L.A.'s mellow response to 2020 Commission's crisis warning," Los Angeles Times, June 15, 2014 (www.latimes.com/opinion/op-ed/la-oe-newton-column-2020-report-beutner-wesson-20140616-column.html).
[19] "Why is LA's City Council Ignoring the Recommendations of the LA 2020 Commission?" CityWatch, January 9, 2015 (clkrep.lacity.org/onlinedocs/2014/14-1184_misc_1-8-15.pdf).
[20] "A Time for Truth," Los Angeles 2020 Commission, December 2013 (www.la2020reports.org/reports/A-Time-For-Truth.pdf).
[21] "A Time for Action" Los Angeles 2020 Commission, April 2014 (www.la2020reports.org/reports/A-Time-For-Action.pdf).

The 2020 Commission recommends creating a Los Angeles Utility Rate Commission to be an independent regulator and the ultimate rate-setting authority for the utility. The commission would have a five-member Board appointed by the Mayor and approved by City Council. In addition to setting rates, the Board would also appoint the general manager, determine policy, and provide overall operational oversight. A full-time, professional staff would advise the Board.

Ultimately, the 2020 Commission believed that an independent appointed Board with professional advisory staff would function efficiently and consistently as a professional rate-setting body, remove most of the destabilizing politics from LADWP, and reduce the distraction in City government related to LADWP.

The 2020 Commission presented to City Council after the release of the second report in April 2014, but as mentioned, reportedly met with a cool reaction. Eventually, a number of the 2020 Commission's recommendations were referred to the Rules, Elections, and Intergovernmental Relations Committee, which in turn referred them to several other committees. Council approved this referral on January 20, 2015.[22] From here, the recommendations will go through the lengthy committee hearing process. The recommendation for the Los Angeles Utility Rate Commission has not yet been included in the committee process.

[22] Report available at: clkrep.lacity.org/onlinedocs/2014/14-1184_ca_01-20-15.pdf.

5. Review of Alternative Governance Structures

To identify examples of governance structure options for LADWP, Navigant reviewed the governance arrangements of other U.S. municipal utilities. Los Angeles stakeholders were particularly interested in seeing a selection of different public utility governance models, supporting the notion that there is real interest in a City Charter change.

There are various types of municipal utilities, including utility districts like SMUD, public utilities commissions like SFPUC, and city-owned departments like LADWP but with different roles and responsibilities. As evidenced by the case studies described in this section, utilities take a relatively wide variety of approaches to the formation of the governing body, the utility's financial relationship to the municipality, and other areas of governance. To synthesize our findings, we group the case studies into three general forms of governance: elected board governance, elected city official governance, and appointed board governance. We also analyze the strengths and weaknesses of these structures in the context of the applicable governance challenges identified in Section 3. Specifically, each of the three models of governance is evaluated on the basis of the two issues most easily addressed by structural changes: decentralized city authority and the lack of external reporting, trust, and transparency.

This section also provides a summary of other Ratepayer Advocate roles in municipal utilities and in the California Public Utility Commission (Section 5.4) for comparison to the Los Angeles OPA.

5.1 Elected Board Governance

5.1.1 Sacramento Municipal Utility District

Sacramento Municipal Utility District (SMUD) is an electric-only utility with a service territory including most of Sacramento County and a portion of Placer and Yolo Counties, with a population of 1.4 million. A utility district is a public agency created by the local community (i.e. a portion of a city, county, or multi-county), typically because residents want new or improved utility services.[23] The citizens of Sacramento voted in favor of the community-owned electric service in 1926, but due to legal hurdles SMUD was not officially operational until 1946. The citizens wanted to control the power resources of their city,[24] were dissatisfied with Pacific Gas & Electric rates and service, and generally distrusted corporate monopolies.[25]

Under the California Municipal Utility District Act, any public agency with unincorporated territory or two or more public agencies with or without unincorporated territory may organize and incorporate as a municipal utility district.[26] The Act gives SMUD the power to fix rates and charges for commodities or services it furnishes, and to incur indebtedness and issue bonds or other obligations. SMUD is exempt from payment of federal and state income taxes and, under most circumstances, real and personal

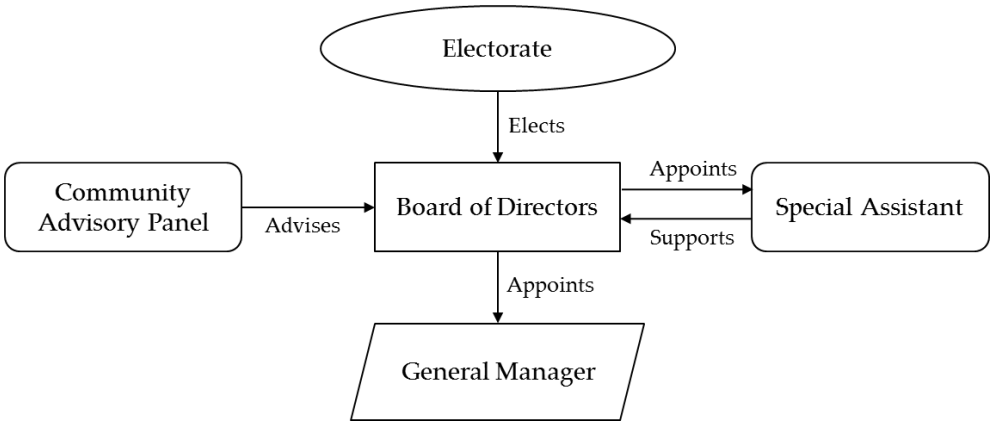
[23] "Governance in a Changing Market," RAND Corporation, 2001, pp. 30-31.
[24] SMUD website (www.smud.org/en/about-smud/company-information/history/).
[25] IBEW 1245 website (ibew1245.com/education/history-of-our-union/sacramento-municipal-utility-district).
[26] A "public agency" is defined as a city, county, water district, county sanitation district, or sanitary district. See California Public Utilities Code Section 11501-09 and 11561-62.

property taxes.[27] In addition, SMUD must submit annual financial reports to the State Controller and must follow state laws pertaining to public meetings, bonded debt, record keeping, and elections.[28]

SMUD is governed by a seven-member Board of Directors. Board members are elected for four-year terms by customers from each of the seven geographic areas within the company's service area. Board membership is on a part-time basis compensated at a daily rate for up to ten days of service per month.[29] The Board of Directors appoints the General Manager/CEO (under an employment contract), approves the budget, and approves rate changes. The Board is supported by a Special Assistant, which helps the Board fulfill its responsibilities and is hired and terminated by the Board.[30] A Community Advisory Panel also interacts with the utility, as a group of small business organization representatives that raises local small business awareness about contracting opportunities with SMUD and helps the utility expand its pool of potential contractors. New memberships are reviewed at panel meetings and approved by majority vote.[31] A simplified governance diagram is shown in Figure 5-1, below.

Up to 5 percent of the SMUD workforce can be non-civil service employees, and civil service rules and labor negotiations are approved by the General Manager/CEO.[32] To financially support the local government, SMUD customers in the City of Sacramento pay a utility tax of 7.5 percent and customers in the unincorporated area of Sacramento County pay a tax of 2.5 percent.[33]

Figure 5-1. SMUD Governance Structure



Source: Navigant

5.1.2 Strengths and Weaknesses

The potential strengths and weaknesses of an elected board governance structure are highlighted by SMUD's experience. According to interviews, in 2003-2004 the utility was struggling with a number of

[27] SMUD Annual Report, 2013, p. 39.
[28] California State Controller's Office, Special Districts Report (www.sco.ca.gov/ard_locarep_districts.html).
[29] GP-12 Board Compensation and Benefits (www.smud.org/assets/documents/pdf/GP-12.pdf).
[30] BL-4 Board-Special Assistant Relationship (www.smud.org/assets/documents/pdf/BL-4.pdf).
[31] SMUD Community Advisory Panel Charter (www.smud.org/assets/documents/pdf/CAP%20Charter.pdf).
[32] IBEW Local Union 1245 Memorandum of Understanding, 2013-2017 (http://www.ibew1245.com/Agreements/SMUD_MOU_2013-2017.pdf).
[33] California State Controller's Office website (www.sco.ca.gov/Files-ARD-Local/LocRep/adhoc_city_9899utilityuserstax.pdf).

governance challenges, despite structurally being the same municipal utility district as today. However, at the time the board was becoming too tied up in the details of decision-making processes, particularly in areas where it did not have sufficient expertise. Because this was becoming a significant burden on leadership, SMUD initiated an intensive two-year process to establish clear policy, roles, and expectations for the utility district.

At the end of the two years, SMUD had established a strategic direction, defining what the organization wanted to accomplish.[34] The set of policies incorporated into the overall strategic direction are grouped into three categories, as follows:

1. Strategic Direction: Defines organizational values.
    a. Core values: Competitive rates, reliability, safety, environmental leadership, ethics, etc.
    b. Key values: Research and development, economic development, system enhancement, and outreach and communication.
2. Board-Staff Linkage: Defines responsibilities and expectations.
    a. Defines the relationship between the Board and staff, including the CEO, general counsel, and auditor.
    b. Establishes performance evaluation policy.
    c. Establishes delegation policies.
3. Governance Process: Defines election, committee, and training procedures and principles, the Board's governance focus and Code of Conduct, and more.

These policies appear to have been very effective in focusing SMUD on its role as a utility now and into the future. Policies are revisited annually, which provides SMUD with the flexibility to handle the current power utility industry transition.

Although the public election process does not necessarily produce board members with utility or business expertise, SMUD has a robust training program for its Board. Strategic Development Policy GP-10 sets the standards for initial orientation and continuing education. Orientation involves in-depth conversations with utility executive including the CEO. Continuing education includes industry conference attendance and presentations by industry experts organized by a committee focused on strategic development. Although board terms are set for four years, members traditionally serve multiple terms. This affords members the opportunity to become experts in the field, as well as providing leadership continuity.

The Board relies on information provided by SMUD staff for decision-making, but policies establish a permanent internal auditor role[35] and mandate an annual audit from an external auditor.[36] As elected officials, Board members are also accountable to their wards. Due to the nature of elections, the elected board governance structure does not completely remove politics for SMUD. However, the well-defined strategic direction and supporting policies have reduced politics by establishing a highly articulated

[34] Overview of SMUD's strategic direction available at: www.smud.org/en/about-smud/company-information/board-of-directors/strategic-direction.htm.
[35] Board-Internal Auditor Relationship, BL-3 (www.smud.org/assets/documents/pdf/BL-3.pdf).
[36] External Auditor Relationship, GP-14 (www.smud.org/assets/documents/pdf/GP-14.pdf).

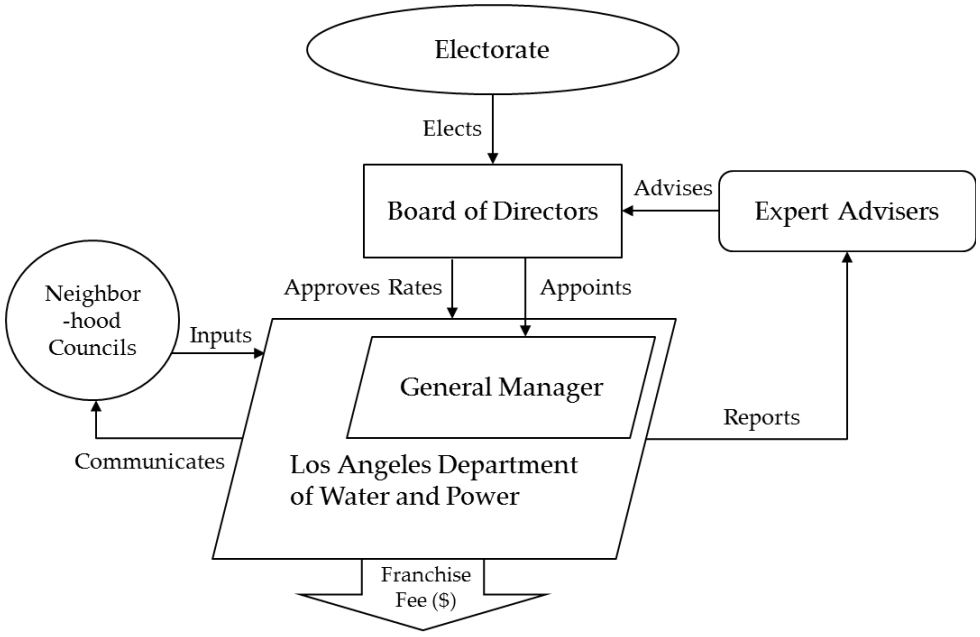
operating structure. An additional element of stability is the CEO's contract, which helps protect the position from political pressures.

SMUD interfaces with local governments via partnerships (e.g. the Mayor of Sacramento's 10,000 Home Initiative) and through the local government group in SMUD and key account representatives working with jurisdictions on energy efficiency and environmental goals. This could be a weakness of the model according to city officials who lack the authority to dictate policy for the utility, but there are numerous partnership opportunities to align goals. Overall, stakeholders have expressed high satisfaction with the current SMUD governance model, both in interviews with Navigant and in survey results from an outside study.[37]

5.1.3 Opportunities for LADWP

Based on the apparent success of SMUD, the municipal utility district model may have significant potential to de-politicize the governance structure by distancing the utility from the primary political bodies and allowing it to function as an independent business organization, while directly serving the citizens of Los Angeles and maintaining financial support for the city. This transition could result in a LADWP governance model to the one shown in Figure 5-2, below.

Figure 5-2. LADWP Municipal Utility District Governance Sample



Source: Navigant

In this model, the Board of Directors should also have a panel of subject matter experts appointed to monitor and analyze the Department to support decision-making, similar to SMUD's internal auditor role but reporting solely to the Board. The Los Angeles Neighborhood Councils could still function as citizen advisories; however, the OPA as a city department would need to be revised to apply to an

[37] "Improving Public Utility Governance: A Case Study," Leading Resources Inc., 2015 (www.oppd.com/media/165301/2015-2-improving-public-utility-governance.pdf).

independent utility district. One possibility is for OPA to act as liaison between City government and the utility district. The utility district could pay a franchise fee or tax to Los Angeles, which could effectively maintain the City Transfer.

As demonstrated by SMUD, strong elected board leadership requires well-defined policies. These would potentially enable the internal and external controls and reporting necessary to transform LADWP into a transparent, communication driven, and accountable organization. However, the election of board members still leaves governance open to some politicization. In this environment, the general manager/CEO's employment contract is important to minimizing political influence because it provides the CEO a secure, defined role.

Elected board governance for LADWP is only possible through a City Charter change and would result in the City of Los Angeles losing direct control of the utility. As an independent agency, the general manager/CEO would have responsibility for negotiating the labor agreement.

Table 5-1. Elected Board Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• Elected board acts as a clear central authority • Other City politics no longer relate directly to the utility • Focused attention on utility matters at all times • More shared responsibility between the board and utility executives	• Direct reporting channel established between utility leadership and board • Candidate qualifications impact election results, encouraging nominees with relevant expertise • Decision making is likely to be based on firm business principles
Does Not Address	• Opportunity for politicization around election of board members • Opportunity for too much board involvement in utility operations (though this could be mitigated by well-defined policies)	• Elected board members may have limited experience (though this could be mitigated by training and a dedicated advisory staff) • Potential for controversial elections to lead to public distrust

5.2 Elected City Official Governance

5.2.1 Seattle City Light

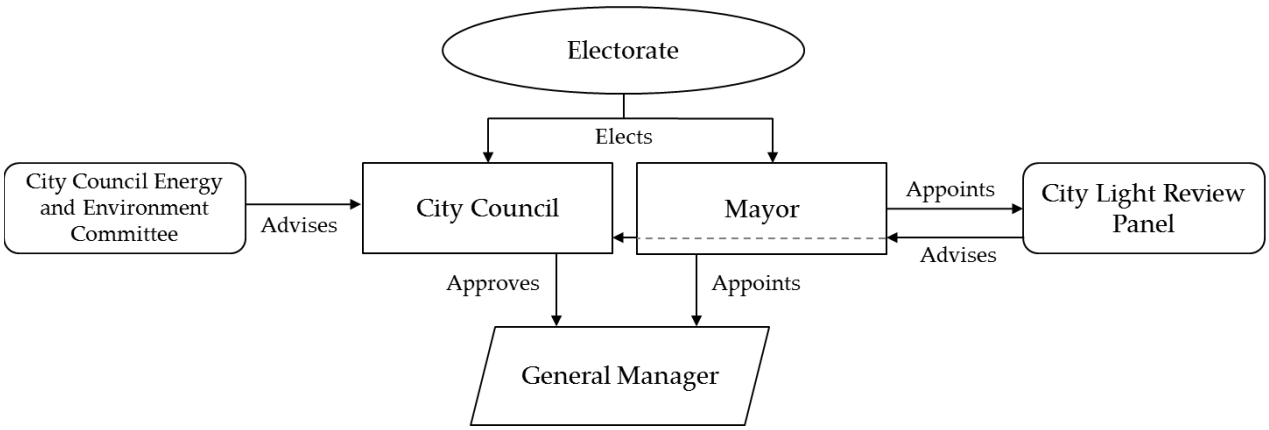
Seattle City Light (SCL), or the City Light Department, is an electric utility serving 415,000 customers in the City of Seattle and eight adjacent jurisdictions, created by the citizens of Seattle in 1902.[38] It is governed by Seattle City Council and the Mayor of the City of Seattle as a City Department established by the Seattle Municipal Code, Title 3 and the City Charter. The mayor appoints the general manager subject to the approval of the council, and makes a recommendation to the council regarding rates based

[38] 2014 Annual Report (www.seattle.gov/light/pubs/annualrpt/2014/default.html).

on information from SCL. City Council is the final ratemaking authority.[39,40] Additionally, the Council's Energy and Environment Committee reviews the processes and policies of SCL, including rates and resource matters, and provides recommendations to Council. Six percent of rate revenue goes to the City's General Fund.

The City of Seattle and City Light Department enter into the labor agreement through the Joint Labor/Management Committee process, with representatives from the General Manager and CEO of Seattle City Light, City of Seattle Director of Labor Relations, Seattle City Light Human Resources Officer, and the Union Business Manager.[41]

Figure 5-3. Seattle City Light Governance Structure



Source: Navigant

5.2.2 Austin Energy

Austin Energy is a department of the City of Austin and the largest city in the United States whose municipal utility is governed directly by its city council.[42] Austin City Council appoints the general manager and approves the utility's policy, rates, budget, and bond issuances.[43]

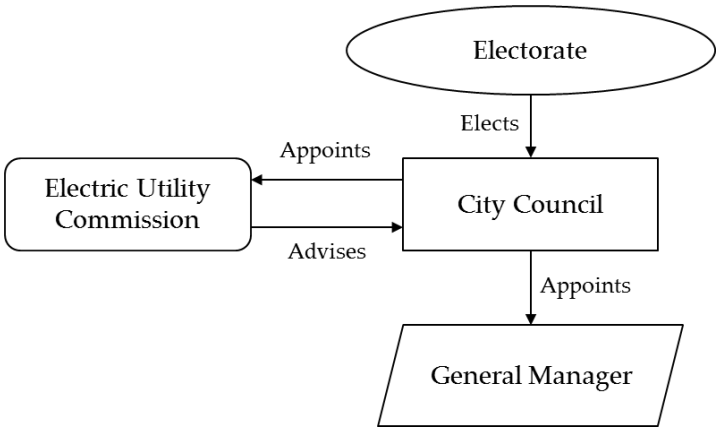
The city also has an Electric Utility Commission (EUC), a seven-member citizen's advisory committee appointed by City Council. Committee members may include registered engineers with experience in power production, attorneys, and utility customers who live outside the city's corporate limits. The EUC reviews and analyzes the utility's policies and procedures including rate structures, fuel costs, budget, and strategic planning.[44] Recommendations are given to City Council, the City Manager, the utility, city

[39] Seattle governance structure, Office of the City Clerk (www.seattle.gov/cityclerk/legislative-process-guide/governance-structure).
[40] Seattle City Light Strategic Plan Interim Outreach Meeting Summary, June 8, 2011 (www.seattle.gov/light/strategic-plan/docs/Forum%20Summary%20-%20McKinstry%20-%20June%208.doc).
[41] IBEW Local 77 agreement, 2013-2017 (www.seattle.gov/personnel/resources/pubs/Local%2077%20CBA%202013-16.pdf).
[42] Austin Electric Utility Commission Report and Recommendations Regarding Future Governance of Austin Energy - October 29, 2012 (austinenergy.com/wps/wcm/connect/fd6c0304-afca-495a-a6f5-0c96d84f1611/EUCgovernanceRecommendationsOct2012.pdf?MOD=AJPERES).
[43] Response to Resolution 20130321-041 Comparison of Municipal Utility Performance, Austin Energy.
[44] City of Austin website (www.austintexas.gov/euc).

departments and city boards. Austin City Council adopted a policy in 2012 requiring that rates be reviewed every five years.

Austin Energy makes a General Fund Transfer of its net revenue to the city, which is an annual payment that does not exceed 12 percent of its three-year average revenue (i.e. the actual total revenues of the past two years plus the current year projection of total revenue).[45]

Figure 5-4. Austin Energy Governance Structure



Source: Navigant

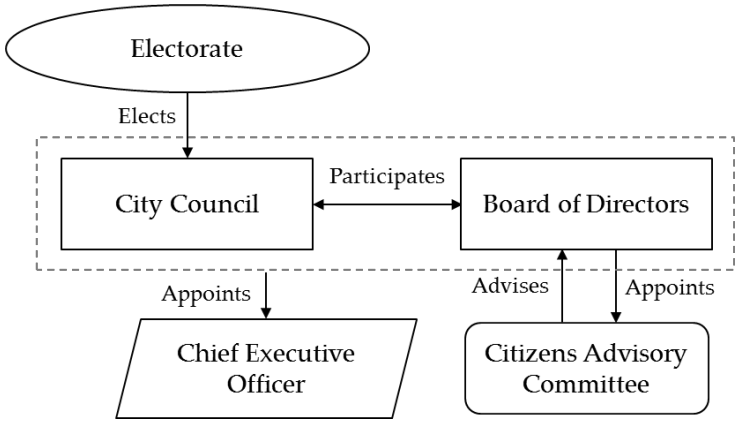
5.2.3 Colorado Springs Utilities

Colorado Springs Utilities (CSU) is an enterprise of the City of Colorado Springs, providing power, natural-gas, water, and wastewater services. CSU is governed by the City Council directly and through its Board of Directors, which wholly comprises City Council members. City Council approves the budget and acts in a legislative capacity to establish ordinances regarding utility services and to issue bonds. City Council also fills a regulatory role similar to the California Public Utilities Commission to establish tariffs, rates, and extension policies. As the Board of Directors, councilmembers establish policy direction for the utility and monitor performance.

City Council appoints and establishes executive limitations for CSU's Chief Executive Officer, who is accountable for all management and operational responsibilities. The Board of Directors appoints a seven-member citizens Utilities Policy Advisory Committee (UPAC) that develops policy recommendations from an informed perspective for consideration by the Board. The mayor is currently required to sign all CSU contracts; however, this is the result of an oversight during a charter change process in 2010, in which the city transitioned from a council-manager to a council-mayor form of government.[46]

[45] City of Austin, Texas Financial Policies, Volume II, pp. 516-517.
[46] Governance Alternatives White Paper, Colorado Springs Utilities, January 2011 (www.csu.org/CSUDocuments/governancealternatives2011.pdf).

Figure 5-5. Colorado Springs Utilities Governance Structure



Source: Navigant

5.2.4 Strengths and Weaknesses

In theory, the elected city official model of governance provides some clarity of leadership if there is one central authority removing confusion around roles and responsibilities and establishing a direct reporting channel; however, this is not the case when there are multiple elected officials involved. Directly involved elected city officials also allows for a greater degree of politicization.

External reviews conducted for the preceding utilities help highlight the several weaknesses associated with elected city official governance. A 2011 UMS Group report highlighted inefficiencies in Seattle City Light governance, suggesting that enhanced organizational performance through benchmarking, efficiencies, and performance-based reporting efforts aimed at making the utility leaner could, with other improvements, save SCL $35 million a year. The report echoed the findings of a 2006 expert panel, which recommended that the city appoint an independent board. In particular, the expert panel noted that SCL is vulnerable to "political winds."[47]

In 2012, the Austin City Council asked the Electric Utility Commission (EUC) to evaluate alternative governance models provided by the City Manager.[48] Like the UMS report for SCL, the EUC's evaluation resulted in a recommendation for the Austin City Council to transfer management and control of Austin Energy to an independent board of trustees in order to increase transparency and accountability, improve efficiency, clarify leadership, remove political interference, and provide a mechanism by which all Austin Energy customers would be represented.

Colorado Springs Utilities has faced even more scrutiny. Since becoming an enterprise of the municipal government in 1993, four separate studies have examined a change in governance structure, each recommending CSU establish an independent board of directors. The latest study identified the following drivers and benefits of transitioning governance to an independent board:

[47] "Seattle City Light told to get leaner as rates rise," *The Seattle Times*, December 3, 2011 (www.seattletimes.com/seattle-news/seattle-city-light-told-to-get-leaner-as-rates-rise).
[48] "Governance Study of Public Power Utilities for the City of Austin," Bob Kahn, LLC, August 27, 2012 (austinenergy.com/wps/wcm/connect/f3bb639b-6433-4dfb-a687-b0c0376ed3b1/governanceStudy.pdf?MOD=AJPERES).

- Business drivers: the complexity of running a multi-service utility is accelerating (due to resource supply uncertainty, volatile costs of fuel and purchased power, expensive environmental compliance, high financial scrutiny, increasing risks and liabilities, a shrinking work force, and rising customer expectations), demanding governance by a devoted team with utility expertise.
- Political drivers: the breadth of constituency concerns managed by City Council and the relatively short-term duration necessarily results in members with a narrow window to become experienced in utility issues and a limited bandwidth for utility matters.
- Benefits: a separate board would relieve City Council from an extensive time commitment, providing more opportunity for Council to engage in its core role on behalf of the City. The appointed board would be a clear delineation from the municipal government, enabling the long-term interests of the utility to be placed above short-term or political goals. Additionally, rating agencies support strong independent boards with industry expertise as the preferred governance structure.[49]

Despite the recommendations of these reports, SCL and Austin Energy have not changed their governance structures. The SCL committee with oversight of the utility rejected an independent board structure, pointing to lax corporate boards that contributed to the recession. However, the report did spur the creation of SCL's first multi-year plan in its 100-plus-year history, based on four key objectives: improving customer experience and rate predictability; increasing workforce performance and safety; enhancing organizational performance; and continuing conservation and environmental stewardship.[50]

In 2013, Austin City Council postponed indefinitely the ordinance that would have formed an independent board. Instead, it approved an ordinance to form a council subcommittee to provide oversight and policy recommendations.[51] CSU is in the midst of a Governance Structure and Governance Process Review led by the Board. The public review will determine a proposed governance structure and/or governance process and is targeting the implementation of a development plan in April 2016.[52]

The fact that each of these utilities has had an outside entity suggest a transition to governance by an independent board but been unable to make that transition attests to the extreme difficulty of restructuring the governance model of a large utility. To help guide LADWP through this challenge, Navigant included a process roadmap in Section 6.

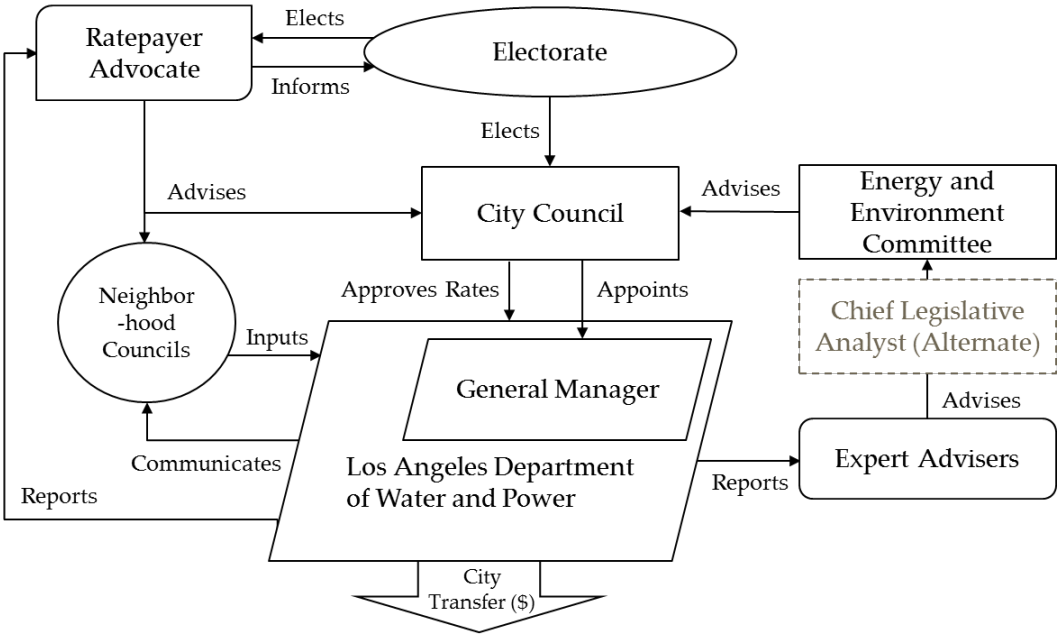
5.2.5 Opportunities for LADWP

LADWP's is already governed largely by elected city officials. If it were to transition to full City Council authority like Austin Energy, it would reduce the number of City stakeholders and centralize

[49] Governance Alternatives White Paper, Colorado Springs Utilities, January 2011 (www.csu.org/CSUDocuments/governancealternatives2011.pdf).
[50] "Seattle City Light rate plan provides predictability, accountability," *The Seattle Times*, June 21, 2012 (www.seattletimes.com/opinion/seattle-city-light-rate-plan-provides-predictability-accountability).
[51] "Austin Energy governance ordinance postponed indefinitely," *Community Impact Newspaper*, May 24, 2013 (communityimpact.com/2013/05/24/austin-energy-governance-ordinance-postponed-indefinitely/).
[52] Governance Process and Governance Structure Review, Colorado Springs Utilities (www.csutilitiesgovernance.com/home).

responsibility for LADWP. Making this transition while maintaining a fairly similar structure to the current one could result in a governance model similar to Figure 5-6, below.

Figure 5-6. LADWP City Council Governance Sample



Source: Navigant

The Council's Energy and Environment Committee would still review the processes and policies of LADWP, including rates and resource matters, and provide recommendations to the Council. Alternatively, the CLA could fill the role of adviser to City Council on LADWP matters. With this model, a panel of subject matter experts should also be appointed to monitor and analyze the Department and support the Energy and Environment Committee or CLA. As in the current governance structure, the Ratepayer Advocate could also function as an independent analyst and the Neighborhood Councils could continue to function as citizens advisory committee-type bodies. LADWP could also continue to provide the City Transfer in its current form.

However, as found in Seattle, Austin, and Colorado Springs, the utility would likely remain highly prone to political influence and may continue to experience transparency and accountability issues.

Table 5-2. City Council Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• City Council acts as a clear central authority	• Direct reporting channel established between utility leadership and City Council
Does Not Address	• Inherent politicization of decision making • Interest in utility matters influenced by election cycles	• Without a dedicated advisory staff, City Council has limited expertise and bandwidth for utility issues • Utility is vulnerable to public distrust of politics

	• Appointed utility executives more vulnerable than City Council to blame for utility missteps	• Decision making based on political whim rather than firm business principles

5.3 Appointed Board Governance

5.3.1 San Francisco Public Utilities Commission

The San Francisco Public Utilities Commission (SFPUC) is a department of the City and County of San Francisco, providing water, power, and wastewater services to the city and surrounding area. Power customers are primarily San Francisco municipal departments (San Francisco International Airport, San Francisco Police Department, San Francisco Fire Department, etc.), certain residents and businesses, and the Modesto and Turlock Irrigation Districts. Surplus energy is sold on the open market. In addition to providing retail drinking water and wastewater services to San Francisco, SFPUC also supplies wholesale water to three Bay Area counties.[53]

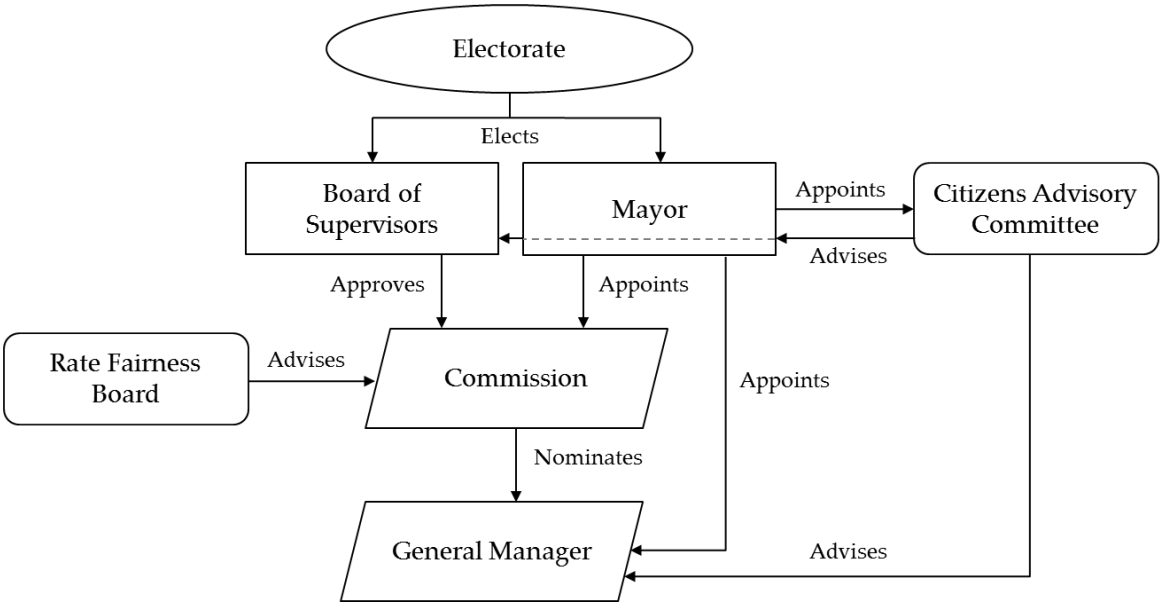
SFPUC is governed by five commissioners who are nominated by the Mayor and approved by the San Francisco Board of Supervisors, which is a legislative branch of the City and County of San Francisco. Each of the 11 members of the Board of Supervisors is elected on a non-partisan basis by the district in which he or she lives.[54] The SFPUC commissioners serve on a part-time basis[55] for terms of four years, determine utility rates, approve contracts, and define organizational policy. Previously, a 2008 City Charter amendment made several significant changes to SFPUC governance. It terminated the appointment of five commissioners (all of whom had been appointed by the mayor alone), set new qualifications, and required that the Board of Supervisors approve the mayor's appointments by majority vote (previously, the Board could reject an appointee with a two-thirds vote but did not have approval authority). Qualifications include expertise in environmental policy, consumer advocacy, project finance and power, and public utility management.[56]

The SFPUC also has a 17-member Citizens Advisory Committee that provides feedback to the Commission and the Board of Supervisors on the utility's long-term strategic, financial, and capital improvement programs. Each member of the Board of Supervisors appoints a resident of his or her district to the committee and the President of the Board appoints two additional members. The mayor appoints the remaining four members. The mayor also appoints the general manager nominated by the SFPUC. The general manager and SFPUC then enter into an employment contract with a fixed term (not limited to one term).[57]

[53] SFPUC website (www.sfwater.org).
[54] San Francisco Board of Supervisors website (www.sfbos.org).
[55] Assumption that City employees serving on charter-mandated boards and commissions will spend 0.25 of their time in service, and SFPUC commissioners are compensated at $100 per month (www.sfcontroller.org/Modules/ShowDocument.aspx?documentid=2392).
[56] SFPUC Comprehensive Annual Financial Report, 2009, p. 2.
[57] https://infrastructure.sfwater.org/fds/fds.aspx?lib=SFPUC&doc=762564&data=293587140.

The city's Director of Human Resources enters into labor agreements on behalf of the City and County of San Francisco, its Boards and Commissioners, and on behalf of City Departments.[58] Surplus revenue that the SFPUC determines is not required for utility purposes may be transferred to the city's general fund.[59]

Figure 5-7. SFPUC Governance Structure



Source: Navigant

5.3.2 CPS Energy

CPS Energy (CPSE) is a natural gas and electric utility owned by the City of San Antonio. It is the largest municipally-owned utility in the U.S. that provides both natural gas and electric service, with more than 1 million total customers in and around San Antonio. The City of San Antonio acquired the former San Antonio Public Service Company in 1942.

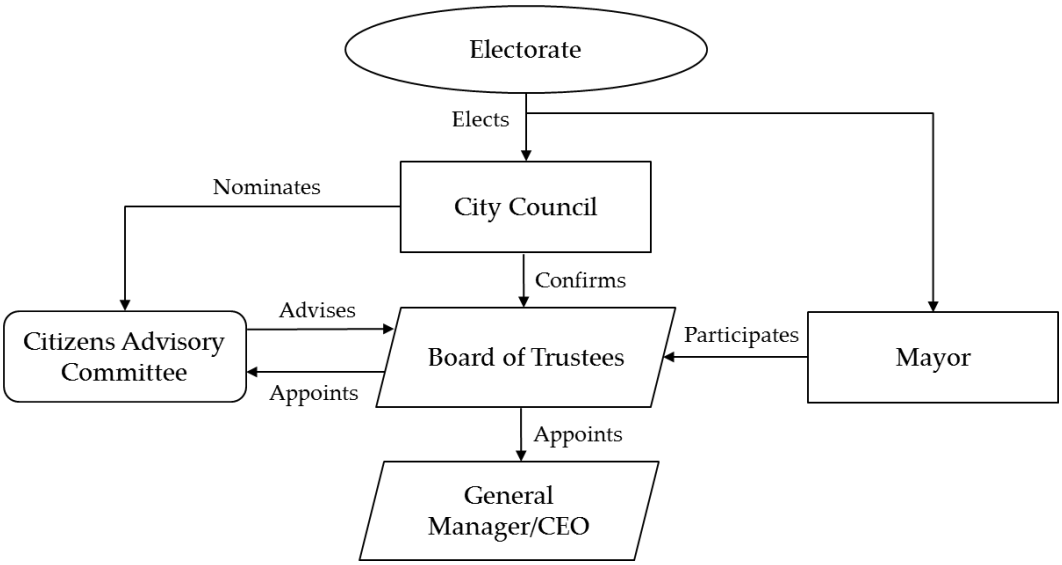
CPSE is governed by a five-member Board of Trustees, which includes the mayor (ex-officio) and four other representatives from the four geographical quadrants of San Antonio. Board members serve part-time for a term of five years and are eligible for an additional term.[60] Board of Trustees vacancies are filled by majority vote of the remaining members and confirmed by City Council. The mayor is responsible for keeping the City Council informed about the Board's actions and decision. The Board of Trustees appoints the utility CEO, approves the budget, and provides rate recommendations to City Council for approval. CPSE appoints all officers and employees, self-funds its pension and health care

[58] IBEW Local 6 Collective Bargaining Agreement, 2014-2017 (www.sfdhr.org/modules/showdocument.aspx?documentid=20603).
[59] SFPUC Comprehensive Annual Financial Report, FY 2012-13, p. 43.
[60] CPS Energy website (www.cpsenergy.com/en/about-us/who-we-are/trustees.html).

plans, and is completely independent of city services such as HR, financial, fleet, etc.[61] Trustees receive a small annual compensation.[62]

14 percent of the utility's gross revenue is transferred to the City's general fund each year.[63]

Figure 5-8. CPS Energy Governance Structure



Source: Navigant

5.3.3 Jacksonville Energy Authority

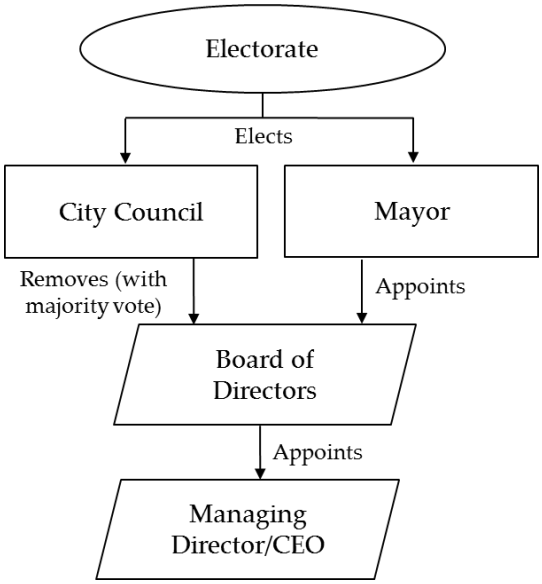
Jacksonville Energy Authority (JEA) is an independent city agency in Jacksonville, Florida, created by the consolidation of city and county governments, providing power, water, and wastewater services. The utility is governed by a seven-member Board of Directors that is appointed by the mayor and confirmed by the city council. Board members serve four-year terms for no more than two consecutive terms and are uncompensated.[64] JEA pays a franchise fee of 3 percent of electric system and water and sewer system revenues.[65]

The Board of Directors appoints the utility CEO and has the power to approve rate changes for the utility; however, City Council approves its budget.[66] Accordingly, the JEA governing board is distanced from City Council and board member removal requires two-thirds of the City Council vote.[67] The City of

[61] "Governance Study of Public Power Utilities for the City of Austin," Bob Kahn, LLC, August 2012 (austinenergy.com/wps/wcm/connect/f3bb639b-6433-4dfb-a687-b0c0376ed3b1/governanceStudy.pdf?MOD=AJPERES).
[62] $2,000 per year. The chairperson received $2,500 per year and the mayor receives no compensation (https://webapps2.sanantonio.gov/boardcomm/PrintAgenda.aspx?id=CPS%20Energy%20Board).
[63] http://newsroom.cpsenergy.com/blog/corporate-responsibility/community-involvement/publicly-owned-cps-energy/.
[64] Charter of the City of Jacksonville, Section 21.03 (www.municode.com/library/fl/jacksonville/codes/code_of_ordinances?nodeId=CHRELA_PTACHLACHJAFL_ART21JE).
[65] Charter Section 21.07.
[66] JEA website (www.jea.com/About/Company_Info/Budget_Process/).
[67] "Governance in a Changing Market," RAND Corporation, 2001, p. 24.

San Antonio Employee and Labor Relations Division manages and administers the City's labor relations, making recommendations to the mayor, city council, and department heads.[68]

Figure 5-9. JEA Governance Structure



Source: Navigant

5.3.4 Strengths and Weaknesses

Appointed board governance offers many of the strengths seen with an elected board. Clear leadership by a central authority with subject matter expertise and dedicated attention simplifies operations and provides the professional oversight necessary to create an atmosphere of accountability and support long-term goals based on firm business principles. Additionally, with set terms and appointment limits, an appointed board may have the greatest potential to be distanced from city-wide politics. With the proper controls, appointed board members could be protected from political whims and function as a fully professional entity.

On the other hand, while the model creates a direct reporting channel between the utility and the board, the structure may not sufficiently establish transparency and oversight between the utility, the board, and elected city officials. In 2009, CPSE found itself in the midst of a $32 million lawsuit to exit the South Texas Project nuclear deal with NRG Energy. This, in part, was the result of CPSE executives withholding critical financial information from the Mayor and City Council regarding a $4 billion increase in expected construction costs of the nuclear reactors, which would have required a larger rate increase than originally proposed. The utility's CEO, another executive, and several board members were forced to step down as a result, and the utility continues to repair public trust issues.[69]

JEA provides another example of the importance of transparency and trust within an appointed board governance structure. The utility is currently facing serious governance and legal issues with the

[68] Charter Section 33.401.

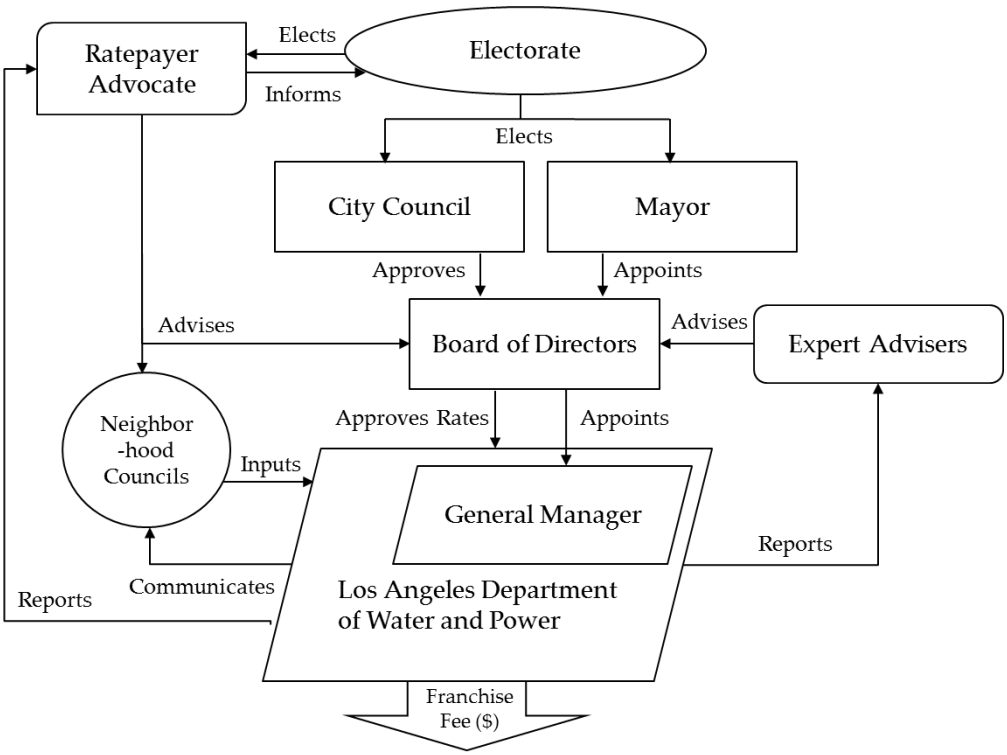
[69] "CPS deal died of multiple causes," San Antonio Express-News (intrabecc.cocef.org/programs/intranetnotasperiodico/uploadedFiles/cpsdealdiedofmultiplecauses.pdf).

Sunshine Law: the Board was discovered to be preparing scripted talking points in advance of meetings. Unfortunately, this comes at a time when the utility has been working to earn the public's trust and confidence regarding the utility's long-standing practice of employee annual bonuses. The Chief Administrative Officer commented that a "complete revamp of structure and leadership may be in order" at JEA. Thus far, the mayor has asked two board members to resign.[70]

5.3.5 Opportunities for LADWP

LADWP currently has one type of appointed board governance structure; however, a new version may be required to solve the governance issues related to transparency, accountability, and oversight. One possibility for an appointed board structure would be the recommendation by the 2020 Commission to establish an independent, appointed Los Angeles Utility Rate Commission (Section 4.4). This would involve a five-member Board appointed by Mayor and approved by City Council serving staggered four-year terms, with direct authority to determine LADWP's policy, appoint the general manager, set rates, and provide overall operational oversight. A version of this structure is illustrated below.

Figure 5-10. LADWP Appointed Board Governance Sample



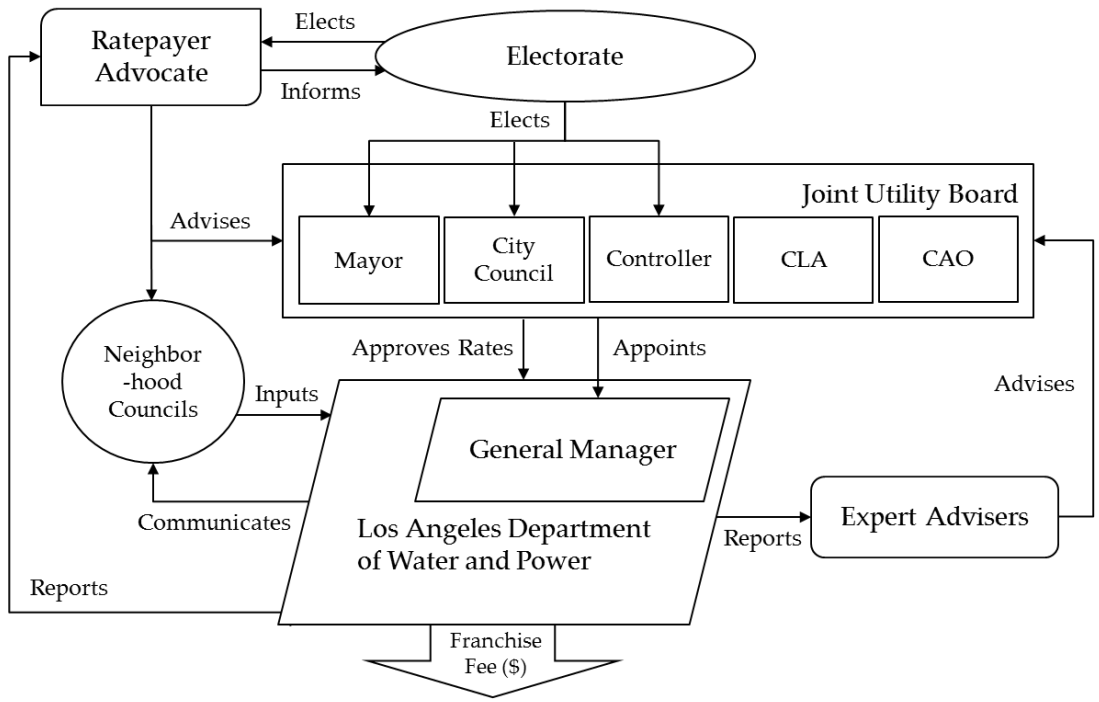
Source: Navigant

However, the problems encountered by CPSE and JEA argue that the utility may be at higher risk of a communication breakdown between the various layers of authority. Another option for LADWP (shown

[70] "After Times-Union report, Curry asks 'what the hell' is going on at JEA, raises legal and governance concerns," The Florida Times-Union, September 21, 2015 (jacksonville.com/news/metro/2015-09-21/story/after-times-union-report-curry-asks-what-hell-going-jea-raises-legal-and).

in Figure 5-11 below) is to simplify the structure by involving City elected officials and executives directly in the board. A board comprising five City stakeholders, as shown, would clarify and centralize roles and responsibilities while allowing multiple City offices to have direct input. However, this structure would also remain vulnerable to politicization, and disagreements between the various offices would potentially slow down decision-making processes. Additionally, as term limits are tied to City offices, the board would be prone to issues arising from relatively high turnover in leadership positions.

Figure 5-11. LADWP Joint Utility Board Governance Sample



Source: Navigant

Under either model, LADWP may pay a franchise fee rather than the City Transfer. The Ratepayer Advocate and Neighborhood Councils could likely function as before. Transitioning to an appointed board would require a Charter change.

Table 5-3. Appointed Board Structure: Resolution of Governance Challenges

Governance Challenges	Decentralized City Authority	Lack of External Reporting, Trust, and Transparency
Does Address	• Appointed board acts as a clear central authority • Focused attention on utility matters at all times • More shared responsibility between board and utility executives	• Direct reporting channel established between utility leadership and board • With board member expertise requirements, members will have necessary skillset and knowledge to run the utility • Decision making likely to be based on firm business principles
Does Not Address	• City-wide politics may influence board appointments (mitigated by	• Reporting channel between the board and the City not clearly established

	fixed terms and limited reappointments)	• Without requirements for board member expertise, members may lack necessary skillset and knowledge to run the utility • Because the board is not directly accountable to the public, it is potentially less transparent

5.4 Ratepayer Advocate Structures

LADWP's OPA currently finds itself in a role in which it is neither a regulator nor a truly independent advisor. Further refinement of the OPA's mission to establish itself as either a purely independent office focused on ratepayer priorities or an office with a staff oversight role would result in greater benefits for the Department and ratepayers. Navigant reviewed the Ratepayer Advocate roles of several of the municipal utilities above to spark a conversation on how the office can operate more efficiently and effectively.

In several utilities, the role of the Ratepayer Advocate is filled by city officials or an appointee of city officials. This creates a situation similar to the OPA's in which the entity is subject to political influence.

5.4.1 Seattle City Light Review Panel

Seattle City Light has a nine-member City Light Review Panel that helps develop the company's strategic plan and plays an important role in engaging SCL's ratepayers in the development and review of the utility's biennial update to the six-year Strategic Business Plan.[71] The panel includes five members nominated by the Mayor and four members nominated by City Council. Panel membership must include a set of required positions: an economist, a financial analyst, a representative from a non-profit or non-governmental organization whose mission is to advocate for the efficient use of energy, representatives from SCL's residential, industrial, commercial, and low-income customers, a representative from among SCL's suburban franchise area, and an at-large candidate.[72]

The required mix of technical experts and customer representatives serves to produce a panel that can independently handle technical rate information as well as report easily digestible financial information to ratepayers. Additionally, strict personnel requirements may curtail political influence during the nomination process and for day-to-day operations.

5.4.2 Austin Energy Electric Utility Commission

Austin Energy presents another structure for the Ratepayer Advocate. Austin Energy does not have a full-time ratepayer advocate, but as part of the five year rate review process the EUC can request an outside consultant to review the policies and procedures of the utility and can hire an independent consumer advocate to represent the interests of residential and small commercial customers throughout the rate-making process.[73] The independent consumer advocate is not only experienced and competent in ratemaking matters, but truly independent from Austin Energy and the EUC. This model eliminates costs associated with a full-time Ratepayer Advocate while providing a similar service; however, it does

[71] City of Seattle Ordinance No. 123256.
[72] City of Seattle website (www.seattle.gov/citylightreviewpanel/).
[73] City of Austin Code of Ordinances § 2-1-143 – Electric Utility Commission.

not provide the regular oversight of a fulltime advocate. In 2014, Austin Energy also developed a Low Income Consumer Advocacy Group to revise rules for deferred payment plans and utility service disconnections.[74]

5.4.3 SMUD Policies

SMUD's governance structure with its set of strategic directives serves to eliminate some of the need for a Ratepayer Advocate by establishing the maintenance of competitive rates as a core value of the utility district. Policy SD-2 clearly defines the Board's rate objectives to be the following:

- The Board establishes a rate target of 18 percent below Pacific Gas & Electric Company's (PG&E) published rates on a system average basis. In addition, the Board establishes a rate target of at least 10 percent below PG&E's published rates for each customer class.
- SMUD's rate of change for both rates and bills shall be competitive with other local utilities on a system average basis.
- In addition, SMUD's rates shall be designed to balance and achieve the following goals:
    - Reflect the cost of energy when it is used,
    - Reduce use on peak,
    - Encourage energy efficiency and conservation,
    - Minimize "sticker" shock in the transition from one rate design to another,
    - Offer flexibility and options,
    - Be simple and easy to understand,
    - Meet the needs of people with fixed low incomes and severe medical conditions, and
    - Equitably allocate costs across and within customer classes.[75]

One argument for the effectiveness of this strategy is that SMUD's rates that are among the lowest in California, and on average are more than 27% lower than those of neighboring PG&E.[76]

5.4.4 San Francisco Public Utilities Commission Rate Fairness Board

The SFPUC has a Rate Fairness Board (RFB) which was established by Proposition E in 2002 and comprises city residential and business customers and officials from the offices of the City Controller and City Administrator. The current roster has appointees from the Director of the Office of Public Finance, Board of Supervisors, Mayor, Controller, and City Administrator.[77] Responsibilities include conducting an annual review of the five-year rate forecast, holding public hearings on rate proposals, providing a report and recommendations to the SFPUC on the rate proposal, and submitting to the SFPUC rate policy recommendations for consideration by the Commission. Proposition E also expressly mandates that one seat of the SFPUC must be held by an experienced utility ratepayer or consumer advocate.

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[74] Austin Energy Low Income Customer Advocates information available at: www.austintexas.gov/content/austin-energy-low-income-customer-advocates.
[75] SMUD Board Policy SD-2 available at: https://www.smud.org/assets/documents/pdf/SD-2.pdf.
[76] SMUD rate comparison (https://www.smud.org/en/residential/customer-service/rate-information/rate-comparison.htm).
[77] Rate Fairness Board, SFPUC website (www.sfwater.org/index.aspx?page=120).

In 2008, Proposition I was introduced which called for the creation of the office of an independent Ratepayer Advocate for the SFPUC,[78] a role that would improve the professional and technical analysis of proposals by the RFB and theoretically would also improve the objectivity of the analysis by shielding it from political pressures. Proposition I was voted down, likely due to the perceived overlap between the position and the RFB. However, in 2012 the SFPUC adopted the Ratepayer Assurance Policy and Scorecard, which is reviewed annually as part of the budget process and independently verified and published by the Office of the Controller to ensure measurable, verifiable, and wise use of ratepayer resources. The framework is based on three key elements ratepayers expect from their utility: reliable asset management, cost-effective sustainability and mission management, and excellent service/personnel management.[79] The scorecard functions as a vehicle through which issues with the SFPUC are illuminated to increase the dialogue around performance and process improvements.

5.4.5 CPS Energy Citizens Advisory Committee

CPS Energy has a 15-member Citizens Advisory Committee (CAC) to enhance community relations and provide advice on all utility-related projects and programs. Ten committee members are nominated by City Council, representing each city district, and five members are at-large candidates nominated by the committee. [80] The Board of Trustees appoints nominated members to the committee. The CAC meets monthly with the primary goal of providing judicious advice from a customer perspective on utility-related projects and programs, including weighing in on a new CEO. A background in energy is not necessarily for appointment to the committee.[81] To date, there have

5.4.6 California Public Utility Commission Office of Ratepayer Advocates

Navigant also reviewed the California Public Utility Commission's (CPUC) Office of Ratepayer Advocates (ORA) to inform our discussion on the OPA. The ORA is an independent arm of the CPUC with the mission to obtain the lowest possible rates for service consistent with reliable and safe service levels.[82,83] The ORA has a staff of 142 engineers, economists, scientists, and auditors with expertise in regulatory issues related to the electricity, natural gas, water, and telecommunications industries in California. ORA's analysis continuously evolves to incorporate state policy directives and customer needs into the rapidly changing landscape of utility services, include state goals on topics such as increasing safety, reversing climate damage, and stimulating economic development.

In 2013, the ORA lobbied decision makers nearly 200 times, reportedly saving California ratepayers more than $1.5 billion – a significant amount compared to the Office's $24.375 million budget.[84] The ORA's independence from the CPUC removes political pressure, allowing the Office to focus solely on ratepayer needs. Additionally, the Office's success is highly attributable to the staff's expertise and

[78] Charter amendment for Proposition I available at: www.smartvoter.org/2008/11/04/ca/sf/prop/I.
[79] Ratepayer Assurance Scorecard Manual, SFPUC (sfcontroller.org/Modules/ShowDocument.aspx?documentid=4989).
[80] Citizens Advisory Committee, CPS Energy website (www.cpsenergy.com/en/about-us/who-we-are/citizens-advisory-committee.html).
[81] "CPS Energy's CAC, Citizens Advisory Committee, needs to fill vacancies," CPS Energy, August 21, 2013 (newsroom.cpsenergy.com/blog/corporate-responsibility/community-involvement/cps-energy-cac-advisory-committee).
[82] Public Utilities Code Section 309.5 (www.leginfo.ca.gov/cgi-bin/displaycode?section=puc&group=00001-01000&file=301-327).
[83] More information available at: www.ora.ca.gov.
[84] Office of Ratepayer Advocates, 2013 Annual Report (www.ora.ca.gov/AR2013.aspx).

ability to adapt to the evolving utility landscape. While the scale of the ORA is much larger than the Los Angeles OPA, it is important to note the ratepayer benefits that result from an advocate's independence, clear objectives, and ample resources.

One immediate recommendation from this observation is that—assuming further clarity of the OPA's role is provided—the office would benefit from additional supporting professional staff positions.

6. Roadmap for Change

Creating a new governance structure to address LADWP's current governance challenges is no small undertaking. If the City of Los Angeles chooses to pursue fundamental governance changes as discussed in this report, it will be embarking on a complex, multi-year journey. Navigant recommends that the City initiate a process by which it can ultimately propose specific governance reforms on the 2017 ballot.

The governance issues described in Section 3 should provide sufficient motivation for revisions to the City Charter by ballot measure. However, significant additional work must be completed before those revisions are determined. Without careful management and comprehensive stakeholder engagement throughout a well-defined process, the City is at risk of falling into a politically charged, contentious situation. In this section, Navigant outlines the steps and underlying principles for this change process. Because of the large scope of the challenge, the first subsection presents a set of short-term recommendations that address some of the governance issues by making improvements to the current governance structure. The following subsection lays out a framework to make more fundamental changes.

6.1 Short-Term Recommendations

In the near term, increased transparency through reporting is one of the simpler solutions to several of LADWP's governance issues. Improved reporting on key metrics would help address the lack of transparency, accountability, and oversight. A variety of metrics are already reported regularly to the Board and online, but as mentioned previously, LADWP is not required to account for its performance against budgets or rates. This means that there is no clear connection between rate increases and specific accomplishments, internal Power and Water System budgets are relatively fluid, and the rate-setting authority (City Council) may not have complete information for decision-making purposes.

Navigant recommends that LADWP tie financial and performance metrics to rates by ordinance. This would mean defining and reporting a set of key metrics to decision makers on a specific schedule, in order to inform annual rate adjustments via the adjustment factors. Specifically, for each major Department program and initiative, the ordinance would require agreed-upon metrics (including budget targets and actuals, milestones, etc.) to be reported to the Office of Public Accountability, Board of Water and Power Commissioners, and City Council (Energy and Environment Committee). Issues could be elevated by the OPA to the Board and Council, establishing a clear role for the Ratepayer Advocate. These reporting requirements would not automatically impact rates; however, Council would make its decision based on the most recent, relevant, and concise information. Furthermore, establishing this procedure in the rate ordinance ensures it would be consistently followed by LADWP, regardless of management or other changes.

Tying financial and performance metrics to rates would also serve to centralize internal controls and reporting if a central office is responsible for the reporting activities. Navigant recommends that the Chief Financial Officer lead this effort within the FSO. Information from the separate organizations in LADWP would ideally be consolidated, interpreted, and disseminated from this office.

While Navigant considers it to be an improvement, this recommendation would not necessarily achieve 100 percent accountability because decision-makers are not required to act in any particular way based on the information they receive, and because there are still multiple layers of authority clouding

accountability. Having a single governing entity, for example, would address this issue more permanently. This is the type of change that can be explored during the process recommended in the next section.

6.2 Long-Term Recommendations

Many utilities struggle with making long-term governance changes. As described previously in Section 5.1, since 1993 Colorado Springs Utilities has had four separate studies recommending that it move away from city council governance—without success. Seattle City Light and Austin Energy received similar recommendations in 2011 and 2012 respectively, but eventually rejected the more significant changes in favor of smaller improvements. SMUD and LADWP itself have undertaken some of the more successful change efforts, with SMUD establishing a comprehensive governance policy over a two-year process in the early 2000s and LADWP creating the OPA by Charter in 2010.

Understandably, stakeholders are often reluctant to cede control of the utility even when they acknowledge the governance structure is not working. In the case of CSU, SCL, and Austin, the city council was deciding whether or not the utility should report to city council—a clear conflict of interest, for some. Stakeholders may also feel, with or without justification, that none of the alternatives would be an improvement over the status quo. Although LADWP does not have a single governing entity, stakeholders may similarly be loath to give up what control they do have, and may also be skeptical of alternatives. With this in mind, Navigant recommends an inclusive process that emphasizes consensus among the stakeholders.

Notably, here we include representatives from union leadership. All parties involved in the management, operations, and governance of the Department would benefit from consistently positive and improved relations with the employee unions. The unions and their leadership would need to be active participants in any conversation concerning the governance of the Department.

The City of Los Angeles should take the following steps for its governance reform process:

1. City Council introduces a motion forming a committee to examine governance reforms for the LADWP, with the explicit task of reporting on its findings and recommending a measure for the 2017 ballot.
2. City Council forms a hybrid committee which includes, at a minimum, representatives from the Mayor's office, City Council Energy & Environment Committee, CAO, CLA, Controller, City Attorney, Office of Public Accountability, Board of Water and Power Commissioners, the general manager of LADWP, and a representative from labor. Navigant recommends that the CAO, CLA, and an outside third-party facilitator be assigned the role of facilitators (additional detail on facilitation in Section 6.2.1).
3. The committee defines the governance issues it seeks to address via ballot measure.
4. The committee conducts an in-depth study of solutions to the specified governance issues, including multiple opportunities for public input.
5. The committee reaches consensus on a solution and submits a final report with a proposed ballot resolution to City Council, in time for the 2017 ballot according to a schedule set by the CAO, CLA and City Attorney.

6. City Council requests the City Attorney, with the assistance of the CAO and CLA as necessary, to prepare a ballot title and finalize the resolution for placement on the 2017 ballot.

The final result of this process should be a measure that the committee in good faith believes will address LADWP's current governance issues.

6.2.1 Facilitation

For LADWP's 2010 governance reforms described in Section 4.3, the CAO and CLA with assistance from the City Attorney prepared the report with recommendations and eventually the ballot language. However, in that situation they had specific direction from City Council to assess a number of related motions and how to implement them—a relatively narrow scope of work. For the recommended process here, Navigant proposes forming a larger committee comprising more City stakeholders due to the wider, as yet undefined scope of the reform. The facilitator's role is especially important because of the many participants and their variety of views, as well as being tasked with defining the "what" as well as the "how."

Because of their experience with past City reform processes and other legal and administrative items, Navigant recommends the CAO and CLA undertake the project management role for the committee. We recommend they also bring in an outside facilitator to help guide the process; specifically, to maintain the schedule, help with dispute resolution, and provide research and analysis services as requested. This role would not involve decision-making, but rather serve to move the process along. An external guide for the process is important because it provides an independent view, whereas City stakeholders may have something to gain by controlling the process.

6.2.2 Topics of Study

City Council may wish to provide more structure for the committee's work. Navigant recommends considering the inclusion of the following topics or areas of study for the study (this list is not comprehensive, nor is it in order of importance):

- Define a vision of a functional LADWP with clear governance objectives.
- Define the governing body with authority over LADWP.
    - Specify the procedure for electing or appointing the governing body.
    - Specify membership length of term.
    - Specify membership qualifications.
    - Specify membership compensation.
    - Explore the need for and role of a professional advisory staff.
- Define the role of the Ratepayer Advocate.
- Explore the need for and specify the terms of a fixed general manager contract.
- As necessary, define terms for the City Transfer or equivalent.
- As necessary, assign responsibility for labor negotiations.

Volume V

Unified Water Approach

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Unified Water Approach Report
Volume V

Prepared for:
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NAVIGANT

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1. Introduction

In this chapter, Navigant highlights the changing role of a water utility in California. While there is attention on the governance structure of LADWP, the City may find it valuable to also reevaluate its city-wide approach to water (including potable water, storm water, and wastewater). In Navigant's interviews and further review of alternative governance structures for the Department, we began to explore the City's options for creating a single, holistic water function (either within or without LADWP). This chapter summarizes our findings in order to support a discussion around how Los Angeles views and manages this increasingly valuable and scarce resource.

During Navigant's interviews regarding LADWP's governance structure, the idea was posed to combine the Water System with water functions across Los Angeles, encompassing the water-related responsibilities of the Los Angeles County Public Works Department and the City of Los Angeles Bureau of Sanitation. In response to this suggestion, Navigant reviewed several state and city-level initiatives as well as two utility case studies with a unified water approach.

The initiatives reviewed include the following:

- The California Water Action Plan: A statewide plan released in January 2014, focusing on water conservation. The plan outlines water recycling, expanded storage, groundwater management, investment in safe drinking water, and wetland and watershed restoration as imperative for the state's journey toward sustainable water management. One specific action calls for increased regional self-reliance and integrated water management across all levels of government.
- Governor Brown's Executive Order directing the State Water Resources Control Board to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016.
- City of Los Angeles Water Integrated Resource Plan: A 2006 IRP with plans through 2020 that call on City Departments and the community to manage all water as one water.
- City of Los Angeles One Water L.A. 2040: Builds upon the success of the IRP by expanding coordination and partnerships between City Departments, regional agencies, and new and existing stakeholders to achieve a more sustainable water future for LA beyond the year 2020.
- The Sustainable City pLAn / Mayor Garcetti's Executive Directive Number 5: A plan to reduce per capita potable water use by 20 percent by 2017, establish a Water Cabinet to implement key aspects of local water policy, expand recycled water production by at least 6 million gallons per day, and replace 95 miles of water pipe infrastructure.
- County of Los Angeles Enhanced Watershed Management Program: A program in which municipalities, non-governmental organizations, and community stakeholders work collaboratively to develop Enhanced Watershed Management Plans (EWMPs) for each of the county's five watersheds.

In these initiatives, we note a recurring theme emphasizing the need for collaboration amongst key stakeholder groups to manage all aspects of the water cycle in a coordinated fashion. Clearly, policy makers are recognizing that water issues can no longer be addressed in isolation. This, combined with

the drought emergency, presents the optimal opportunity to discuss the unified management of the City's water infrastructure.

This work has already been initiated in Los Angeles by TreePeople, a local non-profit organization which recently brought together the Los Angeles water agencies as part of the Greater LA Water Collaborative to build the case for a collaborative, systemic approach to address the region's short-term drought emergency and long-term water crisis. Navigant recommends the City not only support collaboration of this type, but conduct an additional in-depth study of the management of the three Los Angeles water agencies as one entity.

The chapter is organized into the following sections:

1. Water in California
2. Combining Water Utilities
3. Future Approach for Los Angeles

2. Water in California

California utilities are generally aligned with the California State Water Resources Control Board's mission "to preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations"[1] and have moved towards greater collaboration.

Furthermore, California is in the midst of an unprecedented water crisis. According to the State Water Resource Control Board, severe drought combined with ecosystem decline, climate change, and population growth are testing California's ability to provide the clean water needed for a healthy environment, population, and economy both now and in the future. [2]

2.1 Drought

In January 2014, California Governor Edmund G. Brown Jr. proclaimed a State of Emergency directing state officials to take all necessary actions to prepare for drought conditions. In April 2014, he proclaimed a Continued State of Emergency due to critically low rainfall and snowpack levels, redoubling state drought actions. California's water supplies continue to be severely depleted, with record low snowpack in the Sierra Nevada Mountains, decreased water levels in most of California's reservoirs, reduced flows in the state's rivers, and shrinking supplies in underground water basins – leading to challenges including drinking water shortages in communities across the state, diminished water for agricultural production, degraded habitat for fish and other wildlife, increased wildfire risk, and the threat of saltwater contamination to fresh water supplies in the Sacramento-San Joaquin Bay Delta.

With the possibility of the drought stretching into 2016 and beyond, Governor Brown issued an Executive Order in April 2015, calling for the State Water Resources Control Board (State Water Board) to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016, among other water saving initiatives.[3]

2.2 Water Management Plans

The California Water Action Plan, released by Governor Brown in January 2014, focuses on conservation and lays out water recycling, expanded storage, groundwater management, investment in safe drinking water, and wetland and watershed restoration as imperative for the state's journey toward sustainable water management. One specific action calls for increased regional self-reliance and integrated water management across all levels of government. This action acknowledges that the management of infrastructure and investment for multiple functions is sometimes handled separately by individual

[1] www.swrcb.ca.gov/about_us/water_boards_structure/mission.shtml.
[2] www.swrcb.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0003_a.pdf.
[3] www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/040115_executive_order.pdf.

agencies within a region. It is accompanied by guidance to integrate individual government efforts into one combined regional commitment to result in an effort with a "sum greater than any single piece."[4]

The City of Los Angeles was actually a step ahead of this advice with its 2006 adoption of the award-winning Water Integrated Resource Plan (IRP), an implementable facilities plan through the year 2020 that calls on City Departments and the community to manage all water "as one water." The IRP resulted in citywide benefits including cost savings, water conservation, and reduced dependence on imported water supplies by better utilization of recycled water and runoff.[5] The One Water LA 2040 Plan builds upon the success of the IRP by expanding coordination and partnerships between City Departments, regional agencies, and new and existing stakeholders to achieve a more sustainable water future for Los Angeles beyond 2020.[6]

Upon taking office in 2013, Los Angeles Mayor Eric Garcetti appointed the City's first Chief Sustainability Officer, Matt Petersen, and created a Mayor's Office of Sustainability. Garcetti tasked Petersen with leading the effort to create the Sustainable City pLAn – described as a comprehensive, actionable directive designed to produce meaningful results today and in the future by addressing the environment, economy, and equity together to move toward a truly sustainable future. Short-term water initiatives include meeting Executive Directive Number 5 (reducing per capita potable water use by 20 percent by 2017), establishing a Water Cabinet to implement key aspects of local water policy, expanding recycled water production by at least 6 million gallons per day, and replacing 95 miles of water pipe infrastructure. Long-term goals include reducing LADWP's purchases of imported water by 50 percent by 2025, sourcing 50 percent of water locally by 2035 (including 150,000 acre-feet per year of storm water capture), reducing average per capita water use by 22.5 percent by 2025 and 25 percent by 2035, improving stormwater quality, and reducing the number of annual sewer spills to fewer than 100 by 2025 and fewer than 67 by 2035.[7]

The Enhanced Watershed Management Program is yet another initiative within the County of Los Angeles in which municipalities, non-governmental organizations and community stakeholders are working collaboratively to develop Enhanced Watershed Management Plans (EWMPs) for each of Los Angeles' five watersheds. Each watershed has a Watershed Management Group that meets regularly to identify current and future multi-benefit projects that will improve water quality and promote conservation and will identify appropriate control measures, monitoring plans, and strategies for adaptive management of projects. [8]

Although this is not an exhaustive review of water initiatives in California, it demonstrates a strong endorsement of collaboration between agencies by state and Los Angeles policymakers.

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[4] The California Water Action Plan is available at: resources.ca.gov/docs/california_water_action_plan/Final_California_Water_Action_Plan.pdf.
[5] The Los Angeles Water IRP is available at: http://lacitysan.org/irp/documents/FINAL_IRP_5_Year_Review_Document.pdf.
[6] One Water L.A. website: www.lacitysan.org/onewater/index.html.
[7] The Sustainability City pLAn is available at: http://san.lacity.org/pdf/pLAn.pdf.
[8] Enhance Watershed Management Program: www.lastormwater.org/green-la/enhanced-watershed-management-program.

3. Combining Water Utilities

3.1 Los Angeles

The City of Los Angeles' water infrastructure is divided amongst three agencies: the City of Los Angeles Bureau of Sanitation (LASAN), Los Angeles County Department of Public Works (LACDPW), and LADWP. These agencies have historically operated within bureaucratic silos to manage discrete, yet overlapping aspects of the water cycle. Responsibilities are currently divided into the following:

- LASAN collects, cleans, and recycles solid and liquid waste through the administration of three primary programs: wastewater collection, conveyance, treatment, and disposal; solid resources collection, recycling, and disposal; and watershed protection.[9]
- LACDPW provides sustainable water supplies and healthy watersheds while reducing flood risks. Priorities include stormwater management, groundwater banking, water conservation, recycling, and reclamation, and maintaining the Sanitary Sewer Network.[10]
- LADWP provides 666,000 customers with reliable, high quality water and leads water recycling programs and conservation efforts for the City.[11]

Independent management of these entities leads to operational redundancies, missed opportunities for water savings, and inflated costs for Los Angeles residents. However, with the current drought, new water regulations, and increased public awareness of California's water vulnerability, policy makers and the public are recognizing that these issues can no longer be addressed in isolation.

3.2 San Antonio

Prior to 1992, the water system in San Antonio looked quite similar to that of Los Angeles. Water was managed by three separate agencies: the city-owned water supply utility, the government department responsible for sewage collection and treatment, and an independent city agency created to develop a system for reuse of treated wastewater.

In May 1992, the refinancing of $365 million in water and wastewater bonds made consolidation of the three agencies into the San Antonio Water System (SAWS) possible. SAWS is a separate entity from the electric utility CPSE and is governed by the San Antonio Water System Board of Trustees (the Mayor and six members appointed by City Council). The Board of Trustees is responsible for overall policy and management of the system. The leadership team comprises the President/CEO, two senior vice presidents, and ten vice presidents whose goal is to maximize productivity and efficiency. Since the formation of SAWS, San Antonio has been recognized nationally for its novel conservation efforts and proactive water management planning. It is the only U.S. city to reuse all three wastewater treatment process byproducts.[12]

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[9] City of Los Angeles Sanitation website (www.lacitysan.org/general_info/about_us/service_summary.htm).
[10] Water Resources, Department of Public Works (dpw.lacounty.gov/landing/waterResources.cfm).
[11] LADWP website (www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water?_adf.ctrl-state=bnco2mpv8_163&_afrLoop=587745062990445).
[12] San Antonio Water System website (www.saws.org/who_we_are/).

3.3 Sacramento

Sacramento provides another example of a water system managed independently from the electric utility. The Department of Utilities provides all critical water services to Sacramento including wastewater and storm drainage. Rates for service are set by the Sacramento City Council, which is informed by input from a seven-citizen Utilities Rate Advisory Commission.

With all aspects of the water cycle under its management, the Department of Utilities is reportedly able to streamline and enhance conservation efforts, manage regulatory compliance without redundancies, protect water rights and quality without oversight, prevent contamination of local creeks and rivers, and maintain adequate financial reserves to provide financing for long-term infrastructure improvements.[13]

[13] City of Sacramento Utilities website (www.cityofsacramento.org/Utilities).

4. Future Approach for Los Angeles

The Los Angeles water agencies were recently brought together by local nonprofit TreePeople as part of the Greater LA Water Collaborative to build the case for a collaborative, systemic approach to address the region's short-term drought emergency and long-term water crisis.[14] By aligning the diverse water and related infrastructure agencies' goals, investments, and programs, the three organizations would ideally be able to achieve benefits including greener and more resilient neighborhoods, a more responsive government, and decreased costs to the public.

Phase One of the three phase project encourages the agencies to establish a whole water cycle collaboration that enables necessary horizontal coordination. The system would allow agency management to gain perspective of the entire system's functionality and resilience but would not detract from individual responsibilities or hierarchy.

The Greater LA Water Collaborative partners are now moving forward into the second phase of the project to develop a framework for increased collaboration and shared prioritization, decision-making, and management across the agencies. TreePeople recommends the Greater LA Water Collaborative partners take steps to achieve no less than a systemic collaboration approach to meet the City's water needs.

The benefits of a collaborative approach may be able to be further amplified by creating a single entity with the sole purpose of managing all aspects of the City's water, wastewater, stormwater, and flood protection services. However, this is a more dramatic step than suggested by previous work. It would require a large organizational and cultural change with significant impacts on the Water Organization. It would also require several City Charter changes, the full support of City leaders and Department management, and a larger process at the County level to include LACDPW. The ultimate design of an integrated water group demands a dedicated analysis of its own. Navigant recommends the City of Los Angeles initiate a study to provide this analysis.

[14] "Moving Towards Collaboration: A New Vision for Water Management in the Los Angeles Region," TreePeople (www.treepeople.org/sites/default/files/pdf/publications/Moving%20Towards%20Collaboration_e-version.pdf).

Volume VI

Security and Emergency Preparedness

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Security and Emergency Preparedness Report
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Security

Objectives & Approach

This report presents Navigant's findings on Security for the IEA Survey. Security at LADWP is critical to protecting Water and Power System infrastructure. Cyber and physical threats are pervasive in the world we live in and it is important for the Department to have the plans, processes and structure to ensure that threats and vulnerabilities are identified and mitigated. For the IEA Survey, Security includes:

- Critical Infrastructure Protection (CIP) Compliance: CIP Compliance is a North American Electric Reliability Corporation (NERC) requirement related to physical and cybersecurity. Navigant examined LADWP's CIP Compliance Program and the Department's transition from NERC CIP Version 3 to CIP Version 5 standards, including a review of the progress being made with current NERC CIP-014 (Physical Security Standard) implementation efforts.
- Cybersecurity: A cyber-risk assessment across the recognized primary domains of cybersecurity, modeled after the Cybersecurity Capability and Maturity Model (C2M2); and
- Physical Security: A physical security review to assess the abilities of the LADWP to deter, protect, detect, communicate, and coordinate in case there is a threat made or realized to the critical infrastructures of the LADWP. The review included visual inspections of certain critical facilities.

A summary of findings, including corporate policy and governance recommendations related to cyber and physical security, is provided at the conclusion of this report. Insights from interviews and document review complement these assessments.

CIP Compliance

The North American Electric Reliability Corporation (NERC) is an international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC's area of responsibility includes the United States, Canada, and the northern portion of Baja California, Mexico. As the electric reliability organization (ERO) for North America, NERC is subject to oversight from the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.

NERC develops and enforces reliability standards, monitors the bulk system through system awareness, and trains and certifies industry personnel. NERC's jurisdiction includes users, owners, and operators of the bulk power system.[1] Accordingly, LADWP must comply with NERC requirements. NERC Reliability Standards define the reliability requirements for planning and operating the North American bulk power system. The Reliability Standards focus on measurable performance, risk mitigation strategies, and entity capabilities.[2] One component of these NERC standards are the Critical Infrastructure

[1] NERC website (http://www.nerc.com/AboutNERC/Pages/default.aspx).
[2] NERC website (http://www.nerc.com/pa/Stand/Pages/default.aspx).

Protection (CIP) mandatory and enforceable standards, which address the cybersecurity, physical security, and operational security of the bulk electric system.[3]

While Version 3 of the CIP standards (CIP v3) is currently effective, FERC approved Version 5 (CIP v5) in November 2013. CIP v5 adopts new cybersecurity controls and extends the scope of the systems protected by the CIP v3 standard. CIP v5 will become mandatory and enforceable on April 1, 2016 for medium and high Bulk Electric Systems and Cyber Systems.[4] This version of the NERC CIP standard significantly increases the efforts that the Department needs to undertake to mitigate cyber risks to the bulk power system. Based on a brief overview of CIP Version 5 documentation and interviews with LADWP staff responsible for CIP compliance, Navigant found that the Department appears to have an adequately defined plan and timeline to comply with future NERC regulations. The CIP project team has a sufficient budget and is well-managed and comfortable with the milestones, deliverables, and products; however, senior leadership should be more engaged in the CIP Version 5 transition process as the deadline approaches to ensure CIP compliance risk is minimized.

Further, it is common practice that utilities such as LADWP work with regional representatives from NERC to further audit compliance plans, timelines, and supporting documentation. Accordingly, Navigant recommends that LADWP further engage with the Western Electricity Coordinating Council (WECC), LADWP's regional representative with delegated authority from NERC to monitor and enforce compliance.[5] Navigant further recommends that the Department participate in standard development bodies, NERC technical committees, and NERC national grid exercises.

Due to security restraints at the Department, access to CIP Version 5 policies, procedures, facility and BES Cyber System documentation was limited to two interviews with CIP compliance leadership. This restricted access was largely due to the preliminary status of LADWP's CIP Version 5 documentation. Consequently, Navigant only obtained a cursory review of the CIP Version 5 product and cannot opine on the detailed plans for CIP v5 compliance.

LADWP is similarly positioned to comply with CIP-014, the physical security standard. The purpose of CIP-014 is to identify and protect transmission stations, transmission substations, and their associated primary control centers from physical attack.[6] The CIP Compliance team at the Department is in the process of identifying the critical bulk power facilities and completing threat and vulnerability assessments for those facilities. The Department has a consulting firm assisting with these efforts and appears to be progressing towards compliance with the standard requirements.

Cybersecurity

Navigant conducted a maturity assessment of ten cyber domains and found that some of the Department's cybersecurity efforts lack documented policies and processes. According to interviews

[3] NERC website (http://www.nerc.com/pa/CI/Pages/default.aspx).

[4] The CIP v5 requirements applicable to low impact bulk electric system cyber systems will become enforceable on April 1, 2017. *See* "Cyber Security Reliability Standards CIP V5 Transition Guidance," NERC Compliance Operations, August 12, 2014 (www.nerc.com/pa/CI/Documents/V3-V5%20Transition%20Guidance%20FINAL.pdf).

[5] There are eight Regional Entities that monitor and enforce NERC compliance standards. FERC approved NERC's delegation of authority to the Regional Entities in 2007. Together, NERC and its Regional Entities are referred to as the Electric Reliability Organization (ERO) Enterprise. *See* "Improving Coordinated Operations across the ERO Enterprise," February 2014 (www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx).

[6] CIP-014-1 Standard (www.nerc.com/pa/Stand/Reliability%20Standards/CIP-014-1.pdf).

with LADWP staff, the Department is developing an Enterprise Cyber Security Plan that will identify key areas that need improvement and provide plans to address them. This document needs executive level support to ensure timely completion and consistent implementation throughout the Power, Water and Joint Services Systems.

Several major findings resulted from the cybersecurity maturity assessment, including insufficient executive level leadership and governance, resource constraints, a lack of formal policies, and limited communication among the Power, Water, and Joint Services Systems at the Department. Navigant found that the IT group within the Joint Services System is not able to quickly hire experienced, mid-level cybersecurity professionals, which limits the Department's ability to adapt and respond to the rapidly changing cybersecurity environment. Navigant also found that many cybersecurity processes are ad-hoc and inconsistent throughout the organization. For example, there are no policies, procedures, or risk register that clearly identify prioritized risks on an enterprise level. This ad-hoc approach to risk impacts the other cybersecurity domains such as threat and vulnerability management because without documented risk strategy and risk criteria, cybersecurity vulnerability assessments may not be analyzed and prioritized appropriately.

Moreover, there is little oversight from senior management and executive leadership due to the lack of formal processes and accountability. While this decentralized approach works for the management of certain Operations Technology (OT) assets, the Department is not able to appropriately prioritize cybersecurity issues on an enterprise level. Furthermore, LADWP is not able to track the completion of critical cybersecurity projects. Formalized security processes and increased communication between Power, Water and Joint Services Systems would ensure proper resource utilization, consistent implementation, and project completion for critical security needs.

Physical Security

The Physical Security group at the Department is restricted by a lack of authority and processes to ensure that security gaps are reported and resolved. Facility managers in the Water and Power Systems are not required to report physical security threats or vulnerabilities to the Physical Security group and they are ultimately responsible for financing and resolving these gaps. Accordingly, if security gaps are reported to Physical Security, the group does not have the authority to ensure that facility managers implement its physical security recommendations or the capital project budget to close critical security gaps at these facilities. This decentralized organizational structure and lack of formal business processes do not allow the Department to be proactive about physical security measures.

Physical Security has completed numerous assessment audits on LADWP facilities; however, according to staff interviews, the security recommendations included in these audits have not been addressed. Moreover, the facility managers do not provide any feedback or status updates back to Physical Security once these recommendations are provided. In addition to the assessment audits, Navigant reviewed a 2001 security assessment of critical Power and Water facilities that found numerous security gaps and provided recommendations to address these vulnerabilities. Similarly, interviews with Department personnel indicated that these recommendations were not implemented. Based on these findings, Navigant staff visited some of the Department's critical facilities. Navigant found that most of the security gaps in the 2001 assessment were not mitigated. Conversations with facility managers at these facilities confirmed that the lines of accountability to address security gaps are broken.

Further, the Security Planning component of Physical Security, which plans and manages physical security projects, has been moved around the Department in recent years. As a result, Physical Security does not have the capital budget, authority, or processes to ensure that physical security in the Power and Water Systems is prioritized. Navigant recommends that the Department create a clearly defined process to ensure that security gaps are addressed and communicated to Physical Security and senior management. The Physical Security group should have more oversight into the dispersion of security resources to ensure proper placement and project accountability.

Conclusions

Past assessments by LADWP security staff and the recent assessment conducted by Navigant have revealed a number of factors that limit the Department's ability to mitigate security threats and vulnerabilities, including a lack of formal cyber and physical security processes, limited risk assessments, constrained resources, and limited executive level support. While certain aspects of Security such as CIP Compliance and Water OT security are robust, security is not appropriately addressed on an enterprise level. Moreover, there is no formal executive governance structure to support cyber and physical security initiatives.

LADWP has the opportunity to address these issues and increase the reliability of the bulk electric system and the integrity of Los Angeles' water supply. Navigant recommends a behavioral and structural change from the top down to empower security personnel and to initiate a Department-wide shift towards proactive security measures. LADWP should create senior executive level positions for security and risk that report directly to the General Manager. A formal risk and security governance would provide the accountability needed to ensure that security processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing security vulnerabilities. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate threats and vulnerabilities. Both physical and cybersecurity personnel should have the appropriate budget and staff to support these changes. In addition to an empowered security staff, the Department should consider developing an updated Corporate Security Policy that identifies the processes necessary to communicate security vulnerabilities, mitigation efforts, and risk assessment on a corporate level.

In addition to the governance and corporate policy recommendations, a prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Develop a Corporate Security Plan that includes sound policies, programs, and project management for cyber and physical security on an enterprise level.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the Corporate Security Plan and other cyber and physical security initiatives.
- Complete the Enterprise Cyber Security Plan to identify and address weaknesses in the cybersecurity program.
- Identify risk criteria and develop a risk register to prioritize risk assessments on an enterprise level.
- Initiate 24x7 cybersecurity monitoring to provide a common operating picture of the cybersecurity environment in near real-time.
- Develop a formalized process to identify and mitigate physical security threats and vulnerabilities across Systems.
- Move Security Planning back to Physical Security to ensure that the group has project management resources.
- Provide Physical Security with a line budget to close critical security gaps.
- Improve the hiring process for experienced, mid-level staff in the cyber workforce.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs, including a complete Business Impact Analysis to appropriately prioritize processes and resources in the event of a major incident.

Medium Priority Recommendations

- Upgrade Central Monitoring System, the camera monitoring system used by Physical Security, to include a smart system.
- Develop the relationship with the Western Regional auditors to confirm the Department's interpretation of CIP Version 5.
- Increase participation in standard development bodies, NERC technical committees, and NERC GridEx.
- Create a formalized practice for information sharing that includes horizontal and vertical communication policies, processes, and capabilities to enable real-time sharing.
- Conduct cybersecurity exercises on a regular basis.
- Complete cybersecurity vulnerability assessments for all critical assets.
- Aggregate log data for cybersecurity assessments to identify patterns, trends, and common features.

Low Priority Recommendations

- Ensure that the credentials for employees align with their current position.
- Formalize the relationship between cybersecurity requirements and supplier contracts.

Emergency Preparedness

Objectives & Approach

This report presents Navigant's findings on Emergency Preparedness for the IEA Survey. Comprehensive emergency preparedness is central to any utility's strategic and operational planning, as natural and man-made threats can significantly disrupt normal operations. As a municipal utility, the Department has a unique accountability for ensuring the design, implementation, testing, and continuous improvement of emergency preparedness programs. Indeed, such plans are critical for ensuring that the Department can achieve its Mission to provide "clean, reliable water and power in a safe, environmentally responsible and cost-effective manner with excellent customer service."

This report is a strategic and operational assessment of both the emergency response and business continuity stance of the LADWP. Emergency Preparedness and Business Continuity are closely related disciplines, which in combination provide a comprehensive framework for responding to a "worst-case disruption."

Navigant reviewed the organizational structures, accountabilities, policies, and business practices adopted by the Department to complete this report. We also conducted interviews with Department staff to gain further insight into the current and proposed emergency and continuity practices. The goal of this assessment is to identify and recommend opportunities for improving the Emergency Preparedness

and Business Continuity disciplines at the Department. For the IEA Survey, Emergency Preparedness and Business Continuity include:

- Emergency Preparedness and Business Continuity Overview: An introduction to the disciplines of Emergency Preparedness and Business Continuity.
- Emergency Preparedness and Business Continuity in Utilities: A description of common practices adopted by utilities.
- Standards in Emergency Preparedness and Business Continuity: An overview of the various standards that influence these disciplines.
- Emergency Preparedness and Business Continuity at the Department: An assessment of the current and proposed policies and practices at LADWP.

A summary of findings and recommendations is provided at the conclusion of this report.

Emergency Preparedness and Business Continuity Overview

Emergency Preparedness is defined as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response. Emergency Preparedness is directly related to other business disciplines, including most notably Business Continuity Management (BCM) and Disaster Recovery (DR). BCM is a holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause. This process provides a framework for building organizational resilience that safeguards the interests of the organization's key stakeholders, reputation, brand, and value-creating activities. DR is the collection of policies, plans, and actions to recover system applications and infrastructure in a tiered approach, whereby technology priorities are identified (software and hardware) to facilitate the continuation and recovery of key business processes. DR is often considered the technical aspect of business continuity.

As mentioned above, BCM is a forward-looking and holistic approach to building organizational resiliency. It is a coordinated and integrated approach that spans the entire company and all of its operations. Central to BCM is the Business Impact Analysis (BIA). A BIA identifies the critical business processes that are most affected by a worst-case disruption, and helps prioritize recovery strategies for an extended business disruption. It is important to note that the core principles of BCM – including the derivation of a BIA or DR plan – are standard in the utility industry. Despite this, the Department does not have a BCM program and has never completed a BIA.

Emergency Preparedness and Business Continuity in Utilities

Increasingly, utilities are being scrutinized for their response to emergencies and disasters that significantly disrupt normal operations. While focus and attention is often given to the potential impact of natural disasters, other scenarios that require planning and response include acts of terrorism, sabotage, cyberattacks, or other similar events. A variety of stakeholders – including regulators, customers, and community leaders – have focused more and more attention on the planning and recovery from all types of emergency and disaster. In light of this, utilities are designing and implementing programs to actively assess situations and respond with the execution of specific protocols to restore critical services in a phased and prioritized manner, based on a standard risk assessment.

These efforts are of great importance to investor-owned and municipal utilities alike. Erosion to the reputation of (and trust in) a utility due to an inadequate response to an emergency or disaster event can have long-term implications. Evidence confirms that overcoming a significant reputational risk event requires the dedication of significant resources (time and capital) often over a long period of time, and diverts attention away from other activities that advance the strategic plans of the company.

Standards in Emergency Preparedness and Business Continuity

A variety of standards define standard and leading practice in the Emergency Preparedness and Business Continuity disciplines in the energy and utility sector.

Federal Regulatory Standards

Principal among the federal standards is Continuity of Operations (COOP) planning. The Department has developed and implemented a COOP policy and plan. Additional relevant standards are established by the Federal Energy Regulatory Commission (FERC), North American Electric Reliability Corporation (NERC), and the Federal Emergency Management Agency (FEMA).

California Rules and Regulations

Although the California Public Utilities Commission (CPUC) mandates do not apply to the Department, it acknowledges and references these mandates when designing emergency response plans. Additional requirements from the California government code also influence LADWP planning efforts.

Municipal Requirements

The Department is required to support the City Emergency Management Department (EMD) and Emergency Operations Center (EOC) in the event of a significant regional emergency or disaster. These requirements are reflected in specific Mayoral Executive Directives.

Other Standards

Practices established by the International Organization for Standardization (ISO) and industry oversight groups (American Water Works Association (AWWA), Edison Electric Institute (EEI)) further inform the discipline of emergency preparedness and business continuity.

Peer Practices

In addition to regulatory requirements, emergency preparedness and business continuity planning is defined by utility sector peer practices. Our report broadly identifies a series of common attributes of emergency preparedness and business continuity programs. The Department's programs are out of sync with these common practices in areas such as clear accountabilities, design and roll-out of a BCM program, active training and testing programs, alignment between BCM and DR plans, and clear governance over program leadership.

Emergency Preparedness and Business Continuity at the Department

The following are key characteristics of the emergency and continuity programs at the Department.

Organization

- Office of Emergency Management (OEM): Emergency Preparedness at the Department is loosely coordinated by the Office of Emergency Management (OEM). However, significant

accountability for plan development, improvement, testing, and training resides in the Systems and Divisions.

- System Leads: At present, the Department does not have comparable leadership roles in the Water and Power Systems. While the Water System has identified a resiliency lead, the Power System has not.
- Resilience and Sustainability Programs: The Water and Power Systems do not share a common approach to preparedness or continuity.

Continuity of Operations Plan

The Department's plan aligns with the required phases of COOP as outlined by FEMA. However, the plan does not seem to be actively embraced by the Department. According to the plan, a COOP Program Manager (OEM) will review and update the COOP, ensure that COOP testing, training, and exercising is conducted, and define short and long-term COOP goals and objectives. The plan also states that all employees will be trained on COOP activation procedures at least once a year. However, Navigant found that employees have not been trained on the COOP in recent years. Navigant recommends that the Department train and exercise this plan to inform employees of the processes in place to maintain operations after an event and to ensure that the mission essential recovery times are appropriate and achievable. As discussed in further detail in the *Security* portion of the IEA Survey, Navigant also recommends that LADWP further develop its risk assessment processes and procedures to support the relocation decisions and timelines associated with the COOP. The Department should also consider developing disaster-specific business continuity plans for earthquakes and other major events because priorities and timelines can change depending on the type of emergency.

Emergency Plans

The Department has also created Emergency Response Plans (ERP) in accordance with the Mayoral Executive Directives. We believe the frequency of plan review, level of rigor and plan detail, frequency of training, and frequency, method, and rigor of testing need to be addressed. For example, the ERPs briefly discuss the Department's efforts to prepare for and mitigate the effects of specific threats and hazards likely to occur in Los Angeles; however, the documents lack detailed plans to fully prepare for these threats. Disaster-specific plans for these events would help the Department proactively prepare for these events beyond broad goals and mitigation plans.

Navigant also found that only nine employees attended the annual EMD emergency management workshop. According to Department personnel, attendance is limited to executive staff and OEM that receive an invitation from the EMD. Navigant recommends that LADWP conduct an internal Emergency Workshop to disseminate information gathered at the EMD Workshop as well as additional information that fosters emergency preparedness. Participants in the internal Emergency Workshop could include a combination of OEM, executives, and middle management that are rotated on an annual basis. In addition, 31 Department employees attended the EOC functional exercise, which was a two-hour exercise directed to the Power System. Based on this participation and scope, the effectiveness of the EOC exercise was limited. Department personnel also indicated that although the ERPs call for annual testing, the plans are not tested every year. The Department should increase the participation and frequency of emergency exercises to ensure that substantial staff in the Power, Water, and Joint Systems is involved and aware of the existing plans and procedures.

Crisis Communication Plan

The plan clearly identifies the communication processes and resources that should be used in an emergency situation. Moreover, the plan includes multiple scenarios and levels of communication that can be applied to a wide range of emergency situations, which aligns with best practice.

Mutual Aid Assistance

The Department has established mutual aid agreements with multiple regional organizations and utility peers. This reflects a best practice standard.

Business Impact Analysis

The Department does not have a BCM program defined by a rigorous BIA or set of DR plans. These facets of organizational resiliency are commonplace for utilities and other organizations across all sectors. Consequently, the Department is behind the rest of the industry in this area.

Conclusions

The Department has many of the policy frameworks that help define an emergency preparedness program. These include the COOP, ERP, and Crisis Communication Plans. However, features of rigorous programs – including evidence of routine and diverse testing, adherence to training requirements and schedules, clear accountability for plan design, development, and continuous improvement – are lacking at the Department. In addition, there is a lack of cohesion amongst the various emergency preparedness plans. While each document appears to define certain processes, resources, and strategies, it is unclear how these plans interact. Inadequate emergency preparedness can have significant impacts on operations as well as the health and safety of the employees and customers due to insufficient mitigation efforts, delayed responses and unorganized recovery.

OEM should create a strategic plan that identifies the emergency preparedness efforts that exist and the direction that the OEM will take to improve these efforts. A strategic plan would also establish timelines to complete OEM initiatives such as training employees and exercising and updating plans.

Leadership for these and other facets of good planning have been decentralized and pushed into the Water and Power Systems, which has resulted in distinct approaches for building organizational resiliency. Importantly, accountability for emergency and business continuity planning is also dispersed, and in many instances, is one of many responsibilities for an already burdened staff. These and other foundational aspects of good planning must be addressed to strengthen the emergency and continuity programs.

As discussed in further detail in the *Security* report for the IEA Survey, LADWP should create senior executive level positions for security and risk that report directly to the General Manager. In addition to the tasks outlined in the *Security* report, a formal risk and security governance would provide the accountability needed to ensure that emergency plans and processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing disruptions of service. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate natural and man-made threats.

In addition, the ERPs and COOP should address disaster resilience. While we understand that the ERPs are based on a template provided by the City of Los Angeles EMD, the Department's emergency

preparedness documents are overly broad and do not address the gradation of responses from a single pipe break to a worst-case scenario. Moreover, the ERPs should incorporate known vulnerabilities into disaster-specific response planning.

A prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department.

High Priority Recommendations

- Dedicate resources to completing an OEM Strategic Plan to define major initiatives for 2016, including the staffing and capital resource requirements to design, execute, manage and monitor programs.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the plans related to emergency preparedness and business continuity as well as other emergency preparedness and disaster resiliency initiatives.
- Clarify the emergency preparedness and business continuity governance structure, roles, and responsibilities between the OEM and the Water and Power Systems for core aspects of program design, execution, and decision-making.
- Finalize the BCM and BIA RFP.
- Execute the BCM and BIA scope of work.
- Confirm a consistent approach to plan development across Systems.
- Establish a role in the Power System to address resiliency and emergency preparedness efforts.
- Expand and enforce emergency training and exercises.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Re-evaluate and conduct training programs in line with policies and good business practice.
- Define a rigorous testing plan for the programs, including a phased approach to tabletop and scenario tests (announced and unannounced), and testing of the "Hot Sites."

Low Priority Recommendations

- Review and standardize other aspects of the emergency preparedness programs (including templates and forms of documentation).
- Confirm performance reporting protocols to the General Manager and other members of executive management.
- Integrate emergency preparedness and business continuity programs into Department benchmarking initiatives.

NAVIGANT

1. Introduction

1.1 Study Objectives

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort. This report presents Navigant's findings on Security and Emergency Preparedness.

The Power, Water, and Joint Services Systems of LADWP are operating in a different environment than when the original systems were designed and built, let alone post 9-11. Cyber and physical threats to the bulk electric system and water systems are very real as witnessed across the United States and abroad. Daily cyber and physical attacks are perpetrated on critical infrastructures, our industries with proprietary secrets, and our citizenry.

Cyber vulnerabilities are aggressively pursued and exploited by hackers, political activists, rogue nations and even recognized "civil" nation states. Industrial secrets and personally identifiable information are actively sought, and critical infrastructure, EMS/SCADA and corporate networks are targeted as well. Unfortunately, cyber is the new existential threat and is currently the domain of choice in causing disruptions, espionage, and economical and reputational harm.

For physical threats, recent events are worth noting – the Improvised Explosive Device attack on the Boston Marathon runners (soft targets), Pacific Gas & Electric's (PG&E) Metcalf substation sabotage attack, and insider threat or lone wolf attacks as demonstrated in the Fort Hood and Aurora shootings. These threat scenarios are evidence that what was unheard of or unthought-of is now occurring with greater regularity in the United States.

Fortunately, government leaders and industry executives are taking action to protect and safeguard our critical infrastructures and our people. Government agencies, departments and facilities are acting, reacting, and attempting to protect critical facilities and systems. These infrastructures are operating at various security maturity levels and applying the latest "best practices" of both cyber and physical security.

As part of the 2015 IEA Survey, Navigant was asked by the City of Los Angeles to assess the physical and cybersecurity of the Department. Navigant worked closely with LADWP personnel to understand how the Department pursues its security efforts and to determine if opportunities exist to strengthen the organization and reduce risk. Navigant also benchmarked the security findings against industry best practice to provide a set of security recommendations that could improve the Department's overall security posture.

Emergency Preparedness and related programs are also a central focus of all utilities. A number of significant events over the last two decades have served to emphasize the importance of designing, implementing, and testing strategies and tactics to ensure effective and efficient response to potentially disruptive events. Clear, comprehensive, and well-communicated policies and plans in response to large scale storms and other natural disasters, civil unrest, major equipment failures, or other emergency events are central to any utility's objective of providing safe and reliable service to customers. Navigant's findings and recommendations are summarized below.

1.2 Approach

Information for the Security report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;
- Sensitive material retained in a data room;
- Interviews with Department personnel, including the Chief Information Officer, Chief Information Security Officer, and senior level staff within Physical Security, CIP Compliance, and Cybersecurity;
- A limited Cybersecurity Capability Maturity Model (C2M2) assessment;
- A literature review of California regulation, common approaches to emergency preparedness and business continuity, and peer utility publications on relevant Emergency Preparedness topics;
- A tour of the Central Monitoring Station; and
- Physical Security spot checks at recognized critical facilities.

Navigant conducted interviews with leadership and subject matter experts that manage many of the compliance and security programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

1.3 Report Organization

The report comprises the following chapters:

- CIP Compliance: CIP Compliance is a North American Electric Reliability Corporation (NERC) requirement related to physical and cybersecurity. Navigant examined LADWP's CIP Compliance Program and the Department's transition from NERC CIP Version 3 to CIP Version 5 standards, including the processes, schedule, budget, and tools being used. Navigant also reviewed the progress being made with current NERC CIP-014 (Physical Security Standard) implementation efforts.
- Cybersecurity: An evaluation of the current cybersecurity policies, plans, and processes. Gaps are identified and recommendations are made.
- Physical Security: An evaluation of the current physical security policies and processes as well as an assessment of the physical security at certain critical facilities.

- Security Conclusions: A summary of findings, including corporate policy and governance recommendations related to cyber and physical security.
- Emergency Preparedness and Business Continuity Overview: An introduction to the disciplines of Emergency Preparedness and Business Continuity.
- Emergency Preparedness and Business Continuity in Utilities: A description of common practices adopted by utilities.
- Standards in Emergency Preparedness and Business Continuity: An overview of the various standards that influence these disciplines.
- Emergency Preparedness and Business Continuity at the Department: An assessment of LADWP's current preparedness stance, including the Department's governance, policies, processes, and testing programs, with specific attention given to response plans and assumptions for restoration of service to normal service levels, given a "worst case disruption."
- Emergency Preparedness Conclusions: A summary of findings related to emergency preparedness.

2. CIP Compliance

The North American Electric Reliability Corporation (NERC) is an international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC's area of responsibility includes the United States, Canada, and the northern portion of Baja California, Mexico. As the electric reliability organization (ERO) for North America, NERC is subject to oversight from the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.

NERC develops and enforces Reliability Standards, monitors the bulk system through system awareness, and trains and certifies industry personnel. NERC's jurisdiction includes users, owners, and operators of the bulk power system.[7] Accordingly, LADWP must comply with NERC requirements. NERC Reliability Standards define the reliability requirements for planning and operating the North American bulk power system. The Reliability Standards focus on measurable performance, risk mitigation strategies, and entity capabilities.[8] One component of these NERC standards are the Critical Infrastructure Protection (CIP) mandatory and enforceable standards, which address the cybersecurity, physical security, and operational security of the bulk electric system.[9] LADWP appears to be actively pursuing compliance with the NERC CIP mandatory and enforceable standards.

2.1 CIP Version 5

In November 2013, FERC approved Version 5 of the CIP cybersecurity standards (CIP v5). CIP v5 adopts new cybersecurity controls and extends the scope of the systems protected by Version 3 of the CIP standard (CIP v3), which is the currently effective CIP standard. These standards significantly increase efforts to mitigate cyber risks to the bulk power system, and will become mandatory and enforceable on April 1, 2016 for high and medium Bulk Electric Systems and Cyber Systems.

2.1.1 Cybersecurity Compliance

The Department is currently using a detailed project plan with self-imposed milestones and timelines to transition from CIP v3 standards to CIP v5 cyber standards. The LADWP CIP compliance staff is supported through an internal matrix organizational team of subject matter experts and a hired NERC CIP consultant. The CIP team appears to be effectively driving a schedule to meet the April 1, 2016 deadline for CIP v5.

The LADWP NERC CIP cyber project team seems to embrace what the industry refers to as a "Culture of Compliance." Leadership at the implementation level is strong, competent, and dedicated to the many tasks that drive the transition from CIP v3 to v5. During senior level interviews, leadership seemed comfortable with the processes, timelines, resources, and budget in place for CIP compliance measures. Executive level support is reflected in the sufficient budget, but oversight is not apparent at the highest levels. It is clear that the technical details and CIP status are managed at the project manager level. As the CIP v5 deadline approaches, executive leadership should be more engaged in the CIP v5 transition process to ensure CIP Compliance risk is minimized.

[7] NERC website (http://www.nerc.com/AboutNERC/Pages/default.aspx).
[8] NERC website (http://www.nerc.com/pa/Stand/Pages/default.aspx).
[9] NERC website (http://www.nerc.com/pa/CI/Pages/default.aspx).

As mentioned above, the transition project appears well managed and organized at the project manager level. Specifically, LADWP NERC CIP compliance program personnel are following sound project plans that include the tracking of hundreds of milestones, deliverables, and products. These project plans were reviewed by Navigant staff at a high level and must hold up to rigorous auditing.

According to interviews, LADWP will transition to using Sigma Flow, a recognized off-the-shelf compliance management tool, in the near future. The program will enable the Department to systematically track compliance with cyber requirements and to produce the required audit trail paperwork. This pursuit is commendable and indicates that LADWP NERC CIP compliance is leveraging an industry best practice that will assist in avoiding non-compliance costs which can amount to one million dollars per day per infraction of a NERC CIP standard.

While the CIP program at the Department appears to be cohesive, and due diligence seems to be applied by key people driving the project, the NERC standards and requirements are complicated, new, and have not been explicitly defined by federal regulators. Therefore, there are opportunities for errors in the interpretation and execution of the standards. Given that these standards are new and evolving, leading practitioners are working with their regional and national-level NERC regulators to ensure the appropriate compliance measure are being taken. Accordingly, Navigant recommends that the LADWP compliance team work with its auditors from the Western Electricity Coordinating Council (WECC) during this transition period to confirm that the Department's interpretations meet the standard. WECC is LADWP's Regional Entity with delegated authority from NERC to monitor and enforce compliance.[10] This relationship development with regional auditors is a best practice and will build trust between regional auditors and the Department and limit potential violations (PVs) due to compliance misunderstandings in the future. Over the last four years, LADWP was found to have 4 CIP PVs that cost the City $65,000. Future fines could be significantly more costly if the regulators pursued the full extent of their penalty capability.

Other cybersecurity best practices include collaboration, engagement, and information sharing on a regional and national level. According to interviews with Department personnel, LADWP occasionally attends NERC or WECC CIP compliance workshops; however, the Department does not fully participate in standards development bodies, NERC technical committees, NERC national grid exercises, or NERC provided security conferences. While attending workshops is a good starting point, it does not establish the Department's proficiency or leadership in the compliance arena. This lack of participation and information sharing is a maturity indicator reflecting an area that LADWP could improve in.

For example, Department personnel stated that the annual NERC exercise requirement is met through an internal exercise every October rather than the November biennial national level NERC BES Grid Exercise (GridEx). Given these exercises occur in the same time frame and the national level exercise is free, Navigant recommends that LADWP participate in the nationally recognized NERC cyber and physical security exercise. GridEx would allow the Department to connect with the Electric Subsector Information Sharing (ES-ISAC), the National Communications and Coordination Intelligence Center (NCCIC), local and federal law enforcement, and regional partners such as its reliability coordinator and

[10] There are eight Regional Entities that monitor and enforce NERC compliance standards. FERC approved NERC's delegation of authority to the Regional Entities in 2007. Together, NERC and its Regional Entities are referred to as the Electric Reliability Organization (ERO) Enterprise. *See* "Improving Coordinated Operations across the ERO Enterprise," February 2014 (http://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx).

balancing authority. The exercise would be customized to LADWP's resources, policies and procedures and would strengthen the cyber and physical security programs of the Department.

Due to security restraints at the Department, access to CIP v5 policies, procedures, facility and BES Cyber System documentation was limited to two interviews with CIP compliance leadership. This restricted access was largely due to the preliminary status of LADWP's CIP Version 5 documentation. Consequently, Navigant only obtained a cursory review of the CIP v5 product and there may be moderate compliance risk to LADWP in areas that were not fully investigated.

2.1.2 Physical Security – CIP-014 Compliance

The Department is positioned to achieve compliance with CIP-014, the physical security standard. The CIP Compliance team is working to identify LADWP's bulk power critical facilities, to undertake a threat and vulnerability assessment for those facilities, and to determine an associated security plan to protect and leverage resiliency measures as required by the standard.

Currently, the Department is undergoing the CIP-014 transmission analysis and third party review by Worley Parson and Auriga. Once complete, the Department will use a consulting firm to conduct threat and vulnerability assessments on in-scope substations and primary control centers. The Department will use the same firm to write its physical security response plans and perform third party reviews. Navigant staff was briefed on the Department's early projection of assets that would possibly be in scope, but we have not interviewed the consulting firm engaged by the Department or discussed the methodology used by the Department for the threat and vulnerability assessments.

3. Cybersecurity

In addition to the CIP Compliance group in the Power System, cybersecurity has several additional components at the Department. Enterprise cybersecurity is managed in the Joint Services System and OT security is also managed by personnel in the Water and Power Systems.

Navigant identified several significant findings through its assessment of the Department's cybersecurity programs. It is clear that there is limited communication between the cybersecurity programs in the Water, Power, and Joint Services Systems and there is no uniformity to the cybersecurity policies across Systems. According to interviews with LADWP staff, the Department is developing an Enterprise Cyber Security Plan. The completion and implementation of this document and its supporting policies is critical to cohesively and effectively responding to security issues at the Department.

3.1 Cybersecurity Capability Maturity Model (C2M2)

Navigant evaluated the maturity of the Department's cybersecurity programs through an informal assessment that leverages the Cybersecurity Capability Maturity Model (C2M2). The model was developed in May 2012 by the Department of Energy, in partnership with the Department of Homeland Security and directed by the White House Cybersecurity Czar, to facilitate self-evaluations of cybersecurity programs. The C2M2 assesses the maturity level of 10 benchmarked cyber domains including:

- Risk Management
- Asset, Change, and Configuration Management
- Identity and Access Management
- Threat and Vulnerability Management
- Situational Awareness
- Information Sharing and Communications
- Event and Incident Response, Continuity of Operations
- Supply Chain and External Dependencies Management
- Workforce Management
- Cybersecurity Program Management

Navigant used the C2M2 model to evaluate and benchmark LADWP's cybersecurity capabilities within time constraints imposed by this engagement. Department staff that are subject matter experts in the cybersecurity of the Power, Water, and Joint Services Systems participated in the workshop. Navigant's findings are summarized below.

3.1.1 Major Findings

Several major findings were identified through the cybersecurity maturity assessment:

- Insufficient executive level leadership and governance;
- A limiting resource structure, support apparatus and Human Resource policies;
- A lack of an adaptable enterprise cyber security strategy with formal supporting policies and internal control policing; and

- Limited communication among the Power, Water, and Joint Services Systems at the Department.

According to cybersecurity personnel, LADWP is developing an Enterprise Cyber Security Plan that identifies key areas that need improvement and provides plans to address them. The strategic plan will align with ISO 27001, an international standard that provides requirements for an information security management system. This document will help the Department address some of the findings described below, but it needs the full support of executive leadership to ensure timely completion and implementation.

3.1.1.1 Resource Constraints

Staffing resources appear to be severely limited and restrictive across all of the cyber domain practices. In general, there is a lack of full-time employee positions to support cybersecurity. In addition, the Power and Joint Services Systems are challenged to hire experienced, mid-level cyber professionals in an expedited fashion. This is a significant limit that LADWP and the City of LA need to examine to allow for the expedited hiring of mid-level cyber professionals.

Within the current hiring structure, new IT employees typically start at entry level positions and require intensive training. The Department provides sufficient budget and training for these new employees; however, retention within IT group is not guaranteed because promotions are not necessarily within the group that the employee has been trained for. As a result, it takes years to build the mid-level LADWP cyber workforce. This lag will become more problematic as the number of employees seeking retirement increases. Additionally, if senior management needs to quickly fill a cyber-position, they are further restricted by having to hire from a specific job class. There is also little flexibility in hiring or contracting additional personnel for special skill sets. Overall, with critical security issues at stake, workforce hiring policies, promotion policies, and the filling of critical positions must be flexible.

In contrast, substantial effort has been given to leveraging new technologies within the IT group in Joint Services. LADWP is in the process of implementing several systems that will increase security surrounding access management, privileged accounts, and data logging. While the Department is making technological strides, Navigant recommends that IT take advantage of these systems beyond their core functionality. Sufficient training should also be provided on these systems to ensure smooth implementation.

Navigant also found that the Department lacks a continuous monitoring system for cybersecurity. This effort would require additional resources, but it is critical to a mature cybersecurity system. The Network Operations Center (NOC) should have 24x7 monitoring capability to efficiently track and respond to cybersecurity issues and to communicate directly to both the Power and Water operations centers. This would ensure frequent coordination between cyber security professionals and those operating the power grid and water facilities. Moreover, an enterprise-wide common cyber operating picture would improve resource efficiency and cyber security effectiveness for the entire Department. Awareness and immediate responsiveness are key to mitigating cyber harms to the operating enterprise.

3.1.1.2 Cybersecurity Processes

LADWP has a 2006 Security Plan that broadly identifies security policies, organizational structures, and system requirements; however, the cybersecurity component of this plan is limited and outdated. While the Department is moving in the right direction with the development of a cybersecurity program

strategy, Navigant found that many processes surrounding cybersecurity are ad-hoc and there is a lack of consistency throughout the organization. This finding was voiced and noted consistently throughout the C2M2 discussion. Additionally, there are limited methods and resources for monitoring, tracking and ensuring that policies and procedures are being carried out throughout the organization. As a result, it is difficult for senior security staff to review cybersecurity management activities to ensure conformance with policy. In addition to developing formalized processes, policies, standards and guidelines, Navigant recommends that LADWP regularly monitor and report day to day cybersecurity efforts. The Department should consider summarizing these results in security metrics and key performance indicators.

3.1.1.3 Cybersecurity Communication across Systems

The cybersecurity of the Water System is completely isolated from the rest of the Department Systems. In some ways, this decentralized approach seems to work well for the Water System because it has a relatively small pool of personnel that require access to its system. Accordingly, the Water System has a white list (i.e. a pre-approved list of permissible resources) to control access, an expedited access control process, a hardening process for its remote access laptops, and a clear understanding of the scale and scope of its OT assets. All of these efforts are considered best practice within the industry.

However, security within the Water System is primarily focused on OT and there is limited IT corporate visibility into its security processes, which limits the effectiveness of enterprise IT policies and security prioritization. Further, the lack of communication between the Systems does not provide executive leadership with the appropriate information to make sound strategic plans. Navigant recommends that LADWP develop additional internal controls across the organization.

In contrast, Navigant found that the Power System and IT communicate regularly especially for CIP compliance. LADWP's CIP documentation and processes are well known and accepted throughout the Department. Furthermore, the Department appends its corporate IT policies with the policies associated with CIP and the Power System. This cohesiveness provides a baseline for a comprehensive set of policies; however, the Power System should continue to develop documentation for cybersecurity processes that is separate from CIP compliance.

Cybersecurity policies and strategies should be driven by leadership at the executive level. Based on conversations with LADWP personnel, cybersecurity is constrained by a lack of forward leaning leadership, initiative and support from executive governance. Additional governance recommendations based on these findings are summarized in Section 5.

3.1.2 Findings by Cyber Domain

3.1.2.1 Risk Management

The Department lacks a mature risk management program. Navigant found that IT is starting to implement periodic risk assessments and application testing, but risk management is largely driven by compliance. There are no policies, procedures, or risk register that clearly identify prioritized risks on an enterprise level. As discussed above, the Water System appears to assess OT risk for system changes and investment choices. It also has a documented risk strategy that outlines the processes to create operational awareness for its small user pool. However, the other Systems have little visibility into these processes and communication surrounding cybersecurity does not extend beyond the Water System. In

contrast, Navigant found that the Power System has limited risk policies outside of CIP compliance, but that these compliance policies often spread into non-CIP areas.

Enterprise risk assessment across Systems is critical to a mature cybersecurity program. According to interviews, all of the Systems identify cybersecurity risks, at least in an ad hoc manner, but there is no formal structure to ensure that the identified risks are mitigated. Further, IT has an incident response committee but identified risks are not prioritized or documented in a formal process. This ad-hoc approach to risk impacts the other cybersecurity domains such as threat and vulnerability management because without documented risk criteria and risk strategy, cybersecurity vulnerability assessments may not be analyzed and prioritized appropriately. Navigant recommends that the Department develop a risk management strategy that includes processes for a formal risk register to identify, prioritize, monitor, and expeditiously mitigate enterprise risk.

3.1.2.2 Asset, Change, and Configuration Management

The Power and Water Systems have inventories of OT assets that include attributes to support cybersecurity efforts. The IT group within Joint Services has an inventory of IT assets throughout the Systems, but it is not fully implemented and attributes are still being populated and automated. Changes to inventoried assets appear to be evaluated, logged, and tested prior to deployment. While Power and IT have change management processes that address the full life cycle of the assets, the Water System does not have any processes to monitor these changes after deployment. Overall, Navigant found that this cyber domain is relatively mature because the Department seems to have documented practices for asset inventory, configuration, and change management activities that are followed and reviewed periodically.

3.1.2.3 Identity and Access Management

Identity management is largely implemented; however, there are some processes that need further development. Identities for personnel and other entities are provided and revoked in a timely manner, but credentials are not periodically reviewed. For example, if an employee moves into a different group, IT may not be notified to ensure that their credentials align with their current position. The Department is also developing organizational risk criteria to inform credential requirements. According to interviews, this process will be implemented this year.

Navigant found that the access management processes appear to be mature and well-documented. The Department's access controls are granted based on requirements and access requests are reviewed and approved by the asset owner. Moreover, some systems have access control down to the job description. While monitoring is ad-hoc, anomalous access attempts are monitored and additional technology is being leveraged to improve access control for privileged accounts.

3.1.2.4 Threat and Vulnerability Management

The Department uses information sources (e.g. MS-ISAC, ES-ISAC, the Water –ISAC, ICS-CERT, Los Angeles CICC, federal briefings) to help identify threats and vulnerabilities. LADWP also communicates with internal and external coordinators when addressing a threat or vulnerability. Based on these communications, threat profiles are established; however, they are not formally documented or validated. Further, threats are prioritized and addressed in an ad-hoc manner.

Cybersecurity vulnerability assessments are conducted regularly for certain assets and internal cybersecurity exercises are held periodically. As mentioned above, the lack of a risk criteria and a risk register inhibits the Department's ability to analyze and mitigate vulnerabilities. Navigant recommends that cybersecurity vulnerability assessments be completed for all critical assets and that formalized procedures be documented to guide threat and vulnerability management activities.

3.1.2.5 Situational Awareness

While the Department logs data for its critical corporate infrastructure components, more formalized logging requirements should be implemented. IT is working to aggregate log data and to extend the amount of log history that is maintained. This aggregation will support cybersecurity assessments as well as other business and security processes.

Similarly, monitoring cybersecurity on an enterprise level is performed in an ad-hoc manner. Monitoring and analysis requirements have not been formally defined, and indicators of anomalous activity are not clearly identified. While the LADWP network has a dynamic alert system with automated notifications for anomalous activity, the NOC does not have methods of aggregating data and communicating the current state of cybersecurity. Navigant recommends that the Department have cybersecurity personnel monitor the network 24x7 to provide updates on the operational state of cybersecurity (i.e., a common operating picture) in near-real-time. LADWP personnel have expressed a desire to implement this best practice.

3.1.2.6 Information Sharing and Communications

The Department does not appear to have a documented practice for information-sharing beyond the minimum required to demonstrate compliance with the CIP requirements. Accordingly, information-sharing requirements are undefined and cybersecurity reporting obligations are generally assigned to personnel but accountability is limited. Navigant recommends that documented practices be established and followed for information-sharing activities, including how to address protected, sensitive, and classified information. Navigant further recommends that the Department introduce horizontal and vertical communication policies, processes and capabilities to enable real-time sharing of potential breaches, threats, and vulnerabilities. This information sharing maturity is needed and could be met through a 24X7 LADWP NOC or, at a minimum, with a cyber-watch person.

3.1.2.7 Event and Incident Response, Continuity of Operations

According to LADWP personnel, the Department has incident response plans to address cybersecurity events. The plans identify incident response personnel, reporting mechanisms, and incident life cycle procedures. LADWP also has a well-established relationship with law enforcement and other government entities (e.g. MS-ISAC, ES-ISAC, Los Angeles CICC) to support incident response efforts. The Department conducts annual internal exercises for CIP compliance, but other joint and internal cybersecurity exercises are not conducted on a regular basis. As discussed above, the Department should establish risk criteria, threat profiles, and improved information sharing practices to adjust cybersecurity event response efforts and to identify patterns, trends, and common features.

While some system applications have recovery plans, continuity plans at LADWP are ad-hoc. The Department does not have a corporate continuity plan to guide continuity of operations activities. Furthermore, the Department does not have business impact analyses to support the ad-hoc continuity

plans. These plans and analyses are critical to the security of the Department. The *Emergency Preparedness* section of this report provides greater detail on best practices for incident response and business continuity.

3.1.2.8 Supply Chain and External Dependencies Management

LADWP has a central supply chain services organization. For IT related equipment, the Department has a change management review process that includes a bid or Request for Proposal process depending on the item procured. IT does not have rigorous supply chain controls on the sourcing of materials that go into its devices. Given the current federal-level discussions around supply chain issues, mandatory and enforceable supply chain requirements are likely in the near future. Accordingly, Navigant recommends that the Department formalize the relationship between cybersecurity requirements and supplier contracts.

3.1.2.9 Workforce Management

Cybersecurity responsibilities at the Department are identified, assigned, and documented; however, the cybersecurity team is constrained for resources and many employees have multiple roles and responsibilities. According to interviews with staff, the hiring process at LADWP is difficult and lengthy. Specifically, hiring experienced, mid-level cyber staff is a challenge due to extensive processes, stringent recruitment requirements, and policy constraints such as hiring within job classifications and identifying qualified pools of applicants. For example, if senior management needs to quickly fill a cyber-position, they cannot always hire the most experienced person because they are further restricted by having to hire from a specific job class. There is also little flexibility in hiring or contracting additional personnel for special skill sets or short timelines.

Based on this hiring structure, most new employees in IT fill entry-level positions. While the training for these entry-level roles is extensive, it is difficult for IT to retain these employees because promotions are not necessarily within the group that the employee has been trained for. As a result, it takes years to build the mid-level LADWP cyber workforce. Moreover, the need for flexible, mid-level hiring will increase as more of the Department's aging workforce retires. Navigant recommends that LADWP hire additional, mid-level cybersecurity personnel to ensure that cybersecurity responsibilities are adequately managed. More importantly, Navigant recommends that hiring policies be improved to ensure agile, qualified cybersecurity staffing for all experience levels.

3.1.2.10 Cybersecurity Program Management

As discussed above, the Department is developing a cybersecurity program strategy in alignment with ISO 27001. This plan should have the full support of senior management to ensure enforceability and accountability. The cybersecurity program should be monitored to ensure that it aligns with the cybersecurity program strategy. In addition, Navigant recommends that the cybersecurity program monitor and actively participate in industry cybersecurity standard development, cyber technical committee meetings, and various other cyber initiatives to a greater extent. The CIO and designated staff's participation in implementation of the President of the United States' initiative to develop a Cyber Framework modeled after the Department of Energy's C2M2 framework is a positive step.

3.2 Recommended Cybersecurity Best Practices

As discussed in detail above, the Department should consider implementing the following best practices to achieve a fully mature cybersecurity program.

- Identify risk criteria to evaluate, categorize, and prioritize operational risk based on the Department's risk preferences.
- Design, build, and regularly update a formal risk register that is managed by a risk executive.
- Establish a formal process that prioritizes and monitors threat profiles based on likely intent, capability, and target.
- Improve cybersecurity event detection by increased logging, aggregating, and analyzing cybersecurity events to identify patterns, trends, and other common features.
- Provide a common operating picture by implementing 24x7 cybersecurity monitoring.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs.
- Complete the cybersecurity program strategy and implement it on an enterprise level with support from executive management.

4. Physical Security

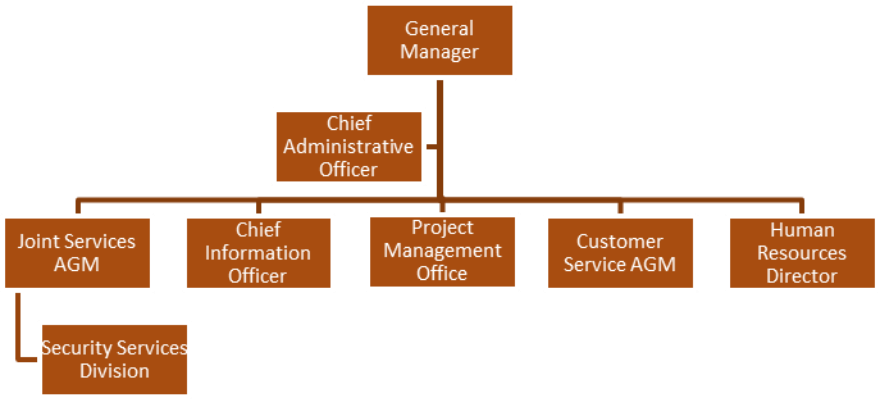
Physical Security is critical to the protection of the Department's facilities. Physical security measures impact LADWP's ability to deter, detect, and delay saboteurs, criminals, or potential terrorists. Components of Physical Security include foot patrols, cameras, access control, and perimeter detection and notification (i.e. alerts, lights, etc.). The successful implementation of physical security measures requires site-specific planning and resourcing such as consideration of vegetation growth in and around key facilities, location and condition of video surveillance, and allocation of security personnel. In addition, effective implementation requires input from experienced physical security personnel and formal business processes to ensure that physical s security measures are properly executed, enforced, and updated.

4.1 Resolving Security Gaps

Physical Security at the Department is restricted by a lack of processes to ensure that security gaps are resolved. Navigant found that facility managers in the Power and Water Systems do not have formal processes to report physical security gaps. Moreover, the Physical Security group has little authority to address reported security gaps and implement security initiatives because it has no line budget for critical capital projects and limited support from executive management. As a result, facility managers are not incentivized to report security gaps because they have to finance the recommendations made by the Physical Security group. Physical Security should be actively involved in the resolution of security gaps because the group has the experience and training to ensure that the appropriate mitigation measures are taken.

Physical Security is managed under the Security Services Division in Joint Services. Figure 4-1 highlights the layers of governance between Physical Security senior executives and the General Manager. This structure limits the enforceability of security measures throughout the Department. As a result, certain security goals and processes are not fully achieved.

Figure 4-1. Physical Security Governance



4.1.1 Security Planning

Department employees stated that Physical Security used to have a Security Planning group that monitored project planning and completion. According to interviews with Department personnel, Security Planning used to have tracking sheets that would monitor physical security issues from identification to resolution. This process should be reinstated because it allows for a documented feedback loop and project accountability. While the Security Planning group is in the process of being returned to Physical Security, it is crucial that this process be expedited as the group will support the implementation of formal processes to report and resolve threats and vulnerabilities. Security Planning should also work with programmers, design and construction engineers, cost estimators, budget planners, and other disciplines to support the security program at the Department. Finally, the group should have the size, budget, and power it had prior to its dispersion.

4.1.2 Physical Security Assessment Audits

Over the last two years, Physical Security has completed security assessment audits on numerous facilities and business locations at the Department. These detailed reports identify a number of cost-effective solutions to resolve security gaps at these locations. The internal assessments were comprehensive and viewed each facility from a threat actor's perspective. Moreover, the assessments looked at current security technologies on-site as well as perimeter security and guard force resources. Security measures that were examined included:

- Barriers: fences, entry gates, door latch guards, hinge pins and security bars
- Locks: deadbolts, padlocks, high security combination locks
- Alarms: motion, infra-red, intrusion
- Exterior lighting and cameras

- Anti-theft: tool cribs, secure storage, interior single hinged security doors
- Vegetation management and removal from site perimeter

Most, if not all, of the suggested security recommendations or enhancements were focused on improving existing technology or fixing failing fences, alarms, and lighting. These improvements would be low cost and could be done with Department staff. Unfortunately, according to multiple interviews, the security gaps and highlighted repairs in these assessments have not been made to ensure perimeter security, access control, and early warning systems (alarms, intrusion detection, and cameras) are properly maintained and in acceptable working order.

Physical Security provides these concise reports to the relevant facility managers who are responsible for physical security implementation. However, there are no processes to ensure that these security gaps are closed. Facility managers prioritize their budget according to a wide range of needs and they are not required to report back to Physical Security (or any other senior executives) regarding outstanding gaps. Moreover, Physical Security does not have the authority or capital project budget to mitigate these issues. It currently relies on relationships rather than formal processes to complete repairs and desired projects. While these reports provide significant insight into the physical security of LADWP facilities, formal policies and processes that ensure these gaps are addressed and mitigated are essential.

4.1.3 Critical Facility Physical Security Assessment

In addition to the internal assessment audits completed by the Physical Security group, Navigant reviewed an independent Security and Terrorism Threat Assessment completed by R.S. Hahn Company, LLC in 2001. Independent threat assessments provide additional insight into physical security vulnerabilities and identify best practices for mitigation measures. These assessments should be conducted regularly to review the physical security of critical facilities and to ensure that best practice measures are considered. The 2001 report appears to be the most recent independent threat assessment conducted at the Department's critical facilities. The 2001 assessment evaluated critical administrative, power, and water facilities and provided recommendations to improve security and to reduce threat vulnerabilities. According to interviews with Department personnel, these recommendations have not been implemented and security is not prioritized at these facilities. As a result, Navigant visited certain critical facilities to determine if these outstanding security issues were addressed and mitigated. Further, Navigant identified the gaps in Department processes and governance that prevented the resolution of these vulnerabilities. The [redacted] were selected for review because of their criticality to the Department's day to day operations.

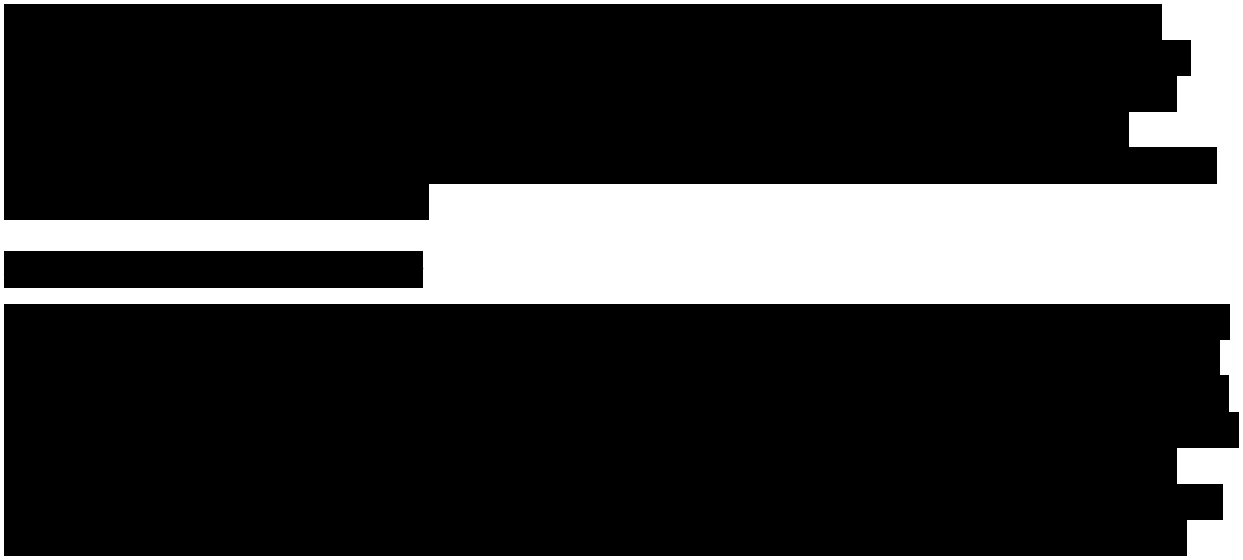
Based on the on-site review, Navigant found that the security culture differs significantly between the Water and Power Systems. Specifically, the Water System appeared to take a more proactive stance on physical security and technology. In contrast, Navigant found that the Power System facilities ignored most of the recommendations identified in the 2001 assessment. Accordingly, these facilities should increase the resources directed to physical security, especially for significant constraints such as limited camera coverage and security staff. However, the more critical finding is the lack of processes to ensure that security improvements, such as those in the 2001 assessment and the aforementioned audits, are addressed.

Navigant's conversations with facility managers confirmed that there is a lack of security process for identifying security gaps, supplying recommendations, and then following through with those recommendations to mitigate the security gap or vulnerability. Based on conversations with security staff and facility management, Navigant observed that lines of "issue ownership" and accountability are broken. Once recommendations are made, it is up to facility management to act upon those recommendations, often times resulting in significant delays in fixing the security issue or no action at all. Navigant's on-site findings are discussed in detail below.

[redacted]

[redacted]

[redacted]



Based on the findings summarized above, Navigant recommends that the Department create a clearly defined process to ensure that security gaps are addressed and to communicate these upgrades to Physical Security and senior management. The Physical Security group should have more oversight into the deployment of additional security resources at critical facilities. This will ensure proper placement, maximum coverage, and project accountability and completion.

4.1.4 Upgrading Security Measures at Existing Facilities and Business Centers

According to multiple interviews, certain components of the physical security system are out of date including the Department's access control system and Central Monitoring System (CMS). The CMS should consider a smart system that actively notifies security personnel of potential physical security threats. Mandatory training for active shooters and insider threats should also be considered.

5. Security Conclusions

Navigant's Security assessment revealed a number of factors that may limit the Department's ability to identify and mitigate security threats and vulnerabilities, including a lack of formal cyber and physical security processes, limited risk assessments, constrained resources, and limited executive level support. While certain aspects of Security such as CIP Compliance and Water OT security are robust, security is not appropriately addressed on an enterprise level. Moreover, there is no formal executive governance structure to support cyber and physical security initiatives.

5.1 Recommendations

Based on the findings above, Navigant has several policy and governance recommendations to prioritize security within the Department.

5.1.1 Corporate Security Plan and Budget

A corporate security plan is essential to providing the Department with sound policies, programs, and project management on an enterprise level. As discussed above, LADWP has an outdated 2006 Security Plan that broadly discusses security policies and physical, electronic, and information security requirements. Navigant recommends that the Department update and expand this plan to ensure that corporate resources are used in a productive way and to allow for visibility into the physical and cyber security programs within the Systems. The plan should identify the persons (and budget) responsible for implementing the aforementioned policies to guarantee that security issues are resolved in a timely manner.

A strategic plan or security roadmap should also be developed to outline future goals and timelines. While security-related technology is constantly changing, a strategic plan that identifies and prioritizes security needs and their associated costs will allow for more concrete planning and accountability within the LADWP security system.

5.1.2 Organizational Behavior Changes

Security should be a top priority throughout LADWP. Security senior executives are currently buried within the organization and there is little support for addressing and mitigating security gaps. A behavioral change is imperative for the Department to reduce outstanding security risks and to be proactive about security initiatives. Furthermore, the organizational structure changes discussed below provide recommendations to elevate security within the Department.

5.1.3 Organizational Structure Changes

Today's business risk environments have become increasingly more significant, complex, and interdependent, both at the local utility level and across the bulk power system. The effective management of these environments is a fundamental requirement of business. Boards of Directors, shareholders, key stakeholders, and the public correctly expect organizations to identify and anticipate areas of risk and set in place a cohesive strategy across all functions to mitigate or reduce those risks. In addition, there is an expectation that management will respond in a highly effective manner to those events and incidents that threaten the assets of the organization. Effective leadership within the top levels of the organization and its related security functions are imperative. Organizational reputation, the uninterrupted reliability of electric infrastructure and normal business processes, protection of physical and financial assets, the safety of employees, and shareholder confidence all rely in some measure upon the effectiveness of an accountable senior security executive.

LADWP is lacking a single position at the senior governance level with the responsibility for crafting, influencing, and directing an organization-wide protection strategy. At the Department, accountability is dispersed among several facility managers in different departments (Water, Power, and Joint) with potentially conflicting objectives. Navigant recommends that LADWP create a new senior level executive position, reporting directly to the General Manager, that has physical and cybersecurity as their sole responsibility. This position should be charged with the protection of the company's integrity, people, processes, and assets from attack, harm and loss.

As discussed above, risk is a crucial component of a security system and it should be assessed on an enterprise level. Navigant recommends that the Department create a senior executive position that is

responsible for enterprise risk assessment including security, financial, operational, regulatory, compliance and reputational risk. The individual should be in constant communication with the General Manager, the security senior executive, and senior risk representatives across Power, Water, and Joint Services. One way to facilitate this communication is to have a Risk Committee chaired by the senior risk executive and populated with the aforementioned representatives to ensure that the systems are communicating and resources are appropriately distributed. This individual should also have the ability to conduct internal audits to identify and mitigate risk related issues.

Best practice indicates that utilities with the above-mentioned positions are better equipped to address corporate risk and security. Moreover, these positions are a growing trend in the utility industry due to the demand for senior level executives that are aware of risk tolerances and the evolving security environment. Recent security crises have also increased the need for these positions. Examples of utilities that have similar positions include American Electric Power, Sempra Energy, and Tri-State Generation and Transmission.

5.1.4 Prioritized Recommendations

Navigant's prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Develop a Corporate Security Plan that includes sound policies, programs, and project management for cyber and physical security on an enterprise level.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the Corporate Security Plan and other cyber and physical security initiatives.
- Complete the Enterprise Cyber Security Plan to identify and address weaknesses in the cybersecurity program.
- Identify risk criteria and develop a risk register to prioritize risk assessments on an enterprise level.
- Initiate 24x7 cybersecurity monitoring to provide a common operating picture of the cybersecurity environment in near real-time.
- Develop a formalized process to identify and mitigate physical security threats and vulnerabilities across Systems.
- Move Security Planning back to Physical Security to ensure that the group has project management resources.
- Provide Physical Security with a line budget to close critical security gaps.
- Improve the hiring process for experienced, mid-level staff in the cyber workforce.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs, including a complete Business Impact Analysis to appropriately prioritize processes and resources in the event of a major incident.

Medium Priority Recommendations

- Upgrade Central Monitoring System, the camera monitoring system used by Physical Security, to include a smart system.
- Develop the relationship with the Western Regional auditors to confirm the Department's interpretation of CIP Version 5.
- Increase participation in standard development bodies, NERC technical committees, and NERC GridEx.
- Create a formalized practice for information sharing that includes horizontal and vertical communication policies, processes, and capabilities to enable real-time sharing.
- Conduct cybersecurity exercises on a regular basis.
- Complete cybersecurity vulnerability assessments for all critical assets.
- Aggregate log data for cybersecurity assessments to identify patterns, trends, and common features.

Low Priority Recommendations

- Ensure that the credentials for employees align with their current position.
- Formalize the relationship between cybersecurity requirements and supplier contracts.

6. Emergency Preparedness and Business Continuity Overview

Emergency Preparedness is defined as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response.[11] Emergency Preparedness and response is often considered one facet of Crisis Management, and includes coordination, communication, and centralized command structures. Emergency Preparedness is directly related to other disciplines, including most notably Business Continuity Management (BCM) and Disaster Recovery (DR). BCM is a holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause. This process provides a framework for building organizational resilience with the capability of an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities.[12] BCM is an ongoing, integrated process that:

- Identifies, in advance, the potential impacts of a wide variety of worst-case disruptions, and determines tolerable losses relative to an organization's risk appetite.
- Provides a method of restoring an organization's ability to supply its critical products and services to an agreed level.
- Delivers a capability to manage the disruption and protect the organization's reputation and brand.
- Proactively improves an organization's resilience.

DR is the collection of policies, plans and actions to recover system applications and infrastructure in a tiered approach, whereby technology priorities are identified (software and hardware) to facilitate continuation of key business processes and inevitably, recovery. DR is often considered the technical aspect of business continuity. This Report includes a review of the Department's BCM and Emergency Preparedness policies, practices, and organization. A review of the LADWP's DR measures is provided in the *Technology Infrastructure* portion of the Survey.

6.1 Aspects of Emergency Preparedness and Business Continuity

The concepts of Emergency Preparedness and BCM are linked; preparedness focuses on organizing people, processes, and equipment for use when a disaster occurs. BCM is founded on the on-going assessment of the potential impact of a disaster, and the design of prioritized restoration plans for key services. In this way, an organization's level of preparedness is contingent on the types of analyses conducted to understand the business impact of a disaster (as noted, typically referred to as a worst-case disruption). As noted above, Emergency Preparedness typically focuses on methods of coordination, communication, and leadership of response efforts through command and control structures. At the highest level, Emergency Preparedness plans are typically focused on three objectives: Life Safety, Incident Stabilization, and Property Conservation.[13]

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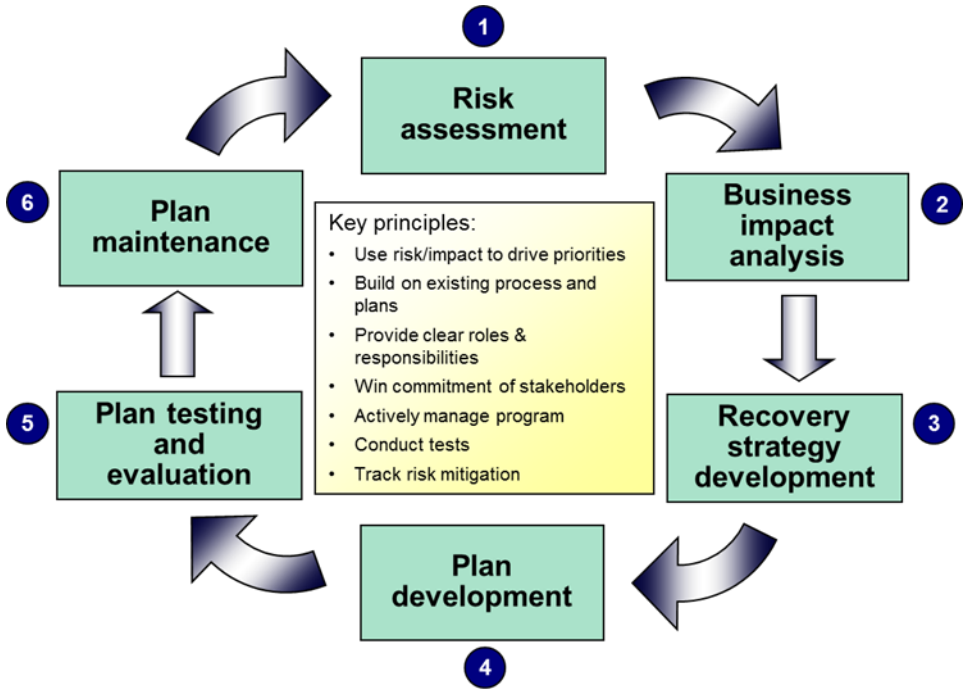
[11] Department of Homeland Security/Federal Emergency Management Agency (http://www.dhs.gov/topic/plan-and-prepare-disasters).

[12] International Organization for Standardization (ISO) 22301, Societal Security – Business Continuity Management Systems (2012).

[13] Emergency Response Plan Implementation (www.ready.gov).

BCM is the discipline of service restoration, where service in this context can also refer to an organization's most critical business processes. In the case of any utility, this would include the restoration of the most critical business processes to restore core operations to a level that enables the delivery of safe and reliable service to customers. The BCM process is comprised of the following high-level steps:

Figure 6-1. Common Steps in Business Continuity Planning



1. Risk Assessment: Identification and specification of risk drivers (the most critical risks to the organization, given a disruption) and their impacts (an assessment of the relative impact on the organization of a disruption in a service).
2. Business Impact Analysis (BIA): BIA identifies the critical business processes that are most affected by a worst-case disruption, and helps prioritize the recovery strategies that might be needed during an extended business disruption.
3. Recovery Strategy Development: Strategies to improve business resilience and technology resilience.
4. Plan Development: Detailed planning documents that establish recovery teams, the recovery process, and other facets of recovery.
5. Plan Testing and Evaluation: Protocols for testing the plans (including scheduled walkthroughs and unscheduled drills).
6. Plan Maintenance: Governance over the plan, testing, and program enhancement.

This is a standard "top-down" approach to continuity planning, which considers holistic threats to normal operations that could impact an entire organization. In the event of such a widespread disruption, the BCM process guides decision-makers as to the most critical services and activities that must be brought back online *from across the entire enterprise*. This approach removes functional silos and

"local" approaches to recovery, which are inappropriate when considering the impact of a worst-case disruption event. In this way, the standard BCM approach identified above prioritizes how services are returned – and dedicates corporate resources to that prioritized effort – in a manner that is closely aligned to strategic goals and objectives. Consistent enterprise-wide execution of BIA, risk assessment, testing, training, reporting, and other facets of program implementation reflect an organization that is committed to BCM. Importantly, when implemented properly, each of these steps comprise an iterative process, which is administered in a consistent fashion by a centralized function at the enterprise-level.

6.2 Accountability for Emergency Preparedness and Business Continuity

BCM is a forward-looking and holistic approach to building organizational resiliency. It is a coordinated and integrated approach that spans the entire company and all its operations.[14] Clearly defining the ownership and responsibility for emergency preparedness and business continuity is an important topic. As noted above, accountability for the consistent design and administration of the program typically resides at the corporate level. (This includes ensuring appropriate testing, training and the like.) While active coordination and facilitation is provided by a corporate function, coordinators in each line of business are responsible for working closely with corporate staff to properly develop, test, and improve plans according to clearly documented protocols. Inevitably, while the corporate function provides an administrative role, each line of business executive sponsor is directly accountable for the success (or failure) of BCM for their organization.

Evidence confirms that successful and well-managed programs have clear support and active sponsorship from the highest executive levels of the organization. This sponsorship is critical for ensuring proper communication of program goals across the organization, driving engagement in the active management of the program, and confirming that BIA and other facets of the program are properly aligned to strategic objectives. Increasingly, leading practitioners integrate BCM with the organization's overall Enterprise Risk Management (ERM) process.

[14] Business Continuity and Disaster Recovery Planning for IT Professionals, 2nd Edition by Susan Snedaker. *2013*

7. Emergency Preparedness and Business Continuity in Utilities

Increasingly, utilities are being scrutinized for their response to emergencies and disasters that significantly disrupt normal operations. While related, definitions of emergency and disaster differ in terms of the extent of the disruption to normal operations. Specifically, an emergency is commonly defined as an unexpected or impending situation that may cause injury, loss of life, destruction of property, or cause the interference, loss, or disruption of an organization's normal business operations to such an extent that it poses a threat. A disaster, by comparison, is defined as a sudden, unplanned catastrophic event causing unacceptable damage or loss. In either case, utilities design and implement programs to actively assess situations and respond with the execution of specific protocols to bring back critical services in a phased and prioritized manner, based on a standard risk assessment.

A variety of stakeholders – from regulators, to customers, to community leaders – have focused more and more attention on all aspects of planning and recovery from all varieties of emergency. Perhaps the most prominent examples from the utility sector include the major hurricanes of the last decade (Katrina, Irene, and Sandy). Common areas of critique during these and less significant emergency situations have included the pace, sequence and quality of emergency response and service restoration, the nature of communication to customers and stakeholders during an emergency event, and the thoroughness of plans in-place to meet service disruption (among others). Importantly, while focus and attention is often given to the potential impact of natural disasters, other scenarios requiring planning and response include acts of terrorism, sabotage, cyberattacks, or other similar events.

Utilities focus on providing clear evidence of emergency and disaster planning and testing in order to mitigate multiple forms of risk. While operational risk is the most immediate form of risk mitigated by strong emergency preparedness, reputation and financial risk are also mitigated by rigorous emergency preparedness. Evidence confirms that poor preparedness and inadequate response can lead to significant financial penalty. As an example, a $25 million civil penalty was levied on Florida Power and Light (FPL) in 2009 under NERC's mandatory reliability standards for, among other things, shortfalls in emergency operating procedures. In addition to the financial penalty, NERC mandated that FPL enhance its compliance program; enhance training and certification requirements for operating employees; improve its frequency response; update emergency operating procedures; provide additional staffing for Bulk Electric System (BES) analysis; and ensure that specified equipment is properly inspected and maintained.[15]

In addition, an erosion in the reputation of (and trust in) any utility can have long-term implications. It is increasingly believed that a company's reputation is the single most important driver of value creation or value destruction, making the active management of risk to reputation a top priority. A utility's reputation is built over a long period, and determined in large part by how well several core commitments are met, including delivering reliable, safe, and cost effective services to customers, while meeting and exceeding the financial (cost and revenue) expectations of a variety of stakeholders. Inadequate response to any emergency or disaster situation can significantly erode reputation, which then impacts other forms of risk (principally, political and regulatory). Evidence confirms that emerging from a significant reputational risk event requires the dedication of significant resources (time and capital) often over a long period of time, and diverts attention away from other activities that advance

[15] Federal Energy Regulatory Commission, Docket No. IN08-5-000, Florida Blackout, October 8, 2009.

the strategic plans of the company. Evidence from the utility sector in areas such as failed storm restoration confirm the potential negative impact of reputational risk.

Given this, all utilities are focusing greater attention on planning for the most significant of disruptive events. The disciplines of emergency preparedness and business continuity are defined by a combination of regulatory standards, the recommendations of standard-setting organizations, and the peer practices of other organizations that are continuously redefining the notion of leading practice. The following section introduces several of the more important standards that are shaping the discipline of business continuity and emergency preparedness in the utility sector.

8. Standards in Emergency Preparedness and Business Continuity

Standards in Emergency Preparedness and BCM are driven by regulatory requirements, recommendations of oversight and standard-setting organizations, and the leading practices of organizations in every sector – including the energy and utility sector. The following is a brief overview of some of the more prominent and influential standards in Emergency Preparedness and BCM, with particular emphasis on those that define the practices of organizations in the energy and utility sector. While some of these standards may not directly apply to the Department, they help form the basis for leading practice in the discipline of emergency preparedness and business continuity.

8.1 Federal Regulatory Standards

A variety of federal regulations inform a utility organization's emergency preparedness and response stance. Principal among these standards is the Continuity of Operations (COOP) and Continuity of Government (COG) Federal Preparedness initiative. COOP planning aims to ensure that Primary Mission Essential Functions (PMEFs) continue to be performed during a wide range of emergencies, including localized acts of nature, accidents and technological or attack-related emergencies. The Department has developed and implemented a COOP policy and plan, which is discussed further in Section 5.

Additional federal initiatives and mandates related to business continuity are identified below.

8.1.1 Federal Energy Regulatory Commission (FERC)

Federal Energy Regulatory Commission (FERC) RM01-12-00 2003 made business recovery plans mandatory for all energy companies. The standard applied to the U.S. electric power industry, and specifically larger metro utilities. Subsequent to this standard, the Energy Policy Act of 2005 created the Electric Reliability Organization (ERO), an independent, self-regulating entity that enforces mandatory electric reliability rules on all users, owners, and operators of the nation's transmission system. The FERC is given oversight authority for the ERO. In July 2006, FERC certified the North American Electric Reliability Corporation (NERC) as the ERO. In March 2007, FERC approved 83 NERC Reliability Standards, which became the first set of legally enforceable standards for the U.S. bulk power system, effective June 4, 2007. Today NERC oversees eight regional reliability entities and is responsible for establishing and enforcing mandatory reliability standards for the power grid.

8.1.2 North American Electric Reliability Corporation (NERC)

The North American Electric Reliability Corporation (NERC) has a number of standards that direct how a utility company assesses threats to critical infrastructure, and responds to situations that may disrupt operations. NERC standards focus on cyber and physical security protocols, which are outlined in our *Security* report. NERC has also established guidelines related to establishing an effective operations continuity plan. Specifically, the guideline describes steps that "an electricity sector organization should consider in developing plans that will strive to ensure continuity of operations during and after an incident or crisis."[16] Key aspects of this guideline include the specification of the following:

[16] NERC, Security Guideline for the Electricity Sector: Business Processes and Operations Continuity, May 2011.

- Program Policies and Management: top-level authorization, support, and commitment to preparedness
- Analysis: evaluate best practices, define and document the scope of the preparedness program, conduct risk assessment and impact analysis
- Planning: clear plans with defined end products, a specific schedule, and assigned responsibilities and resources
- Implementation: development and maintenance of comprehensive project management and control system
- Test and Evaluation: specify evaluations to examine the implementation process; use dry runs
- Maintenance, Review, and Improvement: implementing periodic formal reviews and identifying program areas that require periodic maintenance

8.1.3 Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency (FEMA) has established a number of guidance documents and standards that relate specifically to continuation of operations in an emergency or disaster situation. One of the primary guidance documents, *Developing and Maintaining Emergency Operations Plans: Comprehensive Preparedness Guide (CPG) 101 (Version 2.0)*, integrates key concepts from national preparedness policies and doctrines, as well as lessons learned from disasters, major incidents, national assessments, and grant programs. CPG 101 provides methods for planners to:

- Conduct community-based planning that engages the whole community by using a planning process that represents the actual population in the community and involves community leaders and the private sector in the planning process
- Ensure plans are developed through an analysis of risk
- Identify operational assumptions and resource demands
- Prioritize plans and planning efforts to support their seamless transition from development to execution for any threat or hazard
- Integrate and synchronize efforts across all levels of government.

8.2 California Rules and Regulations

The California Government Code includes Section 3100 that requires all public employees to be "disaster service workers subject to such disaster service activities as may be assigned to them by their superiors or by law." Accordingly, all Department employees are required to be disaster servicer workers. Compliance with this rule requires a training program to learn about what it means to be a disaster service worker.

The California Emergency Services Act (CESA) provides guidelines for the state and local governments to declare a state of emergency before, during, or after a disaster. This declaration is necessary to secure mutual aid from other local, state, and federal organizations. Specifically, a state of emergency can activate the California Disaster and Civil Defense Master Mutual Aid Agreement between the State of California, its various departments and agencies, and the various political subdivisions of the state. CESA also includes a Governor-approved state emergency plan and requires cities and counties to

administer it. The plan contains information regarding the standardized emergency management system (SEMS) framework, continuity of government, emergency services of governmental agencies, mobilization of resources, mutual aid, and public information. CESA does not contain mandatory elements for local agencies to include in their emergency plans, but the state plan contains contact information for the chain of command and assistance organizations as well as sample forms and documents to ensure that emergency powers are properly exercised.[17]

In addition to the California Government Code and CESA, there are a variety of regulations and mandates from the California Public Utilities Commission (CPUC) that address emergency preparedness and continuity of operations. For example, CPUC General Order 166 requires jurisdictional electric utilities to file annual emergency response plans with the CPUC. General Order 166 also requires that the utilities develop mutual assistance agreements, perform annual emergency exercises, and develop a written communications strategy for emergencies. In addition, it sets time limits for the evaluation, communication, and restoration of the utility. Finally, the General Order benchmarks the restoration and call center performance of these utilities.[18]

In 2012, Bill AB1650 was passed to supplement General Order 166. It stated that the CPUC will establish standards for disaster and emergency preparedness and will require electric and water corporations to develop plans in compliance with these standards. It also requires that each electric corporation meet with representatives of every city and county it serves on a biannual basis to develop an effective emergency and disaster response plan.[19] According to CPUC Proceeding R1506009, the CPUC is in the process of establishing these emergency preparedness standards.[20]

While the Department is not mandated to follow the CPUC regulations, these organizations provide a relevant framework for LADWP's emergency preparedness and business continuity efforts.

8.3 Municipal Requirements

In addition to coordinating and executing emergency preparedness and business continuity plans to resume core utility operations in the event of a disruption, municipal utilities commonly have an accountability to assist in the broader municipal recovery. Emergency preparedness at the Department is also driven by the broader objectives of the City. The City of Los Angeles is susceptible to 13 of the 16 federally identified natural and man-made threats. Los Angeles is particularly vulnerable to natural disasters such as wildfires, mudslides, and earthquakes. In recent years, the City of Los Angeles has significantly developed its emergency preparedness efforts. It has an Emergency Management Department (EMD) to manage the City's response to and recovery from emergencies through the operation of an Emergency Operations Center (EOC). The EMD develops training, planning, and response efforts for all City Departments, including coordination with local, state, and federal agencies. To support this development in emergency preparedness, Mayoral Executive Directives have been

[17] California Emergency Services Act (http://hazardmitigation.calema.ca.gov/docs/ESA-all8-06-final.pdf).
[18] California General Order 166 (http://www.cpuc.ca.gov/gos/GO166/GO166_startup_page.html).
[19] California Assembly Bill No. 1650 (http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB16500).
[20] CPUC Proceeding R1506009 (http://delaps1.cpuc.ca.gov/CPUCProceedingLookup/f?p=401:56:8450711617061::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R1506009).

issued to enforce emergency planning efforts throughout the departments of the City, including LADWP.

The following table describes the Mayoral Executive Directives (Nos. 15-19) related to emergency planning and business continuity.

Table 8-1. Mayoral Executive Directives

Mayoral Directive	Description
Directive No. 15	The Department's Emergency Plan should comply with the City's Guidelines for Department Emergency Plans, which addresses preparedness, mitigation, response, and recovery. The plan should be updated annually and submitted to the Emergency Management Department. The directive also states that Department Heads should ensure that their employees are trained as appropriate on emergency management roles and responsibilities.
Directive No. 16	All City employees will be Disaster Service Workers and will assist the various City Departments with disaster services pursuant to the California Emergency Services Act.
Directive No. 17	The EOC will be organized around the Incident Command System (ICS) and the EMD will appoint members and develop standardized training for the EOC.
Directive No. 18	The Department must incorporate NIMS into its emergency plans including planning, training, and exercises. In addition, all personnel who participate in the EOC, Department Operation Center (DOC), and other emergency response efforts must complete IS-700, IS-800, ICS-100, ICS-200, and ICS-300.
Directive No. 19	The Mayor's Emergency Response Council (MERC) will advise City Council on emergency or disaster response and recovery. Members of MERC include the General Manager of the EMD, the LAFD Chief, the LAPD Chief, and the Deputy Mayor of Homeland Security and Public Safety.

An evaluation of the Department's adherence to directives 15, 16 and 18 is included in Section 5.4.

8.4 Other Standards

8.4.1 International Organization for Standardization (ISO)

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. In 2012, the ISO published an International Standard addressing business continuity management. ISO 22301 provides a framework to plan, establish, implement, operate, monitor, review, maintain and continually improve a business continuity management system. More specifically, ISO 22301 establishes standards for:

- Monitoring the extent to which business continuity policies, objectives and targets are met

- Measuring the performance of processes, procedures and functions that protect prioritized activities
- Monitoring compliance with the ISO 22301 standard and business continuity objectives
- Reviewing historical evidence of deficient business continuity plan performance
- Conducting internal audits at planned intervals
- Evaluating each facet of the program during management reviews at planned intervals

Additional relevant ISO standards include ISO 27001 (Requirements for Information Security Management Systems) and ISO 27002 (Code of Practice for Business Continuity Management).

8.4.2 Industry Organizations

Utility industry organizations such as the American Water Works Association (AWWA), Water Research Foundation (WRF), and the Edison Electric Institute (EEI) also contribute to the discourse on emergency preparedness and business continuity.[21]

8.5 Peer Practices

In addition to the mandates and recommendations of regulatory groups and oversight organizations, it is important to consider the practices of peer utilities when assessing emergency preparedness and business continuity programs. In today's uncertain environment, municipal, investor-owned, and cooperative utilities are pursuing the design and implementation of active programs that focus on preparedness, response, and recovery. While in some instances the economic downturn of 2008 shifted attention away from business continuity due to budget constraints and competing priorities, the economic recovery has enabled utilities to shift attention back to the importance of these disciplines. In addition, many utilities are improving risk awareness and response through enterprise risk assessment techniques. And, while some utilities are playing "catch-up" to meet minimum standards, others have established rigorous and well-tested preparedness and continuity of operations programs. The following are brief descriptions of some of the more prominent program characteristics of peer utilities:

- Corporate Program: It is common practice for emergency preparedness and resiliency programs to be sponsored and managed closely at the corporate-level. This is a central aspect of driving a consistent approach to risk assessment and response prioritization, allocation of resources, communication, testing, and training.
- Executive Sponsorship: The most effective programs have clear, active and executive-level sponsorship.
- Organization: Increasingly, emergency and business continuity programs reside in a dedicated corporate risk management, compliance, or security organization. In brief, many utilities are raising the profile of program ownership to an executive level, and also consolidating residence of relevant programs.
- Accountability: Roles and responsibilities for program management and execution are very clear between the corporate function and lines of business.

[21] Water Research Foundation, Business Continuity Planning for Water Utilities: Guidance Document, 2013; Edison Electric Institute, "The Electric Power Industry Is United In Its Commitment To Protect Its Critical Infrastructure" (www.eei.org).

- Policy & Process: An integrated set of corporate policies and business processes are documented. Process "owners" from the centralized corporate function and business lines work closely to ensure that processes and protocols reflect the latest thinking in preparedness and continuity; a continuous improvement mindset is applied to the on-going management of these areas.
- Program Integration: Utilities are integrating emergency response and preparedness, disaster recovery, and business continuity efforts. As noted, many organizations are also integrating business continuity and ERM programs. In combination, these programs are seen as key aspects of a holistic approach to risk mitigation.
- Staffing: Emergency preparedness and business continuity organizations are generally staffed in a lean manner, and work with individuals in the business lines who matrix to the corporate function. The individuals in the business line provide subject matter expertise on threats and responses, while the corporate team facilitate the consistent roll-out of approaches to risk identification, response testing, training, and overall program monitoring. Significant responsibility – and authority – is placed in these organizations.
- Training: Training on all aspects of preparedness and continuity occurs on a prescribed basis. Who is trained, in what areas of the program, and with what frequency are program parameters clearly spelled out in policy documents (including training "refresh" efforts).
- Testing: All aspects of the holistic program are tested in a variety of ways – from drills, to workshops, to tabletop exercises, to planned and "surprise" functional exercises. Results are tabulated, and communication to the organization is provided in "lessons learned".
- Performance: Program performance plans and expectations are clearly identified, including policy and process review and updates, planned and unplanned exercises and review of results. Companies consolidate findings from tests and actual incident response into a consolidated readiness report.
- Cooperation: Close working relationships are maintained with internal and external stakeholders in program design, testing, and review. Ensuring coordination between the business lines and shared services (IT) is a central responsibility of the corporate function. Mutual Aid Agreements with regional peers and maintaining close working relationships with other municipal agencies and other government agencies is imperative.

While the nature of each utility's program is based on a variety of factors (including the complexity of the system and operations, and the organization's risk tolerance), the above factors generally form the basis of effective preparedness and continuity programs.

9. Emergency Preparedness and Business Continuity at the Department

9.1 Overview

The Department's Emergency Preparedness and Business Continuity stance is shaped by a number of different factors, including federal, state and municipal mandates to which LADWP must adhere. In addition, as a municipal utility, the Department is an active participant in broader efforts to prepare and respond to a significant disaster that impacts the City. Finally, the Department should design emergency preparedness and business continuity plans that align to common utility practice and help ensure the health and safety of customers and employees, system and service reliability, and customer responsiveness. This combination of requirements confirms the need for strong and centralized coordination, clear accountabilities, and rigorous planning and testing protocols.

The remainder of this section provides an assessment of the emergency preparedness and business continuity organization, governance, policies and programs currently in place at the Department. The section also describes current status of a formalized BCM program at the LADWP.

9.2 Organization

The Department's governance arrangements, roles and responsibilities, and organizational structures are important factors in the effectiveness of emergency preparedness and business continuity programs. The following is an overview of the organizational structure and governance characteristics of the programs at the Department.

9.2.1 Office of Emergency Management

The Office of Emergency Management (OEM) is organized under Security Services in the Joint Services System. The OEM has four full-time staff, including one director and one for each of the Systems. The group is the liaison for emergency preparedness for the Systems and communicates with the emergency command centers for the Power and Water Systems. The IT System has a command center as well, but interviews suggest that communication between OEM and IT is limited.

It is important to note that significant accountability for emergency preparedness and business continuity is pushed into the Systems. Therefore, at present, OEM is often in a facilitation and support role in areas such as emergency training and planning efforts. Navigant found that the OEM is developing relationships with division heads to encourage standardization of emergency preparedness efforts, but the OEM does not have the authority or formal processes to enforce these efforts.

In addition, there seems to be little accountability at the division and facility manager level to engage in emergency preparedness training and exercises beyond annual fire and earthquake drills. Navigant also found that the OEM has had significant turnover in recent years, which limits the stability and enforceability of emergency preparedness initiatives. In general, although efforts focus on expanding and strengthening the role of OEM in corporate-wide initiatives, significant responsibility for preparedness resides in the Systems.

9.2.2 System Leads for Emergency Preparedness and Business Continuity

As discussed above, a significant amount of the accountability and decision-making authority for programs has been decentralized and pushed into the Systems. This has led to distinct approaches to leadership and program development in each of the Systems. For example, while the Water System has designated a Water System Resilience Program Manager, there is no analogous Resiliency Program Manager in the Power System. More specifically, the Power System has created an executive working group to potentially discuss initiatives in this area. Navigant recommends that this working group continue to meet, until a Power System Resilience Program Manager (or equivalent) is named.

9.2.3 Resilience and Sustainability Programs

In 2013, the Mayor commissioned a Seismic Safety Task Force to evaluate and make recommendations to address the City's vulnerabilities from earthquakes. One component of the recommendations emerging from the evaluation focused on the fortification of water system infrastructure. Recommendations included developing an alternative water system for firefighting, fortifying the Los Angeles Aqueduct (as well as other aqueducts and dams), increasing local water sources, creating a seismic resilient pipe network, implementing a Resilience by Design Program at LADWP, and developing a statewide seismic resilience bond measure.

As a result of this evaluation, the City requested that the Water System establish a Seismic Resilience and Sustainability Program. To develop this program, the Water System sought to define characteristics of a seismically resilient Water System, to identify the current status of Water System seismic resilience, and to recognize aspects which may improve Water System seismic resilience. In September 2014, the Program provided six initial recommendations for increased resilience based on the Mayor's Resilience by Design initiative.[22] In July 2015, the Program expanded on certain recommendations through its documented preliminary plans to reduce risks from the San Andreas Fault at the Elizabeth Tunnel and to manage fires following earthquake risks.

While these initial reports are a great starting point, this Program needs additional resources to implement these recommendations. The current Water System Resilience Program Manager has several additional accountabilities (including the Trunk Line Design Group Manager and the Water System Emergency Preparedness Coordinator). Each of these roles is critical to the Water System; we suggest that these the responsibilities be dispersed among more than one individual. Further, no staff have been allocated to support the Water System Resilience and Emergency Preparedness efforts. While the assignment and goals for the Water System Seismic Resilience and Sustainability Program are clearly identified, Emergency Preparedness and Seismic Resilience need to be prioritized within the Department to accomplish them.

As noted above, according to interviews with LADWP staff, there is no analogous Resiliency Program Manager in the Power System. Navigant recommends that this working group meet regularly to prioritize emergency preparedness, business continuity, and resiliency efforts. While the Mayor's Resilience by Design program does not directly apply to the Power System, resiliency is a key component to business continuity after a major event and LADWP should consider developing a Power System resiliency initiative that is similar to the Water System.

[22] Water System Seismic Resilience and Sustainability Program, Summary Report, September 2014.

9.3 Continuity of Operations Plan

As noted in Section 4.1, the Department is required to develop and actively manage a COOP. The purpose of the COOP is to provide methods to ensure that operations continue during an emergency, specifically when the primary facility is threatened or inaccessible. Activation scenarios include credible threats, natural disasters, utility failures, hazardous material incidents, and civil disturbances that close operations at the Department's primary facility or other critical facilities. According to the plan, the event is categorized into a minor, major, or catastrophic event depending on whether the event requires partial, full (for up to 30 days), or permanent relocation of personnel and agency resources. The COOP has three phases:

- Phase 1 - Activation and Relocation: This phase takes place within the first 12 hours of the event. All relevant employees will be notified and the transition to alternate operations at alternate facilities begins. The COOP Relocation Team (CRT), which includes the GM, the AGMs of Power and Water, the CAO, and the Director of Security Services and OEM, will work from the alternate location and will ensure that mission-essential functions are performed. In addition, the General Manager will ensure that the alternate facilities have the same level of security as the primary facility.
- Phase 2 - Alternate Facility Operations: This phase takes place from 12 hours after plan activation to termination. The transition to the alternate facility should be complete and essential functions should be performed. The COOP identifies mission-essential functions that must be performed within one day, one week, and one month of plan activation. Each of these functions has a CRT staff member assigned to it to ensure operations continue with minimal interruptions. The Department will also begin the transition back to normal operations at the primary facility.
- Phase 3 - Reconstitution and Termination: All personnel will be informed that the threat no longer exists and normal operations will resume. Prior to the cessation of alternate facility operations, an After-Action information collection process will begin to identify lessons learned. This information will be used to complete a COOP Remedial Action Plan with recommendations that can be incorporated into the COOP Annual Review Process.

The Department's plan aligns with the phases of COOP as outlined by FEMA, but the plan does not seem to be actively embraced by the Department. According to the plan, a COOP Program Manager will review and update the COOP, ensure that COOP testing, training, and exercising is conducted, and define short and long-term COOP goals and objectives. The plan also states that all employees will be trained on COOP activation procedures at least once a year. However, Navigant found that employees have not been trained on the COOP in recent years. Navigant recommends that the Department train and exercise this plan to inform employees of the processes in place to maintain operations after an event and to ensure that the mission essential recovery times are appropriate and achievable. As discussed in further detail in the *Security* portion of the IEA Survey, Navigant also recommends that LADWP further develop its risk assessment processes and procedures to support the relocation decisions and timelines associated with the COOP. The Department should also consider developing disaster-specific business continuity plans for earthquakes and other major events because priorities and timelines can change depending on the type of emergency.

9.4 Emergency Plans

The Department maintains Emergency Response Plans (ERP) and updates them annually in accordance with Executive Directive No. 15. LADWP has a corporate ERP that is maintained by the Department's Office of Emergency Management as well as ERPs for the Water, Power, and IT Systems. Each division has a more specific ERP that is consistent with the System and corporate ERPs; however, these plans are not updated annually.

9.4.1 Components of the ERP

The ERPs have four core elements:

- Mitigation
- Preparedness
- Response
- Recovery

Each of these plan components is described in greater detail below.

9.4.1.1 Mitigation

Mitigation includes activities and efforts to prevent emergencies or to minimize their effects. As mentioned above, there are 13 threats and hazards to which Los Angeles is susceptible. The ERPs briefly discuss the Department's efforts to prepare for and mitigate the effects of these specific threats and hazards; however, the documents lacks a detailed plan to fully prepare for these threats. Disaster-specific plans for these events would help the Department proactively prepare for these events beyond broad goals and mitigation plans. Moreover, LADWP could apply City documents such as the Local Hazard Mitigation Plan to Department-specific plans to support this effort. For events that are very high risk such as a major earthquake on the San Andreas Fault, a detailed plan is critical to timely response and mitigation efforts.

9.4.1.2 Preparedness

Preparedness activities include planning, training, and exercising to effectively respond to emergency events. According to Executive Directive No. 16, all City employees are "disaster service workers…for the purpose of engaging in disaster service pursuant to the California Emergency Services Act."[23] As a result, all new employees at the Department are required to complete training on how to be a disaster service worker. New employees must also sign a Loyalty Oath as outlined by the California Government Code. According to Department personnel, OEM provided over 400 Power System responders with employee preparedness training in 2014, which included the Disaster Service Worker requirements, family preparedness, and alternate work site locations. Additional training requirements for emergency preparedness, response, and recovery are discussed below.

The OEM is responsible for ensuring the Building Emergency Coordinator (BEC) for each facility is appropriately trained and the BECs are responsible for training their facility staff. Specifically, the OEM

[23] Mayor Executive Directive No. 16.

is responsible for coordinating National Incident Management System (NIMS)/ Standardized Emergency Management System (SEMS) training, fire and life safety training, and conducting annual "drop, cover, and hold" drills. At a minimum, the ERP states that all Department employees should have fire, life safety, and NIMS/SEMS introductory training.

Navigant found that key emergency response personnel appear to have the necessary training for emergency preparedness; however, all Department personnel should have at least introductory SEMS and Incident Command System (ICS) emergency training. While OEM has trained approximately 4,500 staff in ICS since 2006, the training statistics in recent years are not supportive of consistent ICS training efforts. According to 2014 training statistics, two employees completed ICS 100 (Introduction to Incident Command System), two employees completed ICS 200, 90 employees completed ICS 300 (Intermediate ICS), and 23 people completed SEMS Orientation.[24] According to OEM staff, the Department recently hired an Emergency Preparedness Coordinator with credentials to teach ICS. Accordingly, efforts are underway to revive ICS and SEMS training through an in-house training program. This effort should have the support of executive level staff to ensure that the program is implemented and standardized.

Navigant also found that certain exercises such as building evacuations, annual fire drills, and five-floor relocation drills are well-attended. However, only nine employees attended the annual EMD Emergency Management Workshop. According to Department personnel, attendance is limited to executive staff and OEM that receive an invitation from the EMD. Navigant recommends that LADWP conduct an internal Emergency Workshop to disseminate information gathered at the EMD Workshop as well as additional information that fosters emergency preparedness. Participants in the internal Emergency Workshop could include a combination of OEM, executives, and middle management that are rotated on an annual basis. In addition, 31 Department employees attended the 2014 EOC functional exercise, which was a two-hour exercise directed to the Power System. Accordingly, the scope and effectiveness of the exercise were limited.

Based on these figures, training completion and exercise attendance are inadequate. Department personnel indicated that although the ERPs call for annual testing, the plans are not tested every year. Various table top exercises have been conducted over the past few years, but these are not consistent, full scale exercises of the ERP. It is important to note that each division is responsible for its own training programs. The BECs at the facility level are not monitored to ensure that facility staff are appropriately trained for an emergency and the OEM does not have any authority to enforce training beyond the facility manager level.

According to Department personnel, exercises are monitored by assigned internal staff and lessons learned are summarized in after action reports. An improvement matrix is then developed or assigned, but the implementation process for after action recommendations is not well documented. Accordingly, the Department should establish processes to ensure plans are updated according to exercise findings.

According to Water System interviews, the incident command system is routinely practiced through responses to water leak repairs. While this provides a good introduction to emergency preparedness, the Department should conduct system-wide and community-wide emergency exercises. LADWP should also consider conducting unscheduled tests to simulate a real emergency.

[24] 2014 Department Specific Emergency Preparedness/Training Activities Annual Report.

9.4.1.3 Response

Response provides the framework to put preparedness plans into action to prevent further damage and continue operations. For this component, LADWP has established three primary Department Operations Centers (DOC) that organize operational recovery efforts for each of the Systems after an emergency event. These DOCs include the Emergency Command Center for Power (EmCC), Water Emergency Command Center (WECC), and Information Technology Emergency Center (ITEC).

Each DOC has an Emergency Operations Director (EOD) who is responsible for overall emergency management for the System and each facility has a BEC that provides emergency training and exercises to facility personnel. The Department also has a Crisis Management Center (CMC) that acts as a DOC in support of the System DOCs. According to personnel, the CMC and the back-up facility are tested every year.

The CMC provides staff for a Crisis Management Team (CMT), supports Customer Service and Public Affairs in the dissemination of information to the public, supports the Joint System, Financial Services, and BECs in the collection of damage assessment information. The CMT is a group of high-level managers that disseminates emergency information to line management and identifies resources for emergency response efforts. The CMT includes a GM-appointed Disaster Planning Coordinator (DPC) to implement disaster preparedness policies.

9.4.1.4 Recovery

Recovery is the final component of the ERP and includes actions to return to normal operations following an emergency. For this element, each System ERP has a prioritized list of its critical functions; however, the lists are brief and there are limited actions and processes to support the restoration of these functions. In addition, the Department ERP does not have an enterprise list of prioritized functions, which restricts the efficient distribution of corporate resources and the communication between Systems in an emergency. (Refer to Section 5.8 below for additional information on the current status of an enterprise-wide risk assessment and BCM effort.)

LADWP has supplemented this component of the ERP with a Continuity of Operations Plan, which is discussed in more detail below.

9.4.2 Power Emergency Response Plan

In addition to the ERP components identified above, the Power System has operating orders that support its emergency preparedness efforts. While it is important to document these procedures, the absence of testing limits the effectiveness of these policies.

9.4.2.1 Operating Order – Power System Emergency and Disaster Procedures

The Power System has several facilities that assist with emergency response efforts. As discussed above, the Emergency Command Center (EmCC) is responsible for coordinating the Department's major emergency and disaster response and disseminating status information. The Customer Information Center (CIC) answers calls from the public during major emergency situations. CIC personnel provide information on the adequacy and integrity of the Systems, the anticipated duration of widespread service disruptions, and the measures that can be taken by customers to mitigate shortages.

9.4.2.2 Operating Order – Power System Damage Assessment

After an emergency or disaster, the Power System assesses damage according to a prioritized facility inspection list. Damage to the facilities is then rated according to its hazard to personnel safety and system reliability. These processes support the Department's disaster recovery efforts.

9.4.3 Water Emergency Response Plan

In addition to the ERP components identified above, the Water System has additional components to support its emergency planning efforts. The Water ERP outlines a process, Planning "P" to create an Incident Action Plan (IAP), to provide the objectives, strategies, and supporting activities that the System will use in an emergency event. According to the ERP, the IAP is centrally developed through WECC and decentrally executed through Incident Commanders. This detailed process includes developing a common operation picture, defining an operational period, goals, and objectives, designating resources, and creating a defined communications strategy. In the absence of formalized business continuity planning, this process approximates aspects of a more formal BIA and associated planning. Formal IAPs are a beneficial step to mitigating the impact of a major event. According to interviews with Department personnel, the Power System has chosen not to include this process in its ERP. Navigant recommends including a similar IAP planning process and communicating the benefits of the process to employees.

9.4.4 ITEC

Because a BIA has not been completed, comprehensive and rigorous DR plans have not been prepared at the Department. ITSD has established a DR site in Las Vegas, and worked with some system owners on an appropriate DR preparation. However, according to interviews, there are many systems where the system owner has not responded to requests to establish the level of DR required.

ITSD has established the replication of all centrally stored data (Network Attached Storage and Storage Area Network) to the DR site. Many major systems have servers established at the DR site and cutover has been tested. Several of the systems that system owners have not defined prioritized DR are complex, such as Supply Chain (eRSP), the Customer Service Division (LADWP.com site) and the Siebel CRM system. Therefore, while the data is preserved, restoring these systems would take considerably longer. The Power System has some systems on the enterprise network and have not transitioned their DR programs to the Las Vegas DR site. When the Data Center moves, these systems are expected to move their DR location to Las Vegas to get improved resilience to a major disaster.

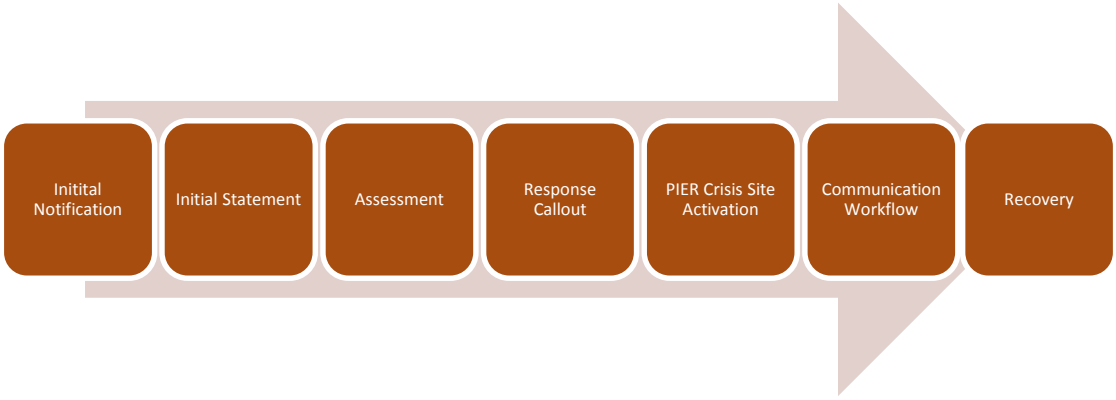
The control and critical dispatch systems (such as the Outage Management System that dispatches electric trouble crews) have their DR locations at the alternate dispatch locations, so that in the event that the networks, despite their resilience, are unavailable they can dispatch via emergency radio or other alternate means of communication.

See our report on Technology Infrastructure on the current status of Disaster Recovery efforts. Importantly, interviews suggest that OEM does not have insight into the critical IT components involved in restoration and cannot support or coordinate with these efforts.

9.5 Crisis Communication Plan

In August 2014, LADWP developed a Crisis Communication Plan in compliance with NIMS requirements. The purpose of the plan is to enhance and protect the Department's reputation and public trust by providing a clear plan for communicating during crises and major events. The plan includes response activities for LADWP-led events and City-led events (i.e. an event beyond the bounds of the Department that requires a coordinated response with the City). According to the plan, the Department has four Public Information Officers (PIO) that will manage crisis communications from event confirmation through recovery. The Department will use Public Information Emergency Response (PIER), a comprehensive, web-based communications platform, to communicate with key stakeholders and the public. After the event is confirmed and an initial statement is released through PIER, the PIO in coordination with the Incident Commander, the senior executive managing the response, categorizes the event into one of three levels and identifies response resources according to the level of the emergency. Information will be communicated regarding the status of the emergency until normal operations are restored. Figure 5-1 summarizes the phases of the plan.

Figure 9-1. Crisis Communication Plan



The plan clearly identifies the communication processes and resources that should be used in an emergency situation. Moreover, the plan includes multiple scenarios and levels of communication that can be applied to a wide range of emergency situations. Accordingly, Navigant found the Communication Crisis Plan to be a sound planning document.

9.6 Mutual Aid and Assistance

LADWP has a number of mutual aid and mutual assistance agreements to help distribute resources in an emergency. Resources may be requested from or requested by the Department to ensure continuity of operations. These agreements are utilized depending on the extent of the emergency event. The Department is also part of the California Utilities Emergency Association (CUEA), an organization that provides emergency response support, training, and mutual assistance agreements for utilities in California.

The Water System has mutual aid and mutual assistance agreements with multiple organizations including:

- California Water / Wastewater Agency Response Network (Cal WARN)
- California Mutual Aid Laboratory Network (CAMAL Net)
- Member Agency Response System with MWD
- Mutual Assistance Agreements with East Bay Municipal Utility District (EBMUD) and Las Vegas Valley Water District (LVVWD)

The Power System has the following mutual aid and mutual assistance agreements:

- Mutual Aid Agreement with American Public Power Association (APPA)
- Southern California Public Power Authority (SCPPA) Mutual Aid Playbook
- Western Region Mutual Assistance Agreement

It appears that the Department is active in mutual aid arrangements with regional peer companies and organizations.

9.7 Business Impact Analysis

As described above, a BIA is a foundational and standard component of business continuity planning in companies across all sectors – including the energy and utility sector. A BIA is critical for standardizing an organization's approach for assessing risk in terms of strategic objectives, prioritizing response in terms of the criticality of business activities and processes, and designing testing and training protocols on continuity plans.

A formalized BIA helps determine the financial and intangible losses that could result in the event that the Department's systems, assets, personnel, and data are not available due to a significant disruption (worst-case scenario event). Further, a BIA is a rigorous analysis: A BIA identifies recovery point objectives, resources required for recovery, estimated recovery time, estimated costs of operation interruption, and estimated cost of recovery for each critical business process or function. Finally, a BIA not only informs the prioritized recovery of key business processes, but also the systems that support the execution of those processes (e.g. software, hardware, vital records, and critical resources/equipment).

At present, the Department does not have an active BCM program, and has never completed a BIA. Interview results suggest that while the Department has drafted an RFP to conduct an enterprise-wide BIA, the initiative has stalled and is not being pursued. According to interviews with staff, the RFP has been drafted for more than five years. There is limited accountability for the RFP because ownership has been reassigned over the years and senior leadership is not supporting the effort. For example, a BIA working group has been formed to push this initiative forward; however, the group has not met in some time.

A BIA should be a critical component of the Department's disaster recovery strategy because it identifies critical business processes that are most affected by a worst-case disruption and it helps prioritize recovery strategies on an enterprise level. In brief, LADWP cannot develop enterprise-wide strategies and distribute resources effectively or efficiently in the wake of a disaster without a BIA.

10. Emergency Preparedness Conclusions

The Department has many of the policy frameworks that help define an emergency preparedness program. These include the COOP, ERP, and Crisis Communication Plans. However, features of rigorous programs – including evidence of routine and diverse testing, adherence to training requirements and schedules, clear accountability for plan design, development, and continuous improvement – are lacking at the Department. In addition, there is a lack of cohesion amongst the various emergency preparedness plans. While each document appears to define certain processes, resources, and strategies, it is unclear how these plans interact. OEM should create a strategic plan that identifies the emergency preparedness efforts that exist and the direction that the OEM will take to improve these efforts. A strategic plan would also establish timelines to complete OEM initiatives such as training employees and exercising and updating plans.

Leadership for these and other facets of good planning have been decentralized and pushed into the Systems, which has resulted in distinct approaches for building organizational resiliency. Importantly, accountability for emergency and business continuity planning is also dispersed, and in many instances, one of many roles and responsibilities for already burdened staff. These and other foundational aspects of good planning need to be addressed to strengthen the emergency and continuity programs.

As discussed in further detail in the *Security* section, LADWP should create senior executive level positions for security and risk that report directly to the General Manager. In addition to the tasks outlined in the *Security* section, a formal risk and security governance would provide the accountability needed to ensure that emergency plans and processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing disruptions of service. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate natural and man-made threats.

In addition, the ERPs and COOP should address disaster resilience. While we understand that the ERPs are based on a template provided by the City of Los Angeles EMD, the Department's emergency preparedness documents are overly broad and do not address the gradation of responses from a single pipe break to a worst case scenario. The ERPs should incorporate known vulnerabilities into response planning.

A prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department.

High Priority Recommendations

- Dedicate resources to completing an OEM Strategic Plan to define major initiatives for 2016, including the staffing and capital resource requirements to design, execute, manage and monitor programs.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the plans related to emergency preparedness and business continuity as well as other emergency preparedness and disaster resiliency initiatives.
- Clarify the emergency preparedness and business continuity governance structure, roles, and responsibilities between the OEM and the Water and Power Systems for core aspects of program design, execution, and decision-making.
- Finalize the BCM and BIA RFP.
- Execute the BCM and BIA scope of work.
- Confirm a consistent approach to plan development across Systems.
- Establish a role in the Power System to address resiliency and emergency preparedness efforts.
- Expand and enforce emergency training and exercises.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Re-evaluate and conduct training programs in-line with policies or good business practice.
- Define a rigorous testing plan for the programs, including a phased approach to tabletop and scenario tests (announced and unannounced), and testing of the "Hot Sites."

Low Priority Recommendations

- Review and standardize other aspects of the programs (including templates and forms of documentation).
- Confirm performance reporting protocols to the General Manager and other members of executive management.
- Integrate emergency preparedness and business continuity programs into Department benchmarking initiatives.

Appendix A. List of Interviews

Name	Title/Topic	Interview Date
Pat Findley	Executive Assistant to the General Manager	July 28th
John Dennis	Chief Compliance Officer	July 28th
James West	Director of Security Services – Uniform Security	July 29th
Sergio Sais	Director of Security Services – Special Operations	July 29th
Sandra Wallace	Security Services Administrator	July 29th
Matt Lampe	Chief Information Officer	July 29th
Brian Koch, Silvia Lozano, Pjoy Chua, Linh Doan, Sanda Cea, Felix Lebron	CIP Compliance Group	July 29th
Gary Wong	Joint Services Assistant General Manager	July 30th
David Alexander and Stephen Kwok	Director of Corporate Cyber Security	July 30th
Silvia Lozano	CIP Cyber Security Team Manager	July 30th
Dr. Craig Davis	Trunk Line Design Group Manager / Water System Resilience Program Manager / Water System Emergency Preparedness Coordinator	August 5th
Lisa Hayes	Office of Emergency Management Coordinator	July 30th, September 24th

C2M2 Workshop Participants (August 20th)

Name	Title/Topic	Organization
Matt Lampe	Chief Information Officer	ITS
Wai Lee	Electrical Engineer Associate	ITS
David Alexander	Information Systems Manager	ITS
Marie Park	Senior Systems Analyst	ITS
Bruce Untiedt	System Programmer	ITS
Stephen Kwok	System Programmer	ITS
Rafik Alsawalhy	System Programmer	ITS
Silvia Lozano	CIP Cyber Security Team Manager	Power
Paul Schultz	Power Engineering Manager	Power
Robert Tokashiki	Waterworks Engineer	Water

Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. Navigant also viewed additional documents in a secure data room at the Department. Some of the documents that were viewed in the data room are not listed here for confidentiality purposes. The primary documents are listed in detail below.

Documents Provided by LADWP	
1	Archangel Security Assessment Report - March 25, 2009
2	Deployment of Access control, Alarms and Video Systems, (R Hahn & Company April 2002)
3	Report on Security and Terrorism Threat Assessment (The R.S. Hahn Company, LLC. November 2001)
4	Executive Review Status of Electronic Security Systems: Moving Forward - January 2008
5	Bomb Incident Management Guidelines for the John Ferraro Building
6	IRP Scorecard (Output) Summary Pages for 2014 IRP Recommended Case
7	NERC Reliability Standards Compliance Program
8	NERC CIP-006 CIP Standard Compliance Program Version 3.4
9	NERC CIP-002 CIP Standard Compliance Program Version 3.4
10	NERC CIP-003 CIP Standard Compliance Program Version 3.4
11	NERC CIP-004-3: Personnel & Training Version 3.4
12	NERC CIP005-3: Electronic Security Perimeters Version 3.4
13	NERC CIP-007-3: Systems Security Management Version 3.4
14	NERC CIP-008 CIP Standard Compliance Program Version 3.4
15	NERC CIP-009 CIP Standard Compliance Program Version 3.4
16	NERC CIP Cyber Security Standards IEA Survey Version 3.4
17	Firewall Configuration for JFB - 108 pages
18	Web Security Gateway – Diagram
19	Network Access Control – Diagram
20	Wireless Infrastructure - Drawing CSA-2670
21	Internet Network Drawing
22	LADWP corporate wireless network summary
23	McAfee Overall IPS Infrastructure
24	Internet Infrastructure - HTTP Off-load
25	JFB Network Data Center - CSA-2601
26	DWP Corporate Network Internet Infrastructure - CSA-2683
27	LADWP Firewall Guideline
28	DWP Firewall Rules Implementation/Update Procedures
29	LADWP SGRDP Architecture Diagram
30	Sw4500-voip-template Documentation
31	JFB Smart Grid Firewall Configuration - 65 pages
32	BGP Routing
33	Disc - SIEM-01 (1 of 2)
34	Disc - SIEM-02 (2 of 2)

35	Disc - IEA Survey (IDM/McAfee/MAAS360)
36	Disc - Data Power
37	Disc - ITS-NOC 2015 IEA Survey Data (ITS-NOC)
38	2013 Power System Reliability Plan (PSRP and IEC Report)
39	2014 Long-Term Transmission Assessment
40	Scope of Work - Business Impact Analysis and Training Plan
41	PS Operation Procedures - Operating Order 29
42	PS Operation Procedures - Operating Order 32
43	PS Operation Procedures - Operating Order 36
44	Disc - SIEM-01 (1 of 2)
45	Disc - SIEM-02 (2 of 2)
46	Disc - IEA Survey (IDM/McAfee/MAAS360)
47	Disc - Data Power
48	Disc - ITS-NOC 2015 IEA Survey Data (ITS-NOC)
49	2013 Power System Reliability Plan (PSRP and IEC Report)
50	2014 Long-Term Transmission Assessment
51	Scope of Work - Business Impact Analysis and Training Plan
52	PS Operation Procedures - Operating Order 29
53	PS Operation Procedures - Operating Order 32
54	PS Operation Procedures - Operating Order 36
55	Mayor's Exe Dir #16 DSW
56	Mayor's Exe Dir #17 EOC
57	Mayor's Exe Dir #18 NIMS
58	Mayor's Exe Dir #19 MERC
59	LADWP Crisis Communications Plan
60	CAL WARN
61	CUEA Mutual Assistance Agreement (Electric)
62	Multi-Agency Water Mutual Assistance Agreement
63	Mutual Aid Agreement (2)
64	Western Region Mutual Assistance Agreement
65	LADWP Dept ERP 2015
66	Power ERP - Attachment B
67	Power ERP - Final
68	Water System ERP 2015 Final
69	Annex A - COOP Relocation Team 2015-Final
70	Annex B - Alternate Facilities 2015-Final
71	Annex C - Orders of Succession 2015-Final
72	Annex D - Delegations of Authority 2015-Final
73	Annex E - Definitions and Acronyms 2015-Final
74	Annex F - Security and Access Controls-Final
75	Continuity of Operations Plan (COOP) 2015 - Final
76	LADWP Pandemic Influenza Plan 2015 Final
77	2014ladwp

78	Recovery Final November 2014
79	Earthquake_report_FINAL_Dec_8_full_report_compressed
80	OO-29-Damage Assessment
81	2014 After Action Report Final 3 05 15
82	AAR
83	EmCC PDOC Organization Chart
84	OO-32 – Power System Emergency and Disaster Procedures
85	OO-36 – Communications
86	ITEC_manual
87	LADWP June 2015 BEC List – IEA Survey
88	IT Restoration
89	BIA Statement of Work – Prelimary
90	Mid Valley Water Facility – EOC Preliminary info
91	Mid Valley Water Yard Preliminary Layout 2015
92	SOW Emergency Base Camp Final
93	Water Master Exercise Calendar – IEA Survey
94	IEA Survey 2
95	IEA Survey file 3
96	IEA Survey 4
97	IEA Survey 5
98	IEA Survey 6
99	IEA Survey 13
100	IEA Survey 18
101	IEA Survey 19
102	IEA Survey 11

Volume VII

Technology Infrastructure

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Technology Infrastructure Report
Volume VII

Prepared for:
The City of Los Angeles

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NAVIGANT

Table of Contents

Executive Summary

Objectives & Approach

This report presents Navigant's findings on Technology Infrastructure for the IEA Survey. Technology infrastructure plays a critical role in the effective management and continuous improvement of the Department's operations. As a key driver of business processes, technology has a significant impact on the ability of LADWP to effectively and efficiently pursue its mission to provide safe, reliable, and affordable water and power utility services for the ratepayers of the City of Los Angeles.

This report is a strategic and operational assessment of the technology infrastructure of the LADWP, and in particular, the Information Technology Services Division (ITSD). ITSD is the Department's internal technology services organization, and the primary vehicle through which the Department drives and manages its technology infrastructure. Navigant reviewed the business practices adopted by the ITSD to formulate and implement the strategic direction of the Department's IT infrastructure and the tools with which the Department manages IT operations and evaluates performance. The goal of this assessment was to identify and recommend opportunities for the ITSD and, more broadly, the Department, to improve its approach and management of its technology infrastructure. For the IEA Survey, the *Technology Infrastructure* report includes:

- IT Standards: An overview of several of the most prominent industry standards related to technology infrastructure.
- Functions and Services: A review and assessment of the Department's Information Technology Infrastructure Library (ITIL) in relation to best practices, including roles and responsibilities, the services offered, processes to be followed, and primary contact persons for each area of enquiry.
- IT Strategic Planning and Governance: A review of LADWP's current IT environment for both corporate and System services and applications, as well as relationships with other functionality-specific Operational Technology (OT) environments.
- Primary Applications and Suites Supported: Navigant identified all of the major software applications used by the Department to gain an understanding of its current and future technological direction.
- Hardware, Network and Telecommunications Infrastructure: A review of the current standards for network operations, hardware, and telecommunications to determine if LADWP's strategy is sustainable and consistent with best practices.
- Portfolio and Project Management: A review and assessment of the processes and tools used to manage the portfolio of IT assets, vendor relationships, and project management.
- Information Security and Disaster Recovery: Navigant assessed the Department's information security policy and disaster recovery program.

A summary of findings and recommendations is provided at the conclusion of this report. Insights from interviews and document review complement our assessment.

Information Technology Standards

The discipline of information technology management is defined by specific standards established by oversight groups, as well as by the ongoing practices of technology professionals. Utilities with a large number of system applications commonly reference and apply control and management standards as defined by oversight groups such as the IT Governance Institute. The IT Governance Institute has two sets of widely accepted IT standards: Control Objectives for Information and related Technology (COBIT) and the IT Infrastructure Library (ITIL).

COBIT provides a framework to establish controls that ensure high levels of information quality, the establishment of clear policies, and adoption of good business practices. This framework is provided in four domains: planning and organization, acquisition and implementation, delivery and support, and monitoring. ISO 20000 is a global standard established by the International Organization for Standardization (ISO) that describes the requirements for an information technology service management (ITSM) system. The standard was developed to mirror the best practices described within the IT Infrastructure Library (ITIL) framework. ITIL provides a set of best practices related to IT service management, and includes practices that are categorized into five core areas, including service strategy, service design, service transition, service operation, and continual service improvement. The themes contained in these standards have been used to evaluate the maturity of the Department's technology-related policies and practices.

Information Technology Functions and Services

The Information Technology Services Division (ITSD) is LADWP's internal technology services organization. The division provides information systems technology to support the delivery of utility services. As a division in LADWP's Joint System under the Chief Administrative Office (CAO), the ITSD is responsible for management, policy setting, strategic planning, and leadership in the use of computer, radio, and telecommunications technologies with more than 450 full-time positions.[1] The ITSD is also involved in providing and managing the Department's telecommunication services through its fiber-optic network for both the City of Los Angeles and private companies.

The services provided by ITSD are categorized into six main areas:

- **Infrastructure**: Communications; Servers; Storage; Data Management; Disaster Recovery; and Training Facilities.
- **Applications:** Corporate; Vertical; and Infrastructure Applications.
- **Security:** Security Policy; Critical Infrastructure Protection; Risk-based Policy; Incident Management; Vulnerability Assessment and Remediation; Information Security Monitoring and Operations.
- **Projects and Processes:** Project, Incident, Problem, Change, Release, and Configuration Management; System Integration; Quality Assurance; and Business Process Improvement.
- **Administration:** Budget; Management Analysis; System Architecture; Safety; Personnel Management; and Training Management.
- **Commercial Services:** Fiber-optic and other technology services.

[1] ITSD Strategic Agenda 2014-15.

Information Technology Strategic Planning and Governance

Strategic Plan

In 2008, the ITSD began an effort to define a strategic vision for technology infrastructure at LADWP. This effort culminated in the drafting of the ITSD Strategic Agenda, a document which presents the ITSD's vision for the Department's technology infrastructure for the next five years. The most recent version (2014) identifies five key strategic goals to pursue from 2014 to 2018, including:

1. **Operational Effectiveness**: Provide the "most appropriate services to meet customer IT needs and objectives in a cost-efficient manner," including identifying and implementing innovative technologies to meet business challenges, deploying best practices in the area of service management, while also retaining, developing, and attracting an "outstanding workforce."
2. **Enterprise Architecture**: Develop and improve "an integrated, modern infrastructure and implement an application portfolio built upon technology standards."
3. **Customer Service**: Support and help to strengthen the LADWP customer service experience of end-users (i.e. rate-payers) as well as ITSD's internal customers within the Department.
4. **Security and Continuity of Services:** Drive to maintain "the confidentiality, integrity and availability of information and communications to support LADWP operations."
5. **Technology Leadership:** Provide leadership in setting the direction of the Department's technology in alignment with its broader strategic goals and direction.

While the Strategic Agenda defines a vision and general direction for the ITSD for the next five years, it has a limited scope compared to comprehensive strategic planning documents adopted by similarly situated utilities. In particular, the Strategic Agenda does not provide a detailed outline of the resources and direction required to comprehensively meet the needs of the organizations that ITSD serves.

Navigant recommends that ITSD expand the Strategic Agenda into a comprehensive IT Strategic Plan that addresses major technology initiatives, desired outcomes, performance metrics, and specific target dates for key activities. To the extent that a formal LADWP Strategic Plan is developed per Navigant's recommendations in other Survey reports, the IT Strategic Plan should align with that plan and define the IT resources and capabilities that are needed to achieve LADWP's overall strategy.

In addition, many utilities have developed a Technology Roadmap that provides an overview of the major technology initiatives required to achieve the IT Strategic Plan. Specifically, this document provides the timing for these major initiatives and can be used to develop IT-related budgets for the coming years. In addition to a comprehensive strategic IT plan, Navigant recommends that the Department develop a Technology Roadmap to support enterprise-wide IT and technology investments and operating costs.

Governance

While the Department employs project-level governance and oversight, our understanding is that the Department lacks an executive-level steering committee to help establish, monitor, and evaluate the overall technology strategy across a long-term horizon. The absence of such a governance structure leads to a lack of clarity in strategic direction for the use of technology within the organization and may result in inconsistent alignment of IT goals and objectives with those of the Power, Water, and Joint System

more broadly. Over the past seven years, an informal approach to IT governance has been employed by the Chief Information Officer (CIO) to gain support for the Department's IT needs. At the executive-level, this practice has proven to be problematic in light of the frequent changes in Department leadership. Frequent changes in leadership have resulted in repeated changes in priorities and inconsistent support from Department leaders for major IT projects. Clear priorities and consistent support for IT are both critical factors for a robust IT strategy, as well as for providing ITSD with the necessary financial and human resources.

Navigant recommends that LADWP establish a formal, executive-level committee tasked with the following:

1. Design, align, and implement strategic plans with an adequate view towards and understanding of the joint-business requirements of the Power, Water, and Joint System.
2. Provide support for the process that identifies technology needs, justifying and prioritizing IT initiatives in the form of projects.
3. Discuss and coordinate annual budgeting processes to ensure that adequate financial and human resources are allocated to ITSD to adequately support the strategic priorities and activities of the Power and Water System, as well as the broader Joint System organization.
4. Include a Technical Advisory Committee that focuses on the establishment of standards and technology direction for the Department.

Primary Applications and Suites Supported

The ITSD manages a portfolio of over 160 corporate and business applications to support the business activities of the Department. Dedicated ITSD teams of analysts, developers, programmers, and contractors manage these applications. Applications are organized into three categories:

- Vertical Applications (Customer Service, Asset and Work Management, Capital Project Management, etc.);
- Infrastructure Applications (Web access, Email, GIS, etc.); and
- Corporate Applications (Joint Systems—Enterprise Resource Planning, Human Resources, Payroll, etc.).

Vertical Applications

The Department has engaged in several projects to replace legacy systems. Most notably, the Customer Information System (CIS) was implemented and the Asset and Work Management systems is being upgraded.

The ITSD continues to address the issues that emerged as a result of the launch of the CIS system, including fixing meter configurations, adjusting calculations of bills and billing errors, and by returning collection activity to focus on customers owing the Department $250 or more for more than 60 days. ITSD actively manages the outstanding issues with this implementation, working closely with the Customer Information, Communication and Technology (CICT) group, which resides within the Customer Service Division (CSD). At the time of this writing, work continues to identify and remediate

defects and test system functionality in the hopes of bringing increased stability to the deployment and achieve a base level of CIS functionality.

The ITSD is also in the process of upgrading and integrating the Department's asset and work management systems (i.e. Maximo) for the Water and Power System. The project launched in 2011 and is expected to be complete before the end of the year. This system upgrade will provide a consistent approach to asset management across Water and Power by unifying the relevant data into a common application and instance.[2] Navigant believes that adopting a consistent approach to asset management activities across the Power and Water Systems is an important and valuable objective, which can be further facilitated through the adoption of common technologies. ITSD should ensure that the Water and Power Systems take advantage of this collaborative approach.

Infrastructure Applications

ITSD has also been working on the standardization of geographic information systems (GIS) to improve enterprise level planning, work and asset management, customer visibility and emergency response. While the Water System uses GIS, the Power System is still in the initial stages of implementation. According to the IT Strategic Agenda, the core GIS software has been acquired for Power, an RFP has identified the consultant to lead the implementation, and the project is underway. However, the Power System has not allocated resources to manage its GIS program, which is delaying the implementation process. ITSD should continue to consolidate and integrate the Water GIS into a common standard, and assure that the Power GIS is consistent with this standard. The silos between the Water and Power System will also need to be overcome if the Department is to optimize the information sharing synergies which can be leveraged through the integration of GIS across Systems.

Navigant found that the Department's use of web services is limited but expanding. For example, the ITSD has developed MYDWP, an intranet portal for employees to review data and information from Human Resources, Supply Chain, and Retirement Systems. ITSD is also developing a MYDWP mobile application to provide employees with remote access to this information.

Corporate Applications

Perhaps the biggest challenge the ITSD and the Department must face with regard to technology infrastructure will be the implementation of an enterprise resource planning (ERP) system, which would consolidate and upgrade old and unsupported platforms, including payroll, human resources, financials, and budget.

The ERP implementation will be a large and complex undertaking for the Department, similar to that of the CIS implementation. While lessons learned from CIS implementation will hopefully improve the Department's ability to implement the ERP system, ITSD should do extensive planning to ensure that the project has the appropriate resources and a rigorous approach to project management. Specifically, the ITSD should develop a detailed project plan, including end of life planning, the identification and documentation of business requirements, resource planning, and deployment timelines. In addition, a clear set of business requirements should be documented, working closely with stakeholders across the Department. Prior to launching the ERP, the ITSD should allocate adequate testing resources to ensure the system is functioning properly and that the staff are comfortable with the system processes. These

[2] In a technical context, an Instance can be defined as a single copy of a running program. Multiple instances of a program mean that the program has been loaded into memory several times.

measures will reduce the risks associated with implementing such a large system. The Department has taken some early steps to advance this implementation, including the hiring of a QA firm, the completion of a Strength, Weakness, Opportunities and Threats (SWOT) analysis, and the use of Oracle Insight to strategically implement ERP to address critical objectives and challenges.

In general, meeting future system upgrade and deployment needs will require more rigorous planning at the project and portfolio level, the ability to hire and retain specialized technology and program management professionals, a dedication to business process change, and a continuous focus on training. In the absence of these, the Department may encounter challenges related to large-scale implementation efforts.

Hardware, Network, and Telecommunication Infrastructure

Navigant found that the Department's current standards for network operations, hardware, and telecommunication infrastructure are consistent with best practices.

One of the key challenges in this area will be the integration and data migration to its new data center in Los Angeles. For example, ITSD has ten positions allocated to this effort and three of these positions are currently vacant.

The telecommunications infrastructure at LADWP has maintained a data reliability rate in excess of 99.9% across its network. ITSD able to maintain a high availability for its internal customers and third parties through its fiber optics network. Most critical in-basin telecommunications are over fiber infrastructure, with over 300 facilities fiber connected. The ITSD's continued ability to provide a high data reliability is contingent upon an adequate allocation of resources. Navigant found that ITSD staff are often diverted from day-to-day operational responsibilities because of ad-hoc projects. This finding is apparent throughout the ITSD.

Portfolio and Project Management

Portfolio and project management are critical components to successfully maintaining existing information systems and effectively managing new technology initiatives. With over 160 applications and new projects on the horizon, project management tools could be extremely helpful for ITSD to overcome its current work backlog. This backlog includes upgrading and consolidating applications as well as removing legacy systems. While some progress has been made in managing this workload, ITSD still faces challenges in this area.

A key aspect of portfolio and project management is change management, an area where ITSD has improved via a Change Management Policy and implementation of a Change Management Process that includes the Remedy software tool for receiving and tracking change requests. However, an overall IT Portfolio Management and Project Management Office has not been implemented at LADWP, although an effort has been made to do so. The ITSD is allocated limited and almost non-existent resources around project management. For example, there is only one Project Management Office (PMO) position on staff, which is also currently vacant. While the ITSD's project management approach is relatively effective, it is lacking and ad-hoc when it comes to smaller projects, which represent the bulk of the day-to-day activities of the ITSD.

Information Security and Disaster Recovery

Information Security

An Information Security Policy (ISP) is a common and important business policy in any organization. At the highest level, an information security policy provides management direction and support for information security across the organization. The objective of an ISP is to guide or control the use of systems to reduce the risk to information assets in terms of breaches of confidentiality, integrity and availability. Documentation of the ISP is one step in an overall information security process, which includes an information security risk assessment.[3] Ongoing monitoring and management of the ISP are additional steps in an overall security framework.

In 2008, the ITSD formalized an Information Security Policy (ISP or Policy) to provide protocols for managing LADWP computer systems, data, and network infrastructure. The ISP provides a foundation for standards, procedures and guidelines that govern LADWP's information security. The Department has executed numerous updates to the ISP and developed documentation to supplement policies. While the supplemental documentation refers to the specific section(s) of the ISP to which it relates, the ISP itself does not refer to the supplemental standards, procedures, and guidelines which have been developed.

Disaster Recovery

Emergency preparedness, business continuity, and IT disaster recovery (DR) are critical focus areas for utilities and the organizations that oversee them. Increasingly, utility organizations are exhibiting heightened risk awareness and focus on business resiliency. A variety of high-profile events over the last several years (both natural disasters and manmade events) have moved disciplines that support on-going business resiliency to the forefront of utility planning.

DR planning addresses the recovery of critical IT assets – including systems, applications, databases, storage, and network assets – given a significant operational disruption. DR is often considered the technological component of Business Continuity Management (BCM), which is defined as the management process that identifies:

- The most significant threats to an organization's on-going operations,
- The impacts to business operations that those threats, if realized, might cause, and
- The phased and prioritized approach to service recovery.

A rigorous business continuity management (BCM) process is central to business resiliency. As an aspect of that process, a disaster recovery (DR) plan that defines the phased approach for bringing vital forms of technology back in a phased manner in the event of an emergency is critical. While the ITSD provided a variety of documents that point to emergency and disaster recovery related procedures, there is no single and comprehensive plan along with related policies, procedures, and guidelines to direct employees in the event of an emergency or disaster recovery scenario. Furthermore, the extent to which ITSD employees are aware of or have been trained on their roles and responsibilities in the event of an emergency or disaster recovery situation is unclear.

Navigant found that accountability for DR has been decentralized, and resides in the Power, Water, and Joint Systems, and then within each Division in each System. According to the Department's Information Security Policy, the Assistant General Managers of the Systems or their designees (System Owners) are responsible for defining the business parameters for disaster recovery plans, including both the required

[3] Ryan Mazerik, "Information Security Policies", General Security, April 2014.

recovery time and the required recovery point. The System Owners also must ensure that adequate back up and system recovery procedures are in place to ensure the continued operation of a System. The policy states that system operators should work with the Assistant General Managers and other System personnel to prepare disaster recovery plans. We requested, but did not receive, the current DR plans in place at the Department. Further, we learned that DR plans have not been developed consistently across the Systems or Divisions, and that appropriate DR preparation has only been developed for some System Owners. For these reasons, we believe that the Department lacks consistent protocols that define how DR plans are to be derived, tested, and maintained across the Department.

Perhaps most importantly, the Department does not have a business impact analysis (BIA), which forms the foundation of business continuity planning. The BIA specifies the impact of disruptive events on business operations, financial performance, reputation, employees and supply chains, and the systems and networks that support them. As a result, the Department's overall DR priorities are not defined. Stated differently, how ITSD would work with each System to bring back critical applications in a prioritized manner is not defined. Consistency across all lines of business in BIA, testing methodologies, reporting schedules and other aspects of BCM are all characteristics of an organization that takes BCM/DR seriously. Navigant recommends that the LADWP prioritize the development and completion of these BCM components. Refer to our report on *Emergency Preparedness* for additional considerations on BCM and BIA.

Conclusions

In general, ITSD is appropriately organized and performs well in many of the critical areas for which it has responsibility. Specifically, the telecommunications network, the information communications network, and the provision and maintenance of mainframes and servers are all areas that are performing well. ITSD has also placed significant focus on maintaining the current state of operations, continuously working to overcome issues with the CIS implementation, and attempting to upgrade or replace a wide variety of diverse technologies currently in use. ITSD's biggest challenge is in the area of software applications, which is due in part to the age and diversity of the applications, but also due to the absence of a clear IT governance framework and an IT Strategic Plan. Accordingly, ITSD's current focus is more tactical than strategic.

Establishing a Strategic Agenda has provided a positive step in the right direction, but a more detailed Strategic IT Plan is necessary to transform and modernize the Department's use of technology. As noted, the Department should also establish an IT executive committee structure to ensure that the Strategic IT Plan is supported by the entire organization. A central aspect of this strategic plan would include an approach to address current and potential staffing limitations, which may hinder the achievement of IT objectives.

A prioritized list of additional recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Ensure that ITSD has the staff and contracting resources to address its current system challenges as well as future upgrades and platform implementations.
- Develop an IT Strategic Plan that builds on the IT Strategic Agenda to address major technology initiatives, desired outcomes, performance metrics, and specific target dates.
- Establish an executive-level governance that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure.
- Create an additional budget for ITSD to address unplanned projects and budget reallocations by project managers in the Power and Water Systems.
- Extend project management practices used for major projects to all IT projects.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Remove legacy systems and consolidate applications into one version or instance for the entire organization.
- Monitor the transition period between system upgrades to ensure the removal of older instances of systems.
- Establish a formal project management office for technology infrastructure to ensure that projects are monitored and completed.
- Ensure that the Maximo upgrade establishes an enterprise asset management program that encourages communication between the Water and Power System, including linking the new version of Maximo to other systems such as GIS.
- Develop a detailed implementation plan for an enterprise resource planning (ERP) system.
- Complete the new data center to consolidate data and enhance data security.

Low Priority Recommendations

- Expand the "My Account" section of the website to provide customers with additional usage and billing metrics.
- Complete the development of a mobile application for employees to access MYDWP information.

NAVIGANT

1. Introduction

1.1 Study Objectives

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort. This report presents Navigant's findings on technology infrastructure.

As defined by the scope of work for the Survey, the objectives for this report include an assessment of the following technology infrastructure focus areas:

- Current and proposed information technology infrastructure, including, but not limited to, a new financial system, purchasing system, human resources system, and other major legacy system replacements.
- Technology acquisition strategies and the effectiveness of project implementation strategies.
- Incorporation and use of technology in conservation and departmental efficiency efforts, customer service and education.
- Technology infrastructure with relation to emergency preparedness and business continuity.

Navigant worked closely with LADWP personnel to understand how the Department pursues technology infrastructure and to determine if opportunities exist to strengthen the organization. Navigant's findings and recommendations are summarized below.

1.2 Approach

Information for the *Technology Infrastructure* report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;
- Interviews with Department personnel including ITSD division and functional leaders;
- Navigant's experience in the management of IT and business functions of major municipal and investor-owned utilities; and
- Best practices with regards to management of technology infrastructure.

Navigant conducted interviews with leadership and subject matter experts that manage many of the technology infrastructure programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

1.3 Report Organization

The report comprises the following chapters:

- IT Standards: An overview of the industry standards related to technology infrastructure.
- Functions and Services: A review and assessment of the Department's Information Technology Infrastructure Library (ITIL) in relation to best practices, including roles and responsibilities, the services offered, processes to be followed, and primary contact persons for each area of enquiry.
- IT Strategic Planning and Governance: A review of the current IT environment of both corporate and enterprise-wide services and applications as well as relationships with other functionality-specific Operational Technology (OT) environments.
- Primary Applications and Suites Supported: Navigant identified all of the major software applications used by the Department to gain an understanding of their current and future technological direction.
- Hardware, Network and Telecommunications Infrastructure: A review of the current standards for network operations, hardware, and telecommunications to determine if the strategy is sustainable and consistent with best practices.
- Portfolio and Project Management: A review and assessment of the processes and tools used to manage the portfolio of IT assets, vendor relationships, and project management. Navigant also assessed the Department's emergency preparedness and disaster recovery program.
- Information Security and Disaster Recovery: Navigant assessed the Department's information security policy and disaster recovery program.
- Conclusions: A summary of findings and recommendations related to technology infrastructure.

2. Information Technology Standards

Information technology standards provide best practice guidance for optimally managing and continuously improving technology infrastructure programs. In addition to peer practices of similarly situated utilities, we referenced the themes included in the standards below to assess the Department's technology practices and programs.

2.1 IT Governance Institute

Utilities with a large number of system applications commonly reference and apply control and management standards as defined by oversight groups such as the IT Governance Institute (Control Objectives for Information and related Technology (COBIT) and the IT Infrastructure Library (ITIL)). These and other standards (including ISO 20000) provide guidance on a variety of topics that facilitate effective management of technology-related activities.

2.1.1 COBIT

COBIT provides a framework to establish controls that ensure information quality, clear policy, and good practices. According to COBIT, control activities take place in four domains:

- Planning and Organization: This domain includes defining a Strategic IT Plan, an information architecture, and an IT organizational structure to ensure compliance, assess risks, and manage projects and IT investments. These tactics ensure that the strategic vision of IT aligns with the business objectives of the organization.
- Acquisition and Implementation: This domain includes the identification, acquisition, and integration of IT solutions. The change and maintenance of existing systems is also covered in this domain.
- Delivery and Support: This domain ensures that the necessary support processes are established to consistently deliver the required services, including the management of service levels, third party services, training, customer assistance, data, and facilities.
- Monitoring: This domain assesses the quality and compliance of an organization's control requirements through internal and external audits.

2.1.2 ISO 20000

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. ISO 20000 is the international standard for IT service management, defined as the activities – directed by policies, organized and structured in processes and supporting procedures – that are performed by an organization to plan, deliver, operate and control IT services offered to customers.

ISO 20000 specifies requirements for the service provider to plan, establish, implement, operate, monitor, review, maintain and improve a Service Management System (SMS). The requirements include the design, transition, delivery and improvement of services to fulfil agreed service requirements. In this

way, deployment of an SMS is necessarily concerned with the appropriate mix of people, process and information technology required to deliver service to technology users.

2.1.3 ITIL

ITIL provides a set of best practice related to IT service management that reinforces ISO 20000, the international IT standard for service management. These practices support the alignment of IT services with the business requirements of an organization. ITIL best practices are provided in five core areas:[4]

- ITIL Service Strategy: This area covers the development of an IT service strategy that generates business outcomes, identifies potential challenges, targets improved customer satisfaction, and helps to identify business opportunities.
- ITIL Service Design: This area identifies the principles, methods, practices, and tools needed to design effective IT services.
- ITIL Service Transition: This area provides an approach to IT service transition, including specification, configuration, test, release, and deployment.
- ITIL Service Operation: This area describes the processes and technology involved in controlling service outages, monitoring performance, automating operations, and maximizing the value of business services.
- ITIL Continual Service Improvement: This area includes the continuous review of an IT System's cost effectiveness and capability against current and future business needs.

2.2 CIP Compliance

As part of the push for increased reliability for the electric grid, the National Electric Reliability Corporation (NERC) has been charged by FERC with establishing reliability standards for the electric power grid. Among those standards are a group of reliability standards related to telecommunications and critical infrastructure protection (CIP). The CIP standards provide requirements for both physical perimeter and electronic perimeter protection to assure continued operations of critical assets in the generation and transmission functions. These standards apply to items such as control rooms, SCADA, control systems, and data management tools. Among the standards are requirements for a number of activities that are standard practices among information technology environments. A discussion of the Department's processes and procedures to comply with CIP standards can be found in the *Security* report for the IEA Survey.

[4] ITIL Best Practice Solutions, Axelos website (https://www.axelos.com/best-practice-solutions/itil/what-is-itil).

3. IT Functions and Services

The Information Technology Services Division (ITSD) is LADWP's internal technology services organization. The division provides information systems technology to support the delivery of utility services. As a division in LADWP's Joint System under the Chief Administrative Office (CAO), the ITSD is responsible for management, policy setting, strategic planning and leadership in the use of computer, radio, and telecommunications technologies with more than 450 full-time positions.[5] The ITSD is also involved in providing and managing the Department's telecommunication services through its fiber-optic network for both the City of Los Angeles and private companies.

The services provided by ITSD are categorized into six main areas:

- **Infrastructure**: Communications; Servers; Storage; Data Management; Disaster Recovery; and Training Facilities.
- **Applications:** Corporate; Vertical; and Infrastructure Applications.
- **Security:** Security Policy; Critical Infrastructure Protection; Risk-based Policy; Incident Management; Vulnerability Assessment and Remediation; Information Security Monitoring and Operations.
- **Projects and Processes:** Project, Incident, Problem, Change, Release, and Configuration Management; System Integration; Quality Assurance; and Business Process Improvement.
- **Administration:** Budget; Management Analysis; System Architecture; Safety; Personnel Management; and Training Management.
- **Commercial Services:** Fiber-optic and other technology services.

3.1 Organization

The organizational structure of ITSD reflects a structure that is commonly used by other large utilities to manage their information technology needs. ITSD is centrally organized as a shared service, establishes policies and standards related to telecommunications, hardware selection, and software applications, and communicates with end use IT customers within the Power, Water and Joint Systems. Importantly, governance is a key aspect of organizational effectiveness. Currently, the CIO at the Department reports to the CAO who reports to the General Manager. Many utility organizations have the CIO position report directly to the General Manager or CEO to ensure that technology infrastructure issues are appropriately addressed on an enterprise level. Where adopted, this governance and reporting relationship elevates the role of technology in the organization,

3.2 Workforce Management

All aspects of "Human Capital" – from recruiting, to compensation, to talent management – have become critical to the on-going management of technology organizations. Increasingly, new skills and competencies are required as organizations look to replace legacy systems, embrace new technologies, and more broadly engage in a transformation in the use of technology and data. This is particularly

[5] ITSD Strategic Agenda 2014-15.

important as technology is increasingly seen as a means of not simply supporting the current business, but helping drive achievement of strategic objectives. In this context – and given the significant legacy system replacement and/or upgrade requirements that will be required at the Department over the next decade – ensuring that the Department is able to quickly attract and retain the right technology resources is critical.

Results from our interviews with multiple members of Department leadership confirm that ITSD has difficulty filling open positions with qualified candidates. While this challenge is not unique to ITSD, it is especially challenging given the unique skills and aptitudes that are required to successfully deliver on the group's mission in the short and intermediate term. Due to the civil service rules and hiring processes currently in place in the City that apply to LADWP, the pool of potential qualified candidates for any particular technology-related position is necessarily limited. Further, ITSD cannot go directly to the open market to find well-qualified candidates with specific skills. This combination of factors is especially troublesome when ITSD is looking for candidates with specialized skills and experiences with newer technology that does not currently exist within ITSD or the City. In addition, due to the active competition for existing resources, our interview results suggest that many IT resources have left ITSD and taken promotions in the operating divisions. While shifting resources across groups is common in matrix organizations, it limits the opportunity to build the "next generation" of IT professionals. Finally, as with other utilities, LADWP has a "graying" work force with a significant percentage of its current staff either eligible or within a few years of eligibility for retirement.

As ITSD begins to transform its business and operations applications to new platforms and applications, the likelihood of acquiring these skills within the existing civil service pool may be low. To effectively meet the needs for unique technical skills that will be needed by ITSD, consideration should be given to an exception to the standard hiring and placement processes in use at LADWP.

Navigant also found that ITSD lacks the ability to hire outside contractors for relatively small and unplanned technology requirements. In major utilities, the practice of IT business functions to hire outside contractors to address ad-hoc requests, unplanned and emergency scenarios, and provide specialized expertise represents a source of critical support in ensuring the effective and efficient provision of services to internal and external customers. Given the existing structure and restrictions within the civil service system and labor union agreements under which the Department operates, the ITSD lacks the ability to pursue this avenue. The ITSD must then almost exclusively rely on existing resources to fulfill not only its day-to-day operational functions, but also unplanned or emergency response scenarios and the multitude of ad-hoc requests from the City of LA and Department leadership. As a result, ITSD employees are required to switch focus from day-to-day operational functions to unplanned requests and scenarios, which diverts focus and comes at the expense of effectively executing primary functions. Navigant recommends the Department consider alternative avenues to hire the appropriate skilled staff for ITSD.

4. Strategic Planning and Governance

4.1 ITSD Strategic Plan

Successful IT planning requires consistent business participation. Accordingly, IT Strategy should be an ongoing process that addresses both creating new business capabilities and sustaining existing ones. IT Strategy establishes the linkage between future business capabilities and their related IT capabilities to maximize the value of IT investments. Specifically, an IT Strategy helps in the following ways:

- Set the direction for IT
- Improve business and IT alignment
- Prioritize IT investments and resources
- Enable effective decision-making through IT principles
- Improve IT project delivery through IT governance and IT principles
- Improve business support through IT governance
- Establish an IT initiative and Roadmap to deliver on business objectives
- Establish the right mix of skills and sourcing options

A strategy should include the following components:

- IT Principles – statements of intent or purpose that guide decisions about the use of technology
- Governance - key decision rights, accountabilities and measures to ensure desirable behavior in the use of technology
- Directions & Priorities – future products or services needed to enable strategic business capabilities
- Skills & Sourcing – critical technology competencies and sources to develop and sustain future IT capabilities
- Roadmap – high-level plan depicting an implementation path for future IT capabilities within the constraints of budget, external influences and organizational change.

According to interviews with Department personnel and the documents provided, LADWP has neither a formally adopted Technology Roadmap, nor an enterprise-wide IT Strategic Plan that is approved by the General Manager. In recent years, utilities have found that with the introduction of new technologies, greater customer expectations in the use of technology, the emergence of a new utility business model in the electric industry, and the convergence of operations technology and traditional corporate information technology, enterprise-wide strategic planning is critical to a successful transition from the status quo.

In 2008, the ITSD began an effort to define a strategic vision for technology infrastructure at LADWP. This effort culminated in the drafting of the ITSD Strategic Agenda, a document which presents the ITSD's vision for the Department's technology infrastructure for the next five years. The most recent version (2014) identifies five key strategic goals to pursue in the 2014 to 2018 period, including:

1. **Operational Effectiveness**: Provide the "most appropriate services to meet customer IT needs and objectives in a cost-efficient manner," including identifying and implementing innovative technologies to meet business challenges, deploying best practices in the area of service management, while also retaining, developing, and attracting an "outstanding workforce."
2. **Enterprise Architecture**: Develop and improve "an integrated, modern infrastructure and implement an application portfolio built upon technology standards."
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4. **Security and Continuity of Services:** Drive to maintain "the confidentiality, integrity and availability of information and communications to support LADWP operations."
5. **Technology Leadership:** Provide leadership in setting the direction of the Department's technology in alignment with its broader strategic goals and direction.

While the Strategic Agenda defines a vision and general direction for the ITSD for the next five years, it has a limited scope compared to comprehensive strategic-planning documents adopted by similarly situated utilities. In particular, the Strategic Agenda reflects the view of ITSD as to the Department's plans and needs, and this may not necessarily be in alignment with the vision of the enterprise wide needs. Additionally, it does not provide a detailed outline of the resources and direction required to comprehensively meet the needs of the organizations that ITSD serves.

Navigant recommends that ITSD expand the Strategic Agenda into a comprehensive IT Strategic Plan that addresses major technology initiatives, desired outcomes, performance metrics, and specific target dates for key activities. To the extent that a formal LADWP Strategic Plan is developed per Navigant's recommendations in other Survey reports, the IT Strategic Plan should align with that plan and define the IT resources and capabilities that are needed to achieve LADWP's overall strategy.

In addition, many utilities have developed a Technology Roadmap that provides an overview of the major technology initiatives required to achieve the IT Strategic Plan. Specifically, this document provides the timing for these major initiatives and can be used to develop IT related budgets for the coming years. In addition to a comprehensive strategic IT plan, Navigant recommends that the Department develop a Technology Road Map to support enterprise-wide IT and technology investments and operating costs.

4.2 IT Governance

A well-organized IT governance establishes clear roles and responsibilities for making decisions and delivering results. The governance framework identifies the accountabilities, empowerment and performance expectations for each role. IT Governance should include the following:

- Established rules, processes and roles for decision making and action.
- Identified stakeholders that play a significant role in planning, managing and deploying IT services, including external suppliers and partners.
- Communicated roles and responsibilities for each stakeholder.

- Documented processes and tools for full service lifecycle including planning, design, implementation, operations, maintenance, and retirement.

The Department lacks an executive-level governance framework (including a strategic technology committee) that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure. The absence of such a governance framework leads to a lack of clarity for strategic direction on the use of technology within the organization and may result in inconsistent alignment of IT goals and objectives with those of the Power, Water, and Joint System, more broadly.

Over the past seven years, an informal approach to IT governance has been employed by the CIO to gain support for the Department's IT needs and develop specific plans from those communications. At the executive-level – including specifically, the GM and CAO – this practice has proven to be problematic in light of the frequent changes in Department leadership. This has resulted in repeated changes in leadership priorities and wavering buy-in from Department leaders for major IT projects, both factors which play a critical role in driving a consistent strategy around IT, as well as provide overall support for the resources required to achieve strategic goals and objectives, such as the allocation of necessary financial and human resources.

Navigant recommends that LADWP establish a formal IT governance framework – including a strategic technology committee – that is tasked with the following:

1. Design, align, and implement strategic plans with an adequate view towards and understanding of the joint-business requirements of the Power, Water, and Joint System.
2. Provide support to the process for identifying technology needs, justifying and prioritizing IT initiatives in the form of projects.
3. Discuss and coordinate on annual budgeting processes to ensure that adequate financial and human resources are allocated to ITSD to adequately support the strategic priorities and activities of the Power and Water System, as well as the broader Joint System organization.
4. Include a Technical Advisory Committee that focuses on the establishment of standards and technology direction.

4.3 ITSD Budget

Organizations of all types struggle with IT-related budgeting. This often occurs due to a lack of alignment between the IT, finance, and the operating functions. In the case of the Department, results from our interviews and data requests confirm that several issues impact the proper budgeting of – and use of funds for – IT-related needs.

The Department lacks a consistent and formal approach to gathering business requirements from end-users and incorporating them into annual budgets. The approach to budgeting at the Department has often led to a misalignment of the needs of ITSD and those of the Power, Water, and Joint Systems because resources are not appropriately allocated to meet business requirements. Given the critical functional support that ITSD provides to the Systems, the Department's budgeting process should align the critical needs of the Systems to ITSD.

In the past, the Department allocated a division budget to ITSD that provided adequate financial resources to pursue and support both its internal priorities and those of the Department. However, the

Department currently allocates the budget by project rather than by division. While this practice is not uncommon amongst major utilities, the Department's approach to this practice has proven to be particularly problematic for the following reasons:

1. The aggregate cost to maintain ITSD infrastructure, telecommunications and existing systems is often not included in the budgets by project.
2. ITSD cannot support the incremental costs of IT requests made by the divisions.
3. When project costs are managed under operating divisions, the most cost-effective or beneficial technologies are not always selected because ITSD is not actively involved in this process. Operating divisions can also reallocate the IT portion of project budgets to other budget areas.

As a result, the current budget allocation process has resulted in, and continues to expose the Department to, substantial risks, including the under-funding of the IT components required to support critical projects and a lack of flexibility for the ITSD to effectively respond to ad-hoc requests and emergency scenarios. As an example, in FY14, Navigant found that ITSD did not have the budget for the IT equipment, software, and support for the unplanned hiring of an additional 300 and 200 staff in the Power and Water Systems, respectively.

Further, according to interviews with Department personnel, the availability and "roll-over" of the contingency funds in the previous budget allocation structure represented a valuable resource that enabled ITSD to respond to challenges such as those that emerged when the Customer Information System (CIS) went live. Such contingencies do not currently exist and must go through both an internal process and Board processes to be approved.

Navigant recommends that the budget not only reflect major projects and ITSD's cost involvement in those projects, but also include an operating budget for ITSD to maintain the current environment. This allocation will allow ITSD to support the IT components of projects being pursued by the Power, Water, and Joint System and to fulfill internal needs and provide it with the necessary flexibility to respond to ad-hoc requests and emergency situations. The budget should align with the ITSD Strategic Agenda and the IT Strategic Plan proposed above.

5. Primary Applications and Suites Supported

The ITSD manages a portfolio of over 160 corporate and business applications to support the business activities of the Department. These applications are organized into three categories: Vertical Applications (Customer Service, Asset and Work Management, Capital Project Management, etc.); Infrastructure Applications (Web access, Email, GIS, etc.); and Corporate Applications (Joint Systems—Enterprise Resource Planning, Human Resources, Payroll, etc.). Dedicated ITSD teams of analysts, developers, programmers, and contractors manage these applications. This section identifies the findings related to the Department's application portfolio.

5.1 Vertical Applications

Vertical applications at the Department include:

- Customer Service and Meter to Cash
- Asset and Work Management
- Incident/Outage Management
- System Modeling and Management
- Capital Project Management

5.1.1 CIS Implementation

The Customer Information System (CIS) facilitates the management of the billing and revenue generation activities for the Department. The Department selected and implemented Oracle's Customer Care and Billing (CCB) solution for customer service.

Since the initial roll-out of CIS, the Department has made progress towards resolving some of the most significant issues that adversely influenced the launch of the CIS system. Key actions have included:

- Customer bills: Resolved estimation and calculation of customer bill.
- Meter Configurations: Completed data conversion and meter configurations for nearly 180,000 meters.
- Rate Trend Estimates: Improved rate trend estimates by granulizing trend areas by zip code rather than the four major areas adopted during launch.
- Collection Activity: Generally returning to normal collection activity.

Based on these findings, IT appears to have successfully addressed many of the most significant deployment challenges that undermined adoption of the core features of the system. Work continues to address defects, with the eventual goal of increasing system functionality and moving toward a more optimized use of the system. Challenges remain in the integration and further use of the smart data stored in the Meter Data Management System, the potential implementation of new rate structures, and the transfer of service documentation to the CIS. ITSD has developed a detailed plan for the remainder of the project and has implemented project management tools to identify and mitigate the remaining challenges. ITSD Project Managers are managing the implementation of this plan, including the execution of key milestones against an MS Project Gantt Chart. The Customer Service Division (CSD) has an IT group (CICT) that works with ITSD on these issues. The role of CICT is discussed in the *Customer Service* report of the Survey.

One key concern in this area is the number of vacancies in ITSD's CIS Programming Group, which is the function tasked with managing the IT components of CIS. According to the July 2015 organizational chart, 25 of the 65 staff positions in the CIS Programming Group are unfilled, including 7 vacant positions, 9 new positions for FY 15-16, and 9 newly authorized positions. These vacancies and openings may limit operations support for and necessary upgrades to the CIS system. In addition, this group will support the planned Mobile Workforce Management (MWM) upgrade and the CC&B transitions from premiere support in 2016 to no support in 2018. Given the imminent CIS-related challenges, this resourcing gap should be addressed immediately.

Our experience confirms that an organization's overall morale and corporate culture are important determinants of successful system deployment. Large-scale system selection, implementation, issue remediation, and continuous improvement are long-term efforts that require a significant amount of capital and staff resources. These efforts also require a significant level of positive organizational "energy". Challenges to large-scale IT deployments can have a lingering negative impact on an organization. In several interviews, Navigant found that the Department is hesitant to aggressively pursue other system roll-outs such as those related to asset management (Maximo) and ERP because of the CIS implementation issues. This environment is exacerbated by related challenges in areas such as staffing and staff retention. A review of the most significant system implementation plans and requirements are discussed below.

5.1.2 Maximo Implementation

Maximo is a work management system used by both the Water and Power Systems to track and record maintenance. The platform is also used to track material requirements for supply chain management and, in some instances, to complete asset management assessments.

In May 2011, the Department retained Total Resource Management (TRM) to improve its enterprise asset management capabilities and facilitate the migration of Maximo to then-current versions. In April 2014, Department approved an increase in the contract amount and also increased the contract term by three years.[6] The Department explained that the contract was extended, in part, because the staff significantly underestimated the complexity of the necessary configuration and implementation tasks. The initial contract also did not provide adequate contingency funds to address unexpected costs associated with an aggressive implementation timeframe. While it is not uncommon for utilities to delay the implementation of major IT systems, the Department should heavily monitor the project to ensure that future deadlines are met.

During the interviews conducted with ITSD personnel, Navigant was informed that the Maximo upgrade is expected to be complete in the next couple of months. Navigant recommends that the Department use the Maximo upgrade to link to other systems to create a more cohesive and integrated technology infrastructure. According to the IT Strategic Agenda, the Maximo upgrade will also provide a consistent approach to asset management across Water and Power by unifying the relevant data into a common application and instance. ITSD should ensure that the Water and Power Systems take advantage of this collaborative approach.

[6] According to Los Angeles City Council Resolution documents, the original contract amount totaled approximately $9.9 million. The additional contract amount totaled approximately $2.5 million.

5.2 Infrastructure Applications

Infrastructure applications include:

- Web and Mobile access
- E-mail
- Content/Document/Record Management
- Identity Management
- Systems Management
- GIS

5.2.1 GIS Integration

In addition to the Maximo upgrade, ITSD has been working on the utilization of geographic information systems (GIS) to improve planning, work and asset management, customer visibility and emergency response on an enterprise level.[7] GIS is a comprehensive tool that identifies where assets and activities are geographically distributed. It also manages data on the characteristics of these assets and activities. One component of effective GIS utilization is integration across Systems. While the Water System has a GIS system that ITSD is working to consolidate and integrate into a common standard, this standardization will also need to extend to the GIS system that is being developed for the Power System. According to the IT Strategic Agenda, the core GIS software has been acquired for Power and an RFP has identified the consultant to lead the implementation. However, the Department will encounter challenges with GIS integration, in part, due to the Power System not having allocated resources to the project, which is one of several recurring issues with the Department's approach to project management. This project should be closely monitored to ensure that every effort is made to establish an enterprise infrastructure that allows ITSD to integrate GIS data into its applications. Moreover, the GIS integration should link to the Maximo upgrade to support enterprise asset management, information sharing, and communication across Systems.

5.2.2 Web Services

Navigant found that the Department's use of web services is limited but expanding. Web services (or application services) are applications that enable the seamless exchange of information between internal business units, customers, and business partners. Many utilities are using web services to interact with both staff (internal) and customers (external). For example, the ITSD has developed MYDWP, an intranet portal for employees to review data and information from Human Resources, Supply Chain, and Retirement Systems. ITSD is also developing a MYDWP mobile application to provide employees with remote access to this information. We envision the continued advancement of web services for use by Department staff to meet a variety of business requirements.

For residential and commercial customers, ITSD has established MyAccount, a web portal that enables customers to manage their account, view area outages, apply for various products and services, and to use social media notifications for sharing program announcements and other uses. The Department should continue to expand the range of services and metrics provided in the "My Account" section of the LADWP website. For example, once the Power and Water Systems upgrade to automated meter

[7] ITSD Strategic Agenda, 20145 draft v2 clean, page 13.

infrastructure (AMI), the web portal should provide customers with the ability to monitor usage on a day-to-day basis. The Department's progress on AMI implementation is discussed in further detail in the *Power* and *Water* reports of the Survey.

Finally, the Department has also adopted an IT Service Request System (ITSRS) to improve the management and tracking of service requests from its customers. This system has automated the service request process and provided a tool that consolidates and prioritizes these requests. This system automation is best practice.

5.3 Corporate Applications

Corporate applications at the Department include:

- Core Financials and Budget systems
- Human Resource management and Payroll
- Procurement and Materials Management

5.3.1 ERP Implementation

According to the IT Strategic Agenda, the ITSD is developing a plan to replace certain key applications with an enterprise resource planning (ERP) system. This system would consolidate and upgrade old and unsupported platforms, including payroll, human resources, financials, and budget. Given the aging workforce, an ERP is a critical project because the current applications are essential to Department operations, but they are often internally developed or highly customized, which limits the number of employees that have the skills and knowledge required to maintain these systems. An ERP would standardize business processes, and provide a consistent approach to these applications.

The ERP implementation will be a large and complex undertaking for the Department; however, it will create an opportunity to remove legacy systems and to more fully address the business requirements of the organization. A formal ERP system will also eliminate ad-hoc systems that have been developed and implemented. The project will be challenging because it will involve every function within LADWP, and will require at least five years to fully implement. The Department has taken some early steps to advance this implementation, including the hiring of a QA firm, the completion of a Strength, Weakness, Opportunities and Threats (SWOT) analysis, and the use of Oracle Insight to strategically implement ERP to address critical objectives and challenges.

Given the importance of ERP applications to process management and financial reporting, the ERP should be implemented in phases to ensure a smooth transition and continuous operations. A phased approach is also important, inasmuch as ERP implementations can have a significant impact on the normal workflow of staff. In addition to the initial steps that are already underway, ITSD should develop a detailed project plan, including end of life planning, the identification and documentation of business requirements, resource planning, and deployment timelines. Due to the impact on the existing staff of legacy systems, this effort should begin as soon as possible.

5.4 Current Application Portfolio Management

Navigant found that ITSD faces significant challenges in managing its current portfolio of applications.

While most Vertical applications have a current and supportable technological direction, there are Corporate and Infrastructure applications with legacy systems that are currently in use and need to be replaced. For example, certain corporate applications that are based on protocols such as Information Management System (IMS) and Customer Information Control System (CICS) are twenty to thirty years old and still in use. Finding staff with experience in these old technologies is difficult, and today's technology hires have little interest in learning these technologies.

There are also applications that need conformity between the Water and Power Systems to minimize the number of instances that are required to meet future needs. For example, the planned Maximo upgrade will require older instances of Maximo to be maintained in the Systems until the projects that are managed in that instance are closed.

ITSD has adopted certain application standards to create consistency in the selection and implementation of applications throughout the organization; however, ITSD should work towards enforcing these standards on an enterprise level. For example, ITSD appears to use FileNet to provide a standard application framework for document and records management. ITSD is also using newer technologies (i.e. web services and .net) to develop many of the ad-hoc systems in the operating divisions. Navigant recommends that the Department continue to pursue these initiatives and upgrades. These efforts should also be extended to the portal services for LADWP customers.

Meeting future system upgrade and deployment needs will require more rigorous planning at the project and portfolio level, the ability to hire and retain specialized technology and program management professionals, a dedication to business process change, and a continuous focus on training. In the absence of these, the Department may have challenges related to large-scale implementation efforts.

5.5 Operations Technology

While ITSD provides desktop equipment, servers, and telecommunication networks to the Power and Water Systems, Navigant found that divisions in the Systems own, operate, and maintain operations technology that has little oversight from ITSD. The Systems also have software applications that are maintained within their own IT environments to support certain critical operations. Examples include energy management systems, outage management systems, geographic information systems (GIS), and power management systems. However, the data and processes supporting these systems often interact with systems that ITSD supports. For example, an effective outage management process requires a close relationship between the data maintained in GIS, Maximo, CIS, and outage management. While ITSD has selected a platform firm for both CIS and ERP and standardized many platform and middleware services, Navigant recommends that the Department continue to take key steps towards establishing an enterprise technical architecture that simplifies the integration of these systems across the "siloes" of the organization.

Navigant also found that ITSD's lack of involvement in the operational technology of the Power and Water Systems has created an environment that allows the Systems to bypass the involvement of ITSD and develop applications with functionality that could be met through existing ITSD technology. As a result, synergies such as the implementation of a GIS server that is used by all Systems are not leveraged. In fact, according to interviews with personnel, "shadow systems" exist within the operating divisions. This arrangement can result in wasted resources and internal competition for both budget and staffing

resources. A further implication of this practice is related to Disaster Recovery; because ITSD does not have a clear understanding of all of the systems and technologies in Power and Water (or the role of those systems in key business processes), ITSD will not be able to adequately support all of the recovery needs in the event of a significant service disruption. (This issue is covered in greater depth in Section 6.5 below.)

Navigant recommends that LADWP conduct an inventory of all applications to identify and eliminate "shadow systems" and to maximize the use of ITSD resources. An inventory would also identify legacy systems and applications as well as parallel instances of systems. Accordingly, Navigant further recommends a detailed plan be developed for end of life for these systems, including plans to replace existing systems and consolidate the platforms on which these systems operate (such as Oracle, SQL Server or .net). While some of these needs have been identified by ITSD personnel, day-to-day activities have limited the resources available to develop a detailed plan to address these issues.

6. Hardware, Network, and Telecommunication Infrastructure

This section reviews the Department's current network operations, hardware, and telecommunications and discusses how the adopted strategy is consistent with best practices and sustainable into the future.

6.1 Hardware

ITSD provides all of the server and desktop requirements other than certain proprietary critical systems for electric operations to the Systems. As a result, ITSD has been able to establish and maintain certain hardware standards with the exception of a few instances where technology needs were not communicated to ITSD. For example, ITSD has standard work station technologies (i.e. PC, keyboard, mouse, etc.) based on a tiered system as well as laptops, printers, and projectors, among others. These hardware standards are best practice and should be extended to all systems in the organization, where absent.

The Department primarily uses Windows and Linux software with a 60% and 40% share, respectively. On servers, the Department uses mostly HP servers with standards that are reflective of best and common server standards. Over the past two years, the ITSD has taken steps towards upgrading the hardware for its data infrastructure. These upgrades should be continued to remove inefficiencies due to aging hardware.

In the last five years, the ITSD has also significantly improved its capabilities for patching servers, the processes by which it can update, fix, and improve computer programs and supporting data. The ITSD has deployed BMC's automated solution to patch servers, which includes identifying missing patches and areas of vulnerability, and deploy fixes to affected devices without interrupting use. The automation of patching has been the norm for utility IT organizations and as a result of this effort, the ITSD can now patch servers on a monthly basis, while in the past, they had remained consistently between 2 and 3 years behind on patches.

6.2 Network

The Department's network is essential to the management of the delivery of water and power. The Department's network engineering and operation function supports this network, including network engineering and security, voice engineering, wireless transport engineering, the network operations center, cable transport engineering and drafting, along with related maintenance support services.

ITSD's enterprise data infrastructure team manages the devices and systems on this network including data centers, servers, storage, backup, and voicemail.

6.2.1 New Data Center

LADWP is working to establish a new data center in Los Angeles that will allow it to consolidate data and enhance its data security. The consolidation will also reduce costs and improve data management. The data center is not fully operational yet because key challenges remain, including the selection of reliable and efficient equipment and the transfer of existing data. The ITSD has ten staff positions allocated to enterprise data infrastructure, which includes the establishment of the new data center;

however three staff positions are vacant. As discussed above, resourcing is an issue in this division and this area needs additional staffing resources to ensure continuous project monitoring and timely project completion.

6.3 Telecommunications Infrastructure

ITSD provides a telecommunications infrastructure that serves the Department's facilities and requires various levels of service for its internal and external customers. This demand notwithstanding, ITSD has been able to maintain a data reliability rate in excess of 99.9% across its network. Not only is ITSD able to maintain a high availability for its internal customers, it also has system capability to offer telecommunications services through its fiber optics network and other assets to third parties outside LADWP. Fiber infrastructure is used for most critical in-basin telecommunications, with more than 300 facilities fiber-connected. In addition, according to Department personnel, fiber connectivity to Owens Valley is nearly complete. The ability of the ITSD to maintain a near complete system availability is critical to supporting Department operations and the execution of day-to-day activities.

While the Department's telecommunications infrastructure is mostly a copper cable system, there are existing plans to transition from copper to fiber optics, of which plan details and deployment timelines have yet to be determined. The Department has also upgraded its telephone system to VoIP and established a video conference system to facilitate business operations. The Department is also upgrading its aging and decentralized radio systems with a single 900 MHZ standard.

ITSD has also delivered the telecommunications infrastructure for the new customer service call center associated with CIS implementation, and has been mandated to deliver the same infrastructure for a new call center in Chatsworth. According to interviews, this call center project was unplanned and has diverted resources away from day-to-day operations. This further highlights the resourcing challenges that ITSD faces.

7. Portfolio and Project Management

Portfolio and project management are critical components to successfully maintaining existing information systems, and effectively managing new technology initiatives. With over 160 applications and new projects on the back burner, project management tools can be especially important to ITSD managing its way out of its current work backlog. While some progress has been made in gaining control of this workload, ITSD still faces challenges in this area.

7.1 Change Management Process

Change management is a critical discipline in effective IT organizations. The purpose of the change management process is to ensure that:

- Standardized methods and procedures are used for efficient and prompt handling of all changes
- All changes to service assets and configuration items are recorded in the configuration management system
- Business risk is managed and minimized
- All authorized changes support business needs and goals

The Department has significantly improved its change management process in recent years. Specifically, ITSD has created a Change Management Policy and implemented a Change Management Process that includes the Remedy software tool for receiving and tracking change requests. These documented policies and processes are based on the ITIL Best Practices Model, which is aligned with best and common practices amongst utilities. At its core, effectivity using ITIL Change Management best practices serve to minimize the risks of exposure, impact and disruption to IT services. The successful implementation of changes on the first try reduce the likelihood that an organization will incur additional costs and detrimental operational impacts. The Change Management Process is being used to manage standard and non-standard change requests related to the various software applications, hardware needs, and telecommunication changes. Through this process, ITSD is able to assure that change requests are approved by business unit management, that the costs to implement the changes are reasonable, and that standards related to software applications, hardware and telecommunications are enforced and maintained.

The Remedy tool has the capability to track change requests, develop metrics for use by project managers, and provide a dashboard for those metrics. While Navigant found that this tool has recently been used for the CIS project, it is unclear how consistent the use of this tool is between the three applications groups, the infrastructure group and the telecommunications group.

In general, the use of the Change Management Process has had a positive impact on ITSD's ability to manage the day to day change requests that it receives. This process should continue to be used, but the broader methodology of portfolio management and project management may have an effect on the Change Management process for larger projects such as the ERP, given the complex scope and actions required to seamlessly implement change. Accordingly, the distinctions between the management methods for day to day operations and large projects should be recognized, and as a request comes in, the project should be immediately categorized to determine which process applies to the request.

Ultimately, these processes will converge when there is an established and comprehensive IT governance framework, a comprehensive IT Strategic Plan, and a standardized portfolio and project management methodology.

7.2 Overall Project Management and Portfolio Management Function

Although an effort has been made, an overall IT Portfolio Management and Project Management Office has not been implemented at LADWP. Due to hiring issues, this program has not be fully implemented across the three applications groups, hardware and infrastructure, and telecommunication groups. The ITSD's Strategy & Project Delivery function has approximately 200 allocated positions and there is one Project Management Office position, which is currently vacant. The ITSD has limited structure around managing its numerous smaller projects, and while they have implemented certain project management tools, the benefits have been limited.

As with many applications and potential new projects, most large utilities have adopted and implemented a Project Management Office which manages project portfolios and uses standard approaches to the management of projects. Such a program usually follows a standard set of processes as defined in the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) and IBM's Rational Unified Process (RUP). While CIS and Maximo have used Rational tools for project management, Navigant recommends that the Department consider developing a formal project management program that utilizes the standard processes and templates available through PMI. This program would require additional resources, but ITSD would greatly benefit from an organized project management structure because it would identify the risks associated with a project implementation, monitor the progress made against a project work plan, and identify areas of concern as the project moves forward.

7.2.1 Service Maps

Service maps are utilized by IT organizations to "clarify dependencies between Service Level Agreements (SLAs), Operational Level Agreements (OLAs), technologies, customers, and the impact to the service delivery."[8] More specifically, service maps can help organizations identify the resources to deliver services, clarify the staff responsible for delivering the services, and specify the pertinent end-user customer. Components of service maps include:

- "Customers. A categorized list of individuals and groups who use the service.
- Hardware. The hardware platforms necessary for service delivery.
- Applications. The operating system(s) and other applications the service requires.
- Settings. The configuration settings necessary for the service to function.
- Internal/External Services. The components that help ensure availability for the services."[9]

[8] Microsoft Operations Framework (MOF) 4.0. Process 2: Identify and Map Services (https://technet.microsoft.com/en-us/library/cc543319.aspx).
[9] Microsoft Operations Framework (MOF) 4.0. Process 2: Identify and Map Services (https://technet.microsoft.com/en-us/library/cc543319.aspx).

Navigant found that the Department does not have comprehensive service maps. According to interviews with Department officials, the key reason that LADWP lacks service maps is the lack of resources. Navigant recommends that the ITSD develop service maps that are aligned to the IT Strategic Plan and the existing (or expanded) services that the ITSD is envisioned to provide.

8. Information Security and IT Disaster Recovery

Information security and disaster recovery are topics that have grown in importance across all sectors over the last many years. The potential impact of failures in information security to an organization's operations, reputation, and financial resiliency have been well-chronicled. Evidence confirms that gaps in information security can be exploited by employees and outsiders alike. Meanwhile, rigorous IT disaster recovery is an important feature of any organization's resiliency planning.

8.1 Information Security Policy

An Information Security Policy (ISP) is a common and important business policy in any organization. At the highest level, an information security policy provides management direction and support for information security across the organization. The objective of an ISP is to guide or control the use of systems to reduce the risk to information assets in terms of breaches of confidentiality, integrity and availability. Documentation of the ISP is one step in an overall information security process, which includes an information security risk assessment.[10] Ongoing monitoring and management of the ISP are additional steps in an overall security framework.

In 2008, the ITSD formalized an Information Security Policy (ISP or Policy) to provide protocols for managing LADWP computer systems, data, and network infrastructure. The ISP provides a foundation for standards, procedures and guidelines that govern LADWP's information security. The Department has executed numerous updates to the ISP and developed documentation to supplement policies. While the supplemental documentation refers to the specific section(s) of the ISP to which it relates, the ISP itself does not refer to the supplemental standards, procedures, and guidelines which have been developed.

8.2 IT Disaster Recovery

Emergency preparedness, business continuity, and IT disaster recovery (DR) are critical focus areas for utilities and the organizations that oversee them. Increasingly, utility organizations are exhibiting heightened risk awareness and focus on business resiliency. A variety of high-profile events over the last several years (both natural disasters and manmade events) have moved disciplines that support on-going business resiliency to the forefront of utility planning.

DR planning addresses the recovery of critical IT assets – including systems, applications, databases, storage, and network assets – given a significant operational disruption. DR is often considered the technological component of Business Continuity Management (BCM), which is defined as the management process that identifies:

- The most significant threats to an organization's on-going operations,
- The impacts to business operations that those threats, if realized, might cause, and
- The phased and prioritized approach to service recovery.

[10] Ryan Mazerik, "Information Security Policies", General Security, April 2014.

When defined as one aspect of a comprehensive BCM process, technology recovery priorities are defined and tested to enable the resumption of key business processes in the event of a significant disruption to normal operations. The key business activities and related processes – and risks to those processes – are identified through a structured approach to risk assessment and prioritized recovery. The combination of business continuity planning and DR are two of the most critical features of an effective approach to enterprise wide resiliency. The following is a brief overview of some of the more prominent and influential standards in DR, followed by an evaluation of the Department's DR policies and practices. This section should be read in conjunction with our review of LADWP's Emergency Preparedness and BCM plans (provided in the *Emergency Preparedness* portion of the Survey).

8.2.1 Standards and Peer Practices in Disaster Recovery

A company needs to have a detailed perspective of the types of risks it will need to be protected from and the impact that those risks represent to the organization. Both a Risk Analysis (RA) and Business Impact Analysis (BIA) should be performed to determine where to focus resources in the DR planning process and how much to invest in building and maintaining those resources. These efforts should be part of a comprehensive, standardized approach to BCM and extend to key aspects of technology. Several standards that help define BCM and DR practices include:

- The global risk management standard, ISO 31000, *Risk Management -- Principles and Guidelines on Implementation*, was released by the International Organization for Standardization (ISO). It is recognized as the benchmark standard for risk management worldwide.
- ISO 31010:2009, *Risk Management -- Risk Assessment Techniques*, which provides guidance on how to organize and conduct a risk assessment. It complements ISO 31000, in that its specific focus is how to prepare for a risk assessment.
- A key standard further defining risk assessment practices is SP 800-30, *Risk Management Guide for IT Systems*, by the National Institute of Standards and Technology (NIST). This standard shifts the focus of the risk management process to IT systems and technology, and is a useful companion to ISO 31010.
- A new global business impact analysis standard is ISO 22317, *Societal Security -- Business Continuity Management Systems -- Business Impact Analysis*. It is the first formal standard that addresses the BIA process. Similar to the above risk standards, this new standard sets out the principles of the BIA, and also offers good practice guidance on how to prepare for and conduct a BIA.[11]

Standards from the Disaster Recovery Institute International (DRI) and other oversight groups provide additional guidance to energy and utility organizations.

8.2.1.1 Role of Business Impact Analysis

As discussed in our *Emergency Preparedness* report, a BIA forms the foundation of business continuity planning. The BIA specifies the impact of disruptive events on business operations, financial performance, reputation, employees and supply chains, and the systems and networks that support them. These categories are specific to each organization, and defined in the course of executing the BIA.

[11] TechTarget, "Risk analysis boosts disaster recovery planning process", Paul Kirvan (2015).

The BIA is the starting point for risk identification in a disaster recovery context; the results of a BIA help define the maximum period of time for which the business can survive without its people, process, technology and physical locations.

BIAs generate a number of important metrics, which in combination help evaluate and prioritize recovery requirements. Two metrics are particularly critical for defining service priorities. First is the Recovery Time Objective (RTO), which is the maximum amount of time a system can be down before the business suffers. Next is the Recovery Point Objective (RPO), which defines the point in time when systems and data were last used (and therefore when recovery efforts need to be focused). From the derivation of these metrics, an organization can derive DR priorities by-software application and hardware requirements. These and other measures are derived in the course of completing a BIA, and are based on the specific nature of an organization's strategies, operations, threats, and risk tolerances.

8.2.2 Disaster Recovery at the Department

A rigorous BCM process is central to business resiliency. As an aspect of that process, a DR plan that defines the phased approach for bringing vital forms of technology back in a phased manner in the event of an emergency is critical. While the ITSD provided a variety of documents that point to emergency and disaster recovery related procedures, there is no single and comprehensive plan along with related policies, procedures, and guidelines to direct employees in the event of an emergency or disaster recovery scenario. Furthermore, the extent to which ITSD employees are aware of or have been trained on their roles and responsibilities in the event of an emergency or disaster recovery situation is unclear.

Further, it is our understanding that accountability for DR has been decentralized, and resides in the Power, Water, and Joint Systems, and then within each Division in each System. According to the Department's Information Security Policy, the Assistant General Managers of the Systems or their designees (System Owners) are responsible for defining the business parameters for disaster recovery plans, including both the required recovery time and the required recovery point. The System Owners also must ensure that adequate back up and system recovery procedures are in place to ensure the continued operation of a System. The policy also states that system operators should work with the Assistant General Managers and other System personnel to prepare disaster recovery plans. We requested, but did not receive, current DR plans in place at the Department. Further, we learned that DR plans have not been developed consistently across the Systems or Divisions, and that appropriate DR preparation has only been developed for some System Owners. For these combination of reasons, we believe that the Department lacks consistent protocols that define how DR plans are to be derived, tested, and maintained across the Department.

Perhaps most importantly, because there is no Department-wide BIA, the Department's overall DR priorities are not defined. Stated differently, how ITSD would work with each System to bring back critical applications in a prioritized manner is not defined. Consistency across all lines of business in BIA, testing methodologies, reporting schedules and other aspects of BCM are all characteristics of an organization that takes BCM/DR seriously. Refer to our report on *Emergency Preparedness* for additional considerations on BCM.

9. Conclusions

Navigant's prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Ensure that ITSD has the staff and contracting resources to address its current system challenges as well as future upgrades and platform implementations.
- Develop an IT Strategic Plan that builds on the IT Strategic Agenda to address major technology initiatives, desired outcomes, performance metrics, and specific target dates.
- Establish an executive-level governance that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure.
- Create an additional budget for ITSD to address unplanned projects and budget reallocations by project managers in the Power and Water Systems.
- Extend project management practices used for major projects to all IT projects.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Remove legacy systems and consolidate applications into one version or instance for the entire organization.
- Monitor the transition period between system upgrades to ensure the removal of older instances of systems.
- Establish a formal project management office for technology infrastructure to ensure that projects are monitored and completed.
- Ensure that the Maximo upgrade establishes an enterprise asset management program that encourages communication between the Water and Power System, including linking the new version of Maximo to other systems such as GIS.
- Develop a detailed implementation plan for an enterprise resource planning (ERP) system.
- Complete the new data center to consolidate data and enhance data security.

Low Priority Recommendations

- Expand the "My Account" section of the website to provide customers with additional usage and billing metrics.
- Complete the development of a mobile application for employees to access MYDWP information.

Appendix A. List of Interviews

Name	Title/Topic	Interview Date
Flora Chang	Assistant Director of the Customer Service System	August 3rd
Gene Gamachi	Assistant Director of Infrastructure and Operations	August 5th
Hy Phan, Anh Wood, Mark Arthur, Quang Han, Kenneth Chan, Natalie Duran, Hain Zhou	Network Engineering & Operations	August 5th
Jim Levesque	Project Manager, Data Center	August 3rd
Mona Guirguis	Information Systems Manager, Business Support Systems	August 6th
Matt Lampe	Chief Information Officer	August 5th
Mark Townsend	Assistant Director – Applications and Services	August 3rd
Rita Khurana-Carwille	Information Systems Manager, Corporate Applications Data	August 4th

Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

Documents Provided by LADWP	
1	CIS Org Chart 2015 draft v9
2	Infrast Eng org chart 16403
3	Network Engineering and Operations Section Org Chart
4	ORG CHART - Org 16870 IT Service Desk July 2015
5	VISIO-16050 FOE Org Chart with pos numbers 2015-05-28
6	CIS Governance Life Cycle
7	Weekly Status Meeting - 20150625
8	Procurement Timeline
9	IT Service Desk ROLES and RESP
10	SystemsContactList
11	HelpDeskSupp-OffHrsCallOutList
12	BillPrintMailOperationsRolesResponsibilities
13	FOE Staff Roster 20140606
14	Appendix D - service order process flowchart
15	SQLDPA1_PA2 042209
16	SQLDPA1_PA2 091609_b4_HPSIM_request
17	SQLDPA1_PA2 091709 b4 NetApp NTP request
18	SQLDPA1_PA2 102709
19	SQLDPAx blade storage apr 2009
20	SQLDB1_PB2 100509 blade storage v2
21	SQLDBPB1_PB2 100509 H_I_J tier 2 later
22	ITIL_DWPCMProcessGuide
23	MetroErequestForm5
24	ME EVC Acceptance Form3
25	IBMServiceCallInfoSheet
26	ACF_CollectionForReview [1]
27	2013-01 Updated Contacts for IPPD
28	ITIL_ChangeManagerGuide
29	ITIL_ChangeMgmtProcessOvrvw
30	ITIL_ChangeMgmtProcess Summ
31	ProcessPTD
32	AccidentIncidentPaperTrail
33	FOE_SCEDTA_WORKFLOW_20130617R_cjolle
34	ProductionTurnoverDocCklist
35	Visio-CWP_FJ_WORKFLOW
36	Workflow Processes Contact Admin.20060706P
37	IT Service Desk 3.5 IM Workflow Diagram

38	CircuitCompletionNotification
39	FOE Deliquency Process October 2010 (2)
40	Information Security Documentation - Guideline Docs: 4.1., 11.1, 11.2, 12, 13.1, 13.2, 13.6 (Hard Disk Erasure), 13.6 (Unwanted Document and Media)
41	Procedure Docs: BasicNet, NOCBasic, AssignedStateIPPDErrors, AutomatedSystemShutdown, CircularFlowError, CorporateBackupRestoreProduction, ICN, InsertingVTSLLogicalVolumes, ITIRT Procedure Final, NOCAccess, OutageNotification, InfoSec Exception, MobileDeviceRemoteWipe, MainFrameOperSafetyDocs, ResetUserPasswordGoogleAppls, TerminateCircuit, Shutdown, PwrOnReset, ReportingEmpInjury, SACACFPassword
42	1 B - NOC RR WS 2015-6-26
43	Appendix A - Service request form
44	Appendix B - sample ladwp estimate form
45	Appendix C - sample ita job order
46	FOE Standby Assignment Info v2
47	CallOutList4CISCONServersandCCBIssues
48	CISProdProbCallList
49	CkList4MoIPLOccasionPOR
50	EmailVirusLADWPdotComStatusCkOffHrs
51	Standard - 11.4 - Host Naming
52	Information Security Policy - Version 1.2.1 - Final
53	IT Security Communications Plan v2.6 - Redacted
54	Exchange2010Upgrade
55	Release readiness review phase
56	3 C - NS Pri Esc 041217
57	Exchange 2010 DR Failover_v2
58	QuarterlyMaintenanceWindowCRQ's
59	3 D - Emergency Response Procedure
60	DisasterRecoveryTeam Activation
61	LADWP Disaster Recovery
62	Incident Response Plan v1.0
63	AccidentAnalysis
64	4 F - ETS Response Level Definitions
65	DataCtrOperCtr - OperProced
66	EmergencyEvacEmpCallList
67	ETSResponseLevel (Storm Level) Broadcasts and Support
68	NoticeAccident Injuries
69	9B - Boylston Backup NOC Layout
70	9 F-Backup NOC Sys Testing
71	10 B new Valley NMS Stat Ck Lst
72	LADWP DWDM MetroE Sonet
73	BACK-UP NOC System Checklist
74	C200specfinal
75	ITSD Strategic Agenda 20145 draft v2 clean

76	DWP_hdwStandards
77	Current Exchange 2010 Infrastructure with Google
78	Exchange 2010 DR Failover_v2
79	DWP - sftwStandards
80	LADWP Wireless Infrastructure Info - 2015
81	7 - Visio -ME arch - Opt2 (2)
82	SYSTEM_MAP
83	CISCON Production Diagrams_v2 7
84	LADWP Telepresence Logical Diagram - Final Architecture
85	VOIP Deployment Presentation
86	Infrast Eng HI 2014 Goals v2
87	CorePC_SWLifecycle_MasterSched
88	Contact Center 10.5 Upgrade
89	FOE Revenue trends
90	Copy of BP 02 BL 02 Returned Mail To Be Business Process v3
91	Categories – Requested from IT Interview with Flora Chang
92	CIS Org Chart 2015 draft v9
93	CISCON Interfaces
94	Copy of CCBMWM_Items_List_asof_073015_Critical_Cat1-4
95	Rational Dashboard Screen Print
96	CAO Org Chart
97	ITS Org Chart Jan 2015
98	CMPolicies
99	SRM_Lifecycle
100	ITSD_Org 16 Itemized Budget by FI_Job_CE
101	Corporate Applications Org Chart August 2015
102	Matrix Org Chart August 2015
103	Business Support Section-application2015MG

Volume VIII

Customer Service

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Customer Service Report
Volume VIII

Prepared for:
The City of Los Angeles

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Executive Summary

Objectives & Approach

This report presents Navigant's findings from a Customer Service benchmarking study, and provides a review of the Customer Service Division's (CSD) use of technology. Customer Service continues to receive significant attention across the utility sector in response to multiple market, regulator/stakeholder, customer, and technological forces.

In many respects, Customer Service is at the "frontline" of utility operations, given the increasing number of possible touchpoints with consumers on a daily basis. That utilities will reflect high-levels of customer service is increasingly the expectation among regulators and customers alike. Meanwhile, the continued growth of new methods of interacting and conducting business with the utility bring together the topics of service quality and technology. Research reflects that customer service is at the forefront of utility continuous improvement planning, given the intersection of: 1) focus on the "customer experience" as central to providing exemplary utility service; 2) increasing stakeholder and customer expectations regarding exceptional service; and 3) the role of technology in customer service operations.

Customer Service Benchmarking

Our team selected 20 performance measures across six (6) areas to evaluate the Department. These areas include:

- Contact/Call Center
- Meter Reading
- Customer Billing
- Customer Payments
- Credit and Collections
- Field Service

In addition to these areas, we also included a category that focuses on the Department's reliability, satisfaction, and employee availability.

LADWP provided 2014 results for a total of 14 of the requested 20 performance measures, which are standard metrics used across the utility industry. Collectively, these measures provide the foundation for active and on-going monitoring of utility Customer Service operations. The Department was unable to provide data on 30% of the metrics selected for our study. Navigant has been informed that work is underway to address issues with the Department's historical customer service data. Resolving these issues may improve the results of the 2014 benchmarking reflected in our report. We encourage the Department to continue to pursue and adopt methods of improving data management practices in customer service.

A tabular representation of the benchmarking results is provided below.

	LADWP	Q	Mean	Q1	Q2	Q3
Contact/Call Center						
Service Level (Live Contacts)	NA		64.7%	75.9%	66.9%	61.4%
Abandonment Rate (Live Calls)	NA		6.6%	4.4%	5.5%	9.5%
Average Speed of Answer (Live Contacts)	1362.0	4th	100.9	46.0	90.0	111.5
Percent of IVR Self-Service Contacts with a Completed Transaction	41%	3rd	46%	62%	45%	35%
First Contact Resolution Measure (Contact Center Process)	NA		78.0%	85.0%	78.0%	72.0%
Meter Reading						
Annual Meter Read Rate	94.0%	3rd	92.3%	98.4%	96.5%	93.1%
Meter Reading Error Rate	NA		0.13%	0.04%	0.10%	0.19%
Meters with Chronic No Read (no bill 3-6-9 billing periods)	0.84%	2nd	1.35%	0.01%	0.84%	1.10%
Customer Billing						
Percent of Bills Issued Electronically	14.4%	3rd	18.5%	22.6%	16.1%	14.4%
Percent of Bills with Post-Bill Adjustments Due to Errors	NA		0.240%	0.098%	0.159%	0.309%
Percent of Bills Mailed Within Billing Window	98.0%	4th	98.95%	100.00%	99.62%	99.34%
Percent of Bills Estimated	4.9%	4th	4.39%	0.82%	1.28%	4.9%
Customer Payments						
Percent of Payments Received from Customers Electronically	35%	4th	53%	50%	54%	58%
Credit and Collections						
Write-offs as Percent of Revenue	NA		0.95%	0.38%	0.79%	1.40%
Days Sales Outstanding	36	2nd	35	31	36	40
Percent of Customers in 30/60/90 Days Arrears	56%	4th	28%	15%	27%	37%
% of Accounts Scheduled for Disconnect Actually Disconnected	2.6%	4th	44%	42%	44%	49%
Field Service						
Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)	66.9%	4th	18.83%	3.70%	10.83%	20.61%
Overall Business – Customer Satisfaction						
Customer Satisfaction - J.D. Power - Business	646	3rd	657	670	659	645
Customer Satisfaction - J.D. Power - residential	641	4th	651	661	647	643

As reflected above, where data was provided, the Department was found to generally fall in the 3rd or 4th quartile for the selected measures.

Review of Customer Service Technology

Technology plays a central role in moving customer service organizations toward leading practices, and delivering core operations in a more optimal manner. The current and proposed future state of the Department's technology infrastructure is a key determinant of how customer service will be delivered and how work will be conducted. As noted, the Department has commissioned a number of studies that provide specific guidance on how technology can be further optimized to meet strategic objectives (including how to move the company toward more customer-focused service). According to one of these studies, the Department has an opportunity to deploy technology more effectively to meet their goals: The CEB Study (2014) found that *Technology Management*[1] was the fourth highest opportunity area ranking, behind *Live Phone Experience*, *Quality Assurance*, and *Service Organization Culture*.

Focusing on technological change in concert with business process improvement and enhanced staffing, we believe the Department has an opportunity to make significant progress on customer service objectives. Pursuing excellence in customer service should be a continuous goal of the Department. We reiterate many of the goals recommendations described in the CSD strategic planning documents and findings from other assessments, and offer several additional recommendations below.

[1] The CEB defined the Technology Management assessment area as follows: "We make technology investments to better enable our existing processes—technology does not define process. We methodically approach vendor-fit evaluations, technology investment priorities, and implementation plans."

High Priority Recommendations

- Evaluate and more clearly define functional accountabilities for key activities between CICT and IT – confirm and draw "brighter lines" between functional responsibilities.
- Create an overarching strategic plan for customer service technology for the next 5-years (including prioritized technology requirements (remediation and new systems), high-level deployment schedules, and estimates of required resourcing (staff and capital) requirements).
- Strengthen the system selection process, and confirm business requirements as a central driver for system selection.
- Continue to develop the training program for CSD, focusing on both technical and business-focused modules. Also continue focus on staff cross-training and staff rotation to enhance flexibility and resiliency in workforce.
- Address staffing and hiring concerns as best as possible, with particular emphasis on specific subject matter expertise and program management acumen.
- Pursue documentation and training on key business processes that align to use of new technologies.
- Measure and evaluate key business activities, processes and personnel; specify Key Performance Indicators (KPI) and define performance targets; incorporate benchmarking as a normal aspect of performance evaluation.
- Conduct workload / workforce balancing analysis to more precisely understand the number of staff and types of skills required

1. Introduction

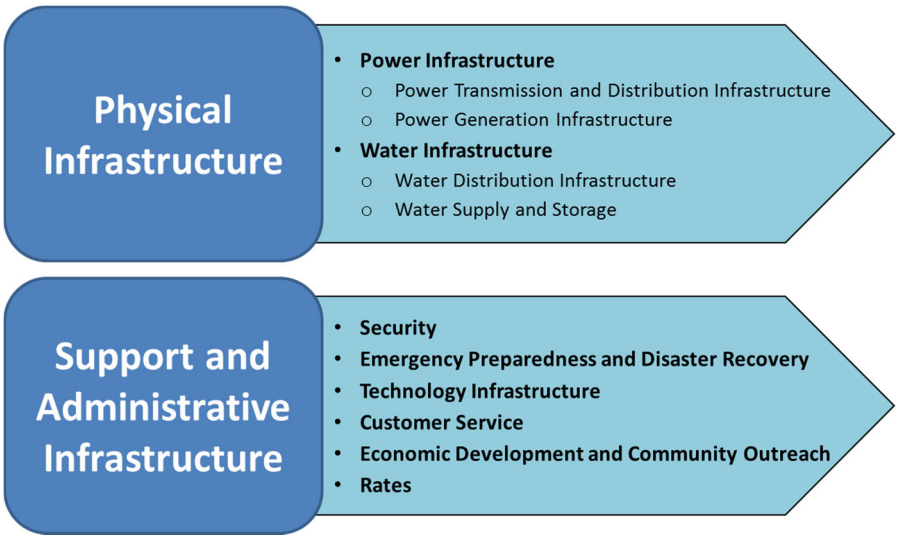
1.1 Study Objectives

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative Survey (IEA Survey) of the Los Angeles Department of Water and Power (the Department, LADWP). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. (Navigant) to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

Figure 1. Focus Areas of the 2015 IEA Survey



This report presents Navigant's findings from a Customer Service benchmarking analysis, and a review of the CSD's use of technology. Benchmarking is a common tool for evaluating performance on standard metrics and in relation to a defined peer panel. In this context, benchmarking has been conducted on key and common customer "touch point" metrics. The review of CSD's use of technology examines the role of the Customer Information, Communication and Technology (CICT) group in the adoption of technology to continuously increase the maturity of customer service practices.

1.2 Approach

Information for this report was derived from several sources:

- A detailed data request was provided to the Department to collect customer service benchmarking information;

- Interviews with LADWP staff;
- Documents collected and reviewed in response to Navigant's data request; and
- Navigant's experience with LADWP's prior reports and practices.

Navigant conducted 10 interviews. See Appendix A for a full description of the interviews conducted. The documents produced by the Department are listed in Appendix B.

1.3 Report Organization

The report comprises the following chapters:

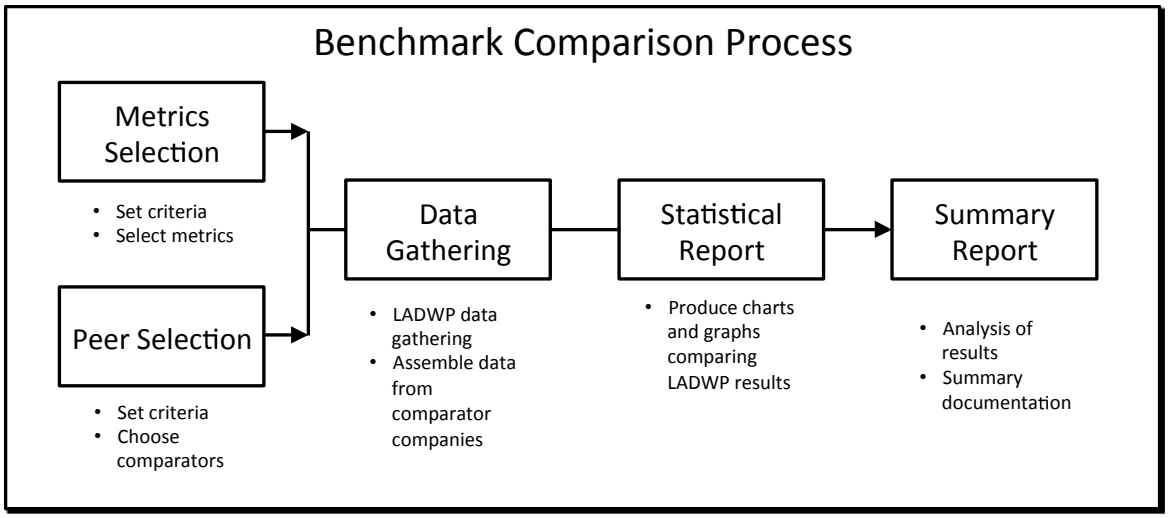
- Customer Service Benchmarking: This section includes an introduction to benchmarking, methods of choosing the best performance metrics, selecting the comparison panel, and a review of the results on the reported measures in relation to peers.
- Review of Customer Service Technology: A description of the use of technology in the CSD in areas such as Strategy, Governance, Organization & Staffing, Roles & Responsibilities, and Training.

2. Customer Service Benchmarking

2.1 Introduction

A component of the IEA Survey was to provide benchmarks and performance comparisons for the Customer Service operations of LADWP. This was executed by comparing the performance of LADWP against a panel of peer utilities from across North America. In so doing, the team performed a series of tasks, as summarized in the figure below.

Figure 2: Benchmark Comparison Process



The benchmark study was designed to determine an appropriate set of performance measures for customer care, compare LADWP on those metrics versus a comparison panel of other utilities, and draw conclusions regarding the results of the comparison. This report summarizes the results of each of the steps. The remainder of this report is structured into the following major sections:

- Choosing the Right Performance Metrics
- Selecting the Comparison Panel
- Results of the Performance Comparisons
- Appendix – Detailed Charts of Performance Results

2.2 Choosing the Right Performance Metrics

Selecting the right metrics for use in monitoring performance in a utility customer service operation involves a balance of cost and service level metrics, with the goal of full coverage without such a deep array that tracking them becomes overtaxing to the organization. In this particular study, costs are being analyzed elsewhere, so the entire focus is on the service and volume metrics. The measures selected for this study were designed to provide coverage across the full range of activities, including contact center, meter reading, billing, payment processing, credit & collections, field service, and overall customer satisfaction, all at a relatively high level.

An issue in a benchmark analysis is assuring that all metrics in use can be compared across companies, so it requires that all measures either be normalized in some fashion. To that end, the project team developed a comprehensive set of metrics to address the stated requirements, and selected those that are presented in this section of the report. Taken together, the collection of performance measures provides a profile of performance of the customer service organization within a utility, in this case for LADWP. All of the metrics included in this list are ones that are routinely tracked by electric, gas, and water utilities across the U.S., and thus lend themselves to comparisons for LADWP.

The remainder of this section discusses the performance metrics selected for this Survey and why they are important, including three (3) perspectives: The value and benefit of the metric to: 1) supporting customers/key constituents, 2) managing the LADWP business, and 3) coordinating efficient and effective internal business processes.

For each of the metrics listed below, the following are presented to enable an understanding of the metric, its importance, and value.

1) Overview of the metric: what the metric is, how it is defined, what it measures
2) What the metric represents and why it was selected
3) The importance of the metric---to customers/key constituents, the LADWP business, and in managing the business process

The following Customer Service metrics are discussed. The metrics themselves can be grouped by function or process and are categorized below for purposes of understanding where the source of the metric should be. This should not limit the reporting of the respective metric to solely the respective functional organization. Metrics are assumed to be shared cross-organizationally to promote joint accountability.

Contact/Call Center

1) Service Level (Live Contacts)
2) Average Speed of Answer (Live Contacts)
3) Abandonment Rate (Live Contacts)
4) First Contact Resolution
5) Percent of IVR Self-Service Contacts with a Completed Transaction

Meter Reading

6) Annual Meter Read Rate

7) Meter Reading Error Rate
8) Meters with Chronic "No Read" (no bill 3-6-9 month billing periods)

Customer Billing

9) Percent of Bills Mailed Within Billing Window
10) Percent of Bills Estimated
11) Percent of Bills with Post-Bill Adjustments Due to Errors
12) Percent of Bills Issued Electronically

Customer Payments

13) Percent of Payments Received from Customers Electronically

Credit and Collections

14) Percent of Customers in 30/60/90 Days Arrears
15) Percent of Accounts Scheduled for Disconnect Actually Worked
16) Days Sales Outstanding
17) Write-offs as Percent of Revenue

Field Service

18) Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)

Overall Business—Reliability, Satisfaction, Employee Availability

19) Electric System Reliability
20) Customer Satisfaction - J.D. Power

The following is a more detailed review of each of these major metric categories.

2.2.1 Contact/Call Center Metric Group

Metrics 1-5 below are all metrics related to the performance and service of the Contact/Call Center.

Service Level (Live Contacts)

Metric Overview: Service level is defined as: "X percent of contacts answered in Y seconds," e.g., 80% of calls answered in 30 seconds. For this metric "contacts" are live, inbound calls from customers seeking to speak to a company representative. Directionally, the higher the % measure, the higher the number of customer contacts that have been handled within the time interval, and thus the fewer customers waiting or possibly abandoning a call.

The metric is used at both the operational level (for example, this metric is often used at 30 minute intervals by contact center and workforce managers in utilities) and business level where it is a key component of service "dashboards" indicating service in the Contact Centers, most typically being reported weekly or monthly at the executive level. Service level is typically available directly from ACD (the call routing system) or workforce management system (WFMS) reports.

Metric Representation and Selection: The metric represents a view into how accessible the center is to LADWP customers, a view into how many call handling representatives are needed to provide efficient

service and when, and is a solid benchmark on how the center's service compares to others in the industry.

It was chosen because it is often viewed in the Contact Center Industry as the single best measure of Contact Center performance, and, along with First Contact Resolution it is one of the best predictors of Customer Satisfaction as well. ◎It is a classic metric that is used by nearly 100% of contact centers in the utility and all other industries.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is critical for customers as it measures how well the company is getting customer contacts through its call handling systems and into the hands of available agents. It is the clearest indication of what customers experience when they attempt to reach the LADWP contact center.
To the business it is essential for planning and budgeting, where service level objectives can be set to provide customers the desired experience and then tied to the resources (phone agents) needed to be available to handle incoming contacts at that level. The importance of the metric is not only in achieving an overall stated service objective, but how consistently the contact center hits those objectives throughout any given day, and therefore its use not only as an annual or periodic metric, but a real-time indicator of customer accessibility.

It is important to the business process because it should drive staffing levels, scheduling decisions, and performance management and ultimately provide a better view into accessibility. While accessibility means that contacts are getting in and being handled efficiently, if quality is poor, things such as repeat contacts (see the FCR metric), unnecessary contacts and escalations and complaints will eventually drive the Service Level Metric down due to increased caller volume and customer frustration. In this manner this metric works together with FCR as a good indicator of the customer experience.

Average Speed of Answer (ASA) for Live Contacts

Metric Overview: The average speed of answer is measured in seconds and is the time interval from when a call enters the ACD (the company's call distribution system) to the time that an agent/representative answers the call, including the time the customer spends listening to any messaging from the company and the wait time in the queue. (Note: This metric should only utilize live caller data, and not blend any self-service contacts in its calculation)

Metric Representation and Selection: The metric is a simple way of understanding the average wait time that a customer experiences in reaching a live agent. The metric moves directionally inverse to the Service Level metric, so as service level goes up, meaning more calls are being answered within the established time interval, the average amount of time that a customer waits to have their call answered (ASA) goes down.

The vast majority of benchmarked utilities and call centers outside of the industry use this metric as well. For regulated utilities, state regulatory commissions often use this metric as a customer service performance target. ASA is ordinarily available directly from ACD (routing system) or workforce management system (WFMS) reports.

Importance of the Metric: Customers/Constituents, Business, and Business Process: ASA is a way to measure service from the perspective of the customer and for contact center managers; it provides further insight into staffing and scheduling needs.

Abandonment Rate (Live Contacts)

Metric Overview: Abandon rate is calls abandoned, e.g. the customer hangs-up the call while waiting for an agent, divided by calls offered, e.g. all of the attempts callers make to reach the call center typically as measured by the ACD (Automated Call Distribution system).

This measure does not take into account calls that may be 1) blocked at the point of entering the system, or 2) calls that may get a "busy" for reasons including not enough telecommunications capacity to handle inflowing calls. The company should have separate measures for these occurrences. (Note: This particular metric should only utilize live caller attempts, and not blend any self-service activity in its calculation). Abandonment rate is available directly from ACD (routing system) or workforce management system (WFMS) reports.

Metric Representation and Selection: The abandon rate metric best represents a contribution to the ability for LADWP to understand callers' tolerance levels (desire to wait for a call to be answered). It is used as a key operational metric in almost all utilities and like ASA, moves directionally inverse to the Service Level Metric, so as service level goes up, meaning more calls are being answered within the established time interval, the Abandonment Rate typically goes down.

Importance of the Metric: Customers/Constituents, Business, and Business Process: As a customer metric it allows the company to start to understand customers' behavior and willingness to wait. For customers this is important as long wait times can lead to frustration, complaints and callbacks.
Operationally, the metric is most often used in concert with the Service Level Metric, where companies monitor both at frequent intervals throughout a day to help understand drivers of customer behavior. For example, the degree of motivation -- how important the call/contact is to the customer, availability of self-service substitutes -- can they get the answer somewhere else (i.e., your Web site, or IVR, etc.), level of expectations -- do they have to wait a long time every time they call and will therefore continue to wait for a long period of time, or did they get right through the last time they contacted you.
The metric's use also helps in supporting decision-making around the kind of messaging to provide customers in the queue, what menu options to provide, callbacks to offer, etc. as well as determining the amount of telecommunications capacity needed to handle customer queues.

First Contact Resolution

Metric Overview: First-Contact Resolution (FCR) is defined as the percentage of initial customer contacts that do not require any further contact (call back) by the customer to address the customer's reason for calling. In other words, the customer does not need to contact the company again to seek resolution. Ideally, first-contact resolution should be defined from the customer perspective. The metric is usually measured on a monthly basis, using a combination of in-contact questions (e.g., "Is this/ was this the first time you are calling about this issue?" and "Has/was the reason for your call been resolved?"), post-contact and post-order transactional surveys. Companies often use statistical sampling of a % of contacts to derive the metric on a timely basis, rather than attempting to use every single contact measured.

For utilities, the metric can be taken from two main perspectives: 1) those contacts that only the contact center is needed to address the customer issue, such as a service inquiry (customer education, account maintenance, taking an order), and/or 2) those contacts where someone other than the call center is needed. Examples are a meter request (meter or field orders, construction-related) that entails downstream work outside the contact center, such as by Meter Reading, Billing, or Field Service. Generally, high performing utilities measure both, often in one metric in order to understand the entire customer experience and not just the contact center experience, as well as stratifying the measure by transaction type.

Metric Representation and Selection: FCR represents one of the best indicators of customer satisfaction. Operationally it is also an indicator of the level of increased/additional operating costs (e.g., lower FCR will mean more customers calling back for issue resolution, creating increased call volume), which drives more staffing or overtime to handle contacts. It also indicates downstream rework if the issue has not been resolved, such as a second field visit, or billing issue investigation. For these reasons the metric is selected as a valuable one to review, discuss and understand root cause issues as to why customers are not experiencing resolution of their issue on the first contact.

Importance of the Metric: Customers/Constituents, Business, and Business Process: To understand the customer satisfaction of customers specifically transacting with LADWP, FCR is one of the best metrics. Out-of-industry studies show a direct correlation between FCR and satisfaction. The process of measuring FCR entails talking to customers and understanding their experiences with specific transactions that can lead to identifying opportunities to improve the business and underlying processes. It also serves as a measure to understand the potential for improvement. For example, consider a company experiencing 25% of its live customer contacts as not experiencing FCR and therefore having to call back. If the measure isolates specific transaction types, e.g. repeat high bill issues, missed appointments, etc., this information can be used to investigate the underlying process.

Percent of IVR Self-Service Contacts with a Completed Transaction

Metric Overview: The metric measures the percentage of self-service contacts that were successfully completed by the customer out of the total number attempted. In this case the measure is for the IVR (Interactive Voice Response, the technology that allows customers to transact through the use of voice and or input via keypad). A "successfully completed" contact is one where 1) the customer does not have to transfer to an agent to complete a transaction intended to be completed in the IVR, 2) the customer does not hang-up and call back to speak to a live agent for support. It should not be measured as "successfully completed" when 1) a customer simply enters the IVR, and 2) a customer simply hangs up after going into the IVR.

Metric Representation and Selection: The metric was selected to represent the level of success customers are having in transacting through the IVR self-service option provided by LADWP. The majority of utilities use this metric. It is measured through the use of IVR reporting as well as post-contact and post-transaction surveys, and should be evaluated operationally at a level that isolates specific transaction types (as opposed to one broad metric encompassing all contacts which may suffice at the executive reporting level)

Importance of the Metric: Customers/Constituents, Business, and Business Process: A review of this metric to understand customer access and ability to complete in the IVR is necessary. The metric can also be used to identify underlying issues that are causing customers to "opt out" and not self-serve, and, similarly to the FCR Metric, the volume of additional live contacts that are caused as a result of unsatisfactory performance in a specific self-service option.

2.2.2 Meter Reading Metric Group

Metrics 6-8 below are all related to the performance and service of the Meter Reading function.

Annual Meter Read Rate

Metric Overview: The Annual Meter Read Rate is defined as the total number of meters read within the meter reading window regardless of attempts, divided by the total number of meters to be read. The metric measures the ability of LADWP to read its customer meters as per its reading commitment in order to utilize an actual meter read for the calculation of the customer bill. It is typically measured monthly and by meter reading cycle at a business unit level and aggregated to derive an annual rate (% of meters read). The metric can be derived from meter reading reports generated in the reading software, (e.g. MV 90) or an AMI system.

Metric Representation and Selection: The metric was selected as a measure of effectiveness for the Meter Reading function and to support having a base metric that can then lead to investigating and understanding of controllable (staffing, routing) and non-controllable (e.g. weather) factors in the reading process.

Importance of the Metric: Customers/Constituents, Business, and Business Process: For customers, having a meter read taken within the committed reading window is critical to getting an actual meter read in support of an accurate bill. For the LADWP business, and in managing the business process, the read rate provides a metric as to the efficiency of the reading process. Supporting metrics at the regional or local level can help pinpoint where the reading process is working or not, allowing for corrective action to be taken.

Meter Reading Error Rate

Metric Overview: The Meter Reading Error Rate is defined as the number of reads that have an error, divided by the total number of reads taken (% meter read error rate). A meter reading error is most typically identified when a read does not pass a hi-low validation (parameters normally set based on previous history and previous reads/usage). Errors can be captured for reporting through the meter reading software at the point of the read (manual reading). An error can also be produced by the billing system, or by the customer and reported. However, errors are best captured in the Billing function as a check of the Meter Reading Process. Most errors in a manual reading process are due to misread and mis-keyed data. For AMI meters the issue will typically be with telemetry or technology at the meter point.

Metric Representation and Selection: The metric was selected as a measure of quality of the Meter Reading process and to support having a base metric that can then lead to investigating and understanding drivers of errors. For example, training in a manual read environment or technology

issues in an AMI environment. Erroneous meter reads also drive back-office work in Billing (exceptions processing) and rework in the field such as sending out a Meter Reader to re-read the meter a second time, thus impacting cost and resource allocation.

Importance of the Metric: Customers/Constituents, Business, and Business Process: To support the accuracy of customer bills, this metric provides the business with a view of meter reading quality. In the event that bills that are generated with erroneous reads, customer calls in the Contact Center and rework in the field can result. The Billing function will also have the added burden of investigating and following-up on reading errors.

Meters with Chronic "No Read" (no bill 3-6-9 month billing periods)
Metric Overview: Meters with Chronic "No Read" (no bill 3-6-9 month billing periods) is defined as the number of active customer meters where no read has been taken over the aforementioned period.

Metric Representation and Selection: The metric was selected as a measure of LADWP's ability to effectively address "no read" situations that result in a customer not being billed over extended periods of time or receiving multiple estimates. In both cases, this can lead to customer dissatisfaction and a loss of revenue to the company. "No read" situations can arise due to several factors including access issues (to the meter) or the meter not placed on a reading route, to technical issues in the case of automated meters.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric's importance is that it allows the company to measure the volume of and drive the identification of the customers whose meters are consistently not being read (a probable cause of dissatisfaction and calls from customers). As a target measure it can move the company toward resolving chronic no-read situations with targeted process steps or activities aimed at solving the problem.

2.2.3 Customer Billing Metric Group

Metrics 9-12 below are all related to the performance and service of the Customer Billing group.

Percent of Bills Mailed Within Billing Window
Metric Overview: Percent of Bills Mailed Within the Billing Window is defined as the number of bills mailed within the billing window divided by the total number of bills that should have been mailed in the billing window. The billing window is normally a period of 2-5 days within each billing cycle (usually monthly) that a bill is to be mailed. This ensures that a customer is getting a bill that reflects roughly the same amount of usage as per the meter read (e.g. close to 30 days for customers on a monthly billing cycle) each month. The metric measures the timeliness of the bill issuance process.

Metric Representation and Selection: The metric was selected as a representation of a timely billing process. It is a common metric for Billing Departments and contributes to better cash flow and timely payment by customers.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is a key measure to ensure billing consistency and as a result, customer understanding of usage and what they

are being billed for. From a business process standpoint, the metric helps to understand how effectively bills are going out.

Percent of Bills Estimated

Metric Overview: The metric is defined as the number of bills that are issued as estimates divided by the total number of bills sent (the sum of estimated bills and non-estimated bills, e.g. those using actual meter reading to calculate the bill). The metric measures the ability of LADWP to provide its customers with a bill reflecting actual usage.

Metric Representation and Selection: The metric was selected to represent a measure that shows the effectiveness of the Meter Reading process and the translation of meter reads into actual bills through the Billing Process. For example, an organization that can effectively and accurately read meters on a timely basis should generate fewer exceptions and likely fewer estimated bills. If the Meter Reading process is good, but bills cannot be issued, then this may reflect issues within Billing (either process, systems or capacity). The metric is thus a broad indicator of the effectiveness of both of these processes. It is a standard metric for almost all utilities that can be readily benchmarked. The metric should be tracked through reporting in the Billing Department.

Importance of the Metric: Customers/Constituents, Business, and Business Process: Customers receiving estimated bills, especially in cases where they receive multiple consecutive estimates are more likely to seek to understand why. In cases where subsequent periods lead to adjustments to prior estimated bills once an actual read is made, customers may also seek to understand, thus driving calls and contacts into the utility. The metric can therefore help elevate the issue of billing estimates and allow the company to take corrective action. If such estimates are due to non-controllable events (such as weather), it can also lead to actions and communications with customers to proactively address the issue.

Percent of Bills with Post-Bill Adjustments Due to Errors

Metric Overview: Percent of Bills with Post-Bill Adjustments Due to Errors is defined as the total number of bills that are identified as erroneous and require an adjustment, divided by the total number of bills sent to customers. A billing error is measured after the bill is sent to the customer. The error can be one that is identified by the customer (most common) who notifies the company, or by the company in the course of its normal business processes, however the measure should only account for those identified "errors" that result in an adjustment to the bill. A post-bill adjustment results from either an office review of the bill and a cancel and re-bill, or a field activity such as a re-read resulting in a correction. The metric measures the quality of the Billing Process and can be derived by the capture and tracking of such adjustments in Billing.

Metric Representation and Selection: This metric was selected as a representation of the quality with which customer billing is done.

Importance of the Metric: Customers/Constituents, Business, and Business Process: Measuring the quality of bills serves to support customer satisfaction and also serves as an indicator of how well the Billing Process is working. For the business, higher levels of actual errors can drive customer contact volume into the Contact Center and drive rework in the form of office reviews and second field visits to

verify meter reads. The metric can serve to trigger root-cause issues that may warrant training, process changes, or enhanced communications across departments.

Percent of Bills Issued Electronically

Metric Overview: The metric is defined as the total number of bills issued to customers electronically (often referred to as "e-bill") divided by the total number of bills issued to customers. Electronic bills are defined as bills that are sent to customers in non-paper forms, including email, web (posted on internet through the customer's on-line account), text, or electronic source such as EDI, or bill consolidator site such as a bank or Checkfree. (Note: the metric should be measured at net customers receiving e-bills to account for customers who enroll and then later dis-enroll). The metric is typically tracked via Billing reports off of the Customer Billing System.

Metric Representation and Selection: The metric represents the level at which LADWP is electronically sending bills to customers (bill presentment). The metric can also serve to measure the impact of LADWP efforts to convert customers to e-bill, eliminating the need and cost of sending a paper bill.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is important as a measure of LADWP's efforts to convert customers to e-bill. Customers on e-bill tend to have higher levels of satisfaction and often enroll in ancillary communications such as on-line or email notification that their bill is ready, etc. As a process metric, LADWP can use it to help evaluate initiatives, promotions, and conversion levels.

2.2.4 Customer Payment Metric Group

Metric 13 below is the metric related to the performance and service of the Customer Payment function.

Percent of Payments Received from Customers Electronically

Metric Overview: The metric is defined as the total number of payments made electronically by customers divided by the total number of payments received. Electronic payments are differentiated by 3 means:

- Payment through the utility website (whether or not a 3rd party is used to process the payment)
- Direct debit, automatic bill pay, pre-authorized payment (utility goes and gets the money from the customer's bank etc.)
- Customer sends the utility the payment via ACH, EDI, Checkfree, or the customer pays through their bank, or through a low income agency (such as LIHEAP).

Metric Representation and Selection: Similar in nature to the prior Electronic Bill metric, the metric represents the level at which LADWP is receiving electronic payments from customers (bill payment). The metric can also serve to measure the impact of LADWP efforts to convert customers to e-pay, eliminating the need and cost of processing a cash or check payment.

Importance of the Metric: Customers/Constituents, Business, and Business Process: E-Pay as a payment option makes it more convenient for customers to pay LADWP bills. It can also support the payment of delinquent bills in a more expeditious manner. As with e-bill, Customers on e-pay tend to have higher levels of satisfaction and often enroll in ancillary communications or programs such as automated

payment. As a process metric, LADWP can use it to help evaluate initiatives, promotions, and conversion levels.

2.2.5 Credit and Collections Metric Group

Metrics 14-17 below are all metrics related to the performance and service of the Credit and Collections operation.

Percent of Customers in 30/60/90 Days Arrears

Metric Overview: The metric is defined as the number of customers that are in arrears (delinquent) at each time interval—30, 60, and 90 days—divided by the total number of customers. The metric can be measured by customer class, e.g. Residential, Small Commercial etc. or in aggregate. In this case the metric is an aggregate measure. Each interval is represented as a percentage, with the total percentage representing the total of customers in arrears. The annual metric is calculated as the average of the actual performance at the month end of the last 12 months.

Metric Representation and Selection: The metric was selected as a representation of the percentage of customers that are in arrears and for how long over the 3 time increments. This is a metric that is tracked by almost all utilities and can be benchmarked across the industry. Operationally the metric is often tracked at frequent intervals (monthly) to monitor movement and support understanding of the impact of credit actions being taken by the company

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric allows the business to understand the arrears level and severity of the arrears. It also is useful as an indicator of cash flow and a predictor of write-offs.

Percent of Accounts Scheduled for Disconnect Actually Worked

Metric Overview: The metric is defined as the number of accounts that are actually disconnected for non-payment (as per the company policy or regulatory agreements that govern service provision) divided by the total number of accounts eligible for disconnect. The measure is presented as a percentage. As defined, the same account can be counted in as many months as it is eligible for disconnect.

Metric Representation and Selection: The metric was selected to represent the actual application of disconnect actions as a proportion of the total actions (disconnects) that could have been taken. The metric can have numerous drivers, ranging from the company deciding not to enforce policy to business process or condition reasons such as staffing shortfalls in the field or ability to take action due to moratoriums etc., and the metric does not allude to those, but presents a rate that can be benchmarked against other utilities.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is important to the business as an aggregate measure of the level of action taken when compared to the possible level of action taken. The measure can lead to further investigation as to whether or not credit actions are being executed as planned.

Days Sales Outstanding

Metric Overview: The Days Sales Outstanding (DSO) measure is defined as the average number of days that the utility takes to collect revenue after the revenue is recorded/realized. A low DSO number implies that it takes the company fewer days to collect its accounts receivable. A high DSO number shows that the company is selling more to customers on credit and taking longer to collect the amount owed. For purposes of calculation, the DSO is the Average month-end accounts receivable divided by the total annual revenues times total days.

Metric Representation and Selection: The metric was selected as a measure of the ability of the utility to collect revenue over time (days). The metric is utilized by utilities across the industry.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is of importance as an indicator of the speed of collection of dollars that are due the company.

Write-offs as a Percent of Revenue

Metric Overview: The Write-offs as a Percent of Revenue metric is defined as the net percent of total revenue written off (e.g. less any recoveries). Write-offs are the annual "net" cost of bad debt. By definition, any recoveries (less fees) should be subtracted from gross write-offs to arrive at the net, which is then divided by the total revenue.

Metric Representation and Selection: The metric was selected to represent the percentage of revenue that is written-off by the company in the given year.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric represents a critical measure of the company's ability to manage its receivables.

2.2.6 Field Service Metric Group

Metric 18 below is the metric related to the performance and service of Field Service.

Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC))

Metric Overview: The Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) is defined as the number of CGI or UTC orders divided by the total orders actually issued to be worked by Field Service in the field. The metric measures the ability of Field Service to complete the work intended in issued work orders. CGI is defined as orders where Field Service could not gain access to the premise to conduct the needed field work and coded the status of the order as such; UTC is defined as an inability to complete the order for any reason, including a wrong order issued, wrong skill set, improper tools or equipment, etc. and coded the order as such.

Metric Representation and Selection: The metric was selected as a representation of the percentage of access and other conditions preventing the Field Service representatives from completing the intended work. It is also seen in the industry as a measure of needed rework, as such orders most often require a second trip to the premise to complete the work once the access or other issue is resolved.

Importance of the Metric: Customers/Constituents, Business, and Business Process: For the business this metric represents the percentage of intended orders that could not be worked. The higher the percentage of UTC and CGI orders, the greater the amount of rework (or in some cases non-completion of the work at all). Rework results in increased costs via second trips to the premise, staffing reallocations, and overtime etc., so as an indicator it can indicate the need to address and understand root cause issues of the results, ranging from obtaining premise access prior to sending a field representative to better training or scheduling etc. For the customer, incomplete orders or unmet commitments can have a negative impact on satisfaction and result in further unnecessary communications or calls to the utility.

2.2.7 Overall Business – Reliability and Customer Satisfaction

Metrics 19-21 below are all metrics related to the performance and service of the Overall Business

Electric System Reliability

Metric Overview: Electric System Reliability metrics are comprised of 3 measures, each mutually exclusive:

1. SAIFI, or system average interruption frequency index, is the average frequency of sustained interruptions per customer over a predefined area. It is the total number of customer interruptions divided by the total number of customers served. ◎
2. SAIDI, or system average interruption duration index, is commonly referred to as customer minutes of interruption or customer hours, and is designed to provide information as to the average time the customers are interrupted. It is the sum of the restoration time for each interruption event times the number of interrupted customers for each interruption event divided by the total number of customers. ◎
3. CAIDI, or customer average interruption duration index, is the average time needed to restore service to the average customer per sustained interruption. It is the sum of customer interruption durations divided by the total number of customer interruptions. ◎

Metric Representation and Selection: These metrics were selected as representing the three most commonly used measures of reliability (as defined by the IEEE). They serve as the most comparable measure of customer interruptions, restoration time, and interruption duration.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metrics are important as indicators of electric service quality. Minimizing interruptions, minimizing their duration when they do occur, and restoring power in a timely manner are critical to successful utility operations and customer satisfaction.

Customer Satisfaction- J.D. Power

Metric Overview: The metric is defined as the JD Power reported score for Electric Residential and Electric Business Customers (2 scores). The score is an annual one and reports the results of its customer satisfaction survey which measures satisfaction with power quality and reliability, price, billing and payment, corporate citizenship, communications and customer service. The metric can be benchmarked against a panel of utilities that is diverse, such as is done here, or against utilities that are comparable in size and geographic region. LADWP is placed in the Western Region, Large Customer Segment in the survey.

Metric Representation and Selection: The metric was selected to represent an aggregate customer satisfaction measure that is used across utilities in the United States. The results can be benchmarked from one utility to another

Importance of the Metric: Customers/Constituents, Business, and Business Process: The survey is the most publicly communicated customer satisfaction survey. Customers can, from media channels, hear about the performance of their utility. The utility can also gain insights as to its performance from interviewed customers' perceptions of the company.

2.3 Selecting the Comparison Panel

2.3.1 Overview of selecting a benchmarking comparison panel

A key part of any benchmarking study for a utility in the U.S. is selection of an appropriate group of utilities for comparison. Theories about the "ideal" comparison panel begin with a debate about whether the comparators should be as much like the utility under study as possible, or should contain a diverse array of comparators. Those arguing for a homogeneous group point out that it's only fair to choose utilities with the most similarity of circumstance, in order to truly understand the relative performance of the test utility within those circumstances. Those arguing for diversity suggest that a comparison group with a wide array of comparators allows the greatest opportunity to identify better practices, factors that affect performance, and the range of performance that customers might expect from their supplier.

After having performed dozens of benchmarking studies in the utility customer service arena over a 25-year span, our consultants have concluded that the best possible comparison groups are those that have variation within the group on an array of factors, thus enabling the best possible learning opportunity. Using a homogeneous comparison group misses the opportunity for greater learning in an effort to find the drivers of small differences between very similar companies. A comparison group that represents the entire industry is most often the best, since it gives a better indication of the performance of the test utility within the industry, regardless of specific circumstances.

With that background, the project team worked to develop a panel for comparison in the benchmark analysis that included utilities with the following characteristics:

1) Similarities to the utility under study
2) Differences from the utility under study
3) Broad geographic coverage
4) A range of ownership structures (Municipal, IOU)
5) Some single-commodity and some multi-commodity utilities
6) Different regulatory jurisdictions

The goal is to get an accurate representation of the industry, and that was the focus of the selection process. The comparators in the selected group face some different circumstances (e.g. regulatory structure, customer base, economic conditions) as well as some similar ones, and have some different characteristics, along with some similarities. The broad, diverse comparison panel provides the greatest learning opportunity in terms of practices, as well as the best way to compare overall outcomes in a broad context.

Having done the analysis using the panel described below, and looking at the results of the performance comparisons, the peer panel selection process turned out to have been a good choice. The relative performance for LADWP within this group, or within a homogeneous comparison panel would have worked out about the same (see results below), and now the results can be seen within a national industry context, rather than just against a homogeneous group of utilities.

2.3.2 The selected comparison panel

The comparison panel chosen for LADWP has the following characteristics:

1) Nationwide coverage
2) Very large utilities
3) Smaller utilities
4) Municipalities and IOUs
5) Utilities with multiple commodities and with only one commodity
6) Utilities in multiple regulatory jurisdictions

The net result for the selected group of utilities is the comparison panel provides a broad cross-section of the industry, with demanding customer groups, regulators, and management teams. While the study did not endeavor to investigate the underlying practices in depth, it is clear there are some significant differences in approaches and levels of success that LADWP can learn from through future process improvement efforts.

The list of companies finally selected for the study includes the following utilities:

Table 1: List of Benchmark Peers

Austin Energy	Iberdrola USA – RG&E
CPS Energy	Jacksonville Electric Authority
DTE Energy	Lakeland Electric
Entergy	Oncor Electric Delivery
Exelon -- BGE	PSE&G
Exelon – PECO Energy	PSEG Long Island
Exelon -- ComEd	Tacoma Public Utilities
Hydro-Quebec	Tucson Electric
Iberdrola USA – Central Maine Power	Westar Energy
Iberdrola USA -- NYSEG	

While questions can be asked about why one or another utility was not included in the comparison group, the project team has great confidence that the conclusions reached through use of this comparison panel will withstand scrutiny, and would be the same if a different group of comparator companies had been selected.

2.4 Results of the Benchmarking Comparisons

This section of the report is divided into two sub-sections. The first describes the ability of LADWP to report against the set of metrics described above, while the second summarizes findings about the relative performance of LADWP on those metrics for which they were able to report results.

2.4.1 Ability to Report Performance

LADWP provided results for a total of 14 of the requested 20 performance measures, which are standard metrics used across the utility industry. Collectively, these measures provide the foundation for active and on-going monitoring of utility Customer Service operations. The Department was unable to provide data on 30% of the metrics selected for our study. Navigant has been informed that work is underway to address issues with the Department's historical customer service data. Resolving these issues may improve the results of the 2014 benchmarking reflected in our report. We encourage the Department to continue to pursue and adopt methods of improving data management practices in customer service. A brief commentary on each metric grouping follows.

Table 2: LADWP Ability to Measure and Report the Metric

	Yes	No
Contact/Call Center		
Service Level (Live Contacts)		✓
Abandonment Rate (Live Calls)		✓
Average Speed of Answer (Live Contacts)	✓	
Percent of IVR Self-Service Contacts with a Completed Transaction	✓	
First Contact Resolution Measure (Contact Center Process)		✓
Meter Reading		
Annual Meter Read Rate	✓	
Meter Reading Error Rate		✓
Meters with Chronic No Read (no bill 3-6-9 billing periods)	✓	
Customer Billing		
Percent of Bills Issued Electronically	✓	
Percent of Bills with Post-Bill Adjustments Due to Errors		✓
Percent of Bills Mailed Within Billing Window	✓	
Percent of Bills Estimated	✓	
Customer Payments		
Percent of Payments Received from Customers Electronically	✓	
Credit and Collections		
Write-offs as Percent of Revenue		✓
Days Sales Outstanding	✓	
Percent of Customers in 30/60/90 Days Arrears	✓	
% of Accounts Scheduled for Disconnect Actually Disconnected	✓	
Field Service		
Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)	✓	
Overall Business- Reliability and Customer Satisfaction		
Customer Satisfaction - J.D. Power - Residential	✓	
Customer Satisfaction - J.D. Power - Business	✓	
Reliability		✓

2.4.1.1 Contact/Call Center

LADWP reported on 2 of the 5 selected metrics, Abandonment Rate and % IVR Self Service Completed. Of the 3 that could not be reported, 2 -- Service Level and Abandonment Rate -- should be derived and available from ACD (the call routing system) or Call Management System (CMS) reports.

2.4.1.2 Meter Reading

2 of the 3 selected metrics -- Annual Read Rate and Meters with Chronic No Read---were reported. The third, Meter Reading Error Rate, should be available through the Meter Reading software (for manual reads) and the Billing System when identifying exceptions, or in the Pre-Bill Audit Process.

2.4.1.3 Customer Billing

3 of 4 selected metrics -- % of Bills Issued Electronically, % of Bills Mailed in the Billing Window, and % of Bills Estimated -- were reported. % of Bills with Post-Bill Adjustments Due to Errors should be tracked in the Billing Group via available reporting, and individual tracking if necessary.

2.4.1.4 Customer Payments

The selected metric, % of Payments Received from Customers Electronically, was reported.

2.4.1.5 Credit and Collections

3 of 4 selected metrics -- Days Sales Outstanding, % of Customers in 30/60/90 Days Arrears, and % of Accounts Scheduled for Disconnect Actually Disconnected -- were reported. Write-offs as Percent of Revenue should be derived from financial statements and write-off tracking.

2.4.1.6 Field Service

The selected metric, Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC), was reported.

2.4.1.7 Overall Business- Reliability and Customer Satisfaction

Reliability metrics -- CAIDI, SAIDI, and SAIFI – were not reported. While not typically tracked in the Customer Service group, these metrics are standard reliability measures that should be tracked and easily available in the Distribution organization. Customer Satisfaction - J.D. Power – Business and J.D. Power Residential, were reported.

2.5 Results on the Reported Measures

The results of performance for the metrics actually reported are shown in the table below. Most of the performance results fell in either the 3rd or 4th quartile of the comparison panel. A brief commentary follows the table.

Figure 3: Performance Profile for LADWP Customer Service

	LADWP	Q	Mean	Q1	Q2	Q3
Contact/Call Center						
Service Level (Live Contacts)	NA		64.7%	75.9%	66.9%	61.4%
Abandonment Rate (Live Calls)	NA		6.6%	4.4%	5.5%	9.5%
Average Speed of Answer (Live Contacts)	1362.0	4th	100.9	46.0	90.0	111.5
Percent of IVR Self-Service Contacts with a Completed Transaction	41%	3rd	46%	62%	45%	35%
First Contact Resolution Measure (Contact Center Process)	NA		78.0%	85.0%	78.0%	72.0%
Meter Reading						
Annual Meter Read Rate	94.0%	3rd	92.3%	98.4%	96.5%	93.1%
Meter Reading Error Rate	NA		0.13%	0.04%	0.10%	0.19%
Meters with Chronic No Read (no bill 3-6-9 billing periods)	0.84%	2nd	1.35%	0.01%	0.84%	1.10%
Customer Billing						
Percent of Bills Issued Electronically	14.4%	3rd	18.5%	22.6%	16.1%	14.4%
Percent of Bills with Post-Bill Adjustments Due to Errors	NA		0.240%	0.098%	0.159%	0.309%
Percent of Bills Mailed Within Billing Window	98.0%	4th	98.95%	100.00%	99.62%	99.34%
Percent of Bills Estimated	4.9%	4th	4.39%	0.82%	1.28%	4.9%
Customer Payments						
Percent of Payments Received from Customers Electronically	35%	4th	53%	50%	54%	58%
Credit and Collections						
Write-offs as Percent of Revenue	NA		0.95%	0.38%	0.79%	1.40%
Days Sales Outstanding	36	2nd	35	31	36	40
Percent of Customers in 30/60/90 Days Arrears	56%	4th	28%	15%	27%	37%
% of Accounts Scheduled for Disconnect Actually Disconnected	2.6%	4th	44%	42%	44%	49%
Field Service						
Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)	66.9%	4th	18.83%	3.70%	10.83%	20.61%
Overall Business – Customer Satisfaction						
Customer Satisfaction - J.D. Power - Business	646	3rd	657	670	659	645
Customer Satisfaction - J.D. Power - residential	641	4th	651	661	647	643

2.5.1 Contact/Call Center

The reported Average Speed of Answer was in the 4th quartile. At close to 23 *minutes*, customer wait time before a call is answered, the Service Level (not provided) could be derived as close to or at 0% of calls answered in 30 seconds. These metrics indicate significant customer access challenges when compared to Mean ASA of 100 *seconds* as a benchmark. Factors to further investigate would be high call volume levels and causes of high volumes, staffing issues, staff to volume scheduling gaps, and drivers of repeat calls from customers. % IVR Self Service Completed falls in the 3rd quartile at 41%, less than the mean of 46%.

2.5.2 Meter Reading

The Annual Meter Read Rate falls in the 3rd quartile at 94%, meaning that on average 6% of the active meters are not being read. Factors to further investigate would be route reading efficiency, effectiveness, and staff productivity. While the % of Bills Estimated was not provided, this Read Rate metric would indicate a similar performance level in Estimated Bills.

2.5.3 Customer Billing

While 98% of bills were mailed within the billing window, this represents 4th quartile performance when compared to the benchmark panel. 2nd quartile performers achieve 99.62%. Factors to further investigate would be drivers of delay in both the Billing (processing backlogs or exception handling delays causing pre-bill adjustments) and Meter Reading (delays in reading on-cycle or missed reads) processes.

The % of Bills Issued Electronically was 14.4%, 3rd quartile performance. Mean performance was at 18.5%. The % of Bills Estimated was 4.9%, which is in the 4th quartile. Factors to investigate here include missed meter reads and/or problems in the pre-bill edit process.

2.5.4 Customer Payments

% of Payments Received from Customers Electronically, was reported at 35%, 4th quartile. The Mean performance was 53%. Factors to further investigate are success of approaches aimed at promoting both e-bill and e-pay to the appropriate customer demographic, both of which increase customer satisfaction and can serve to reduce postage and bill preparation/payment processing costs.

2.5.5 Credit and Collections

% of Customers in 30/60/90 Days Arrears was in 4th quartile and the highest in the benchmark panel at 56%. The Mean was 28%. Factors to investigate are collections policies and approaches, field activities and effectiveness of actions to be taken. % of Accounts Eligible for Disconnect Actually Disconnected was also 4th quartile and the lowest in the comparison group at 2.6%. The Mean was 44%. Factors to investigate are field collections policies, effectiveness, staffing availability, and $ amount and days delinquent minimum to send to the field.

2.5.6 Field Service

Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) was reported at 66.9%, meaning that 2 of 3 fielded orders are not completed, an extremely high level and the second highest in the comparison group, placing LADWP in 4th quartile for this metric. Factors to investigate are order quality, field force effectiveness, scheduling, route management and productivity, and field training.

2.5.7 Overall Business -- Reliability and Customer Satisfaction

Reliability metrics---CAIDI, SAIDI, and SAIFI – were not reported. In other circumstances where these metrics are reported, LADWP typically compares favorably with the industry.

Customer Satisfaction - J.D. Power – Business and J.D. Power Residential, were reported at 646 and 641, respectively, which places LADWP in the 3rd and 4th quartiles of customer satisfaction performance. When viewed in concert with the performance on the operational metrics described above, the relatively low satisfaction results are just what would be expected.

3. Review of Customer Service Technology

Leading practices in customer service are increasingly defined by the advanced use of technology. In general, delivering customer service involves a set of technologies that fall into three main software categories: queuing and routing, CRM customer service, and workforce optimization.[2] These forms of technology are generally adopted to better address customer challenges, provide an increasing number of service delivery choices, improve staff efficiency and effectiveness, and provide meaningful insights to improve customer care. The main focus of enhanced technologies is typically in the following areas:

- Self-service optimization. Finding ways for customers to interact with the business when they want.
- Data management and analytics. Using data collected from customers to analyze their preferences.
- Insight-driven marketing. Using of data to conduct more effective target marketing.
- Marketing automation. Streamlining and automating business processes to improve efficiency.
- Workforce effectiveness. Encouraging staff to improve customer treatment through tools and training. [3]

While the immediate focus of these efforts is to enhance the "customer experience" and deliver operational improvements, inevitably the goal of deploying enhanced technologies is increased customer loyalty. Loyalty is relevant to the Department, inasmuch as inefficient or ineffective methods of customer service can lead to reputational risk and directly impact the relationship between the utility and its various stakeholders.

A 2015 Forrester report cites the following as some of the leading trends in Customer Service:

- "Pain Free": Customers want to feel empowered to get a question answered or an issue resolved at any point during their engagement journey with a company, and expect their service interactions to be painless.
- Proactive: Companies are embracing a new type of customer service engagement that relies on customer context, connected device information, and predictive intelligence to generate proactive or at best, preemptive experiences.
- Personalized: Organizations have long personalized their customer service interactions by providing differentiated experiences for broad customer segments. Now they need to go further, first by delivering the right service experience — either via self-service or agent assisted — to the right user at the right time.
- Productive: Customer service organizations strive to deliver a differentiated service experience for their customers that adds value to commoditized products and services and achieves customer loyalty. Yet they must provide these differentiated experiences at a cost that makes sense to the business — making efficiency a central concern.[4]

[2] Kate Leggett, "Trends 2015: The Future of Customer Service", Forrester Research, March 2015.
[3] Inc.com, "How to Use Technology to Improve Customer Service",
[4] Kate Leggett, "Trends 2015: The Future of Customer Service", Forrester Research, March 2015.

In short, current thinking on leading standards in customer service suggests that the best service should be straightforward, proactive, personalized, and delivered efficiently. For many companies, this level of service is a cornerstone of their customer engagement strategy. As a result, technology has topped the list in investment priorities for the last several years in customer service organizations.[5]

3.1 Technology in the Customer Service Division

Technology strategies and objectives are defined and executed through the Customer Information, Communication and Technology (CICT) group in the Customer Service Division (CSD). As currently organized, the CICT is directly accountable for managing several applications for the Department, including the corporate website, the Customer Relationship Management (CRM) system, the customer service analytics database, and the e-marketing platform. CICT works closely with the Information Technology Services Division (ITSD) to manage other critical applications, including the Customer Information System (CIS), Mobile Workforce Management (MWM), Meter Data Management (MDM), meter reading systems (Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI)), and Interactive Voice Response (IVR).

The following is an overview of the CICT in several key areas, including Strategy, Governance, Roles and Responsibilities, and Major Initiatives. Recommendations are highlighted at the conclusion of this report. This report should be read in conjunction with the *Technology Infrastructure* report to comprehensively understand the challenges and opportunities related to technology.

3.1.1 Strategy

The technology-related strategy of CSD is a primary topic of our review. To prepare this report, we reviewed a number of independent studies and benchmarking initiatives commissioned by the Department that focus on the requirements associated with moving toward greater customer focused operations. Many of the analyses assess the Department's overall customer experience ("Voice of the Customer") and customer service technology management. In addition, we reviewed the CSD Strategic Objectives document, which describes the Division's five (5) principal goal areas, all of which touch on the importance of technology in service delivery and workflow.

One of the strategic objectives in particular – "*Innovate*" – describes system stabilization and integration as important goals. The following are the specific "*Innovate*" goals:

1. Stabilize CIS (CCB) & other platforms
2. Integrate MDM with CCB
3. Integrate Unit Meters with CCB
4. Implement new ladwp.com framework
5. Implement RFP strategies for CCB & IVR Support
6. Increase billing & payment options for customers

The ability to address all of these goals depends on progress made specifically in Goal #1; CIS stabilization and leading day-to-day work consume a great deal of organizational resources.

[5] Forrester Research, "Forrsights Software Survey, Q4 2013".

Each major group in the CSD provided more detailed goals and objectives in five (5) areas: Improve Customer Experience; Operational Excellence; Customer Programs & Outreach; Strengthen People, Values & Culture; and Technology & Innovation. Within these areas, CICT identified specific objectives to improve the use of technologies used by customers, eliminate defects in key systems, and implement Request for Proposal (RFP) strategies for additional customer service systems (among others).
At present, CIS remediation and on-going operations are the two primary Division priorities, with the CIS program appearing to consume the greatest amount of time and resource in the CICT. The reasons for this are clear, as a properly-functioning CIS is critical for the Department. However, it is important to note that interviewees stated that both on-going operations and other strategic programs may suffer when competing with CIS program objectives. This finding is explored further in the *Organization & Staffing* and *Training* sections of our review, included below.

3.1.2 Governance

Customer Service technology strategies are formulated in the CSD, and executed by CICT with delivery support provided by ITSD. Special oversight committees are formed to provide additional governance over major initiatives. For example, the Technical Review Committee (Committee) provides governance over a variety of system-related issues, including the on-going CIS project. Members of the Committee include the AGM of Customer Service, the CIO, and members of CSD and IT management. The Committee reviews and approves program workplans, evaluates progress to-date versus major targets and milestones, and confirms program priorities. CICT then leads meetings with project managers, contractors, and ITSD to evaluate deadlines and overall project requirements.

While we believe this additional governance is appropriate, interviews suggest that the Committee can override the concerns of CICT staff, shift priorities, and commit to aggressive remediation schedules. In our experience, continuously shifting priorities can reduce overall staff productivity and impact morale. In addition, when implementing a program to resolve defects, adhering to aggressive "go-live" deadlines in the absence of comprehensive testing can have lingering impacts on system stability in the long term. CSD staff also noted that if project workplans are rejected by the Committee, alternatives or explanations are not provided and the review process has to start over, which elongates timelines to complete critical projects.

3.1.3 Organization & Staffing

At present, there are approximately 50 staff in CICT, organized around three (3) main functional areas – Customer Information, Customer Communications, and Customer Technology. Some number of these positions are ITSD matrixed staff positions, further indicating the close relationship between the groups. Interviews confirm that staffing levels need to increase, given the effort dedicated to day-to-day operations, remediation of the CIS, and other strategic objectives. Recent retirements exacerbate this need: There have been a large number of retirements in the last two years. Given recent and future changes in the technology and business process landscape in CSD, the type of skills required for this workload also need to be addressed. It is believed that staffing efforts to meet immediate needs could take up to three (3) months, after which training on both the technical and business facets of CSD activities would need to take place. Although progress has been made to improve the efficiency of the hiring process, delays in staffing would immediately impact the CIS remediation project, as CICT's immediate need is for additional analysts to develop business requirements and conduct software

testing. In the near-term, remediating the CIS defects – while also leading operations and preparing for additional technology initiatives – will require a combination of CICT staff and third-party consultants. Staffing plans need to be linked to a clear understanding of the functions, roles and responsibilities in CICT, and how CICT works with ITSD.

Generally, staffing levels in any organization are determined by an understanding of the number of services or products the organization provides, the demand for those service or products, the level of effort required, and the complexity of the work (among other factors). Navigant recommends that CSD conduct a detailed workload analysis to better understand the resource needs across all of the various tasks and activities conducted by CICT and CSD staff. Gaining a clearer understanding of workload and resourcing is particularly important, given that staff are balancing day-to-day operations and "special projects" around system deployments.

3.1.4 Roles & Responsibilities

CICT and ITSD work together on a variety of activities, from system selection to deployment and remediation. In general, clarity around roles and responsibilities, accountabilities, and ownership of tasks is a key determinant of organizational effectiveness. Interview results suggest a lack of clarity around roles and responsibilities and decision-making accountability around some key tasks that involve both groups. More specifically, confusion exists around the role of each group in the area of system "fixes". In addition, interviews suggest that CICT is unclear how business requirements are used in system selection processes.

The functionality of any complex system is determined through: 1) the configuration of standard settings, and 2) specific coding that yields more client-specific, tailored results. It is generally understood that CICT is accountable for identifying and remediating configuration-related system fixes, while ITSD is accountable for coding-related fixes. However, interviews suggest confusion around ITSD's role in configuration activities.

Additionally, CICT is accountable for ensuring the development of business requirements. Business requirements are used in efforts to address system defects, and also to identify new system selection criteria. Currently, accountability around developing business requirements is a significant determinant of CICT's staffing needs. However, interviews suggest that how business requirements inform or drive system selection is unclear among some CICT staff. Clarity around how outputs are used (in this case, business requirements) in an overall business process helps drive organizational and business process effectiveness.

Navigant recommends that CICT and ITSD more clearly delineate their roles and responsibilities, inputs and outputs, and interfaces, in all areas related to customer service technology management.

3.1.5 Training

Training is a critical aspect of successful system implementation. Business processes often change significantly with the adoption of any new system. This is particularly relevant in situations where legacy and proprietary systems are replaced with largely "off the shelf" solutions that reflect best practice processes and workflows.

One of the challenges of the CIS deployment was related to the lack of training. It was found that both existing and new employees did not understand the workflows associated with the new CIS or how

those workflows related to an overall business process. In 2014, CSD established a training academy for customer service in order to facilitate successful transition to new systems (including specifically the CIS). While initial efforts focused on ensuring an adequate level of both technology and business training among the new hires, CSD also focused training efforts on existing employees, with a particular emphasis on skill-enhancement.

These programs are a critical aspect of embedding new processes into CSD "ways of working", and helping new and existing employees understand why they are doing what they are doing in the CIS and other key work activities. Training extends from new technologies to call center, billing, and other key processes. Training programs will include additional facets of the CSD (field training) in the near term.

Navigant believes that comprehensive training not only improves operational performance, but also is an important form of change management: Morale will improve as new and existing employees understand their roles in the context of the overall CSD business process. Interviews suggest that the CSD will be more fully trained by Q3 2016. We believe that the training program is a success story, as CSD aims to ensure adoption of the CIS, build a more flexible and resilient workforce, and develop a "template" for future system and business process transformations.

3.1.6 Major Initiatives

The CICT has a number of major initiatives related to the customer service systems it supports. The following is an overview of several of the more prominent system-related initiatives currently underway.

3.1.6.1 Customer Information System (CIS)

One of the most critical CICT activities is related to the CIS remediation. A significant amount of work has been done to address a large number of system issues: This is a clear commitment of the CICT and ITSD organizations. Despite this progress, CICT and ITSD are still identifying critical tasks and remediating defects. According to interviews with staff, there are more than 600 CIS-related tasks and defects in the queue that need to be addressed. CICT places high-priority on two primary types of defects: 1) billing accuracy, and 2) arrears and collections. Once identified, CICT works closely with ITSD to remediate the issues. While CICT "owns" the prioritized list of tasks and defects (and schedule for remediation), ultimate governance around prioritization and pace of remediation is exercised by the Committee.

Importantly, interviews suggest a disconnect between those who desire a more rapid pace of issue-resolution, and those who strongly believe that both business requirements and testing need to be improved before defects are closed. Furthermore, additional staff are required to meet the schedule expectations for defect remediation. Continuing the pace of remediation while also conducting day-to-day business is contingent on efficient staffing in specific skill areas related to system testing, documenting business requirements, and executing the program of work to address remaining defects.

Finally, on-going training will continue to be important, as more CIS functionality is activated. Interviews with staff suggested that CSD is still working on establishing the core functionality of CIS and that the system offers significantly more capabilities than those being used. Accordingly, it is essential that staff are trained on these additional system components before they are activated and

incorporated into day to day operations. This, plus the desire to create system "superusers", are additional requirements associated with the CIS effort.

3.1.6.2 Mobile Workforce Management (MWM)

Mobile Workforce Management (MWM) systems provide decision-makers real-time information that enables active control and performance of field resources. Stability has improved in the Department's MWM system (RouteSmart), but CICT is still in the process of integrating RouteSmart and the Department's legacy proprietary system. CICT is also evaluating handheld field products to determine which products to integrate with the system. As with CIS, the system has many capabilities, but CSD and CICT continue to work to optimize core functionality.

3.1.6.3 Interactive Voice Response (IVR)

Interactive Voice Response (IVR) is an automated system that interacts with callers, gathers information and routes calls to the appropriate recipient. An IVR system and related business processes are central to effective customer service, insofar as they provide self-service options to customers that help deliver first call resolution. Several reports have specified IVR-related challenges at the Department. For example, a JD Power study (2015) found that IVR processing and routing is too complex, and that the organizational staffing / structure is not in place to adequately support the technology. In addition, a 2015 benchmarking study found:

- Total call time longest of any peer.
- Significant number of menu levels.
- More spoken than direct dial options.
- Confusion over prompts; multiple similar prompts.
- Non-recognition of number.
- Direct transfer not an option for a significant percentage of calls.
- Significantly longer wait time from answer to completion of menu.
- Extraordinary wait times for a Customer Service Representative (CSR).

As noted above, addressing these and other challenges has been identified as a priority in the CSD.

ITSD is currently accountable for managing the IVR system. However, according to interviews, no internal person in ITSD or CSD knows how to change the IVR messages. As a result, all system changes have to go through an external consultant. While there is a project plan to upgrade the system, the ownership of this upgrade is unclear. Moving forward, the CSD would like to actively and more directly manage the IVR system, particularly in the area of configuration (messages and routing), with ITSD providing technical support. There is an understanding that cooperation is required between the groups to make the IVR successful, but there is also the belief that CSD needs to own more of the management responsibility.

As mentioned above, an IVR project plan has been defined to upgrade the system, which contemplates a five-year RFP cycle defined by a number of tasks. Importantly, the JD Power identifies several paths – or preconditions – to IVR success. These typically include:

- Significant financial resources

- Long history with the technology
- Very loyal customer base

The JD Power study further identifies several strategic issues with the Department's IVR program, including (among others): availability of informative data; ownership of IVR performance; support structure; ownership and role definition, and design and direction to future state. These foundational aspects of the program need to be addressed for the IVR program to be successfully turned around.

3.2 Conclusions & Recommendations

Technology plays a central role in moving customer service organizations toward leading practices, and delivering core operations in a more optimal manner. The current and proposed future state of the Department's technology infrastructure is a key determinant of how customer service will be delivered and how work will be conducted. As noted, the Department has commissioned a number of studies that provide specific guidance on how technology can be further optimized to meet strategic objectives (including how to move the company toward more customer-focused service). According to one of these studies, the Department has an opportunity to deploy technology more effectively to meet their goals: The CEB Study (2014) found that *Technology Management*[6] was the fourth highest opportunity area ranking, behind *Live Phone Experience*, *Quality Assurance*, and *Service Organization Culture*.

Focusing on technological change in concert with business process improvement and enhanced staffing, we believe the Department has an opportunity to make significant progress on customer service objectives. Pursuing excellence in customer service should be a continuous goal of the Department. We reiterate many of the goals recommendations described in the CSD strategic planning documents and findings from other assessments, and offer several additional recommendations below.

[6] The CEB defined the Technology Management assessment area as follows: "We make technology investments to better enable our existing processes—technology does not define process. We methodically approach vendor-fit evaluations, technology investment priorities, and implementation plans."

High Priority Recommendations

- Evaluate and more clearly define functional accountabilities for key activities between CICT and IT – confirm and draw "brighter lines" between functional responsibilities.
- Create an overarching strategic plan for customer service technology for the next 5-years (including prioritized technology requirements (remediation and new systems), high-level deployment schedules, and estimates of required resourcing (staff and capital) requirements).
- Strengthen the system selection process, and confirm business requirements as a central driver for system selection.
- Continue to develop the training program for CSD, focusing on both technical and business-focused modules. Also continue focus on staff cross-training and staff rotation to enhance flexibility and resiliency in workforce.
- Address staffing and hiring concerns as best as possible, with particular emphasis on specific subject matter expertise and program management acumen.
- Pursue documentation and training on key business processes that align to use of new technologies.
- Measure and evaluate key business activities, processes and personnel; specify Key Performance Indicators (KPI) and define performance targets; incorporate benchmarking as a normal aspect of performance evaluation.
- Conduct workload / workforce balancing analysis to more precisely understand the number of staff and types of skills required

Appendix A. Lists of Interviews

Name	Title/Topic	Interview Date
Estela Tieman	CICT Manager	August 13th/18th
George Rofail	Director of Customer Operations	August 25th
Greg Hornsby	Key Account Manager	August 12th
Michelle Moore	Field Operations and Call Center Manager	August 12th
Miki Yonamine	Credit and Collections Manager	August 12th
Latrice Williams	Revenue Management Manager	August 12th
Wanda Barnett	Customer Service Center Manager	August 12th
Nance Walker-Bonnelli	Billing Manager	August 13th
Sharon Grove	Assistant General Manager of Customer Experience	August 25th
Victoria Black	Training Manager	August 12th

Appendix B. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

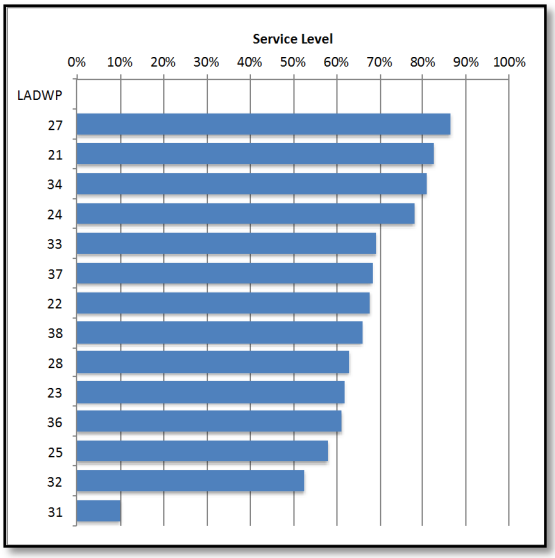
Documents Provided by LADWP	
1	Customer Accounts Receivable Continued Reduction Plan
2	2015 Utility Website Evaluation Study – J.D. Power
3	2010 Electric Utility Business Customer Satisfaction Study
4	2010 REU Study
5	2013 Service One
6	2014 MSI Cogent Energy Management Readout
7	Quality Assurance Planning and Procedures
8	4110 4111_FinalData
9	Active Passive Relationship Presentation April 2013
10	Amendment No. 4 to Software Maintenance and Support with eLoyalty, LLC
11	Chartwell Customer Care Survey Results
12	CIS Remediation Progress Report
13	LADWP 2012 Survey of Residential Customers
14	Change Order 53
15	Customer Accounts Receivable Reduction Plan
16	CSD Organization Charts
17	Customer Service / Transaction Presentation
18	CS Department Goals and Vision
19	Final Data Analysis_20150518_NS
20	IVR Business Requirements
21	JD Power Business Customer Satisfaction Survey
22	JD Power Residential Customer Satisfaction Survey
23	JD Power 2010 and 2011 REU Study
24	LADWP Customer Experience Improvement Advisory Engagement
25	LADWP CS Analysis Board Presentation
26	JD Power Customer Experience Improvement Advisory Final Recommendations Report
27	LADWP IVR Assessment Final Report
28	LADWP Intranet Status
29	LADWP CS Project Plan
30	Link to all CSD Weekly KPI Metrics
31	LADWP CEB Customer Contact Anatomy Survey
32	Mayor Monthly Customer Service Metrics
33	Overall Results 10-28-13
34	Payment Options Presentation Jan 2015
35	2013 Customer Service Policies Survey
36	Segmentation Update Presentation
37	Segmentation Full Report April 2013

38	Services Implementation Kick-off
39	LADWP Customer Service Results from April 2015

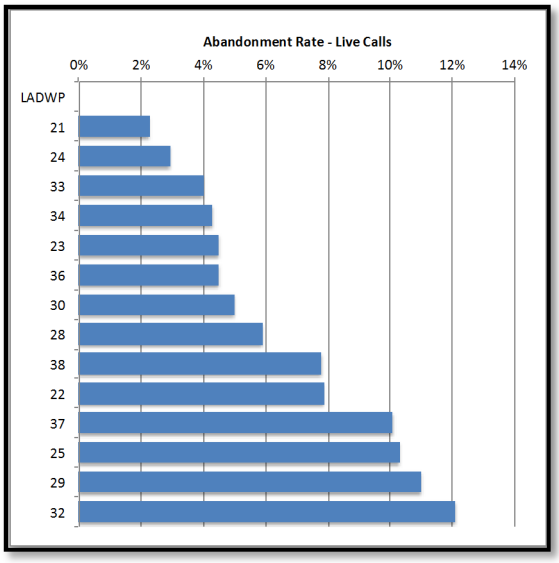
Appendix C. Benchmark Exhibits

The results of each benchmarked metric can be found below. For confidentiality purposes, each peer utility is referenced by a random number rather than by name.

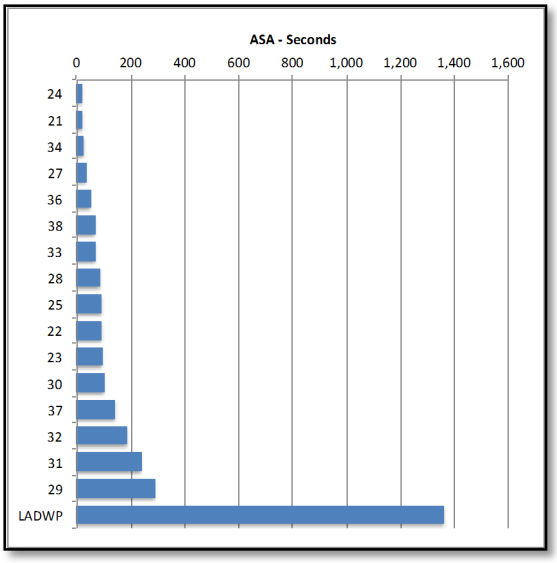
C.1 Service Level (Live Contacts)



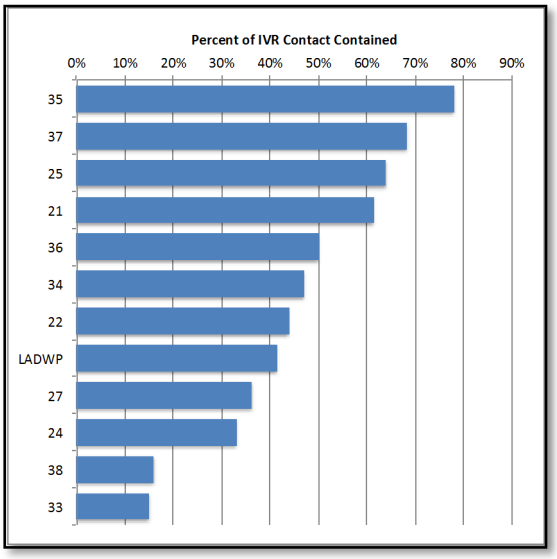
C.2 Abandonment Rate (Live Calls)



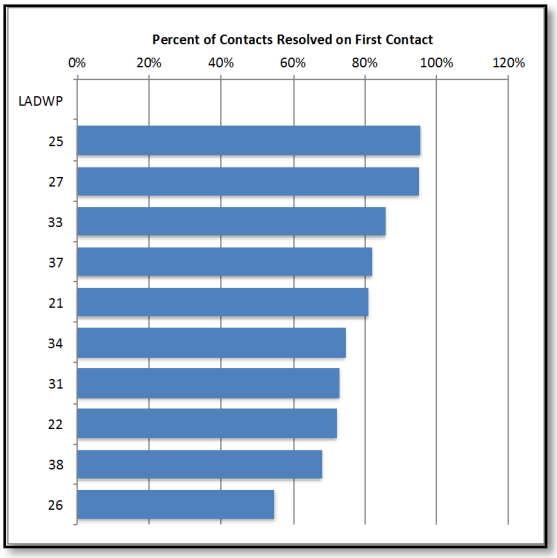
C.3 Average Speed of Answer (Live Contacts)



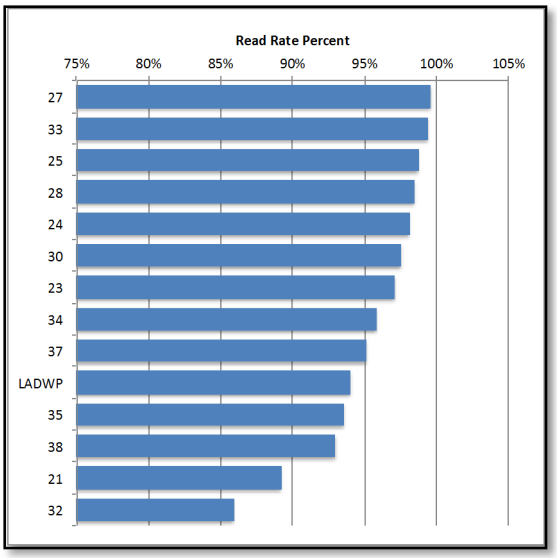
C.4 Percent of IVR Self-Service Contacts with a Completed Transaction



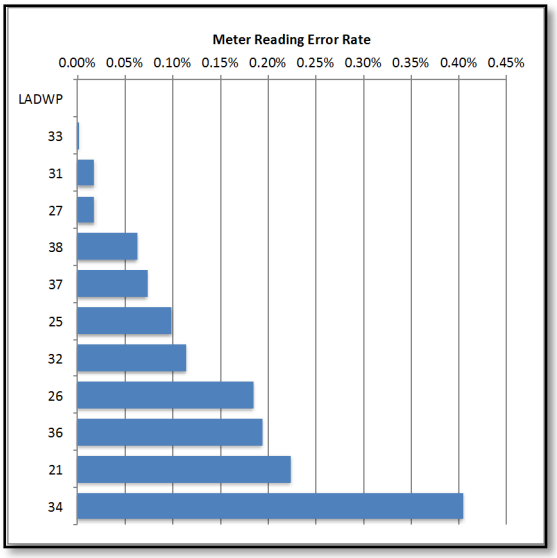
C.5 First Contact Resolution Measure (Contact Center Process)



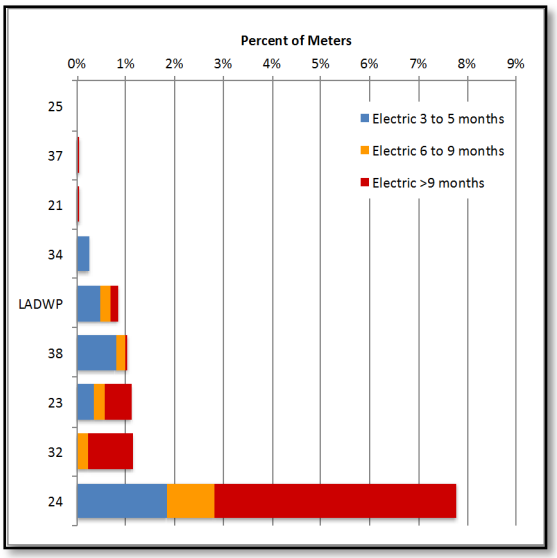
C.6 Annual Meter Read Rate



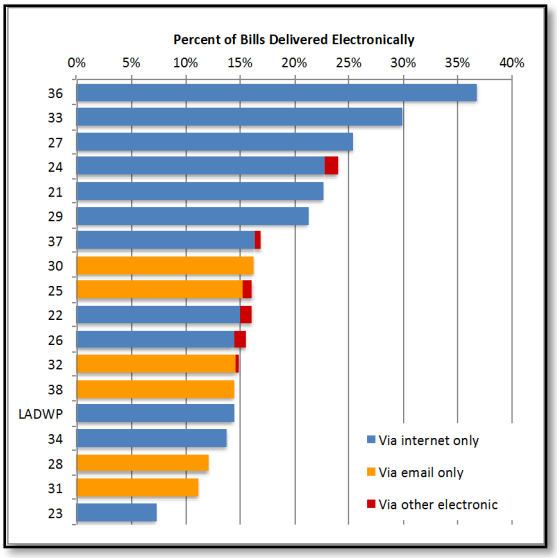
C.7 Meter Reading Error Rate



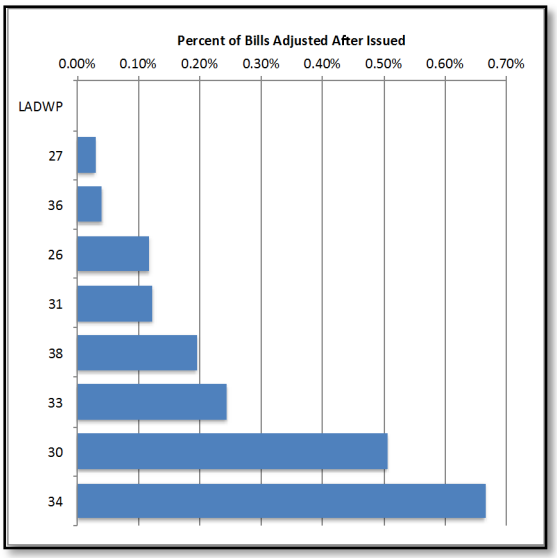
C.8 Meters with Chronic No Read (no bill 3-6-9 billing periods)



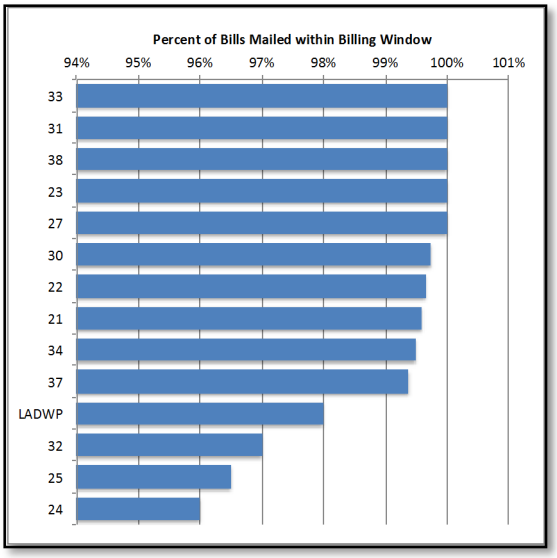
C.9 Percent of Bills Issued Electronically



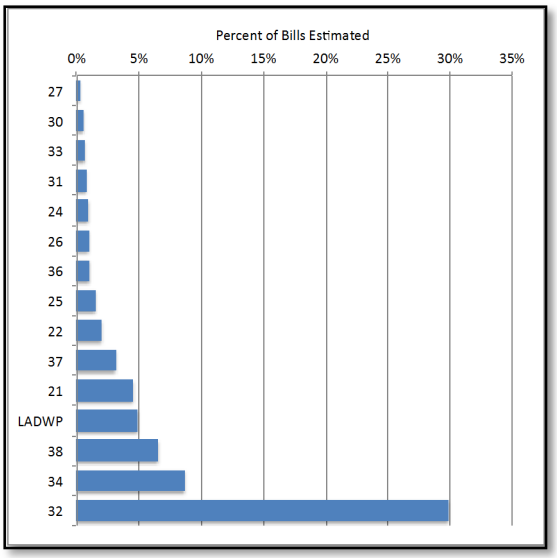
C.10 Percent of Bills with Post-Bill Adjustments Due to Errors



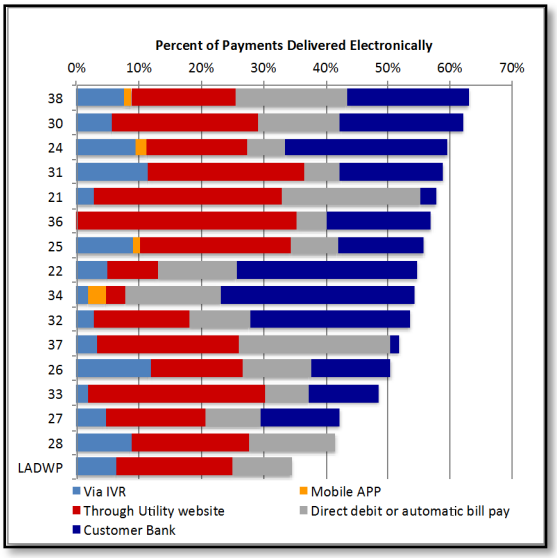
C.11 Percent of Bills Mailed Within Billing Window



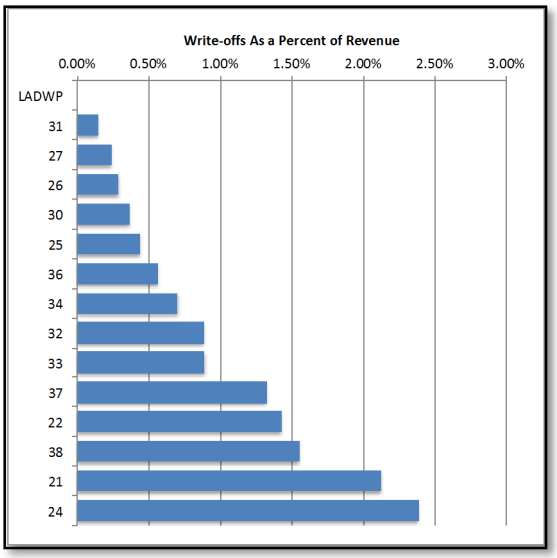
C.12 Percent of Bills Estimated



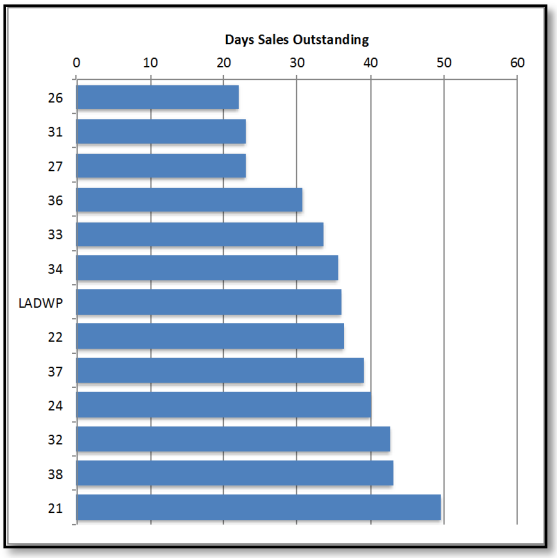
C.13 Percent of Payments Received from Customers Electronically



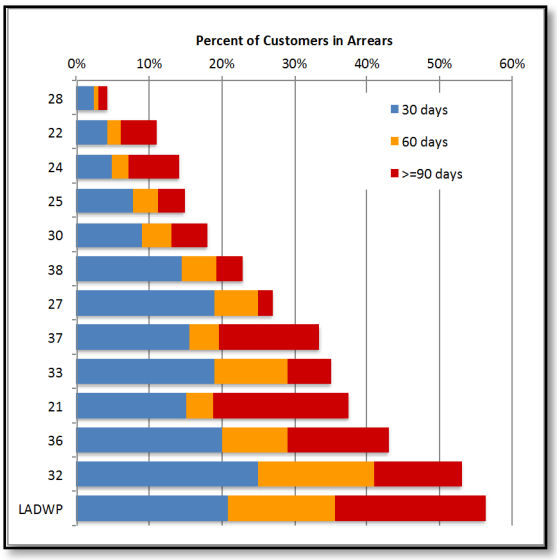
C.14 Write-offs as Percent of Revenue



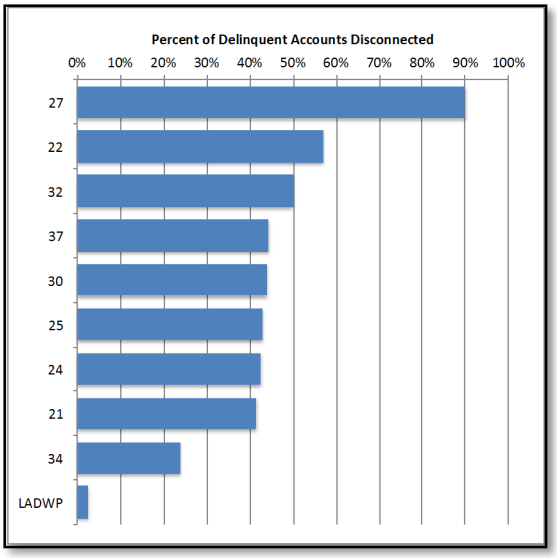
C.15 Days Sales Outstanding



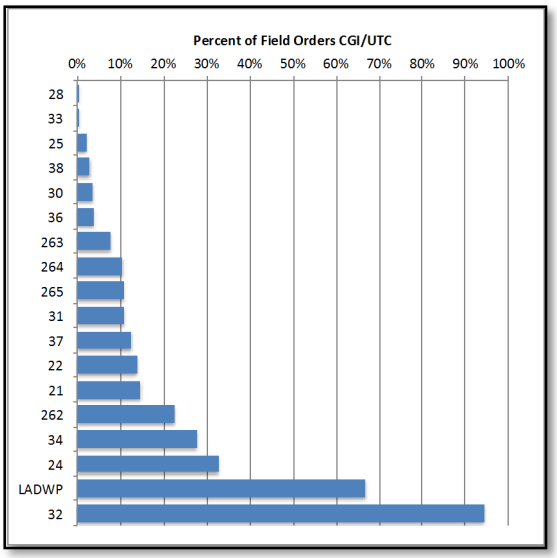
C.16 Percent of Customers in 30/60/90 Days Arrears



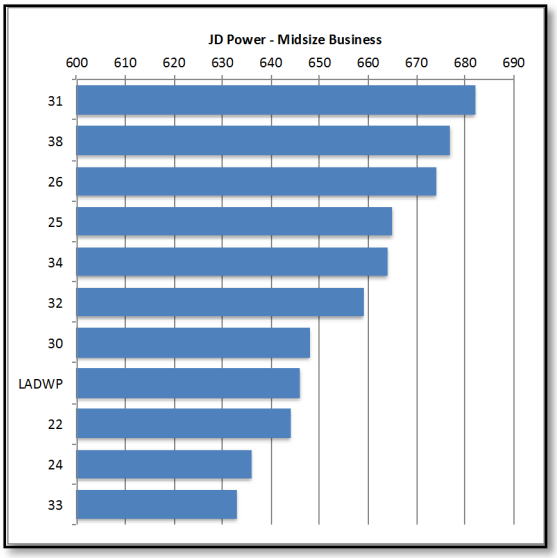
C.17 % of Accounts Scheduled for Disconnect Actually Disconnected



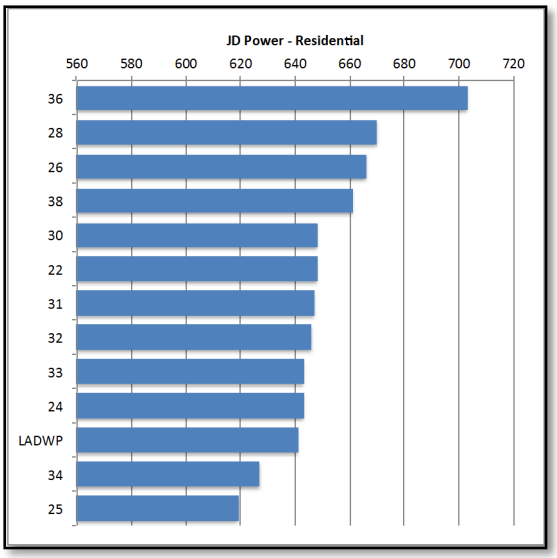
C.18 Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)



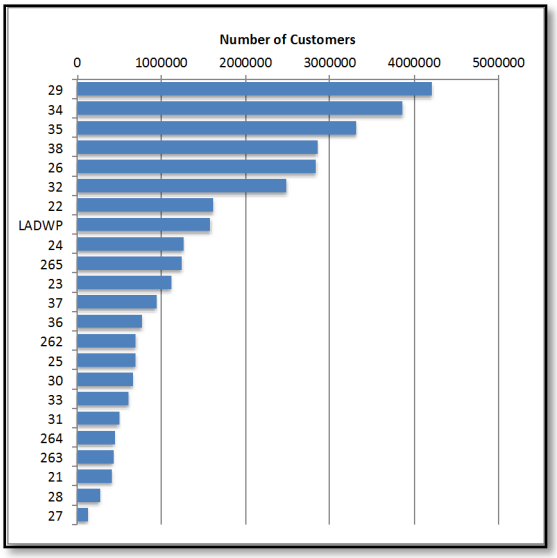
C.19 Customer Satisfaction - J.D. Power – Business



C.20 Customer Satisfaction - J.D. Power – Residential



C.21 Utility Size (Customer Count)



Volume IX

Economic Development and Community Outreach

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Economic Development and Community Outreach Report
Volume IX

Prepared for:
The City of Los Angeles

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Executive Summary

Objectives & Approach

This report presents Navigant's findings on Economic Development and Community Outreach for the IEA Survey. Economic Development and Community Outreach are separate, but related, program areas, each playing a central role in helping the Department achieve its Mission to be a vital and active member of the communities it serves, and supporter of the continued growth of the local and regional economy. Further, these functions help connect the Department to broader City goals and objectives, as forwarded by the Mayor's Office of Economic & Workforce Development and other departments.

Navigant reviewed the organizational structures, accountabilities, policies, and business practices adopted by the Department to complete this report. We also conducted interviews with Department staff to gain further insight into current and proposed economic development and community outreach practices. The goal of this assessment is to identify and recommend opportunities for improving the Economic Development and Community Outreach disciplines at the Department. A summary of findings and recommendations is provided at the conclusion of this report. Insights from interviews and document review complement these assessments. For the IEA Survey, we present our findings on Economic Development and Community Outreach in separate chapters. Each of these chapters includes a discussion on the following:

- Common program features: An overview of the common features of Economic Development and Community Outreach in areas such as planning, operations, performance management, goal-setting, and analytics.
- Economic Development and Community Outreach in utilities: How utilities typically design and implement these programs (with particular attention given to municipal utility peers).
- A review of these programs at the Department: Assessment of the Department's programs in each area, followed by recommendations for improvement.

A summary of findings and recommendations is provided at the conclusion of this report.

Economic Development and Community Outreach Overview

The roles of each of the groups can broadly be defined as follows:

- Economic Development: Design, execute, and monitor plans and programs that leverage Department resources to help attract, retain, and expand businesses in the City of Los Angeles.
- Community Outreach: Design, execute, and monitor plans and programs to provide information to – and gather feedback from – the communities the Department serves on key matters.

These groups design and execute plans and programs that help align with – and advance and build support for – the Department's broader strategies in areas such as energy efficiency, water conservation, among others. Importantly, Economic Development and Community Outreach are supported by the Department's Communications Department, which is charged with formulating and executing communication strategies.

Economic Development Overview

Economic Development is defined as the allocation of limited resources (including land, labor, capital and entrepreneurship) to create a positive effect on the level of business activity, employment, income distribution patterns, and fiscal solvency.[1] It is a process of deliberate intervention in the normal growth cycle, aimed at accelerating the process and optimizing overall economic impact. In any community, Economic Development activities typically involve a number of stakeholders, including elected officials, Chambers of Commerce, venture capitalists, banks, colleges & universities, and utilities.

A review of public power and water utilities and related agencies confirms the importance of economic development in strategic planning and on-going operations. The country's largest municipal and cooperative utilities have focused programs in economic development, while the American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote the role of public power and water utilities in fostering Economic Development.

Utilities and Economic Development

Public power and water utilities are seen as central to local and regional Economic Development efforts. Economic Development is typically featured prominently in the vision and mission statements of municipal, cooperative and other public utility agencies. Business attraction, retention, and the facilitation of urban renewal are just some of the goals of municipal utility development programs.

Features of an Economic Development Program

Economic Development programs are defined by several key features, including:

- A clear Vision and Mission, which reflect the guiding principles of the program
    - The Vision supporting an organizations' Economic Development plan is directly aligned to organizational and local and regional government objectives.
- Strategic plans for each major program area that tie to the Vision
    - Municipal organizations adopt Economic Development Strategic Plans that reflect overall corporate objectives and tie-in to local economic and political objectives.
- Programs for each major strategy that are designed to meet organizational and City objectives
    - Utilities give focus and priority to programs with significant and direct business benefit, which also align to a broader vision (e.g., leadership in renewable resources).
- An organization and budget aligned to program delivery and strategic goals
    - Economic Development groups are staffed by experts in the discipline, with the number of FTE positions commensurate with the vision and objectives of development activities.
- On-going analytics and reporting to support decision-making and performance
    - Programs are defined by the use of continuous monitoring and evaluation, which provide a basis for accountability and transparency in the use of resources.

These facets are closely aligned and adjusted as needs, resources, and performance change over-time.

Peer Practices in Economic Development

Economic development at utilities can encompass a wide range of initiatives, programs, and events that spur small business growth and create job opportunities for customer/ratepayers. While the direct comparison of budgets and staffing across peer organizations can be difficult and unclear, the Department generally pursues comparable types of programs as those that are adopted by peer organizations, including:

- Energy Efficiency and Conservation Programs
- Small Business Assistance Programs
- Commercial and Other Loan Programs
- Solar Initiative Programs
- Business Attraction and Retention Incentive Rates

Economic Development at the Department

The Vision of Economic Development at the Department is driven significantly by the broader objectives of the City, the county, and other regional organizations. Department statements explicitly recognize the role of LADWP in Economic Development: *As the nation's largest municipal utility, the LADWP believes in investing in the future success of Los Angeles. The mission of the LADWP Economic Development Division (EDD) is to attract, retain, and expand businesses in the City of Los Angeles.* This mission is supported by a strategic plan, and variety of specific programs.

Strategic Planning

In response to our document request, the Department provided strategic planning documentation from 2010-2011 that outlines Economic Development programs pursued by the LADWP. We believe that program vision, objectives, strategies, and tactical plans should be revised and formalized.

Programs and Operations

Economic Development plans and programs (and outcomes) are distinct, based on the goals and objectives of each locality. Current strategic imperatives include an emphasis on sustaining small businesses, strengthening the business environment – while encouraging uptake in the Department's programs. As noted above, the types of programs pursued by the Department appear to align to those adopted by peer organizations. However, the total budget available for these programs appears to be smaller than that for other POUs. In addition, the Department's ability to measure direct and indirect impact of the programs appears to be limited.

Organization and Budget

Research suggests that staffing plays a significant role in the performance expectations – and actual performance – of Economic Development organizations. In general, the larger the staff size, the greater the results. To this end, the EDD should assess current staffing levels, and align the program targets to staff required to meet development goals. Our analysis reflects that the EDD has been unable to spend its annual budget over the last several years, due in large part to challenges with contracting. Specifically, the EDD spent less than half of its budget in 2009, 2010, 2011 and 2013. While spending has improved in 2014 and 2015, the EDD has not been able to spend its budget.

Analytics

Analytics and reporting – and the process of delivering insight to stakeholders, decision-makers, and program owners – are key aspects of an Economic Development program. This includes establishing targets for programs, assessing performance versus those targets, and broadly engaging in performance management. We believe the measurement, reporting, and analysis activities within the EDD should be formalized and strengthened to include additional metrics, targets, benchmarks, and routine reporting versus clear goals. Consistent reporting against these targets (and also benchmarking of performance) should also be adopted.

Community Outreach Overview

Community Outreach is a multifaceted approach to consistently engage stakeholders on an organization's strategies, policies, or solutions. Through a variety of methods, outreach programs deliver and receive information to: 1) inform or influence behavior, and/or 2) gather and assess feedback. Community Outreach is often considered a subset of Public Relations, which is conducted to solicit support, shape public opinion, and/or request community participation (e.g., involve the community).

Utilities and Community Outreach

In today's environment, utilities are confronted by significant strategic challenges and opportunities that require a clear and consistent dialogue with ratepayers, community groups, business leaders, and other stakeholders. Community Outreach is a central aspect of a utility's overall approach to engaging the public in a two-way dialogue on a variety of topics. In a utility setting, community outreach efforts are often organized around significant projects and programs including rate increase proposals, design and execution of resource plans, roll-out of significant conservation and efficiency initiatives, and emergency restoration efforts (among many others).

Features of a Community Outreach Program

Outreach programs are typically comprised of the following components:

1) Goals: Clear articulation of the goals of outreach, which are closely aligned to strategic vision of the programs that the outreach supports.
2) Target Audiences: A comprehensive understanding of the various stakeholders for each outreach effort.
3) Messages: The key themes associated with each of the outreach efforts, which are intended to inspire and drive support.
4) Format and Distribution: Coordination of the key messages, how they will be catered to be most effectively delivered to the Target Audiences.
5) Evaluation: Continuous feedback between the delivery of the messages and the effectiveness versus goals and objectives.

Peer Practices in Community Outreach

Given their role in the communities in which they serve, municipal utilities conduct routine outreach efforts, with significant focus on providing various stakeholders insight into – and gathering feedback on – major programs and significant events. There are a large number of outreach methods, which are used optimally to meet the specific communication need. Examples include direct mail campaigns, corporate and "special topic" websites, social media, among many others.

Community Outreach at the Department

Strategic Planning

The Department has not established a formal strategic plan for its community outreach activities. However, the Department's community outreach efforts can be categorized in five main areas:

- ***Stakeholder Engagement*:** This is done primarily through the Los Angeles Neighborhood Councils (LANC) and other forums for information sharing.
- ***Energy Efficiency and Water Conservation:*** Reduce and optimize water and electrical use, both through water conservation measures, and increased reliance and adoption of renewable energy sources and solutions to generate power.
- ***Rates & Water and Power Infrastructure:*** Increase water and power rates to enable the Department to fund and pursue capital projects to improve and update its aging water and power infrastructure.
- ***Safety:*** Increase awareness related to electric safety tips, emergency and earthquake preparedness, and the health effects of electric and magnetic fields.
- ***Educational Programs***: Help secure a knowledgeable base of residential and business customers to better understand and appreciate water, energy, and environmental issues.

The lack of a formal and centralized plan may be due to several factors, including the decentralization of responsibility for certain outreach initiatives to the Power and Water Systems.

Program and Operations

The Department utilizes a variety of outreach communication methods, which are in large part driven by the Communications Department. These include traditional methods (e.g., newsletters, websites, press releases) and emerging methods (e.g., social media), which are used in targeted fashion to address specific constituents or needs. Close interaction with the Los Angeles Neighborhood Councils (LANC) is one of the most critical functions of the Department's Community Relations function; workshops on discrete matters such as the Integrated Resource Plan or rate action are additional focus areas. The Department should continue to pursue and adopt methods of engaging with stakeholders on a routine and consistent basis, outside of special events such as rate actions or resource planning reviews.

Organization and Budget

One of the most significant roles of the Community Outreach function and its staff is related to routine and on-going engagement with the neighborhood councils. In consideration of the scope of the mandates of the Department and number of customers which it serves, Navigant believes that the size of the IACO staff should be revisited. For example, only two (2) of the Intergovernmental Affairs and Community Outreach (IACO) staff are dedicated to representing the Department across the ninety-five (95) Neighborhood Councils in the City. The limited staff resources may result in inconsistent engagement across the set of councils (with the potential for smaller, and less influential Neighborhood Councils receiving less attention than larger Neighborhood Councils). Further, given the significant size and potential impact of the capital programs in both the Power and Water Systems, additional staff should be considered to actively manage the outreach efforts around these programs.

Analytics

At present, Community Relations programs do not appear to be consistently assessed and managed in relation to a set of cost, effort, or performance metrics. Through our document request, we did not receive reports that reflect a consistent analysis of the impact from Community Outreach efforts in relation to goals and objectives. As with Economic Development, Navigant believes that specific goals and targets should be established for Community Outreach programs.

Conclusions

Economic development and community outreach are key activities for municipal utilities. This is particularly true as MOU's are seen as contributors to the goals and objectives of local government and the communities they serve. Further, we believe that attention on these activities has increased in recent years in line with the recovery of the economy after the Great Recession of 2008 and in response to the nature of current and future challenges in the largest municipalities in the US – including Los Angeles.

Our recommendations in each of these areas focus on strengthening the foundational aspects of program strategy, design, implementation, and monitoring. This would include a dedicated strategic planning effort (which would dovetail with the Department's and City's overall goal-setting activities). It would also include design and clear specification of programs on an annual basis (which would include targets for program performance), and the consistent reporting of program performance to Department, City, and customer stakeholders. We further recommend greater focus and diligence on budgeting and budget monitoring in these areas. Transparency and financial rigor in these areas is important in relation to the Department's overall goals of exhibiting greater focus on the customer, as well as dedication to financial controls (reflected in consistent reporting of performance versus goals and targets).

In addition, we also believe that additional focus in these areas will clarify the number and type of staff required to deliver target programs. From a clear inventory of programs and desired timing to meet objectives, the Department can identify the resources required to deliver. Further, given that some level of decentralization has occurred in each of these areas, we recommend that the Department clearly determine accountability for development and outreach activities. While the "ways of working" between these functional groups and the Power and Water Systems may be known informally, a thorough review of business processes will improve service delivery and clarify roles and responsibilities.

At the highest level, we encourage the Department to reassess these areas in terms of their current and potential role in meeting the goals of the utility and the City.

High Priority Recommendations

- Develop a Strategic Plan for Economic Development and Community Outreach at the Department.
- Confirm goals and objectives for all programs in each area.
- Define and launch foundational aspects of a performance management program for each functional area and each program, including:
    - A set of rigorous Key Performance Indicators and targets that focus on benefits-derived for each program given a level of cost.
    - Recurring performance reports (including distribution lists).
- Improve budget monitoring and assessment practices in coordination with defined targets and metrics.

Medium Priority Recommendations

- Complete a thorough staffing assessment to determine the appropriate level and skill set of staff required to execute the strategic plan and programs identified above.

Low Priority Recommendations

- Engage in a benchmarking effort for these areas, working closely with Corporate Performance.

1. Introduction

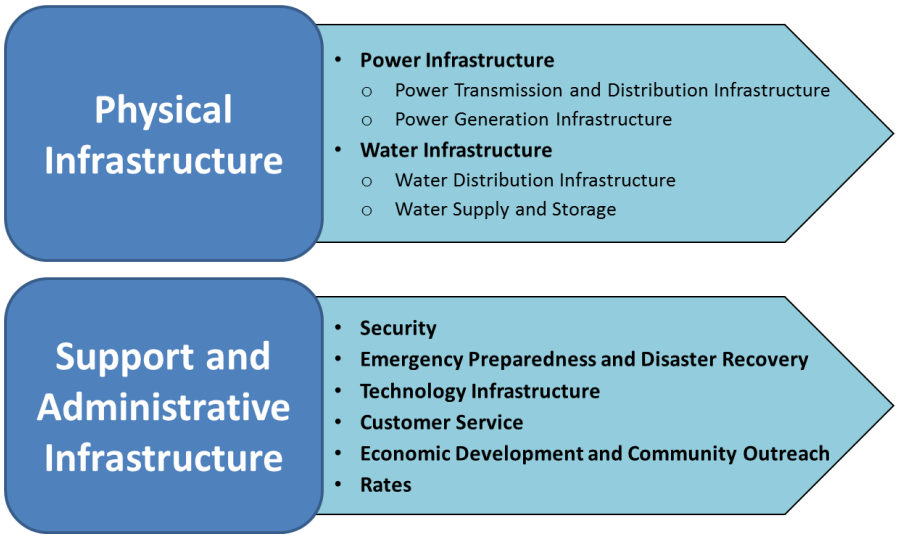
1.1 Study Objectives

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative Survey (IEA Survey) of the Los Angeles Department of Water and Power (the Department, LADWP). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. (Navigant) to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

Figure 1-1. Focus Areas of the 2015 IEA Survey



This report presents Navigant's findings on the Department's programs and organizations in Economic Development and Community Outreach, with particular attention paid to measures of program effectiveness and cost-benefit. Finally, the appropriateness of LADWP's business outreach and business development programs is evaluated in relation to the Department's Mission, the City's Vision, and the priorities of similarly situated utilities.

1.2 Approach

Information for the Economic Development and Community Outreach report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;

- Interviews with Department personnel, including the Director of Communications, the Chief of Staff, the Director of Local Government and Community Relations, and the Director of Economic Development; and
- Best practices with regards to economic development and community outreach programs.

Navigant conducted interviews with leadership and subject matter experts that manage many of the economic development and community outreach programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

1.3 Report Organization

The report comprises the following chapters:

- Economic Development and Community Outreach Overview: An introduction to the disciplines of Economic Development and Community Outreach.
- Economic Development: A description of the common features of economic development programs, the role and implementation of economic development in utilities, and economic development at the Department.
- Community Outreach: A description of the common features of community outreach programs, the role and implementation of community outreach in utilities, and community outreach at the Department.

While the remainder of this report considers these programs separately, we also note key areas of program overlap, where appropriate.

2. Economic Development and Community Outreach Overview

Economic Development is defined as the allocation of limited resources (including land, labor, capital and entrepreneurship) to create a positive effect on the level of business activity, employment, income distribution patterns, and fiscal solvency.[1] Meanwhile, Community Outreach is a subset of Public Relations involving specific programs, projects or events to further enhance an organization's ability to meet its objectives. Generally, Community Outreach is conducted to solicit support, shape public opinion, and/or request community participation (e.g., involve the community).

Economic Development and Community Outreach each play a central role in helping the Department achieve its Mission to be a vital and active member of the communities it serves, and supporter of the continued growth of the local and regional economy. Further, these functions help connect the Department to broader City goals and objectives, as forwarded by the Mayor's Office of Economic & Workforce Development and other departments.

The roles of each of the groups can broadly be defined as follows:

- Economic Development: Design, execute, and monitor plans and programs that leverage Department resources to help attract, retain, and expand businesses in the City of Los Angeles.
- Community Outreach: Design, execute, and monitor plans and programs to provide information to – and gather feedback from – the communities the Department serves on key matters.

In advancing development and engagement objectives, these groups design and execute plans and programs that help align with – and advance and build support for – the Department's broader strategies in areas such as energy efficiency, water conservation, among others. Importantly, Economic Development and Community Outreach are supported by the Department's Communications Department, which is charged with formulating and executing communication strategies, and also responding to communication requirements on an "as-needed basis". Specific areas include: corporate communications; customer communications; program-specific communication strategies; graphic, creative, and photography services; and media relations.

[1] California Association for Local Economic Development, *Economic Development Handbook* (2014).

3. Economic Development

Economic Development is a process of deliberate intervention in the normal economic growth cycle, aimed at accelerating the process and optimizing overall impact. The California Association for Local Economic Development (CALED) defines Economic Development as "a concerted effort in cities and counties to influence the direction of private sector investment toward opportunities that can lead to sustained economic growth." To this end, a number of stakeholders are typically involved in Economic Development efforts, including elected officials, Chambers of Commerce, venture capitalists, banks, colleges & universities, and utilities.

A review of public power and water utilities and related agencies confirms the importance of economic development in strategic planning and on-going operations. The country's largest municipal and cooperative utilities dedicate some level of resources to Economic Development programs. To exemplify this point, the American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote the role of public power and water utilities in fostering Economic Development.[2] In short, strategies and programs that facilitate the local and regional economic growth are a core aspect of any municipal utility.

3.1 Utilities and Economic Development

Given their role in the communities that they serve, public power and water utilities are seen as central to local and regional Economic Development efforts. In fact, Economic Development is typically featured prominently in the vision and mission statements of municipal, cooperative and other public utility agencies. Specifically, through their efforts, utilities can help facilitate growth by:

- Attracting, retaining, and creating new businesses, which helps maintain and improve local and regional employment.
- Helping broaden a community's tax base, offsetting the need for increased local taxes and improving the local economy.
- Reducing utility costs through development tariff rates, thereby allowing businesses to spend more on other goods and services.
- Facilitating urban renovation, business development, industrial parks and other significant public works projects.[3]

Utilities also directly benefit from the expansion of commercial and industrial businesses through adoption of specific utility programs and the extension of utility infrastructure. Therefore, in addition to being a key stakeholder in fostering growth, utilities have an innate incentive to support commercial and industrial growth within their service territories.

[2] Examples include: AWWA, *Beyond the Tap: City Water Service as a Catalyst for Regional Economic Development* (2007); APPA, Economic Development & Utility Marketing Workshop (Multiple Documents, Multiple Dates); LPPC, General guidance on economic development and related energy programs.

[3] https://austintexas.gov/faq/economic-development-important-utility

3.2 Features of an Economic Development Program

The discipline of Economic Development is generally defined by several common program features, as reflected in the exhibit below.

Figure 2.1. Economic Development Program Features

Well-functioning programs begin with a clear Vision, from which a clear set of strategic plans are derived. The Vision and strategic plans then determine the organizational structure (and related budget), followed by specific development programs required to achieve objectives. Finally, analytics are critical (including targets) to clearly assess performance and determine the cost/benefit of specific programs. However, while these features are common across Economic Development programs, the definition of what an economic development entity is supposed to accomplish varies widely from community to community. Therefore, although outcomes cannot generally be compared, the framework that defines a program can be assessed in terms of the above features and the following high-level principles:

- *Align* the organization's Economic Development Vision, Mission and strategic plans to the City, County, and/or region's Vision and plans.
- *Communicate* consistently with local elected officials and government agencies to efficiently and effectively carry out the Economic Development Vision and Mission.
- *Design* programs to align closely with and integrate into local and regional programs, and to contribute materially on core city objectives.
- *Partner* closely with a wide variety of entities to design and carry out the Economic Development Vision and programs.
- *Implement* an expert-led organization to deliver the identified plans and programs; work closely with Community Outreach professionals across jurisdictions.
- *Specify* performance targets for each major program; design reporting protocols and "look-back" assessments to alter course or direction, as necessary.

The following are additional findings from our research and experience, which in combination with the principles identified above directly guided our evaluation of the Department.

3.2.1 Vision and Mission

Organizations recognize that the goals and methods of driving Economic Development are determined by regulatory (oversight), social, and political dynamics. Therefore, the Vision and Mission supporting an organizations' Economic Development plan is directly aligned with the broader goals and objectives of local and regional governments, and the local and regional government's overall plan for Economic Development.

3.2.2 Strategic Planning

As noted above, Economic Development is both an economic as well as a political activity. As large and prominent players in local and regional politics and economics – with significant assets at its disposal – utilities are central players in Economic Development efforts. Thus, municipal organizations design and adopt comprehensive Economic Development Strategic Plans that reflect and integrate closely with overall corporate objectives, strategic goals, and financial forecasts – as well as specific local and regional economic and political objectives.

At the highest level, high-performing Economic Development organizations design program activities around a strategic vision, and generally engage in the following planning and management activities:

1. Document a strategic plan annually
2. Outline each staff person's role in reaching that plan
3. Set activities and outcomes for each staff person, and for the organization
4. Report quarterly, using a pre-defined dashboard, to the board and other stakeholders
5. Benchmark annually[4]

3.2.3 Programs and Operations

Utility organizations give focus and priority to programs with significant and direct business benefit, which also align to a broader vision (e.g., leadership in renewable resources). Program areas emphasized by utilities include efficiency programs, incentive rates for new businesses, and loans for new construction (among many others). Forward-thinking organizations adopt programs that embrace and accelerate commercialization, entrepreneurship, and other aspects of innovation-based economic development—evolving from traditional economic development organizations focused solely on marketing and recruitment to venture development organizations that reflect today's economic environment.

Importantly, partnering with external groups is a critical aspect of successful Economic Development; organizations typically partner with a broad spectrum of public and private entities (including project funders, legal professionals, financial managers, marketing specialists, colleges and universities, and

[4] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.

many others), and maintain close communication with those entities when designing strategic plans and executing tactical plans.[5]

3.2.4 Organization and Budget

Evidence confirms that one of the most important factors driving successful Economic Development program design, execution, and evaluation is adequate staffing with significant expertise. Budgets are structured to fund specific programs, which are determined through the planning effort; budgets also include allocations for third party experts to assist with detailed forecasting, system expansion, economic impact, and other analyses related to development plans. Evidence reflects that high-performing economic development organizations establish a clear connection between: 1) staffing and budgets and, 2) outcomes.[6] Economic Development organizations are staffed by experts in the discipline, and grow with an increasing number of FTE positions commensurate with the objectives of development activities and number of programs supported.

3.2.5 Analytics

Programs are defined by the use of analytics to assess and report on progress versus clear targets. Analytics in this context refers to both continuous monitoring and periodic evaluation, and the tools and techniques required to conduct both. Program assessment provides a basis for accountability and transparency in the use of resources (an important factor for public institutions).

The Government Finance Officers Association (GFOA) states that providing a thorough and rigorous analysis of each economic development project is critical for the purposes of government accountability and long-term revenue impacts. Responsible use of public funding requires that projects funded provide a suitable return for the jurisdiction, are consistent with overall community goals and priorities, and require that investments are made in a transparent manner with full understanding of all short- and long-term costs and benefits. As a municipal entity, this principal applies to the Department.[7]

The GFOA confirms that an analysis of each project should, at a minimum, include:

- A clear understanding between financial and non-financial costs and benefits
- Consideration of the timing of costs and benefits
- Scope of the analysis
- Identification of all cost and benefits
- Assessment of the chance that each cost and benefit will occur
- Communication of results

Organizations focus on delivering standard reports on the condition of programs, with particular insight into performance versus targets and prior period benchmarks. Economic Development cannot just focus

[5] National Best Practices Scan: Economic Development, State Chamber of Oklahoma Research Foundation, Oklahoma Business Roundtable, October 2012.
[6] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.
[7] Evaluating and Managing Economic Development Incentives, February 2014, Government Finance Officers Association (GFOA).

on activities, it must focus on outcomes. Outcomes are reported in balanced scorecards on a recurring basis.

3.3 Peer Practices in Economic Development

The above principles were derived from strategies recommended by a variety of leading associations and oversight organizations. In addition to the common features and principles identified above, we reviewed the programs in place in other utilities (public and investor-owned) and in non-utility organizations. Organizations assessed as an aspect of this assessment are referenced in Appendix C. From these sources, we derived an indication of common practices and programs that define Economic Development.

3.3.1 Peer Utility Comparison

Economic development at utilities can encompass a wide range of initiatives, programs, and events that spur small business growth and create job opportunities for customer/ratepayers. Accordingly, a utility's return on investment in economic development can vary significantly depending on the programs included in the group's function. A summary of the economic development programs at peer municipal utilities in California is provided in the table below.

Table 1: Peer Company Economic Development Programs

Utility	Economic Development Programs
SMUD	• **Economic Development Rate:** To help companies that choose to open in the Sacramento area, or expand their current operation, SMUD offers new and expanding customers a discount rate over their first three years of service. • **SEED Program** (Supplier Education and Economic Development): Program offers incentives for small businesses to participate in the SMUD's competitive bid process. • **Energy Services and Programs**: **(1) Energy Delivery -** Design and construction for new electric service as well as existing connection set-up; (2) **Savings by Design –** Integrate innovative energy efficiency technologies into new construction, as well as provide incentives, and free analysis tools. • **SMUD Commercial Loan Program** - SMUD provides commercial customers loans for energy efficiency buildings and equipment, including lighting, heating and air conditioning systems, refrigeration systems and process equipment. • **Grow Sacramento Fund** - Grow Sacramento Fund (GSF) is a loan program for businesses in Sacramento city and county. Funded jointly by SMUD and the Sacramento Housing and Redevelopment Agency, GSF is designed to create or retain jobs and to help energy-related businesses. • **State Loan Guarantee Program** - SMUD partners with the California Capital Financial Development Corporation to participate in the State Loan Guarantee Program, providing funds to guarantee loans to small businesses within our service area.

Utility	Economic Development Programs
City of Pasadena, Water & Power	• **me Rewards Program:** Rebates on appliances, home heating/cooling, shade trees and pool pumps • **LED Webshop:** Pasadena residential electric customers can purchase LED light bulbs at nearly half the cost. • **Refrigerator Recycling Rebate** • **Pasadena Solar Initiative:** *Install a solar system at your home and get up to $0.85 per watt* • **Green Power Program:** Reduce your companies' carbon footprint by signing up for 100% renewable power from PWP • **Electric Vehicle (EV) Program:** Reduce fuel costs and emissions by switching to plug-in electric vehicles • **Under One Roof:** Provides money-saving programs and low or no interest loans that help Pasadena residents buy, keep, and revitalize their homes • **Energy Efficiency Partnering Program (EEP):** A flexible rebate program that rewards a broad range of efficiency retrofits • **Pasadena Express Efficiency Rebate Program (PEER):** The PEER program provides Pasadena businesses straight-forward energy efficiency incentives based on type of equipment and the number of units installed • **Water & Energy Direct Install Program (WeDIP):** Provides audits and installation water and energy saving equipment at NO COST to qualifying PWP small business customers • **Pool Pump Rebate:** Provides rebates for replacing older pool pumps with new efficient models • **Cool Trees Rebate:** PWP offers rebates for planting any one of 37 species of shade trees
City of Glendale, Water & Power	• **Large Business Incentives Program:** Incentives for large businesses to complete pre-approved energy savings project • **SoCal Water Smart Program:** Rebates for several water-efficient technologies to help businesses lower bills • **Smart Business Energy Savings Update Program**: Up to $2,000 in free energy and water saving upgrades • **Smart Business AC Tune-Up:** AC system tune-ups for small business customers save energy by ensuring their AC systems are functioning at the optimal level • **Fiber Optic Solutions Program:** Provides both large and small commercial customers optical fiber lease services

Utility	Economic Development Programs
City of Anaheim	• **Economic Development/Business Retention Incentive Rate** • **Green Building Program** • **New Construction Incentives** • **Dusk to Dawn Lighting:** Free high pressure sodium (HPS) or fluorescent lights with photo sensors that automatically turn lights on at dusk and off at dawn. • **EV Charger Rebates:** Rebate to customers who install a Level 2 (240-Volt) plug-in electric vehicle charger. Through this program, the utility reimburses customers for out of pocket expenses up to $1,000 per charger. Eligible expenses include the charger purchase price and installation costs. In addition to the $1,000 rebate, we will waive the City's permit application fees related to the installation of the EV charger. • **Green Power Program:** Customers contribute 25, 50, or 100% of electric usage – and an additional 2 cents per kilo-watt hour (kWh) used will be billed to that percentage of customer accounts. • **Home Incentives Rebates:** Rebates when customers switch to water and energy-efficient appliances and cooling equipment, or install approved high-efficiency household conservation measures.

Despite the limited publicly available data associated with economic development at utilities, there are a number of peer utilities that appear to have expansive economic development groups. For example, Austin Energy supports an Economic Growth and Redevelopment Services Office (EGRSO) in conjunction with the City of Austin. In FY 2011-12, the group had 46 full time equivalent positions and a budget of approximately $9.8 million.[8] The EGRSO funds small business development, cultural arts initiatives, business retention and recruitment programs, music events, and redevelopment programs. These findings should be considered in the context of various organizational alternatives, in which Economic Development staff may be centralized or significantly decentralized across a number of functional areas.

3.4 Economic Development at the Department

The following section outlines our analysis of Economic Development activities at the Department. Observations were derived from document review and interviews conducted with LADWP staff.

3.4.1 Vision and Mission

The Vision of Economic Development at the Department is driven significantly by the broader objectives of the City, the county, and other regional organizations. The Mayor's Office of Economic & Workforce Development directs a variety of programs that provide services to businesses in the City, with the specific goal of improving "…the economic climate of Los Angeles through the provision of financing, technical assistance, training, business tax incentives, and workforce programs. These services help local

[8] "Austin Energy's Investment in Economic Development," Austin Energy, March 2012.

businesses grow, provide living wage jobs for local workers, as well as high quality goods and services to under-served communities."[9]

Statements and resources from Los Angeles County also affirm the role of Economic Development. For example, Goal Two of the Los Angeles County Economic Development Corporation (LAEDC) Strategic Plan for Development focuses on creating a more business friendly environment.[10] These and other sources emphasize the role of the Department in Economic Development activities in the local and regional economy. With these Mission and objective statements as context, Department statements explicitly recognize the role of LADWP in Economic Development:

> *As the nation's largest municipal utility, the LADWP believes in investing in the future success of Los Angeles. The mission of the LADWP Economic Development Division (EDD) is to attract, retain, and expand businesses in the City of Los Angeles.*

This mission is supported by a strategic plan, and variety of specific programs.

3.4.2 Strategic Planning

An organization's Vision and Mission should be closely integrated with the strategic plan, which should then drive tactics to achieve those strategic plans. Several Department documents establish the strategic plan for the Department in terms of Economic Development. Below are the FY2015-2016 goals and objectives for the Department's Office of Sustainability and Economic Development.

The Office of Sustainability and Economic Development works directly with the Power and Water Systems and handles matters involving energy efficiency, water conservation, economic development, distributed generation outreach, the electrification of the transportation network and environmental compliance responsibilities. In addition to working with internal LADWP groups, the Office also works to create innovative partnerships with communities and collaborates with government agencies to advance conservation and sustainability both at a grass roots and policy level. For FY 2015-2016, this Office will continue to make Los Angeles a more environmentally minded and prosperous city by:

- Establishing a path forward to meet the Board of Water and Power's mandate of 15% energy efficiency savings by 2020.
- Aggressively promoting the water conservation goals outlined in Mayor Garcetti's Executive Directive which include increasing water conservation measures for City facilities, business and residential customers.
- Expanding the electric vehicle infrastructure that provides convenient and easy vehicle charging options in Los Angeles.
- Continue expanding economic development with a strong focus in cleantech and STEM careers for youth in the City of Los Angeles.

[9] From the City of Los Angeles, Economic & Workforce Development Department website: http://ewddlacity.com/index.php/local-business.
[10] http://laedc.org/wtc/chooselacounty/

- Ensuring that LADWP remains in compliance with state environmental mandates and goals that incorporate a transparent and rigorous data performance analysis on GHG emissions and sustainable metrics into the day to day operations of LADWP.

In response to our document request, the Department provided strategic planning documentation from 2010-2011 that outlines detailed Economic Development programs. The program documentation proposes focus in nine areas, including (among others): Incentives; Reduced Power Rates; Loans & Grants; and Green Jobs. The documentation also includes the justification for each program, peer utilities with comparable programs, requirements for success, and challenges (or inhibitors) to program implementation. In several cases, lack of funding, inadequate staffing, and the need for close coordination with various local government and business entities are cited as significant challenges.

3.4.3 Programs and Operations

As noted in Section 3.2.1, Economic Development plans and programs (and outcomes) are distinct, based on the goals and objectives of each locality. The following section assesses the Department's programs in relation to the broader goals of the City, and also examines the relative performance of the programs in terms of cost/benefit and record of achievement.

Interviews confirm that the current strategic imperatives in Economic Development include an emphasis on sustaining small businesses and generally strengthening the business environment – while encouraging uptake in the Department's programs. The following is a brief description of the main programs administered by the EDD.[11]

Table 2: Economic Development Programs Administered by the Department

Program	Description
Industrial Incentive Program	Assist the manufacturing sector to develop industrial property, improve to a lean and sustainable manufacturing process and identify energy and water efficiency opportunities.
Business Development Programs	Promotes the attraction of new businesses and the development of existing businesses and job creation in state and federally designated economically depressed areas (Enterprise/Empowerment Zones); provides project case management assistance, such as procurement of permits and clearances; facilitates construction of utility facilities and infrastructure improvement.
Case Management	Provides new businesses that are unfamiliar with the City of Los Angeles' technical processes with information on the following: Electric service planning; Water service planning; Engineering requirements; Meter service; and City and utility programs and incentives.

[11] https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-savemoney/c-sm-economicdevelopment?_adf.ctrl-state=ttxmga4yj_4&_afrLoop=18779611023820

Program	Description
Energy and Water Efficiency Programs	A range of energy and water efficiency programs administered in collaboration with the Power and Water System.
Utility Infrastructure Loan	Available to new and existing commercial/industrial LADWP customers. Loans will only be extended to qualifying prospective projects. [12]
The La Kretz Innovation Campus (LKIC)	Project is envisioned to serve as a clean industry hub – a place where entrepreneurs, engineers, scientists, and policymakers can interact to promote and support the development of clean technologies and Los Angeles' green economy.[13][14]
Hosting Economic Development events	Participated in and hosted international economic development events such as the International Trade Conference of the Economic Alliance of the San Fernando Valley and events with the World Trade Organization.[15]
Locate LA	Provides customers with an innovative, web-based economic development tool (LocateLA) to assist prospective businesses in identifying opportunity sites within the City of Los Angeles.[16]

To facilitate adoption of high-priority programs and resources, the EDD has designed a "Train the Trainer" program that helps guide businesses toward programs such as demand response and energy efficiency, which benefit the business community and that also align closely to the development and sustainability goals of the City.

3.4.3.1 Event Sponsorship

One of the primary vehicles through which utilities drive economic development goals and objectives and engage with the community is by sponsoring and attending local community events. The EDD has an established history of sponsoring and attending community events to support the mission and goals of the Department and the City of Los Angeles.

As illustrated in Table 3, the EDD spent approximately $118,000 to sponsor eleven (11) community events in FY 2014-2015, including business award ceremonies and women technology conferences. Approximately 2,700 people attended these events.

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[12] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-utilityinfrastructureloanprogram?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=424145156341142

[13] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-lakretz?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=424254485244779

[14] Managed directly by the Mayor's Office.

[15] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-nationalandinternationalbusinessresources?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=425162759139984

[16] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-locatela?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=425313401964707

Table 3. LADWP Sponsored Events (FY2014-2015)

	Event	Attendees	Cost
1	Wet Cleaning Demo Workshop for Dry Cleaners	45	$471.00
2	Train the Trainers Workshops	60	$2,134.56
3	Los Angeles County Economic Development Corporation (LAEDC) 19th Annual Eddy Awards	200	$5,000.00
4	CoolCalifornia Small Business Awards (Organized by ARB)	100	$1,000.00
5	Weingart YMCA Wellness and Aquatic Center's Fifth Annual Luncheon	150	$2,500.00
6	Annual sponsorship of The Valley Economic Alliance (TVEA) Events	300	$25,000.00
7	Glendale Narrows Recreational Zone Program	50	$50,000.00
8	Global Stage-Global Opportunity (Glo-Sho14)	800	$10,000.00
9	Southern Cal Minority Business Development Council (SCMBDC) MBOD	100	$7,500.00
10	"California Greenworks, Inc. - Maya Angelou Native Butterfly Garden Dedication Ceremony	400	$5,000.00
11	Wonder Woman Tech Conference	500	$10,000.00
	TOTAL	2,705	$118,605.56

Navigant found that the Department sponsored events are generally in line with the types of events sponsored by investor-owned and municipal utilities. However, the EDD appears to spend less per customer on event sponsorship than peer utilities. For example, the EDD allocated approximately $0.12 cents per (electric) customer to sponsoring events, while Burbank Water and Power allocated approximately $.65 cents per customer. On the upper-bound of this comparison, Austin Energy allocated an $500,000 annually to event sponsorships, which represents approximately $1.12 per customer. It should be noted that the costs incurred by the EDD to sponsor events may not be fully reflective of the Department's sponsorship expenditures because it only reflects those events funded directly by EDD as provided to Navigant by the Department.

3.4.4 Organization and Budget

The following section provides an assessment of the organizational structure and collaboration arrangements of the Department's Economic Development functions, with specific attention given to:

- How the Department's functional groups are organized to efficiently and effectively execute Economic Development plans and tactics.
- The staffing levels of each of the Economic Development functional teams.
- Evidence of effective collaboration between the Department and other City Departments.
- Recent Economic Development-related budgets and the focus of those budgets.

3.4.4.1 Organizational Structure and Staffing Levels

The Office of Sustainability and Economic Development is organized around four main functional areas: Environmental Affairs; Efficient Solutions; Electrification of Transportation Systems; and Economic

Development. The EDD has an organization comprised of ten (10) positions. Documents provided by the Department reflect five (5) of these positions as either new or vacant.

Research suggests that staffing plays a significant role in the performance expectations – and actual performance – of Economic Development organizations. In general, the larger the staff size, the greater the results.[17] To this end, the EDD should assess current staffing levels, and align the program targets to staff required to definitively meet and exceed development goals.

3.4.4.2 Communication and Collaboration

Active collaboration between the EDD and LADWP divisions is critical for advancing the Department's development goals; collaboration with City departments is also important to ensure alignment between the LADWP and the City on development-related matters. Internally, the EDD works closely with Community Relations, with particular attention paid to the small business component of the outreach effort. Economic Development also work closely with internal Power and Water System "customers", who partner with the EDD to help design and roll out programs. Externally, the EDD works closely with a wide variety of entities to design and implement economic development programs, including the Mayor's Office, the Business Improvement Districts, the City Economic & Workforce Development Department (EWDD), the Los Angeles Chamber of Commerce (and ethnic Chambers of Commerce), among many others. Further, the EDD partners with regional utilities and other organizations to design and facilitate workforce development programs. The EDD appears to work closely and communicate consistently with potential program partners (internal and external).

3.4.4.3 Budget Analysis

In addition to the programs identified in Table 2, the EDD continues to make progress to design new programs to address specific and emerging issues. For example, the Construction Impact Mitigation (CIM) program is ramping up to support businesses that may be impacted by the aggressive Capital Improvement Program (CIP) for the Water System. EDD is also networking with Business Improvement Districts to increase participation in economic development programs. Accordingly, EDD has a number of expanding programs that require additional resources. While the EDD has a budget that provides adequate funding to these projects given current objectives, interviews confirm that challenges in contracting are the main driver of the EDD's inability to fully execute programs. As a result, the EDD has been unable to spend its annual budget. Specifically, the EDD spent less than half of its budget in 2009, 2010, 2011 and 2013. While spending has improved in 2014 and 2015, the EDD has still not been able to spend its budget.

According to interviews with Department personnel, the EDD has four analysts that manage multiple programs, including one analyst to track and manage the budget. Navigant also found that EDD fields business-related customer service calls, which is a resource intensive effort. Accordingly, the limited resources in EDD have prevented the group from actively monitoring and reporting on the budget and performance of its programs. According to documents provided to Navigant, the EDD has developed a methodology to track program performance monthly, quarterly, and annually. This methodology

[17] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.

includes tracking certain performance indicators such as jobs retained, jobs created, businesses assisted, and businesses opened. The EDD has also set minimum performance goals for each major EDD program. While this methodology provides the framework to frequently track program performance and EDD personnel have expressed interest in developing formal reports, Navigant found that the EDD has not implemented this methodology on a continuous basis. Accordingly, Navigant recommends that the EDD formalize these tracking methodologies and develop processes to capture this information in a standardized reporting structure. These reports should also include spending by program to track budget against performance. Navigant further recommends that the Department increase EDD staff and fill vacancies to support these processes while also managing programs and customer-service related tasks.

Navigant also found that the EDD's ability to capture data and report on budget and performance is limited by its IT resources. EDD has an Economic Development Information System (EDIS) that tracks program participation, relevant customer complaints, and certain performance metrics. However, EDIS lacks automation and self-service. For example, EDD would like to develop a standardized form for businesses to fill out to promptly collect relevant information and address concerns. According to interviews with staff, the EDIS improvements are not a priority for ITSD. Given the criticality of EDIS for proper tracking and reporting in EDD, Navigant recommends that the Department prioritize these system improvements or identify alternative measures, such as additional staff, to improve program monitoring, data collection, and response times to business concerns.

Furthermore, the development and expansion of EDD programs are restricted by contracting limitations. This issue has been identified in many of the IEA Survey reports. According to interviews, the EDD is trying to hire external consultants to help develop its programs, but the lengthy RFP process and the finality of rejected contracts creates lags and extends project timelines. As a result, budgets are underspent and rolled over to the next year. As discussed throughout the IEA Survey, Navigant recommends that the Department develop a stated contracting strategy to support program implementation and optimization.

3.4.5 Analytics

Analytics and reporting – and the process of delivering insight to stakeholders, decision-makers, and program owners – are key aspects of an Economic Development program. This includes establishing targets for programs, assessing performance versus those targets, and broadly engaging in performance management. The following have been identified as target metrics for key economic development programs at the Department:

Programs	Performance Tracking	Minimum Goal	Reporting
Regional Economic Development (RED) Team	Job Retained	5	Monthly
Green Technology	Job Created	10	Monthly
Business Concierge Services	Businesses Assisted	10	Monthly
Business Promotion Rider	Businesses Opened	3	Quarterly
General Outreach	Businesses Assisted	25	Monthly

Utility Infrastructure Loan	Application Received	5	Monthly
Train the Trainers Workshops	Businesses Assisted	50	Quarterly
Targeted Industry Outreach	Businesses Assisted	20	Quarterly
Construction Impact Mitigation	Businesses Assisted	100	Monthly
Business Improvement District	Businesses Assisted	20	Monthly
Impact Analysis Studies	Businesses Assisted	2	Annually

As noted above, our analysis or Department operations reflects that the EDD does not consistently conduct performance management and evaluation of development programs. It is unclear that these measures are routinely produced, to whom they are reported, or how these measures drive decision-making. Efforts should be dedicated to identifying additional, more robust and comprehensive performance targets in areas such as revenue generation, business attraction, and business retention. Further, EDD program costs should be actively evaluated in relation to realized benefits. These types of analyses – if conducted on a routine basis – will enable the Department to assess program effectiveness versus targets, and reallocate funds if and as appropriate.

As an example of mature practices, organizations such as the Tennessee Valley Authority (TVA) have designed and implemented rigorous measurement and reporting capabilities that allow the organization to measure and report on the impact of economic development programs. Specific examples include:

- In 2012, economic development programs sponsored by TVA – including technical services, research and financial assistance – helped stimulate nearly $6 billion in business investments in the TVA service area.
- Also in 2012, TVA attracted or retained 48,000 jobs, bringing TVA's economic development contributions to more than 300,000 new or retained jobs and $32 billion in business investment for the period 2005-2012.[18]

The Division is currently designing an Annual Report, which when implemented, will provide insight into program performance versus goals and targets. The ability to measure and report on program results is central to demonstrating the Department's commitment to the community and the City's goals. Clearly reporting on development performance can also help influence public perception and build support for the Department's goals.

3.5 Findings and Recommendations

Municipal utilities play a central and unique role in the communities they serve. In addition to providing safe, reliable, and cost effective service to customers, public power agencies are seen as having a role in facilitating regional and local economic growth. Further, economic development groups within

[18] Public Power Weekly, "TVA economic development efforts spur $5.9 billion in investments in fiscal year 2012", November 26, 2012.

municipal utilities are expected to work closely with a large array of government and other stakeholders to facilitate economic growth.

The EDD was established in 2001 by the Board of Water and Power Commissioners. Two of the more prominent goals of the group are:

- Growing the local economy through partnering with other entities to retain, expand, and attract businesses to LA
- Making LADWP's customers aware of money-saving incentives and programs.

Evidence from our review confirms that the EDD is engaged in comparable economic development activities as similarly situated peer public power agencies. Further, interviews and document review reflects support for economic development activities and a positive energy for moving the Department forward in this area. Despite these strengths, our analysis also confirms that several foundational characteristics of strong economic development programs are missing in the EDD, including:

- Current strategic plan
- Detailed operational plans
- Program metrics and reporting
- Budget tracking
- Benchmarking
- Routine plan reviews

As noted in the sections above, we believe the EDD should comprehensively design and implement these structures and business processes to advance the maturity of the organization. With highly formalized strategic and tactical plans in place (including program targets and reporting capabilities), the EDD will be better positioned to reflect the true contribution of program efforts to the Department leadership and City stakeholders. The strategic plans and program targets would be best determined in a series of facilitated working sessions with Department leadership.

We further recommend completion of an analysis to determine the optimal organization size to meet the economic development and facilitation goals of the City and Department. We believe that the EDD should be staffed with the appropriate number of economic development professionals to meet program targets, and build sufficient resiliency into the organization. We believe that the Department can demonstrate support for economic development activities through a commitment to provide appropriate staffing levels (and staff skill sets) in EDD.

4. Community Outreach

Community Outreach is a multifaceted approach to consistently engage stakeholders on an organization's strategies, policies, or solutions. Through a variety of methods, outreach programs deliver and receive information to: 1) inform or influence behavior, and/or 2) gather and assess feedback. Rather than a public information or public relations campaign (which may focus on one-way communication), an effective outreach program is defined by consistent two-way communication that promotes public feedback and uses that feedback to influence decision-making processes and outcomes.[19]

4.1 Utilities and Community Outreach

In today's environment, utilities are confronted by significant strategic challenges and opportunities that require a clear and consistent dialogue with ratepayers, community groups, business leaders, and other stakeholders. Community Outreach is a central aspect of a utility's overall approach to engaging the public in a two-way dialogue on a variety of topics. At the highest level, organizations committed to effective outreach maintain a high level of transparency, cultivate relationships with the surrounding communities, and increase support for their projects and programs by incorporating public involvement early in the planning process and continuing with public outreach over-time.

In a utility setting, community outreach efforts are often organized around significant projects and programs including rate increase proposals, design and execution of resource plans, roll-out of significant conservation and efficiency initiatives, and emergency restoration efforts (among many others). In this context, the most effective outreach programs embody several characteristics, including:

- Organizations that pursue iterative and continuing public outreach strategies tend to generate greater public support.
- Beginning outreach early in the planning phase and continuing throughout the life of a project will likely contribute to the ease with which a project is carried out in subsequent phases.
- Public outreach helps develop a public that is informed about the specifics of the project as well as the tradeoffs associated with different options.
- Involving the public in the planning process, asking for and then making use of input, and answering questions early and often can help appropriately and proactively address concerns.
- Engaging multiple segments of the community results in a more collaborative process, which inevitably leads to decision-making that is more reflective of community values.

Importantly, organizations must accept the costs (time and capital) associated with conducting community outreach programs properly.[20] [21]

Community Outreach is driven by regulatory, social, and political dynamics and requirements. Due to their prominence in the communities they serve, municipal utilities and other public power agencies typically focus significant attention on outreach. These entities work to earn and continuously strengthen

[19] 4 *State of the Practice: White Paper on Public Involvement*. Committee on Public Involvement in Transportation. June 2000.

[20] Best Practices *for* Sustainable Wind Energy Development *in the* Great Lakes Region, Community Support through Public Engagement and Outreach, *Great Lakes Wind Collaborative*, July 2011

[21] How Transit Agencies Can Improve the Public Involvement Process to Deliver Better Transportation Solutions

the public's trust; consistent focus on stakeholder relationships through Community Outreach is essential to building civic "capital".

The American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote Community Outreach as an important method of communicating with various utility stakeholders, and notifying customers of the benefits of public utilities. For example, APPA has a number of tools that help communicate value to community stakeholders including document templates, customer information flyers, and fact sheets about the benefits of public power.[22]

4.2 Features of a Community Outreach Program

There are several guiding principles when designing and executing a Community Outreach program. Outreach activities should be:

- *Aligned*, coordinating closely with the execution of strategic programs.
- *Planned*, reflecting rigorous management across the entire lifecycle of the outreach effort.
- *Inclusive*, involving of as many groups and individuals in the community as practicable.
- *Proactive*, assessing performance continuously throughout the relevant period.
- *Clear*, communicating the entire outreach plan to the public.
- *Innovative*, utilizing multiple forms of outreach and communication channels.
- *Integrative*, incorporating the public's ideas into the decision making process.

Given these principles, programs are comprised of several primary components:[23]

1) Goals: Clear articulation of the goals of outreach, which are closely aligned to strategic vision of the programs that the outreach supports.
2) Target Audiences: A comprehensive understanding of the various stakeholders for each outreach effort.
3) Messages: The key themes associated with each of the outreach efforts, which are intended to inspire and drive support.
4) Format and Distribution: Coordination of the key messages, how they will be catered to be most effectively delivered to the Target Audiences.
5) Evaluation: Continuous feedback between the delivery of the messages and the effectiveness versus goals and objectives.

These principles have been derived through a review of the community outreach strategies designed and recommended by standard-setting associations and leading organizations. This review has provided one frame of reference against which the Department's current practices can be compared. Organizations reviewed to inform best practices in the area include Non-Governmental Organizations (NGO), government agencies, For-Profit and Non-Profit organizations (Non-Utility), and academic research.

[22] APPA website (http://www.publicpower.org/Programs/interiordetail2col.cfm?ItemNumber=37836&navItemNumber=38739).
[23] United States Environmental Protection Agency, Water: Best Management Practices, Development an Outreach Strategy (http://water.epa.gov/polwaste/npdes/swbmp/Developing-an-Outreach-Strategy.cfm)

4.3 Peer Practices in Community Outreach

Given their role in the communities in which they serve, municipal utilities conduct routine outreach efforts, with significant focus on providing various stakeholders insight into – and gathering feedback on – major programs and significant events. There are a large number of outreach methods, which are used optimally to meet the specific communication need. As above, we reviewed the outreach programs in place in other utilities (public and investor-owned) and in non-utility organizations to supplement the common features and principles specified above. From these sources, we derived an indication of common practices and programs that define Community Outreach. See Appendix C for a list of peer companies reviewed.

4.4 Community Outreach at the Department

Community Outreach at the Department is organized under the General Manager's Chief of Staff, within the Intergovernmental Affairs & Community Relations group. This small organization leads intergovernmental and community relations to groups (not at a customer-level), with a goal of creating and strengthening touch points with all the communities the Department serves. Community Relations works with the Systems and Divisions to design and execute outreach programs; information and outreach may be program-specific (e.g., Power or Water System major construction programs) or more broadly, provide insights into the strategic goals or operational performance of the LADWP. All communication is crafted by the Communications Department (also organized under the Chief of Staff).

In addition to specific outreach efforts, Community Relations participates in and sponsors events, which focus on specific themes (e.g., water conservation). The group also conducts tours to Department facilities to educate customers on utility operations.

4.4.1 Strategic Planning

Community outreach activities are central to the promotion of the Department's strategic plans, operational objectives in areas such as rate proposals, resource plans, and major capital programs (among others). The Department has not established a formal strategic plan for its community outreach activities. However, the Department's community outreach efforts can be categorized in five main areas:

- ***Stakeholder Engagement*:** This is done primarily through the Los Angeles Neighborhood Councils (LANC) and other forums for information sharing.
- ***Energy Efficiency and Water Conservation:*** Reduce and optimize water and electrical use, both through water conservation measures, and increased reliance and adoption of renewable energy sources and solutions to generate power.
- ***Rates & Water and Power Infrastructure:*** Increase water and power rates to enable the Department to fund and pursue capital projects to improve and update its aging water and power infrastructure.
- ***Safety:*** Increase awareness related to electric safety tips, emergency and earthquake preparedness, and the health effects of electric and magnetic fields.
- ***Educational Programs***: Help secure a knowledgeable base of residential and business customers to better understand and appreciate water, energy, and environmental issues.

The Department drives community outreach efforts in the above areas through sponsorship and participation in community events as well as communications through print and electronic media and websites.

4.4.2 Program and Operations

As noted above, stakeholder engagement is one of the most critical outreach efforts provided by the Community Relations group. The Department utilizes a variety of outreach communication methods, including:

- Newsletters
- Corporate website(s)
- Press releases
- Emailed notifications
- Brochures
- Utility bill inserts
- Fact sheets
- News articles
- Mailed notifications
- Public service announcements
- Community group newsletters
- Social media / on-line advertisements

Methods of soliciting in-person participation include:

- Public meetings
- Advisory committee meetings
- Hearings (formal comments)
- Working groups/task forces
- Formal presentations
- Workshops
- Open houses
- Tours

The messages crafted by the Department are derived by the Communications Department, working closely with the Systems and other stakeholders.

Within the broad category of stakeholder engagement, planned and unplanned interactions with the LANC are one of the most critical activities of Community Relations. The following are descriptions of the Neighborhood Council and other outreach efforts.

4.4.2.1 Neighborhood Councils

Community Outreach is in part defined through a Memorandum of Understanding (MOU) between certified Neighborhood Councils and the Department. Article IX of the City Charter requires that information be provided to Neighborhood Councils "as soon as practical" to provide sufficient time for review and comment before critical decisions are made. Information provided by the Department to Neighborhood Councils is one aspect of a two-way communication; Neighborhood Councils provide commentary on major decisions, and also "monitor the delivery of City services."

In accordance with the MOU, the Department has established points of contact (liaisons) for each Neighborhood Council. These liaisons attend council meetings and coordinate information and requests. Through this framework, the Department provides each council with information on key programs and initiatives. Plans and programs specifically referenced in the MOU include the Department's Ten-Year

Capital Improvement Program, the Urban Water Management Plan, the Power System Integrated Resource Plan (IRP), and the Power System Operations Business Plan. In addition, rate actions and the Department's budget setting process are also a significant focus of enhanced communication and outreach through this framework. Additional information can be requested by councils on a variety of local issues and other planned and unplanned major projects. LADWP has also created a website that provides information to Neighborhood Councils such as the liaison contact, events, proposals, reports and DWP business.[24]

4.4.2.2 Educational Programs

The Department provides a variety of educational programs for the community. Educational programs provide community members, in particular individuals at younger ages, with an opportunity to engage with the Department, which is an important influence on community perception. Such programs are common amongst peer and best practices, and should continue accordingly. A sample of the educational programs provided by the Department, include:

- LADWP Science Bowl
- Adopt-A-School
- Math and Science Lessons
- Theatre Plays
- Times in Education
- Electric Safety Activities
- Plant Tours
- LAUSD Partnerships

Interviews with Department officials indicated the Plant Tours have played an important role in raising awareness amongst the community relative to utility operations and the complex nature of providing water and power electric services. These tours and site visits are also a common practice among municipal utility peers.

4.4.2.3 Integrated Resource Planning

The Department has designed and incorporated a Community Outreach program into its Integrated Resource Planning (IRP) process. The program includes recurring public outreach to both provide information to – and also gather input from – stakeholders. Public Outreach Workshops are conducted on a recurring basis during the IRP process. During these workshops, overviews and results from IRP planning are presented for public feedback. In general, these workshops serve as an opportunity for public stakeholders to learn about the IRP and provide input on the future of LADWP resource planning. An IRP website and online forms further define the approach to outreach.

In addition to conveying information and gathering feedback on a set of discussion themes, the Community Outreach effort also provides information to customers on key Department programs in which customers may participate (including Environmental Efficiency, Local Solar, and Electric Vehicle Rebates). Stakeholder engagement and the public comment period are central to strengthening public

[24] Reference: http://empowerla.org/neighborhood-councils-and-the-dwp/

support for the IRP. Similarly, the Department should make similar outreach efforts in relation to the pending update to the Urban Water Management Plan.

4.4.2.4 Other Community Outreach Efforts: Emergency, Customer Service, and Rate Cases

The Department' community outreach activities tend to be more re-active, rather than pro-active in nature, and appear to be most visible with regard to responses to emergencies (e.g. UCLA water main break), significant issues that impacts customers (e.g. CIS Implementation), or other major public relations issues (e.g. Audit of Joint Safety Institute and Joint Training Institutes).

While the Department did communicate with individual customers and stakeholders with regard to the problems with implementation of its CIS, particularly via press releases and through its website, Navigant's interviews identified that the Department did not allocate any staff members from its own community outreach team to pursue a pro-active communication approach.

An exception to the reactive nature of community outreach activities at the Department are most evident with regard to years when water and power rates cases are presented. The Department leads a series of public meetings regarding the power and water rate proposals, and also reflects the rate proposals, infrastructure plans, budgets, and rate proposals on MyLADWP. However, Navigant recommends that public support for increases to water and power rates (and more specifically, the substantial programs that provide the basis for rate increases) should be addressed on an on-going basis rather than shortly before a rate case. This can be accomplished through a communication strategy that routinely updates target constituencies on progress versus key capital program goals and targets. Linking rate increases with the tangible benefits of those increases over-time is a common community outreach and communication strategy.

4.4.3 Organization and Budget

The Intergovernmental Affairs and Community Outreach Group (IACO) has eight (8) employees dedicated to leading and managing local government and community outreach activities. In addition to the Director of the IACO, the Group has four (4) employees dedicated to local government functions, two of whom are dedicated to leading the LADWP's engagement with the LANC, and three (3) to other facets of community outreach.

In the execution of its related functions and responsibilities, the Group leverages the employees and related expertise from across the Department. For example, as noted, the Communications Group provides support relative to graphic design (e.g. brochures, event stands, etc.) and press release (e.g. electronic, print, and mail) needs. In additional, IACO is also supported my members of all other Systems and Divisions relative to providing experts and speakers to discuss LADWP programs and initiatives with key stakeholders across the community.

Considering the scope of the mandates of the Department and number of customers which it serves, Navigant believes that the number of IACO staff should be revisited. For example, only two (2) of the IACO staff are dedicated to representing the Department across the ninety-five (95) Neighborhood Councils in the City. This staffing may at times compromise the coverage of IACO staff across all of the LANC. Further, given the significant size and potential impact on various stakeholders of the capital programs in both the Power and Water Systems, additional staff should be considered to actively

manage the outreach efforts around these programs. The size and specific accountabilities of these additional staff would be determined in conjunction with a formal strategic planning effort.

4.4.3.1 Processes

As described earlier, the Department conducts day-to-day community outreach activities primarily through the Office of the Chief Staff and related groups (i.e. Communications, Federal and State Legislative, and Intergovernmental and Community Relations) and also involves virtually all other LADWP divisions.

Navigant's research into common and best practices for community outreach finds that the participation of multiple divisions and engagement of Department employees on community outreach activities is in itself a positive practice. At the Department, for example, the Chief Sustainability and Economic Development Office promotes the energy efficiency, water conservation, and economic development programs and initiatives. Similarly, the Financial Service Office (FSO) leads the Department's efforts around its water and power rate cases, which includes activities such as presenting to the community groups and other key stakeholders. All Department divisions, from its water, power, and joint system, as well as safety and administrative offices, have a stake in and participate in activities which either engage directly with the community or influence community outreach efforts and performance. In the context of the Department, increased engagement of divisions outside the Office of the Chief of Staff is also necessary one in light of limited staffing and financial resources provided to the Intergovernmental and Community Relations Group.

We also found, however, that the Department's decentralized approach has occasionally resulted in a lack of coordination around the various activities being carried out by the Department in the broad area of outreach. The most effective community outreach strategies are those that are supported by a single point of accountability, and defined by clear and cohesive business processes. The benefits of a lean organizational approach to outreach should be weighed against the possibility for communication and control breakdowns.

4.4.4 Analytics

As described in Section 3.4.5 above, measuring and reporting performance in relation to clearly defined goals and targets is an important facet of program management. Measuring performance can:

- Strengthen program strategy and project design, and lead to improvements in implementation.
- Help direct investments toward programs and activities that have the greatest impact on productivity, job growth or investment.
- Build trust with businesses, customers, and other stakeholders by openly sharing results.
- Transparency can further stimulate partnerships, improve stakeholder relations and strengthen the Department's presence in the wider community
- Help ensure and demonstrate that the agreed activities have the desired and intended impact on stakeholders
- Inform practitioners whether they are doing the right things, and doing them well.

- Allow for the benchmarking of programs against leading good practice
- Provide early warning of problems and allow actions to be taken on timely basis

At present, Community Relations programs do not appear to be consistently assessed and managed in relation to a set of cost, effort, or performance metrics. Through our document request, we did not receive reports that reflect a consistent analysis of the impact from Community Outreach efforts in relation to goals and objectives.

4.5 Findings and Recommendations

As noted above in the section on development, outreach programs are typically defined by a common set of strategic plans, operating protocols, processes, and reporting capabilities. In combination, these facets of a mature outreach program enable an organization to more formally prioritize, measure, and monitor the effectiveness of efforts in relation to a clearly articulated plan.

Given the Department's need to consistently engage the public on a variety of key matters (for example, given the significant capital programs and associated rates in both the Power and Water Systems), well-organized and more extensive outreach will become more critical over the next several years. To this end, we recommend that the Department focus on strengthening the foundational aspects of program design and monitoring – from creation of a strategic plan, to specification and documentation of programs, to goal-setting, and finally to enhanced analysis and reporting. As above, these efforts to increase the maturity of the outreach function should extend into clearly identifying the staffing required to deliver on the programs clearly specified in planning activities.

In addition, while great efforts are made to work and coordinate closely with the Power and Water Systems on outreach efforts, decentralization can lead to a lack of understanding of where functional responsibility and accountability ultimately resides for community outreach. As with other studies conducted as part of the IEA Survey, Navigant recommends greater centralized control be exercised by Community Relations over outreach activities. Through this focused accountability, Community Relations would be responsible for designing and adopting a comprehensive public relations strategy to assess, plan, and define tools, tactics, and resources to guide the Department's community outreach activities in alignment with its strategic, operational, and regulatory mandates.

Appendix A. List of Interviews

Name	Title/Topic	Interview Date
Guy Lipa	Chief of Staff	September 17th
Joseph Ramallo	Director of Communications	September 15th
Winifred Yancy	Director of Intergovernmental and Community Relations	September 15th
Kecia Washington	Director of Economic Development	September 29th

Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

Documents Provided by LADWP	
1	Construction Mitigation Program – WETS
2	ED Strategy Report
3	EDD Annual Budget 2009-2015
4	EDD Annual Budget vs. Actuals 2009-2015
5	EDD Outreach Events REVISED
6	EDD Outreach Events
7	EDD Performance Tracking Methodology
8	EDG Summary Position and Duties
9	General Service Rider Business Promotion
10	LocateLA Marketing Outline
11	Mayor's Briefing
12	Proposed ED 2015-2016 Organization Chart by Function
13	Proposed ED 2015-2016 Organization Chart
14	SED Organization Chart Detail
15	Train the Trainers Presentation
16	UIL Board Presentation

Appendix C. Peer Companies

Reference	Description
Public and Municipal Power and Water Utilities	Regional Municipal Utilities: Sacramento Municipal Utility District (SMUD) (Power); City of Pasadena (Water & Power); City of Glendale (Water & Power); City of Burbank (Water & Power); City of Anaheim (Water & Power); and the City of Riverside (Water & Power). Public Power Agencies: Tri-State Generation & Transmission Association, Inc.; Lower Colorado River Authority (LCRA); CPS Energy; Austin Energy; and Omaha Public Power District (OPPD).
Investor-Owned Utilities	Regional peer IOUs, including Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and Sand Diego Gas & Electric (SDG&E).
Non-Utility Entities	Examples include the Port Authority of NY/NJ, Port of Los Angeles, and Port of Long Beach.

Volume X

Water and Power Rates Benchmarking

NAVIGANT

2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

Water and Power Rates Benchmarking Report
Volume X

Prepared for:
The City of Los Angeles

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1. Executive Summary

The City of Los Angeles ("the City"), by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative (IEA) Survey ("the Survey") of the Los Angeles Water and Power Department ("the Department" or "LADWP"). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. ("Navigant") to conduct this study.

The primary objective of the Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at an appropriate cost. This section of the IEA Survey report is focused on the latter and presents the findings of a water and power rates benchmarking study ("the Study") conducted by Navigant. In particular, the Study includes:

- A comparison of LADWP's monthly bill for power and water services, for the residential, commercial and industrial customer classes against selected comparable utilities ("the peer panel"). Monthly bills were computed for the Fiscal Year 2015/2016[1].
- A comparison of the Department's electric and water rate structures against the peer panel companies.
- An assessment of electric and power rate drivers in order to provide context for the rate levels of the peer panel companies as compared to LADWP.
- A review of the incentives for water and power conservation provided by the rate structures of the peer panel.

Navigant's proposal for the development of the peer panel explicitly envisioned the selection of utilities operating in the Los Angeles area, as well as utilities with similar water and power supply constraints operating in Northern California, San Diego and neighboring states. Another key metric considered for the development of the peer panel was the similarity in rate setting mechanisms and cost structures. Rate setting mechanisms and cost structures can differ significantly across the utility industry, especially between Municipality Owned Utilities (MOUs) like LADWP and Investor Owned Utilities (IOUs). Further, the cost structure associated with running a private enterprise usually results in higher rates for IOUs. Finally, a major difference between California MOUs and IOUs is their generation mix. The three California power IOUs, Southern California Edison (SCE), San Diego Gas & Electric (SDG&E) and Pacific Gas & Electric (PG&E), have largely or fully eliminated coal from their generation mix while many Southern California MOUs, including LADWP, still heavily rely on electricity generated by cost competitive coal power plants. Coal has been, and is still one of the most cost competitive energy source for power generation and constitutes one of the key drivers behind the competiveness of many MOUs electric rates.

[1] Starts July 1, 2015 and ends June 30, 2016.

These differences in rate setting mechanisms, cost structures and generation mix can result in large rate level disparities between California MOUs and IOUs, and justify the creation of a peer panel composed exclusively of MOUs.

However, comparing the Department against SCE, SDG&E and PG&E can be valuable since:

- All 4 utilities are all large size utilities supplying power to some of the largest California metropolitan areas.
- LADWP is making the same transition away from coal that the IOUs have now completed, as well as strong investments in infrastructure and reliability. Therefore, comparing their rates is instructive in illuminating future cost drivers LADWP ratepayers will face as the Department moves toward even cleaner and more reliable systems.
- LADWP and SCE are operating in neighboring service areas.
- It provides a point of reference to the public since most electric rate benchmarking studies involving California utilities published to date have included the three California IOUs.

To address these intricacies, Navigant created three peer panels: one water peer panel and one power peer panel composed exclusively of MOUs, and one power peer panel including MOUs as well as SCE, SDG&E and PG&E.

The Department has managed to maintain a strong and stable revenue stream over the last decade despite a limited number of rate increases. However, LADWP – and the vast majority of water and power utilities operating in California and across the Southwest of the United States - is currently facing a number of challenges on both the water and power sides that require significant Capital and Operations and Maintenance ("O&M") expenditures related to the maintenance and replacement of its aging infrastructure, and the compliance with stringent regulatory mandates. Further, the Department faces a unique set of challenges related to:

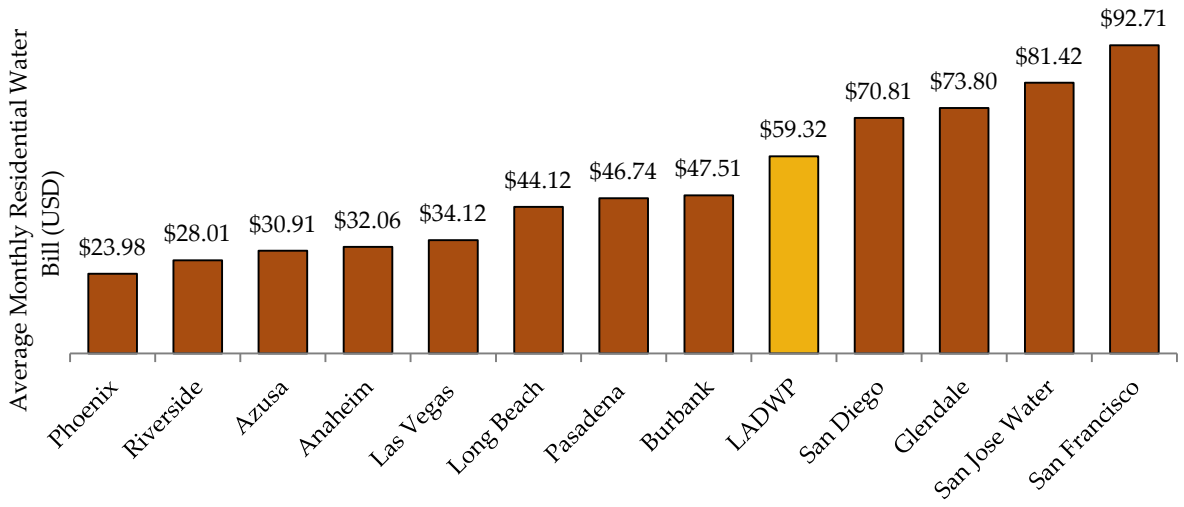
- Its age. Los Angeles is one of the oldest metropolitan areas in the Southwest and faces specific aging infrastructure replacement needs, such as the renewal of a large number of above ground power lines.
- Its diverse service area. The diversity of LADWP's geographic area demands specific operational requirements such as the maintenance of power transmission lines in mountain areas and greater water pumping needs in hilly areas.
- Its vertically integrated structure. LADWP owns and operate its own generation, transmission and distribution systems, and is therefore responsible for the maintenance, repair and replacement of these assets.

The comparison of LADWP's monthly bills for residential water services shows that LADWP's water rates are on the high end of the peer panel overall but the lowest for residential customers among California major metropolitan providers. As stated above, one of the primary drivers for LADWP's higher rates, is the age of its infrastructure. Some utilities in the peer panel, such as Phoenix, Riverside and Las Vegas benefit from a newer infrastructure with flatter terrains and likely have fewer leaks and breaks per mile, lower overall O&M cost due to fewer pumping needs and fewer pressure zones. In

addition, they currently are not confronted with the significant capital expenditures the Department faces to replace its aging infrastructure.

Another key rate driver is LADWP's reliance on water purchases from the Metropolitan Water District (MWD) for most of its water supply. According to Navigant's findings, MWD purchases represent the second most expensive water source in California, behind ocean water desalination. While MWD pricing is outside the direct control of the Department, LADWP is addressing this cost driver by making large investments in its local water supply which will reduce its reliance on MWD over time. The Department is planning on cutting in half its MWD water purchases by 2024 through increased conservation, recycled water, and stormwater capture, and is actively working on the rehabilitation of the San Fernando groundwater basin.

Figure E-1. Average Monthly Residential Water Bill - Medium Usage Scenario (12 HCF/mo – ¾ meter)



LADWP's power rates compare positively against those of the peer panel companies. However, nearly half of the Department's generation mix is currently sourced from the Navajo and Intermountain Power Project (IPP) coal power plants, which represent a very cost competitive source of energy. To meet environmental goals and regulations, LADWP will be replacing coal through a combination of energy efficiency, renewable energy, and natural gas within the next 10 years[2] and will significantly increase its share of energy generated through utility scale solar PV. While this strategy is in line with LADWP's and the City's environmental goals and supported by the relatively low levelized cost of energy (LCOE) associated with these two generating technologies, the transition from coal to natural gas will come at a cost to LADWP's ratepayers since the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

[2] LADWP has finalized the sale of the Navajo Generating Station but is entitled to power from the plant until July 1, 2016, and is planning on divesting from IPP by 2025 according to the Department's 2014 Integrated Resource Plan.

Figure E-2. Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel A

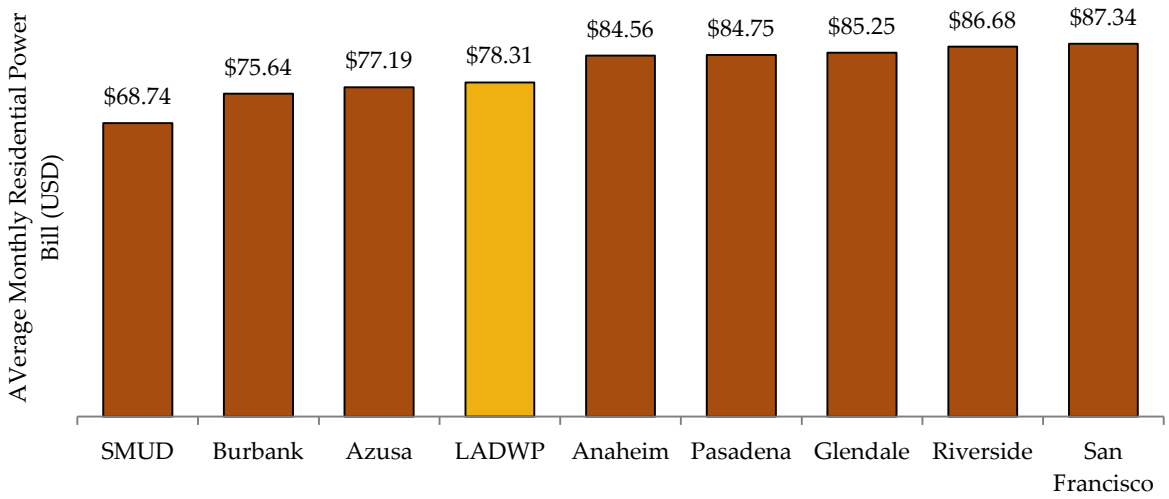
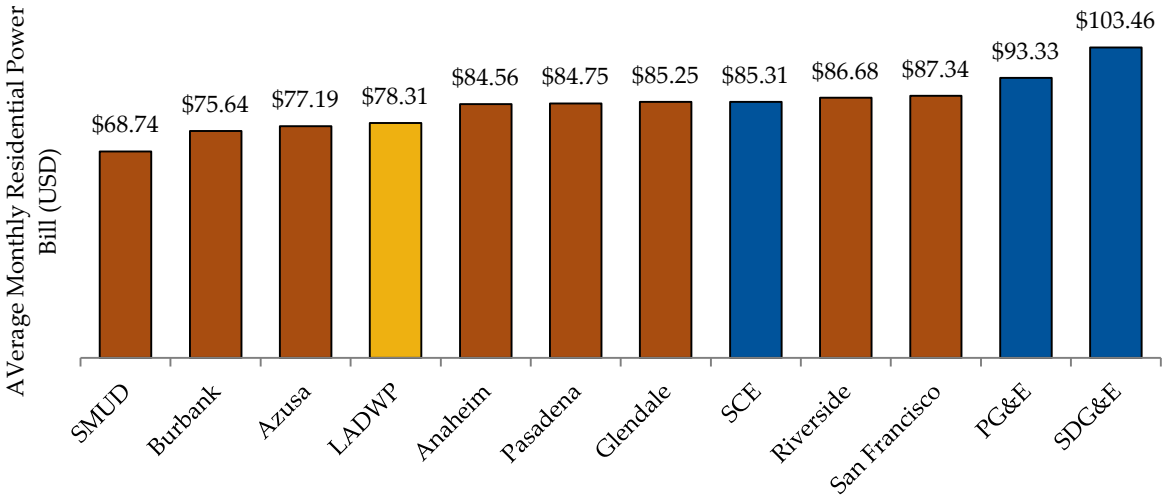


Figure E-3. Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel B



Finally, Navigant assessed LADWP's rate structures against those of the peer panel companies. LADWP's water and electric rate structures appear to be more complex than those of its peers. Both the power and electric rate ordinances can be quite challenging to interpret without a certain degree of familiarity with utilities' rate structures, primarily due to the use of a large number of rate adjustment factors. As a result, it can be challenging for LADWP's ratepayers to understand how their water and power utility bills have been developed. However, each rate adjustment factor is tied to specific water and power programs which can help ratepayers bridge the gap between their monthly bill components and these specific programs.

While LADWP's rate structures appear quite complex, they appropriately support the City's and Department's water and power conservation goals. LADWP uses seasonal rates for both water and power, and implemented shortage year water rates in order to incentivize their customers to limit their water and power usage.

Overall, this Study shows that the Department's rate levels are reasonable when compared to the peer panel, especially given LADWP's unique set of challenges related to its size and the characteristics of its service area. However, it is likely that the Department's rates will increase as it seeks additional funding to address current and new challenges, including the maintenance, repair and replacement of its aging infrastructure, the transition from coal to natural gas and the development of its local water resources. In the future, the Department's rates should be examined against the challenges and regulatory requirements it faces, while ensuring that they accurately reflect the costs of providing water and power supply services to its customers. Low rates are not a desirable goal if they are inadequate to provide the level of service required to meet the policy goals of the City of Los Angeles.

2. Introduction

Utilities meet the requirements of day-to-day operations and large scale capital programs through the derivation and application of rates that are designed for specific customer classes. The manner in which the costs of "doing business" are allocated across the various customer classes is an explicit consideration of all utilities and their oversight bodies.

In general, LADWP has a long history of relatively low power and water rates, few rate increases, and strong financial ratios exemplified by high credit ratings. However, significant capital improvement and other programs are impacting the Department's rate structure over the recent period.

The City included in the scope of the 2015 IEA Survey a "competitive analysis of electric and water rates with neighboring comparable utilities in various customer classes and usage levels". This report presents the findings of the rates benchmarking study conducted by Navigant, including:

- A comparison of LADWP's monthly bill for power and water services, for the residential, commercial and industrial customer classes against the peer panel. Monthly bills were computed for the Fiscal Year 2015/2016[3].
- A comparison of the Department's electric and water rate structures against the peer panel companies.
- An assessment of electric and water rate drivers in order to provide context for the rate levels of the peer panel companies as compared to LADWP.
- A review of the incentives for water and power conservation provided by the rate structures of the peer panel.

This report is organized as follows:

- Presentation of Navigant's approach and methodology in conducting the Study.
- An assessment of LADWP's water and electric rate structures against those of the peer panel companies.
- Water rates benchmarking findings.
- Power rates benchmarking findings.
- An assessment of rate structure designs as they relate to water and power conservation.
- Conclusion.

[3] Starts July 1, 2015 and ends June 30, 2016.

3. Approach and Methodology

3.1 The Peer Panels

To conduct the Study, Navigant developed three peer panels: the Water Peer Panel, Power Peer Panel A and Power Peer Panel B. All three peer panels include utilities operating in the Los Angeles area, as well as utilities with similar water and power supply constraints operating in Northern California, San Diego and neighboring states.

One key metric used in selecting utilities for the Water Peer Panel and Power Peer Panel A was the similarity in rate setting mechanisms and cost structures. Rate setting mechanisms and cost structures can differ significantly across the utility industry, especially between MOUs like LADWP and IOUs. Rate setting mechanisms for California IOUs are based on cost of service studies[4] that define the true cost of providing water and power services to customers and allow a rate of return, while LADWP's rates are primarily designed to recover the cost of debt servicing, ensuring the appropriate level of reserves and paying the City Transfer[5]. In short, the IOUs revenue requirement is based on a rate of return rate base methodology and LADWP's revenue requirement is based on a cash revenue requirement methodology. Additionally, the cost structure associated with running a private enterprise usually results in higher rates for IOUs.

Another major difference between California MOUs and IOUs is their generation mix. The three California power IOUs, SCE, SDG&E and PG&E, have largely or fully eliminated coal from their generation mix while many Southern California MOUs, including LADWP, still heavily rely on electricity generated by cost competitive coal power plants. Coal has been, and is still one of the most cost competitive energy source for power generation and constitutes one of the key drivers behind the competiveness of many MOUs electric rates.

These differences in rate setting mechanisms, cost structures and generation mix can result in large rate level disparities between California MOUs and IOUs. This led Navigant to exclude IOUs from the Water Peer Panel and Power Peer Panel A.

Power Peer Panel B is similar to Power Peer Panel A with the exception that it does include the three California IOUs. While it is justified to compare LADWP's rates exclusively against other MOUs for the reasons outlined above, a comparison against SCE, SDG&E and PG&E is valuable since:

- All four utilities are all large size utilities supplying power to some of the largest California metropolitan areas.
- LADWP is making the same transition away from coal that the IOUs have now completed as well as strong investments in infrastructure and reliability. Therefore, comparing their rates is instructive in illuminating future cost drivers LADWP ratepayers will face as the Department moves toward even cleaner and more reliable systems.
- LADWP and SCE are operating in neighboring service areas.

[4] LADWP has recently completed a 2014 Power Cost of Service Study as part of their latest rate action. However, this cost of service study was not used to develop the rates reviewed in this Study.
[5] Represents 8% of LADWP's power revenues.

- It provides a point of reference to the public since most electric rate benchmarking studies involving California utilities published to date have included the three California IOUs.

This Study will therefore compare residential, commercial and industrial monthly bills across all three peer panels. The utilities included in the water and power peer panels are listed in the following table.

Table 3-1. Water and Power Peer Panels

	Water Peer Panel		Power Peer Panel A		Power Peer Panel B
1	City of Pasadena	1	City of Pasadena	1	City of Pasadena
2	City of Glendale	2	City of Glendale	2	City of Glendale
3	City of Burbank	3	City of Burbank	3	City of Burbank
4	City of Anaheim	4	City of Anaheim	4	City of Anaheim
5	City of Riverside	5	City of Riverside	5	City of Riverside
6	City of Azusa	6	City of Azusa	6	City of Azusa
7	City of San Diego	7	City of San Francisco – San Francisco Public Utilities Commission (SFPUC)[6]	7	City of San Francisco – San Francisco Public Utilities Commission (SFPUC)[7]
8	City of San Francisco – San Francisco Public Utilities Commission (SFPUC)	8	Sacramento Municipal Utility District (SMUD)	8	Sacramento Municipal Utility District (SMUD)
9	City of Las Vegas	9	LADWP	9	SCE
10	City of Long Beach			10	SDG&E
11	City of Phoenix			11	PG&E
12	City of San Jose, San Jose Water			12	LADWP
13	LADWP				

3.2 Monthly Bill Computations

With the objective of considering all charges related to power and water services, and considering that rates structures vary significantly across utilities, power and water monthly bills have been computed for each utility of the peer panel.

[6] The SFPUC provides power to only a very limited number of residential customers, as most of their electric customers are municipalities.

[7] The SFPUC provides power to only a very limited number of residential customers, as most of their electric customers are municipalities.

All charges considered in the monthly bills were derived from publicly available rate ordinances and the appropriate rate schedules. The bill computation process used for the Study considered:

- Charges directly related to providing water and power services - The computations only reflect fees directly related to providing water and power services, i.e. taxes and surcharges not related to such services were excluded from the computations.
- Current rate levels - In order to provide the most current rate levels representation, rates effective July 1, 2015 were considered for the Study and monthly bills were computed for the July 2015, June 2016 study period[8].
- Seasonality – When applicable, and according to each utility's rate ordinance, a distinction was made between months considered to be in the "high", "medium" or "low" season, and summer or winter months. The monthly bills presented in sections 5 and 6 were first calculated for each month and then averaged over the study period, and therefore reflect the seasonality impact on rates.
- Specific on-peak and off-peak electric rates, when applicable.
- Drought – Drought surcharges were included in the water bill computations and rate schedules addressing drought conditions were applied.
- Number of days per month – When applicable, daily charges were translated into monthly charges, considering the total number of days in each month over the study period[9].

Finally, in order to ensure the accuracy of the benchmarking results presented in this report the assumptions and approach used to compute the residential monthly bills were reviewed and validated in collaboration with each peer panel company. Additionally, the commercial and industrial bills were compared against the output of the utilities' bill estimators and/or bill samples, when available.

3.3 Customer Classes

As mentioned previously, the Study provides monthly water and power bill levels for the residential, commercial and industrial classes.

The following is a description of the class definitions and assumptions used for the Study:

- Residential water customers - Considers water sold, supplied, distributed, or transported to customers in a single family accommodation and water sold for general domestic and household purposes, using a 3/4" size meter – this meter size is commonly found in single household accommodations. When a location distinction was necessary, it has been assumed that the residential customers were located "inside" the city.
- Commercial water customers – Considers water sold, supplied, distributed, or transported to customers in a non-residential setting for commercial purposes. It does not consider water for agricultural uses.

[8] Navigant assumed no rate increases over the study period for all utilities included in the peer panel, including LADWP.

[9] The computations account for the fact that 2016 will be a leap year.

- Industrial water customers – Similar to the commercial water customers, the industrial segment considers water sold, supplied, distributed, or transported to customers in a non-residential setting for industrial purposes, excluding agricultural activities.
- Residential power customers - Considers customers located in individually metered, single-family accommodations, where the power is used primarily for domestic and household purposes, including lighting, appliances, cooking and power consuming appliances. This service is typically supplied at one standard voltage through one meter. When a distinction with regards to water and space heating was necessary, it has been assumed that the power residential customers were not using electricity for water and space heating purposes.
- Commercial power customers – Considers customers such as businesses, enterprises, or equivalent in a non-residential setting and where power is used for purposes including lighting, power and heating or any combination thereof. It has been assumed that the power is delivered at a single phase alternating-current.
- Industrial power customers – Similar to a commercial power customer, an industrial power customer is considered a business, enterprises, or equivalent in a non-residential setting, where power is used for purposes including lighting, power and heating or any combination thereof.

3.4 Usage Scenarios

In order to evaluate the impact of the peer panel companies' rate structure on both power and water usage, Navigant developed three usage scenarios for the residential, commercial and industrial customer classes. Comparing usage scenarios across the peer panel provided insights with regards to the utilities efforts in implementing pricing signals to promote energy and water conservation.

The following tables summarize the water and power usage scenarios per customer class.

Table 3-2: Water Usage Scenario Summary (HCF/mo - Meter Size)

Scenario	Residential	Commercial	Industrial
Low Usage	6 HCF – ¾"	50 HCF – 1"	500 HCF – 2"
Medium Usage	12 HCF – ¾"	200 HCF – 1.5"	3,000 HCF – 3"
High Usage	24 HCF – ¾"	1,000 HCF – 2"	15,000 HCF – 6"

1 HCF = 748 gallons

Table 3-3. Power Usage Scenario Summary (kW – kWh/mo)

Scenario	Residential	Commercial	Industrial
Low Usage	250 kWh	40 kW - 10,000 kWh	350 kW - 250,000 kWh
Medium Usage	500 kWh	150 kW - 50,000 kWh	1,000 kW - 300,000 kWh
High Usage	750 kWh	1,000 kW -300,000 kWh	5,000 kW[10] – 2,000,000 kWh

[10] Primary schedules were used for the high usage power industrial bills (demand of 5000 kW), as opposed to secondary schedules for the remaining scenarios.

4. Rate Structures

Water and power rate structures and the associated complexity can vary significantly across utilities. Differences in rate structures may be due to a number of factors, including:

- Funding mechanisms.
- Financial constraints.
- Regulatory and legal requirements.
- Incentives for water and power conservation.
- Water and power supply constraints.
- Water and power transmission and distribution constraints.
- Geography/Service Area.
- Climate.

It is critical for a rate structure to appropriately address all the factors listed above, while ensuring that revenue requirements are met through the application of rates that reflect the true cost of service and provide incentives for water and power conservation. In parallel, utilities ought to use clear and transparent rate structures for their ratepayers to get a clear understanding of how their water and power bills have been developed.

This section of the report provides a high level comparison of the peer panel companies' rate structures and evaluates the associated complexity.

4.1 Water Rate Structures

Table 4-1 compares the residential water rate structures of the peer panel companies against the following metrics:

- Monthly Fee - Identifies if the rate structure includes a fixed monthly fee that is unrelated to water usage.
- Tiered Water Charges - Identifies the number of water usage tiers in each rate structure.
- Water Conservation Incentive – Identifies if the rate structure in effect at the time of the Study promotes water conservation through the use of drought surcharges or drought specific schedules/rates.
- Season Based - Identifies if rates are adjusted by season.

Table 4-1: Residential Water Rate Structures

Charges	Pasadena	Glendale	Burbank	Anaheim	Riverside	Las Vegas	Long Beach	Phoenix	San Jose	Azusa	San Diego	San Francisco	LADWP
Monthly Fee	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tiered Water Charges	4	4	3	1	4	4	3	2	3	3	4	2	2
Water Conservation Incentive		✓			✓				✓	✓			✓
Season Based	✓				✓			✓	✓				✓

Table 4-1 highlights that LADWP is the only utility of the peer panel to exclusively use volumetric rate components (rates based on water usage). All the other peer panel companies' rate structures include a fixed monthly fee that is unrelated to water usage.

The number of tiers across the rate structures reviewed varies from one to four. Anaheim is the only utility of the peer panel without a multi-tier rate structure. While LADWP is currently on the lower end of the spectrum with two tiers, the Department has submitted a water and power rate increase proposal to its Board of Commissioners on July 8, 2015 that includes a transition to a four tiers water rate structure. This is in line with the recommendation from the California Urban Water Conservation Council, who supports a tiered rate structure to encourage conservation.

Five utilities out of thirteen have implemented drought surcharges or drought specific schedules, including LADWP. The Department implemented shortage year rates in June 1, 2009 for all its customer classes, reducing the first tier water allotment by 15%. Shortage year rates were still in effect as of July 1, 2015. Additionally, LADWP has launched multiple water conservation programs including, among others, limiting outdoor watering to three days a week, the turf replacement program, and rebates for residential high efficiency washers, toilets, outdoor watering systems and residential drought resistant landscape.

The use of season based rates across the peer panel companies appears to be limited, as it is only implemented at five out of thirteen utilities, including LADWP. Seasonal pricing can serve to encourage additional conservation efforts during high demand months, particularly for outdoor use. In addition, such rates can be justified in part because they better reflect a user's share of system capacity through peak demand pricing. However, given the current stricter outdoor watering restrictions across California, the difference in seasonal water usage may not be as pronounced, as California residents may only be focused on complying with current watering restrictions without necessarily reducing their winter usage. Such behavior could limit the relevance of season based rate structures during temporary

water restrictions, but seasonal pricing will remain a powerful tool to limit outdoor water use over the long-term.

These observations generally apply to the commercial and industrial rate structure comparison shown in Table 4-2.

Table 4-2: Commercial and Industrial Water Rate Structures

Charges	Pasadena	Glendale	Burbank	Anaheim	Riverside	Las Vegas	Long Beach	Phoenix	San Jose	Azusa	San Diego	San Francisco	LADWP
Monthly fee	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tiered Water Charges	4	1	1	1	2	4	1	2	1	3	1	1	2
Water Conservation Incentive		✓			✓					✓			✓
Season Based	✓		✓		✓			✓					✓

Navigant's review of the complexity of LADWP's rate structure shows that the Department is the only utility of the peer panel with different water usage tiers depending on the customer's zip code to address weather changes across the Department's large service area. In addition, LADWP uses adjustments to tiers based on lot size and family size. Having water usage tiers that vary depending on the customer's zip code, lot size and family size helps ensure that LADWP's customers are treated fairly across the Department's vast service area. However, it adds another layer of complexity to the rate structure.

4.2 Power Rate Structures

Table 4-3 compares the residential electric rate structures of the peer panel companies against the following metrics:

- Monthly/Fixed Fee - Identifies if the rate structure includes a monthly or fixed fee that is unrelated to energy usage.
- Energy Usage Tiers - Identifies the number of energy usage tiers in each rate structure.
- Season Based - Identifies if the rates are adjusted by season.

Table 4-3: Residential Power Rate Structures

Charges	Pasadena	Glendale	Burbank	Anaheim	Riverside	Azusa	San Francisco	SMUD	SCE	SDG&E	PG&E	LADWP
Monthly / Fixed Fee	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Energy Usage Tiers	3	3	2	2	3	2	3	2	4	4	4	**3**
Season Based		✓			✓		✓	✓	✓	✓	✓	✓

LADWP is among the three utilities of the peer panel that exclusively uses volumetric rate components. Note that the Department uses adjustment factors in the event it cannot recover enough revenue through the application of tis volumetric rates.

The number of energy usage tiers varies from two to four across the peer panel, with five out of twelve utilities using three tiers, including LADWP, and the IOUs using four tiers. The use of a larger number of tiers can be seen as an incentive for ratepayers to limit their energy usage to the lowest cost Tier one rate.

Finally, eight out of twelve utilities are using season based rates, including the Department. The use of season based rates is appropriate in areas such as Southern California, where electricity demand is larger in the summer due primarily to greater air conditioning needs.

The commercial and industrial rate structure comparison shown in Table 4-4 highlights a few differences from the observations made on the residential rate structure comparison. LADWP charges a fixed Service Charge to its commercial and industrial customers (only the City of Azusa does not apply such fixed fee) and most peer panel utilities do not use an energy usage tiered structure.

Table 4-4: Commercial and Industrial Power Rate Structures

Charges	Pasadena	Glendale	Burbank	Anaheim	Riverside	Azusa	San Francisco[E]	SMUD	SCE	SDG&E	PG&E	LADWP
Monthly / Fixed Fee	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Energy Usage Tiers	1	1	1	1[B]	1[C]	3	1	1	1	1	1	1
Season based	✓	✓	✓[A]		✓[D]		✓	✓	✓	✓	✓	✓

A - Only for customers with a demand greater than 250 kW.
B - Only applies to customers with a maximum demand of 200 kW. For customers with a demand greater than 200 kW, the City of Anaheim applies two energy usage tiers.
C – For customers with a demand between 20 and 150 kW, the City of Riverside applies two energy usage tiers.
D – Applies to customers with a demand greater than 150 kW.
E – The SFPUC does not have an electric rates schedule for customers with a demand greater than 200 kW.

Overall, this high level review reveals that LADWP's power rate structure for residential, commercial and industrial customers is in line with the peer panel companies and can support the implementation of energy conservation incentive mechanisms.

However, a review of the complexity of LADWP's rate structure showed that the Department is using a larger number of rate adjustments and is the only MOU in the peer panel to have different residential power rate tiers depending on the customer's zip code (or geographical zone)[11] [12].

The large number of rate adjustment represents a good effort from the Department to bridge the gap between the Departments key capital and O&M programs and the components of the customer's bill. The downside is a rate ordinance that is complex for the public to interpret, since it requires a certain degree of familiarity with power rate structures.

Similar to the observations made on the water rate structure comparison, having power rate tiers that vary depending on the customer's zip code helps ensure that LADWP's customers are treated fairly across the Department's service area but adds another layer of complexity to the rate structure.

[11] The California IOUs also use differing tiers depending on the customer's zip code.

[12] Navigant used geographical Zone 1 tiers in order to compute LADWP's residential electric bills. This assumption was validated by the Department.

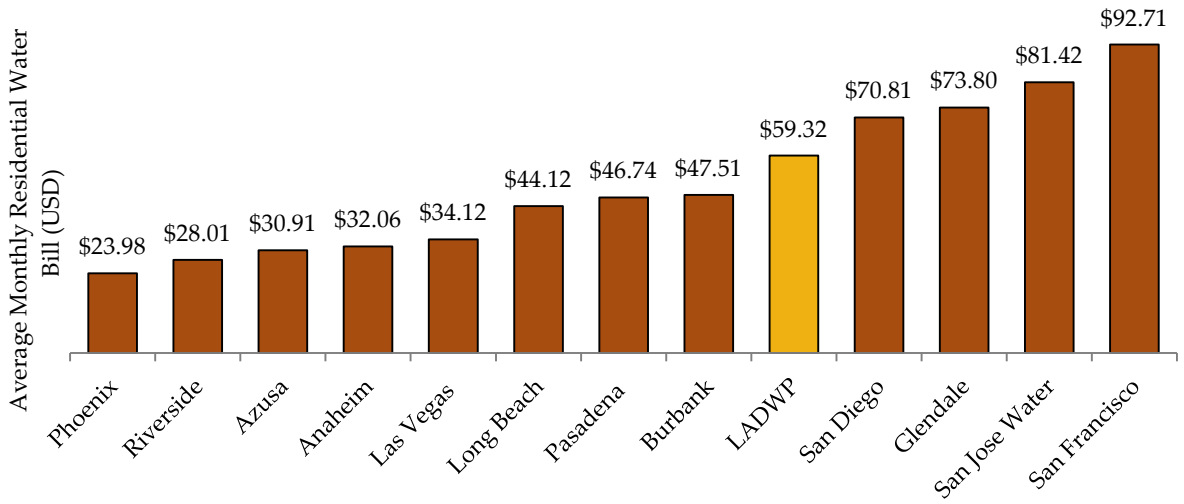
5. Water Rates Benchmarking

This section of the report presents the water rates benchmarking findings for the Water Peer Panel. It includes monthly water bill comparisons for residential, commercial and industrial customers, and provides insights with regards to key water rate drivers.

5.1 Residential Customers

The results from the water rates residential benchmarking study are presented in the chart below. These results reflect the Medium Usage Scenario at a consumption of 12 HCF per month using a ¾" size meter.

Figure 5-1: Average Monthly Residential Water Bill - Medium Usage Scenario (12 HCF/mo – ¾ meter)



The peer panel average monthly bill for 12 HCF is $51.19, and monthly bills range from a low of $23.98 for Phoenix to a high of $92.71 for San Francisco. LADWP's monthly bill is estimated at $59.32, $8.12 or 15.9% higher than the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[13] is $45.31, with a low of $28.01 for Riverside and a high of $73.80 for Glendale. LADWP's monthly bill is the second highest, $14.01 or 30.9% higher than the average.

Water rates are composed of multiple cost parameters that reflect capital expenditures driven by such things as regulatory mandates, water purchases, external or self-driven goals and infrastructure related programs, as well as the company's own operations. Identifying the exact sources for the disparities in monthly bills shown in the figure above would require a detailed and complex review of each peer panel company's cost structure. However, there is one rate driver that can provide an indication for the variance in monthly bills: the utility's water supply sources portfolio.

The water supply sources can be categorized as follows:[14]

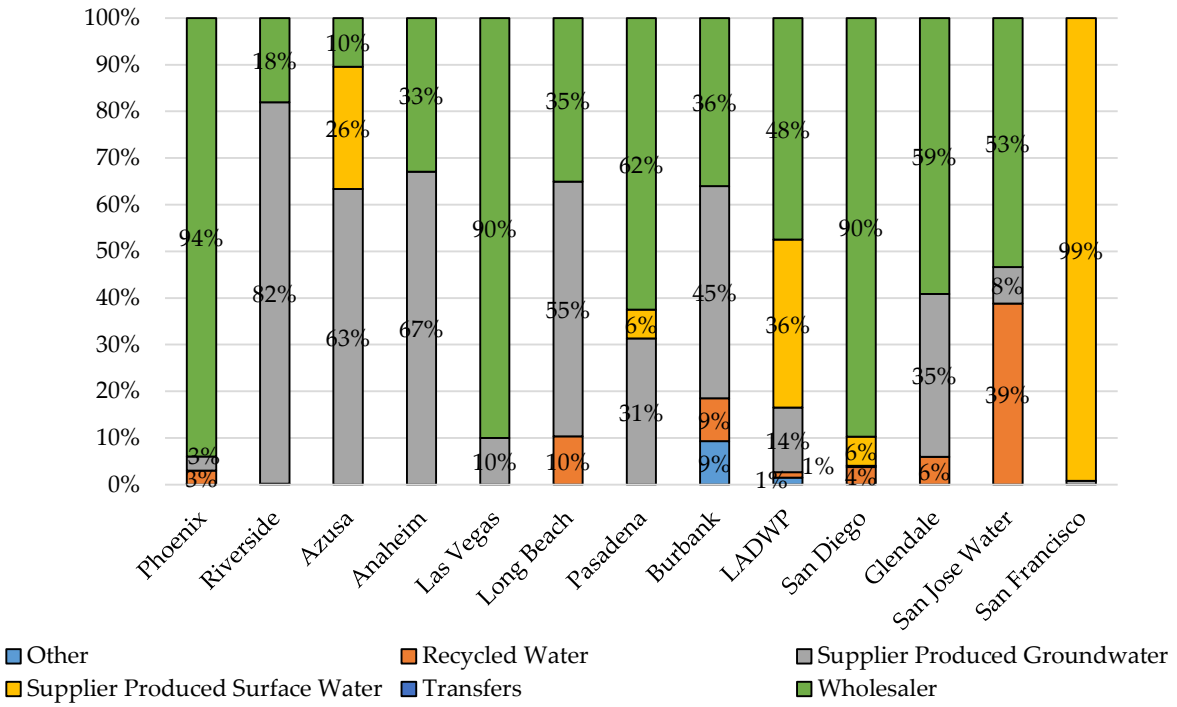
[13] Includes Riverside, Azusa, Anaheim, Long Beach, Pasadena, Burbank, LADWP and Glendale.

[14] The categories presented here reflect the categories used by the California Department of Water Resources (DWR) for the 2010 Urban Water Management Plan reports.

1. Wholesaler – Includes water purchased from a wholesaler. The largest water wholesaler operating in the California and supplying a large share of the water used in the State is MWD.
2. Supplier Produced Groundwater – Includes water directly pumped by the utility from underground water basins. This category excludes groundwater sold by another utility or agency.
3. Supplier Produced Surface Water – Includes water that is drawn from streams, lakes and reservoirs. Water from the Los Angeles Aqueduct (LAA) that is owned and operated by LADWP falls within this category.
4. Recycled Water – Includes water recycled by the utility.
5. Transfer – Includes water transferred from another utility or agency.
6. Other – Includes any other sources of water supply such as stormwater capture.

A summary of the peer panel companies' water sources portfolio is presented in Figure 5-2.

Figure 5-2: Peer Panel Companies Water Sources Portfolio



Sources: California DWR website;[15] "2011 Water Resource Plan" – City of Phoenix Water Services Department; "Water Resource Plan 09 – Southern Nevada Water Authority."

Note: The DWR has aggregated all relevant data from each California water agency 2010 Urban Water Management Plan, including their water supply sources.

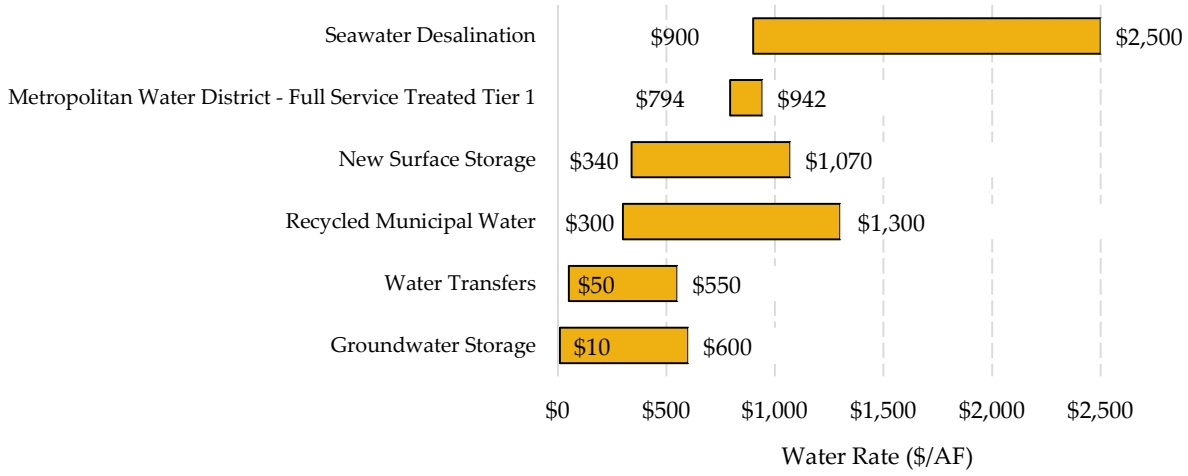
Figure 5-2 highlights that the two primary water sources for the peer panel companies are water purchased from a wholesaler and supplier produced groundwater.

[15] www.water.ca.gov/urbanwatermanagement/2010_Urban_Water_Management_Plan_Data.cfm

As shown in Figure 5-3, the cost difference between these two sources is significant, with groundwater representing a much more cost competitive option. The Public Policy Institute of California refers to groundwater storage as "one of the least expensive ways to make water available".[16] They estimate groundwater storage costs between $10/AF and $600/AF while MWD rates for Full Service Treated Water Tier 1 range from $794/AF in 2012 to $942/AF in 2016.

Therefore, water utilities with the largest share of groundwater in their supply portfolio should be expected to have the lowest monthly bills. This is confirmed by the findings of the Study as Riverside, Azusa, and Anaheim have the largest share of groundwater in their portfolio and the lowest residential bills, among the peer panel companies operating in Southern California.

Figure 5-3: Rates by Water Sources in California



Sources: California's Water Market, By the Numbers: Update 2012; MWD website.[17]
Note: The price range corresponds to the change in Tier 1 Full Service Treated Volumetric Cost between 2012 and 2016.

LADWP's share of groundwater is relatively small when compared to the other peer panel companies operating in the Los Angeles area, which is one of the reasons why the Department does not compare favorably for this Study. However, the primary factor influencing LADWP's water bill is its reliance on purchased water: MWD water purchases represent nearly half of the Department's water supply portfolio. Therefore, large and expensive water purchases lead to greater water rates for LADWP.

While MWD pricing is outside the direct control of the Department, LADWP is addressing this cost driver through large investments in its local water supply, which will reduce its reliance on MWD. The Department is planning on cutting in half its MWD water purchases by 2024 through increased conservation, recycled water, stormwater capture and is actively working on the rehabilitation of the San Fernando groundwater basin.

LADWP rates can fluctuate significantly from a dry year to a wet year due to the variation in water supply from the LAA. LADWP owns this water supply, and the associated costs are much lower than

[16] "California's Water Market, By the Numbers: Update 2012" by the Public Policy Institute of California.
[17] www.mwdh2o.com/WhoWeAre/Management/Financial-Information/Pages/default.aspx#tab2.

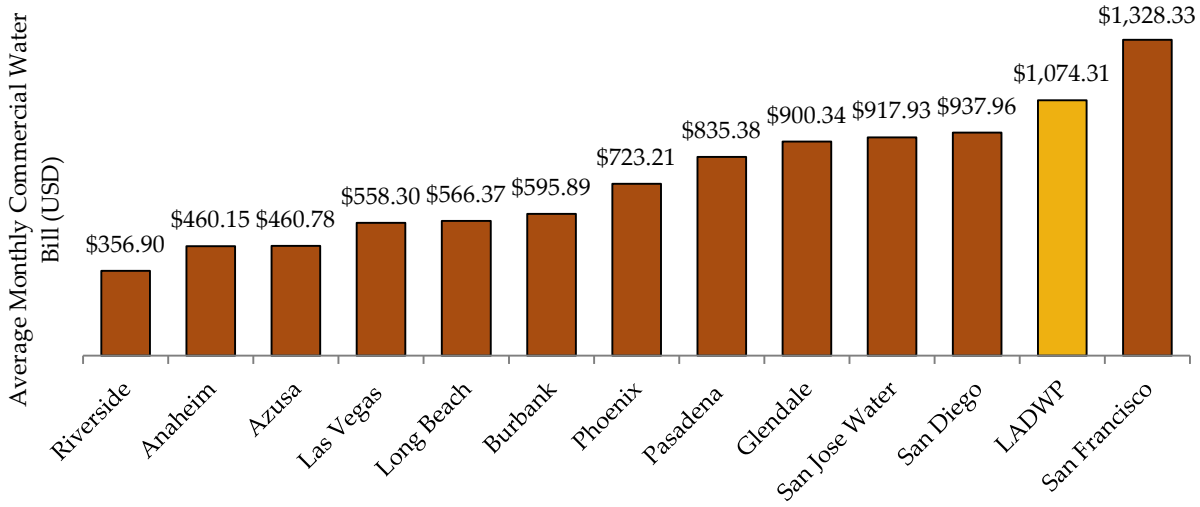
the costs of purchasing water from MWD. The data shown in Figure 5-2 reflect a year of normal precipitations when the Department should receive 36% of its water supply from the LAA. However, in drought years LADWP will rely for the most part on imports from MWD, which will trigger significant rate increases. LADWP ratepayers have experienced higher rates than usual since the beginning of the drought in California (Fiscal Year 2012/2013) for that particular reason. Note that this issue impacts all the utilities of the peer panel, as they need to address the rate impacts of varying weather-dependent water supplies.

Another key rate driver is the age of the infrastructure. Some utilities in the peer panel, such as Phoenix, Riverside and Las Vegas benefit from a newer infrastructure with flatter terrains and likely have fewer leaks and breaks per mile, lower overall O&M cost due to fewer pumping needs and fewer pressure zones. In addition, they currently are not confronted with the significant capital expenditures the Department faces to replace its aging infrastructure. Further, the City of Phoenix, which has the lowest bill, receives most of its water from the Salt River Project (SRP) and the Central Arizona Project (CAP), two wholesalers that have significantly lower rates than MWD. The combination of cost competitive purchased water and newer infrastructure yield much lower rates for Phoenix when compared to the peer panel companies, and LADWP in particular.

5.2 Commercial Customers

The results from the water rates benchmarking study for commercial users are presented below. These results reflect the Medium Usage Scenario, which considers a water consumption of 200 HCF per month, using a 1.5" size meter.

Figure 5-4: Average Monthly Commercial Water Bill - Medium Usage Scenario (200 HCF/mo – 1.5" meter)



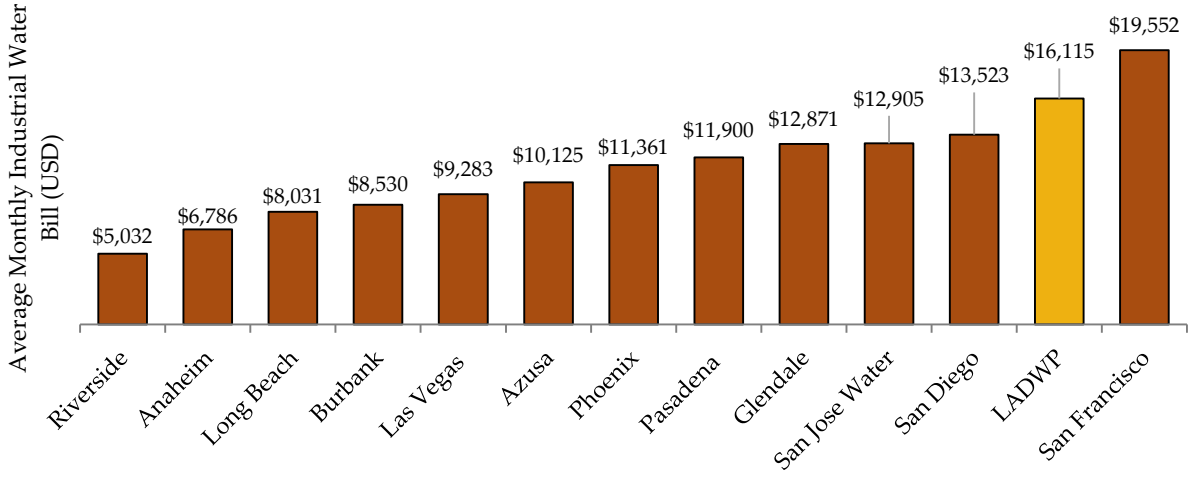
The peer panel average monthly bill is $747.47, and monthly bills range from a low of $356.90 for Riverside to a high of $1328.33 for San Francisco. Consistent with the findings for the residential rates benchmarking, San Francisco has the highest bill. However, Phoenix, who has the lowest residential rates, is now very close to the peer panel average at $723.21, $366.31 or 102.6% higher than Riverside.

LADWP's monthly bill is estimated at $1074.31, $326.94 or 43.7% higher than the peer panel average. LADWP commercial bill is the second highest of the peer panel and the highest of the utilities operating in the Los Angeles area. The average monthly bill for the peer panel utilities operating in the Los Angeles area[18] is $656.26 with LADWP's monthly bill $418.05 or 63.7% higher than the average.

5.3 Industrial Customers

The water rates benchmarking study conducted for industrial customers is presented below. These results reflect the Medium Usage Scenario, which considers a monthly water consumption of 1,000 HCF, using a 4" size water meter.

Figure 5-5: Average Monthly Industrial Water Bill - Medium Usage Scenario (3,000 HCF/mo – 3" meter)



The utilities ranking shown in Figure 5-5 is pretty similar to the ranking for commercial customers, as most of the peer panel companies have very comparable commercial and industrial water rate structures. The peer panel average monthly bill is $11,231.78, and monthly bills range from a low of $5032.23 for Riverside to a high of $19,551.51 for San Francisco. Consistent with the findings for the commercial rates benchmarking study, Riverside and San Francisco have the lowest and highest bills, respectively.

LADWP's monthly bill is estimated at $16,114.65, $4,882.87 or 43.5% higher than the peer panel average. LADWP industrial bill is the second highest of the peer panel and the highest of the utilities operating in the Los Angeles area. The average monthly bill for the peer panel utilities operating in the Los Angeles area[19] is $9,923.68 with LADWP's monthly bill $6,190.98 or 62.4% higher than the average. LADWP's high industrial water bill could be considered by high water use industrial customers as an incentive to invest in water-saving technologies or to relocate their operations where water supplies are more abundant and less costly.

[18] Includes Riverside, Azusa, Anaheim, Long Beach, Pasadena, Burbank, LADWP and Glendale.
[19] Ibid.

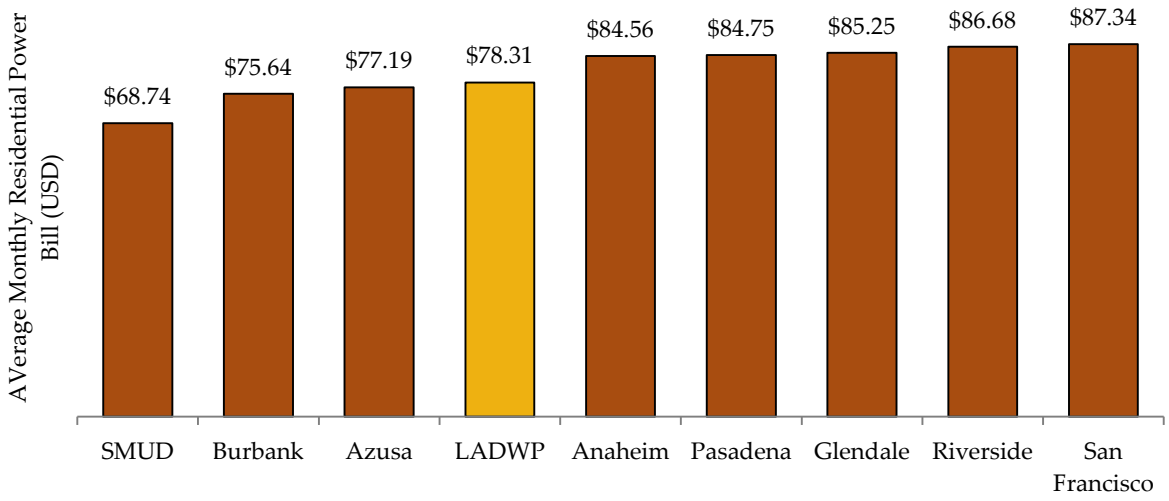
6. Electric Rates Benchmarking

This section of the report presents the electric rates benchmarking findings for Power Peer Panel A and Power Peer Panel B. It includes monthly power bill comparisons for residential, commercial and industrial customers for both power peer panels – findings related to Power Peer Panel A are presented first - and provides insights with regards to key electric rate drivers.

6.1 Residential Customers

The results from the electric rate benchmarking study for residential customers are presented below. These results reflect the Medium Usage Scenario, where residential customers consume 500 kWh per month.

Figure 6-1: Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel A

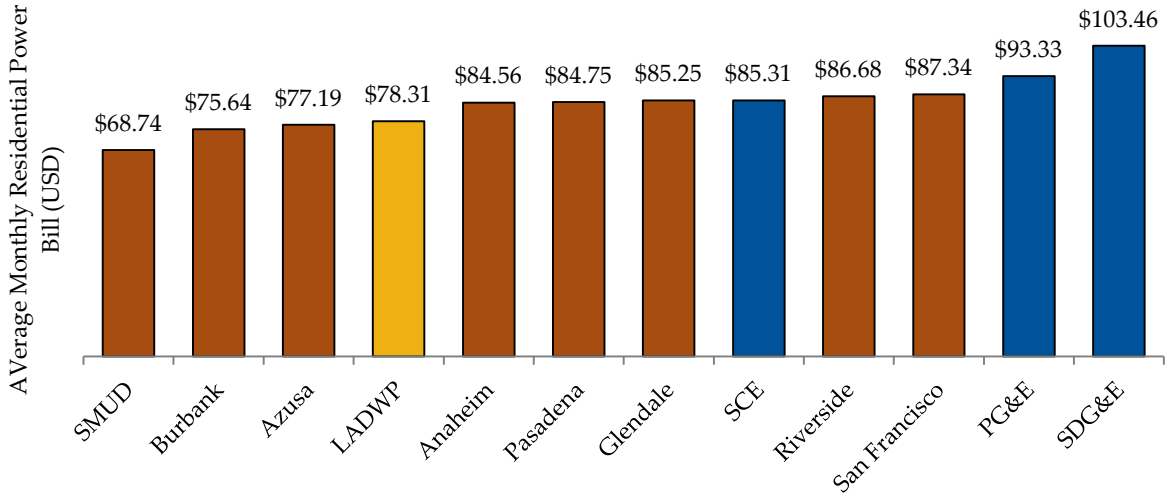


The Power Peer Panel A average monthly bill is $80.94, and monthly bills range from a low of $68.74 for SMUD to a high of $87.34 for San Francisco.

LADWP's monthly bill is estimated at $78.31, representing a $2.63 or 3.3% discount compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[20] is $81.77, with a low of $75.64 for Burbank and a high of $86.68 for Riverside. LADWP's monthly bill represents a $3.46 or 4.2% discount relative to the Los Angeles area average.

[20] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.

Figure 6-2: Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel B



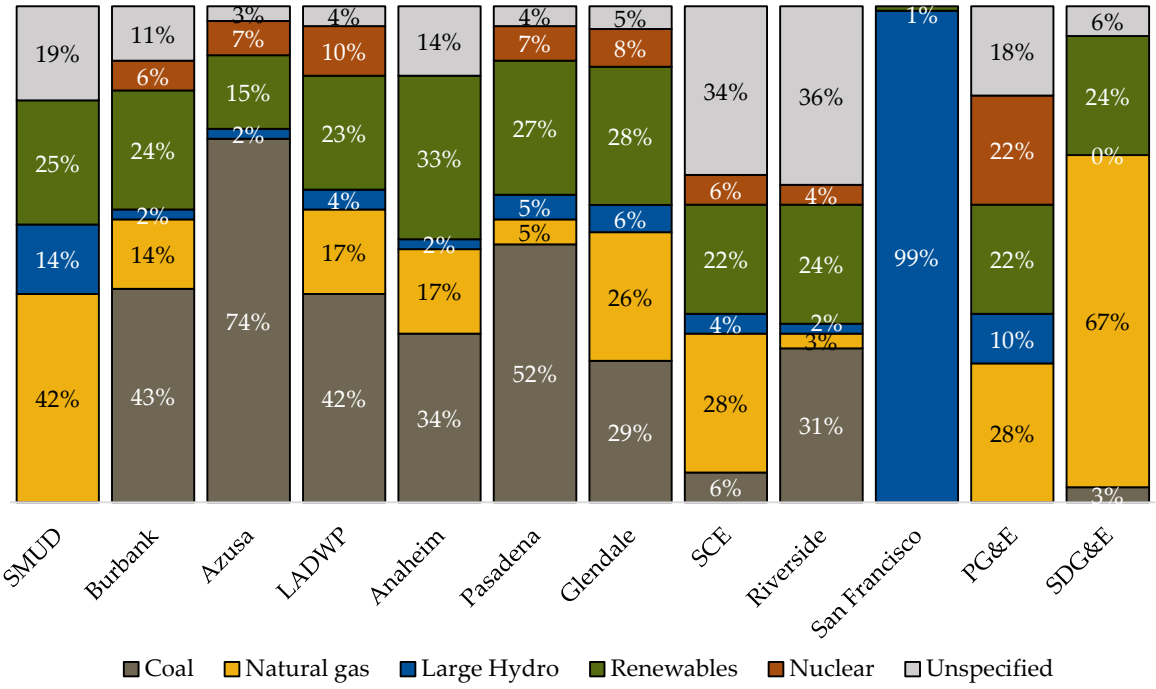
As anticipated, the California IOUs are among the most expensive utilities and raise the average monthly bill of the peer panel. The Power Peer Panel B average monthly bill is $84.21, and monthly bills range from a low of $68.74 for SMUD to a high of $103.46 for SDG&E. LADWP's monthly bill compares more positively than in Power Peer Panel A, representing a $5.91 or 7.0% discount compared to the average for Power Peer Panel B. The average monthly bill for the peer panel utilities operating in the Los Angeles area[21] is $82.21, with a low of $75.64 for Burbank and a high of $86.68 for Riverside. LADWP's monthly bill represents a $3.91 or 4.8% discount relative to the Los Angeles area average.

Similar to water rates, power rates are driven by a variety of cost parameters that are specific to each utility and identifying the exact sources of the disparities in monthly bills shown in Figure 6-1 would require a detailed and complex review of their cost structure. However, the utility's generation mix can provide a reasonable indication for the variance in monthly bill levels.

A utility's generation mix represents the share of energy generated by the company's generating technologies (or energy resources) used to meet its electricity demand in a given year. Figure 6-3 and Figure 6-4 below present the overall generation and renewable generation mix of the peer panel companies, respectively.

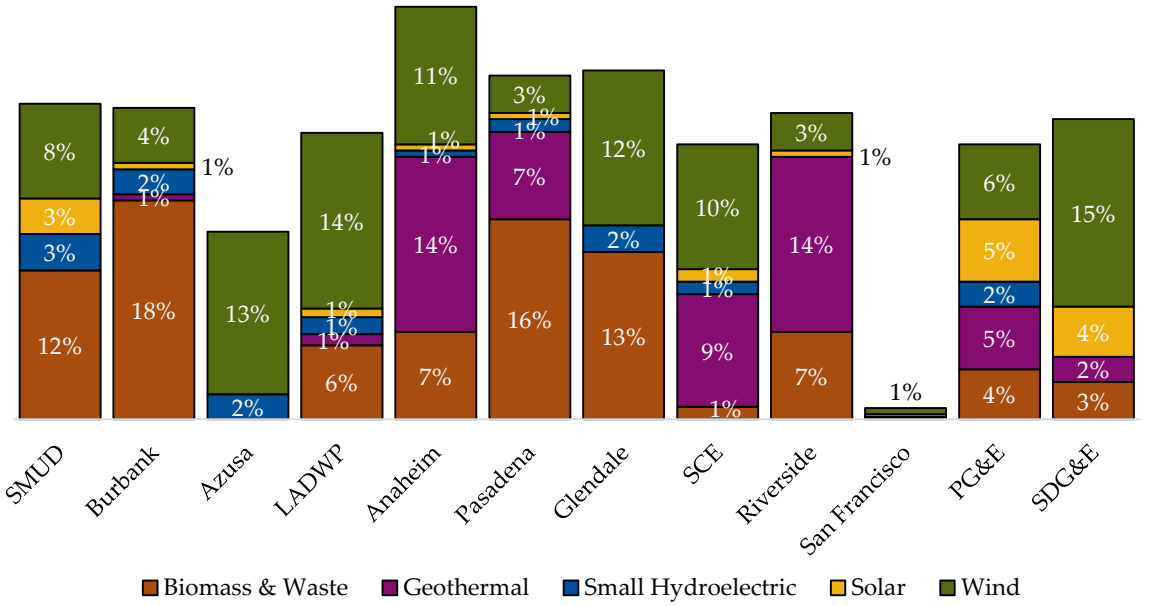
[21] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

Figure 6-3: Peer Panel Generation Mixes (2013)



Source: California Energy Commission website (www.energy.ca.gov/sb1305/labels/index.html).

Figure 6-4: Peer Panel Renewables Generation Mixes (2013)



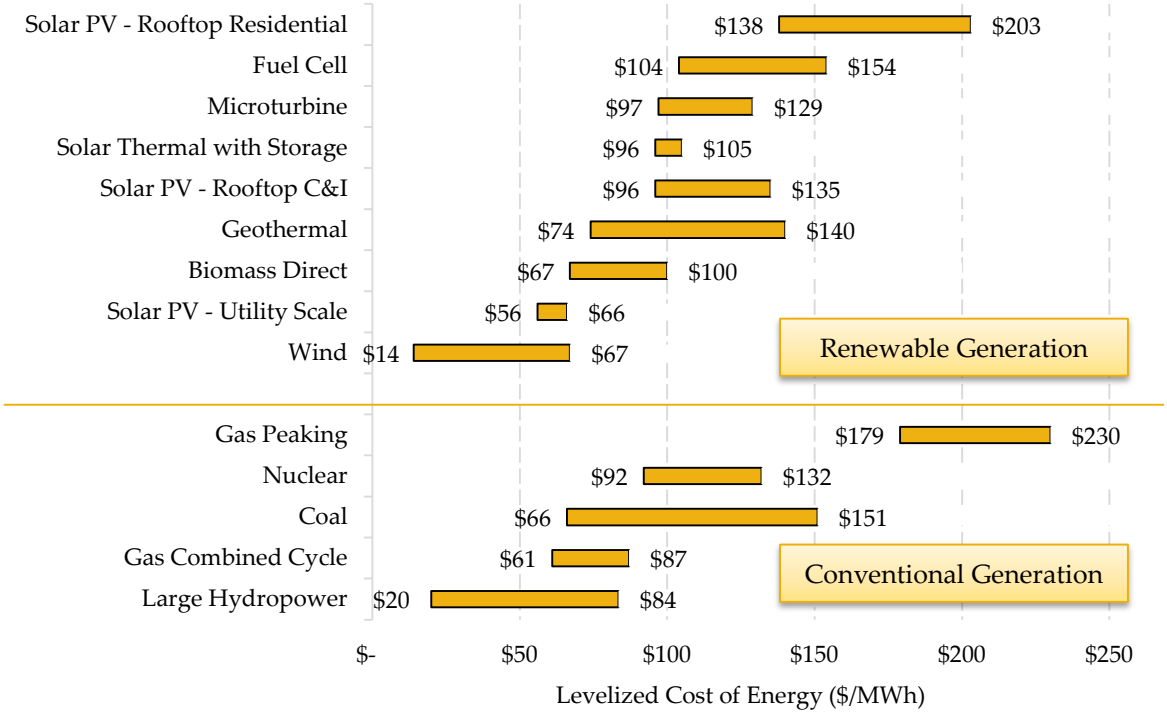
Source: California Energy Commission website (www.energy.ca.gov/sb1305/labels/index.html).

Figure 6-3 and Figure 6-4 highlight significant differences among the peer panel companies generation mix. These changes in generation mix combined with large generating technologies cost disparities can justify the differences in monthly bill levels observed in Figure 6-1.

The measure used to represent the life cycle cost of a particular generating technology is referred to as the levelized cost of energy (LCOE). The LCOE is often used to compare the competitiveness of different generating technologies and reflect the costs of building and operating a power plant over its life cycle.

Figure 6-5 presents LCOE ranges for typical generating technologies and shows that the three least expensive conventional generating technologies are hydropower, gas combined cycle and coal power plants, with wind, utility scale solar PV and biomass representing the most cost competitive renewable options. A utility using a significant share of one, or a combination of these lower cost generating technologies should be expected to have competitive rates.

Figure 6-5: LCOE by Generating Technologies ($/MWh) [22] [23]



The residential rates benchmarking study showed that SMUD has the lowest residential monthly bill of the peer panel. This finding could be explained by a large share of its energy being generated by hydropower plants (14%), natural gas fired plants (42%) and a large share of cost competitive renewable energy (12% biomass and waste, and 8% wind). On the other end, Riverside's relatively high residential

[22] Data Source: "Lazard's Levelized Cost of Energy Analysis – Version 8.0". The renewable generation LCOEs are inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit.

[23] The large hydropower LCOE estimate was derived from data included in a 2010 Navigant LCOE study and the U.S. Energy Information Administration "Levelized Cost and Levelized Avoided Cost of New Generation Resources" study included in the 2015 Annual Energy Outlook.

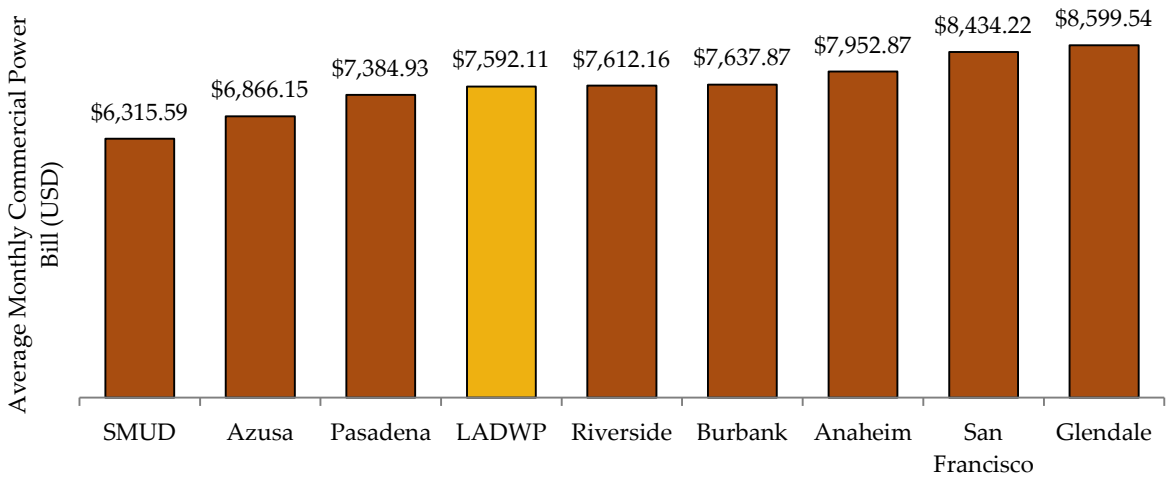
bill could be driven by the fact that it has the largest share of geothermal energy among the peer panel companies, which is the most costly utility scale renewable resource according to Figure 6-5.

Figure 6-3 highlights that utilities with a large share of coal in their generation mix tend to have the lowest monthly bills. This is especially true for the Department which currently benefits from low cost electricity generated by the Navajo and IPP coal power plants[24]. To meet environmental goals and regulation, LADWP will transition from coal to natural gas within the next 10 years and will significantly increase its share of energy generated through utility scale solar PV. While this strategy is in line with LADWP's and the City's environmental goals and supported by the relatively low LCOE associated with these two generating technologies, the transition from coal to natural gas will come at a cost to LADWP's ratepayers since the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

6.2 Commercial Customers

The results from the electric rates benchmarking study for commercial customers is presented next. These results reflect the Medium Usage Scenario representing a 150 kW demand and 50,000 kWh monthly energy usage.

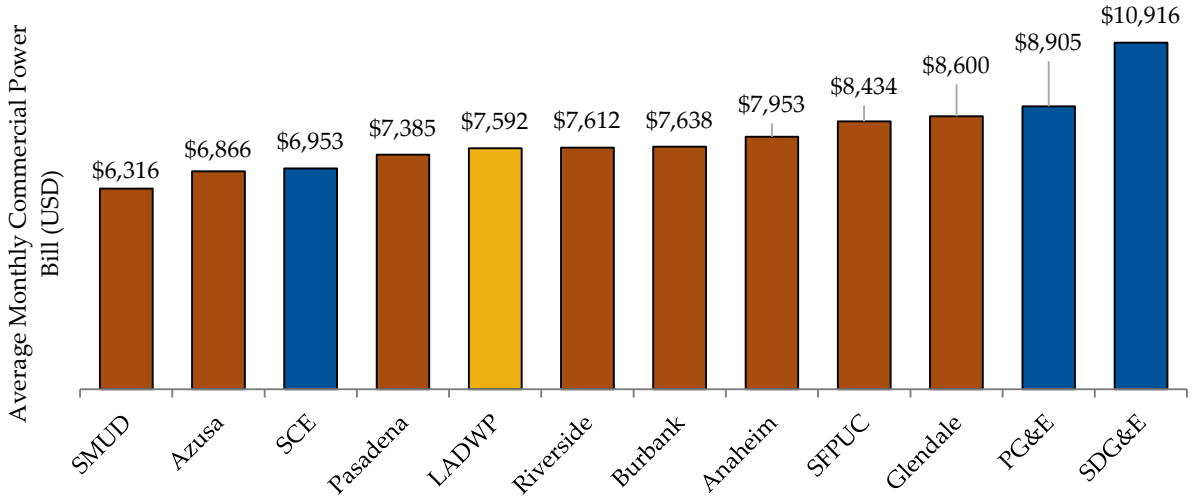
Figure 6-6: Average Monthly Commercial Power Bill - Medium Usage Scenario (150 kW – 50,000 kWh/mo) – Power Peer Panel A



The Power Peer Panel A average monthly bill is $7,599.49, and monthly bills range from a low of $6,315.59 for SMUD to a high of $8,599.54 for Glendale. Similar to the findings for the residential electric rates benchmarking, LADWP compares favorably against most of the peer panel companies. LADWP's monthly bill is estimated at $7,592.11, representing a $7.39 or 0.1% discount compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[25] is $7,663.66. LADWP's monthly bill represents a $71.55 or 0.9% discount relative to the Los Angeles area average.

[24] LADWP has finalized the sale of the Navajo Generating Station but is entitled to power from the plant until July 1, 2016, and is planning on divesting from IPP by 2025 according to the Department's 2014 Integrated Resource Plan.
[25] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.

Figure 6-7: Average Monthly Commercial Power Bill - Medium Usage Scenario (150 kW – 50,000 kWh/mo) – Power Peer Panel B

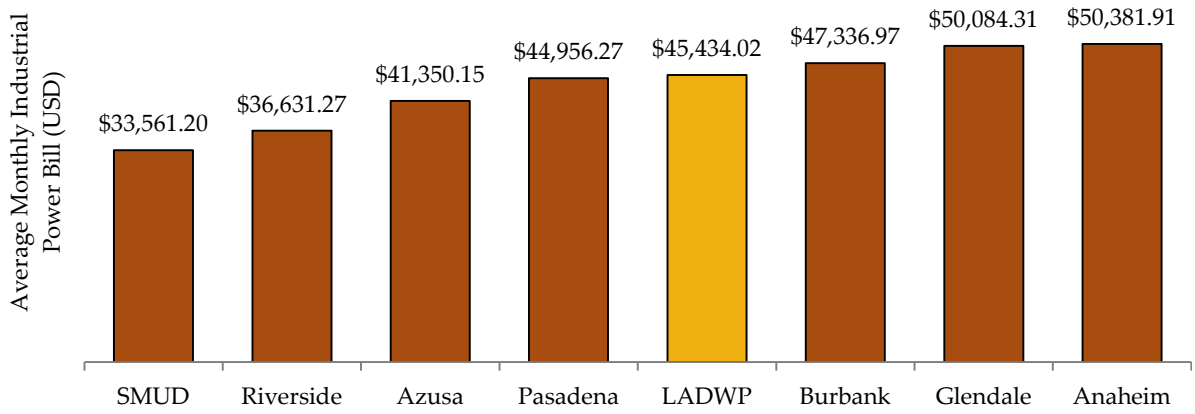


The Power Peer Panel B average monthly bill is $7,930.81, and monthly bills range from a low of $6,315.59 for SMUD to a high of $10,916.02 for SDG&E. LADWP's monthly represents a $338.70 or 4.3% discount compared to the peer panel average. However, when compared to the utilities operating in the Los Angeles area,[26] LADWP's monthly bill is slightly higher than the average of $7,574.86.

6.3 Industrial Customers

The results for the electric rates benchmarking study for industrial customers are presented in Figure 6-8. This results reflect the Medium Usage Scenario, representing a 1000 kW demand and 300,000 kWh monthly energy usage.

Figure 6-8: Average Monthly Industrial Power Bill - Medium Usage Scenario (1000 kW – 300,000 kWh/mo) – Power Peer Panel A

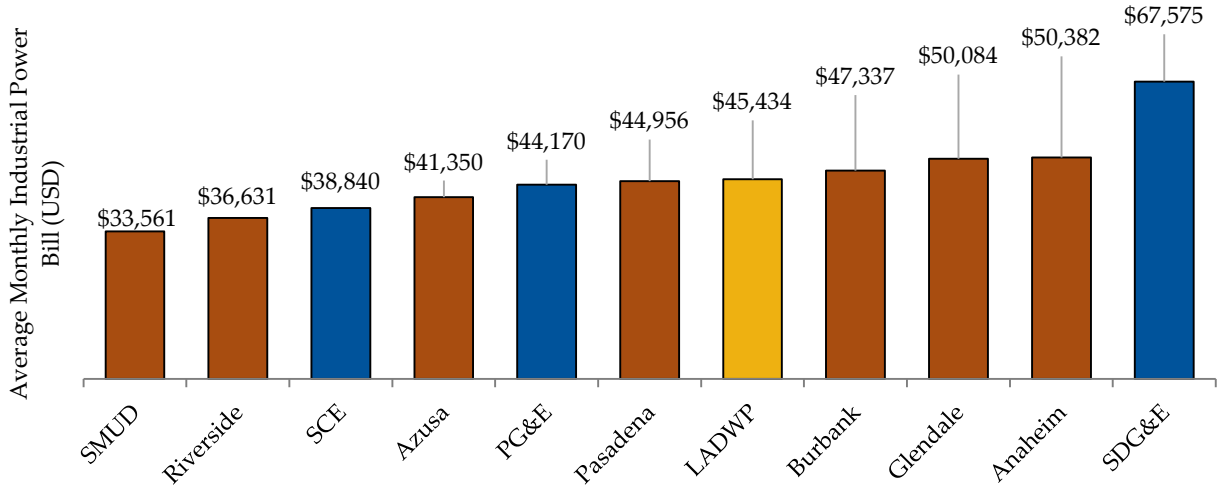


Note: SFPUC does not have an electric rate schedule for customers with an electric demand greater than 200 kW. Therefore, San Francisco was excluded from Figure 6-8.

[26] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

The peer panel average monthly bill is $43,717.01, and monthly bills range from a low of $33,561.20 for SMUD to a high of $50,381.91 for Glendale. LADWP does not compares as favorably against the peer panel companies as it does for the residential and commercial benchmarking. The Department's monthly bill is estimated at $45,434.02, representing a $1,717.01 or 3.9% increase compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[27] is $45,167.84. LADWP's monthly bill represents a $266.18 or 0.6% increase relative to the Los Angeles area average.

Figure 6-9: Average Monthly Industrial Power Bill - Medium Usage Scenario (1000 kW – 300,000 kWh/mo) – Power Peer Panel B



The average of the Power Peer Panel B monthly bill is $45,483.76, and monthly bills range from a low of $33,561.20 for SMUD to a high of $67,574.56 for SDG&E. The Department's monthly bill is on par with the peer panel, $49.74 or 0.1% below the average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[28] is $44,376.92. LADWP's monthly bill represents a $1,057.10 or 2.4% increase relative to the Los Angeles area average.

[27] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.
[28] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

7. Rate Structure Design and Water and Power Conservation

As mentioned previously, Navigant has developed multiple usage scenarios in order to capture the impact of low, medium and high use of water and power on monthly bill levels. The rationale for this analysis was to identify differences in the way the peer panel companies' rate structure incentivize water and power conservation.

Figure 7-1 and Figure 7-2 present the variance in residential monthly bills between the low and high usage scenarios for water and power, respectively. The peer panel companies are ranked from top to bottom, with utilities at the top showing the largest bill variance. The rankings highlighted in Figure 7-1 and Figure 7-2 are comparable to the residential monthly bill rankings shown in Figure 5-1 and Figure 6-1: the higher the monthly bill for the medium usage scenario is, the higher the variance between high and low usage monthly bills will be. This is primarily due to the fact that the largest bill components of the peer panel companies are volumetric, therefore any differences in volumetric rates will be magnified as the customer usage increases, resulting in a significantly larger bill for high usage customers. These observation also apply to commercial and industrial bills.

Phoenix's residential water rates are the only major exception to this finding. Phoenix does not apply a volumetric charge to the first 6 HCF used in a month. Since 6 HCF was the usage threshold used for the low usage scenario, the monthly bill only included a fixed monthly fee and a fixed environmental charge. However, beyond 6HCF a volumetric charge is applied, triggering the large variance observed in bill levels between the high and low usage scenarios.

Figure 7-1: Variance in Residential Monthly Bill Levels between Low and High Water Usage Scenarios

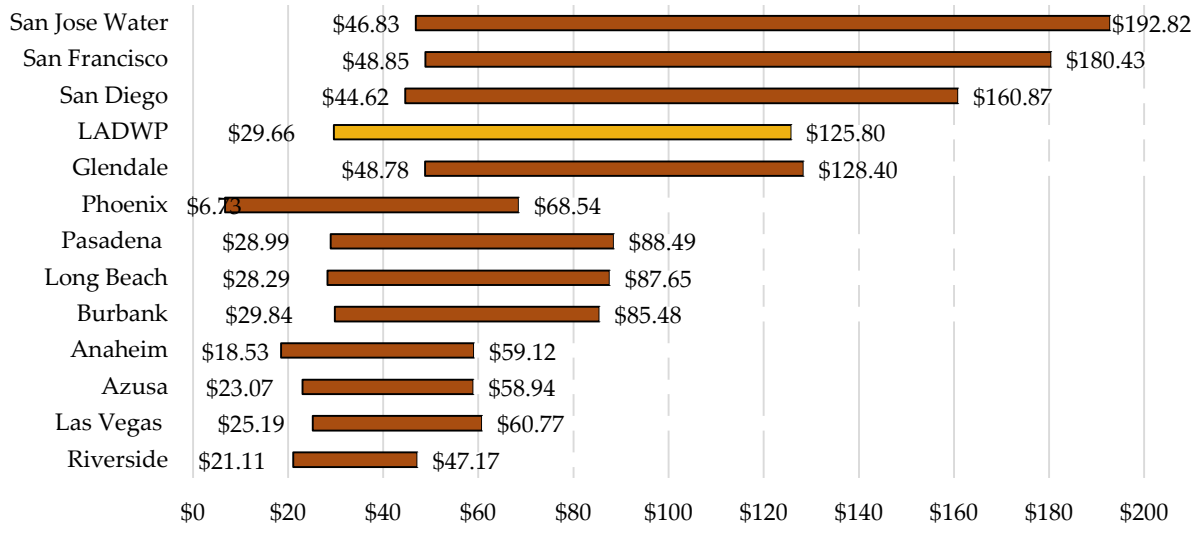
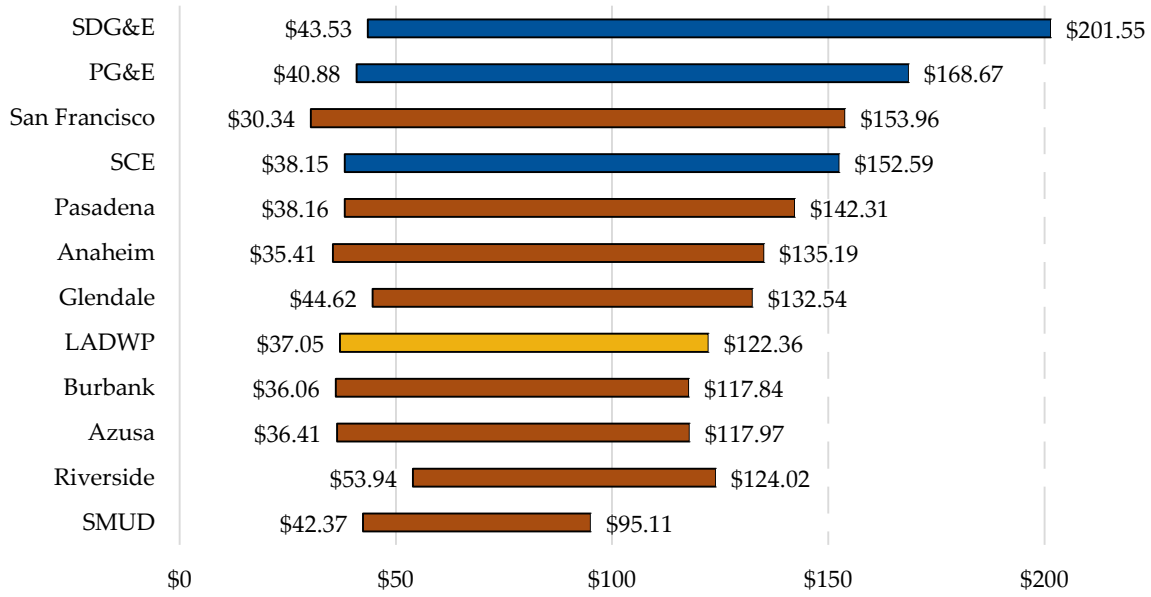


Figure 7-2: Variance in Residential Monthly Bill Levels Between Low and High Power Usage Scenarios



8. Conclusion

This benchmarking Study compared LADWP's monthly bills for power and water services, for the residential, commercial and industrial customer classes against three peer panels.

The study showed that LADWP's water rates are on the high end of the peer panel but are the lowest for residential customers among California major metropolitan providers. Drivers for LADWP's higher rates include its heavy reliance on costly MWD water purchases, greater O&M costs and capital expenditures required to maintain, repair and replace its aging infrastructure, and limited groundwater supply relative to the other peer panel companies. The Department is currently working on addressing its reliance on purchased water with a plan to cut in half their MWD water purchases by 2024 through increased conservation, recycled water, stormwater capture, and the on-going rehabilitation of the San Fernando groundwater basin.

LADWP's power rates compared positively against those of the peer panel companies. However, nearly half of the Department's generation mix is currently sourced from the Navajo and IPP coal power plants, which represent a very cost competitive source of energy. To meet environmental goals and regulations, LADWP will be replacing coal through a combination of energy efficiency, renewable energy, and natural gas within the next 10 years. This transition will come at a cost to LADWP's ratepayers, mostly because the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

The assessment of LADWP's rate structures against those of the peer panel companies highlighted that the Department uses more complex rate structures than its peers. The power and water rate structures include a large number of rate adjustment factors, which can create some challenges for LADWP's ratepayers when trying to understand how their water and power bills have been developed.

While LADWP's rate structures appear quite complex, they appropriately support the City's and Department's water and power conservation goals. LADWP uses seasonal rates for both water and power and implemented shortage year water rates that incentivize their customers to limit their water and power usage.

The Study showed that the Department's rate levels are reasonable when compared to the peer panel, especially given LADWP's unique set of challenges related to its size and the characteristics of its service area. However, it is likely that the Department's rates will increase as it seeks additional funding to address current and new challenges, including the maintenance, repair and replacement of its aging infrastructure, the transition from coal to natural gas and the development of its local water resources. In the future, the Department's rates should be examined against the challenges and regulatory requirements it faces, while ensuring that they accurately reflect the costs of providing water and power supply services to its customers. Low rates are not a desirable goal if they are inadequate to provide the level of service required to meet the policy goals of the City of Los Angeles.