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February 3, 2011

Jonathan S. Bishop
Chief Deputy Director
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

Dear Mr. Bishop:

Subject: Submittal of Los Angeles Department of Water and Power (LADWP) Grid Reliability Study as Required by the Statewide Once-Through-Cooling Policy

Enclosed please find LADWP's most recent draft Grid Reliability Study, as required per *Section 3.B. (3) - Implementation Provisions*, of the Final Once-Through-Cooling Policy/Final Statewide Water Quality Control Policy dated May 4, 2010, which became effective on October 1, 2010.

If additional information is required, please contact me at (213) 367-0436.

Sincerely,

Katherine Rubin
Manager of Wastewater Quality and Compliance

JP:db
Enclosure
c: Ms. Jennifer Pinkerton

RELIABILITY STUDY

FINAL REPORT AND STUDY RESULTS

DECEMBER 31, 2010

Prepared by:
Los Angeles Department of Water and Power
December 2010

1. Executive Summary

This Reliability Study (Study) discusses factors pertaining to the reliability of the Los Angeles Department of Water and Power's (LADWP's) power system, including the role of LADWP's in-basin power plants and individual generation units. LADWP is a vertically-integrated municipal utility which means that LADWP is responsible for the generation, transmission, and distribution of power to its 1.4 million customers and has an obligation by city charter to serve electricity to its customers. As an electric utility, LADWP must also continuously balance the key elements of competitive rates, high reliability, and environmental stewardship.

Utilities such as LADWP must predict or forecast the maximum demand for power, and ensure that there is adequate generation capacity to meet that demand, with some additional capacity that will serve as a reserve. This is known as "resource adequacy". In addition, utilities must ensure the reliability of their systems. Even in the event of disruptions, equipment failures or power outages, the utility must have a plan for providing power and keeping its system "intact." This is referred to as "grid reliability."

LADWP's projected load (demand for electricity) in 2011 is 6,262 Megawatts (MW). This is based on a 1 in 10 Peak Load: 1 in 10 peak load forecast provides 90 percent confidence that peak demand will not be exceeded in any given year.

LADWP's projected capacity (total amount of electricity that can be generated) in 2011 is 7,181 MW.

This Study incorporates the 2010 Resource Adequacy; Summer Transmission Reliability Assessment; and the Security Assessment Group (SAG) Reliability Study Procedure for 2010 – 2011. Reliability of the power system is dependent upon two elements: "resource adequacy" and "resource location". The 2010 Summer Transmission Reliability Assessment determines the minimum in-basin generation that is required for transmission reliability, with the following assumption: that all circuits initially are in service. The study's assumptions, processes, criteria, and results are discussed. The SAG specifies the assumptions, procedures, criterion, and results in order to ensure reliability of the LADWP transmission grid system.

LADWP typically dispatches generators with the most efficient heat rate to the maximum extent feasible, taking into account the reserve requirements, any regulating margin requirement, load requirements, unit ramping capabilities, unit limitations, minimum and maximum equipment operation levels, scheduled outages, forced outages, and any "reliability must run" (RMR) requirements. System reliability takes precedence at all times and unit loading will be modified as needed. The loading of units may also be modified at times in order to accommodate the output from non-dispatchable intermittent renewable resources such as wind and solar.

To ensure power system reliability and stability, it is essential that all of the generating units be available to meet peak system demands. While new units are being installed (repowering or replacement) at these generating stations, it is essential that the old units remain in an operating condition to meet system demands and to prevent the overloading of other transmission lines in the system.

Included in this Study are LADWP's Power Load Forecast and the Power Reliability Program (PRP) from its recently developed 2010 Power Integrated Resource Plan (IRP). The Power Load Forecast has been provided in this reliability report to reflect the variables that cause increases or decreases in future system loads. The PRP has been provided in this reliability report to reflect the investments that are planned to ensure reliability of the transmission, generation, and distribution systems. PRP includes a wide variety of elements including repowering old generating units, replacing transmission cables, and replacing power poles, cables, and transformers thus reducing frequency and duration of power outages.

For purposes of consistency, the format of this report replicates a similar reliability report prepared by the California Independent System Operator (CAL-ISO).

Table of Contents

Section	Page
1. Executive Summary	i
2. List of Acronyms	iv
3. Resource Adequacy	1
a. Local Resources for Reserve Requirement	2
b. Peak Demand Forecast	2
c. Actual Peak Demands for Calendar Year 2010	3
d. Resource Adequacy Projections for Calendar Year 2011	4
e. Figure 1. LADWP Resource Adequacy for Calendar Year 2011	5
4. Summer 2010 Reliability Assessment	6
a. Assumptions	6
b. Reliability Criteria	6
c. Summary of Results	6
d. Critical Contingencies	7
5. Security Assessment Group (SAG) Reliability Study Procedure	7
a. Objective	7
b. Process	7
c. LADWP Reliability Criterion	8
d. Study Report	8
e. Dispatcher Tools	8
f. Voltage Stability Studies	9
g. Dynamic Stability Studies	9
6. LADWP Power Load Forecast (2010 IRP excerpt)	9
Attachment A — Load Forecast and Resources	A - 1
7. LADWP Power Reliability Program (2010 IRP excerpt)	9
Attachment B — Power Reliability Program	B - 1

2. List of Acronyms

ADL-TOL – Adelanto-Toluca Transmission Line
CC – Combined Cycle Generating Unit
HAR – Harbor Generating Station
HAY – Haynes Generating Station
IPP – Intermountain Power Plant
IRP – Integrated Resource Plan
kV – Kilovolt
LADWP – Los Angeles Department of Water and Power
MW – Megawatt
NERC – North American Electric Reliability Corporation
NOB – Nevada Oregon Boarder
NR-TAR – Northridge -Tarzana Transmission Line
PDCI – Pacific DC Intertie
PRP – Power Reliability Program
RIN-TAR – Rinaldi -Tarzana Transmission Line
RS-E – Receiving Station E
RMR – Reliability Must Run
SAG – Security Assessment Group
SCA – Scattergood Generating Station
SCADA – Supervisory Control and Data Acquisition
VAL – Valley Generating Station
VAL-RIN – Valley - Rinaldi Transmission Line
VAL-TOL – Valley -Toluca Transmission Line
WECC - Western Electricity Coordinating Council

3. Resource Adequacy

Reliability of the electric power system is dependent upon two elements: "resource adequacy" and "resource location." Resource adequacy refers to the availability of sufficient generation and transmission resources to meet customer's projected energy needs plus reserves for contingencies. Resource location refers to the placement of generating resources to enable the system to remain stable after experiencing sudden disturbances, outages or equipment failures.

LADWP, as part of the electric power grid of the western United States and Canada (and a small section of northern Mexico), is required to meet operational, planning reserve and reliability criteria, and the resource adequacy standards of the Western Electric Coordinating Council (WECC) and the North American Electric Reliability Corporation (NERC). These standards define the system reserve margin requirements and other criteria for which LADWP must plan and operate and are defined as follows:

> *Generation Capacity Requirement = Net Power Demand + System Reserve Requirement*
> *System Reserve Requirement = Operating Reserve + Replacement Reserve*
> *Operating Reserve = Contingency Reserve + Regulation*
> *Reliability means the system shall operate within System Operating Limits (SOLs) such that instability, uncontrolled separation, or cascading outages will not occur as a result of the most severe single contingency.*

The "Net Power Demand" is the total electrical power requirement for all of LADWP's customers plus transmission system losses at any time. The other reserve requirements are defined below, as well as numerically calculated.

The loss of the largest single contingency of generation or transmission, which could be the Haynes combined cycle unit or an IPP unit, is a key reserve margin determinant for LADWP and defines the Contingency Reserve as well as the Replacement Reserve requirements. Under the current NERC Standards, at least 50 percent of the Contingency Reserves must be Spinning Reserve. The Replacement Reserve requirement is to restore Operating Reserves within 60 minutes of a contingency event. The Regulation Requirement is currently comparatively small (42.5 MW) and is related to system load variations due to customer load changes (this regulation requirement will increase in the future as additional amounts of intermittent renewable generation are added to the generation mix). Given LADWP's current total generation portfolio, the system reserve requirement is approximately 1,100 MW. Therefore, if the system demand is 5,000 MW, LADWP must have a total of 6,100 MW of stable and dispatchable generating capacity (and the transmission for that capacity) to meet the 5,000 MW demand.

It is anticipated that some renewable resources, particularly intermittent resources such as wind and solar photovoltaic, cannot be depended upon to meet peak demand conditions. As LADWP acquires a larger proportion of such resources, studies on the characteristics of these intermittent resources will need to be conducted to determine their effect on reserve and regulation requirement.

The capacity value of a generating resource is based on its ability to provide dependable and reliable capacity under all operating conditions. Resources that can provide firm capacity will have a higher value than resources that are intermittent or cannot provide firm capacity. For purposes of LADWP's reserve adequacy calculations, it was assumed that the dependable capacity of wind would be 10 percent of its nameplate capacity and the dependable capacity of solar photovoltaic would be 27 percent of its nameplate capacity.

a. Local Resources for Reserve Requirements

As a subset of the resource requirements, LADWP has located a significant amount of generating resources within the Los Angeles (LA) area. The specific amount of capacity that needs to be located in the LA Basin is approximately 3,400 MW, but varies, depending on the combination of which units are operating and how much power is flowing on the transmission system at the time. By locating these generation sources within LADWP's service territory, it ensures that LADWP can supply electricity in the event of transmission outages or other situations that could interrupt or restrict the import of power from external sources.

This local requirement is particularly important in the context of deciding which plants that use Once Through Cooling need to be replaced. Los Angeles Basin plants such as Haynes and Scattergood that qualify towards the local area capacity requirement were assumed to be re-powered at the existing site in part to maintain the local capacity requirement.

In order to meet the locational resource requirement, additional generating units are needed so that the minimum generation requirement can be provided even in the event units planned for operation are forced out of service.

b. Peak Demand Forecast

The major drivers for forecasted peak demand are temperature, load growth, and time of year. The temperature variable used in the estimation is the weighted-average of three weather stations. The temperature variable incorporates heat buildup effects and humidity. Temperature is then divided into splines using a unique megawatt-response per degree estimate for different levels of temperature. Ordinary Least Square regression techniques are used to model maximum weekday summer daily hourly demand against the temperature splines and the time of the summer. The constant that is estimated from the regression model is assumed to be the weather-insensitive demand at the peak hour. To forecast the peak demand, it is assumed that the peak will occur in August and that the peak day temperature is equal to the forty-year historical mean peak day temperature. Peak demand then is assumed to grow at the same rate as electricity sales forecasts.

The forecast process described above produces the trend (or base case) forecast which is also referred to as the 1-in-2 case. LADWP also produces alternative peak demand forecasts. LADWP wants to ensure that it can meet native demand with its own resources. System response to weather is uncertain. Temperature and humidity are the primary influences, but other variables such as cloud cover and wind speed can also influence the load. The problem is further complicated by the fact that LADWP serves three distinct climate zones including the Los Angeles Basin, the Santa Monica Bay Coast, and the San Fernando Valley. To prepare for these uncertainties, LADWP formulates its alternative cases by examining expected demands at different temperatures. Based on the Central Limit theorem, it is assumed that the normal distribution produces unbiased and efficient estimators of the true distribution of peak day temperatures. The normal distribution is estimated from the 40 year historical sample of peak day temperatures. From the normal distribution, the probability that the peak day temperature will be below a given temperature can be determined. For the 1-in-10 case, it is the given temperature where ninety percent of the time the actual peak day temperature is expected to be below it and ten percent of the time the actual temperature will be above it. Similar calculations are performed for the 1-in-5 case. These temperatures are input into the peak demand regression model to provide the alternative peak demand forecasts.

LADWP uses the 1-in-10 Case Peak Demand forecast rather than the Base Case forecast for determining resource adequacy. The 1-in-10 Case provides LADWP ninety percent confidence that the forecasted peak demand will not be exceeded in any given year. LADWP's policy regarding obligation to serve is to be self-sufficient in supplying native load and not rely on external energy markets. The Base Case Peak Demand forecast (1-in-2) falls short of this standard since it is expected that fifty percent of the time actual peak demands will exceed the Base Case Peak Demand forecast.

c. Actual Peak Demands for Calendar Year 2010

January	4011	July	5568
February	3790	August	5670
March	3636	September	6177
April	3554	October	4944
May	3851	November	4508
June	4361	December*	3811

* As of 12/26/10

d. Resource Adequacy Projections for Calendar Year 2011

Figure 1 shows a breakdown of LADWP resources to determine if sufficient capacity exists to satisfy peak load demand while maintaining sufficient reserves to meet all NERC reliability standards.

Figure 1 - LADWP RESOURCE ADEQUACY for CY 2011

Resource (Reliable Capacity)	Dec-10 MW	Jan-11 MW	Feb-11 MW	Mar-11 MW	Apr-11 MW	May-11 MW	Jun-11 MW	Jul-11 MW	Aug-11 MW	Sep-11 MW	Oct-11 MW	Nov-11 MW	Dec-11 MW
Thermal Generation	2848	1889	1631	1793	2851	3165	3162	3140	3314	3314	2878	2332	2767
Coal Generation	1568	1568	1409	863	1022	1568	1568	1568	1568	1568	1568	1568	1568
Nuclear Generation	385	385	385	385	259	259	385	385	385	385	256	256	385
Large Hydro	1275	1410	1259	1171	1191	1211	1429	1580	1580	1580	1501	1501	1536
Small Hydro	14	7	7	7	15	25	35	30	30	24	24	24	31
Renewable	285	287	287	287	287	287	287	297	297	297	297	297	297
Other	72	-28	-38	-23	47	47	47	7	7	7	-3	-3	-3
Total Resource	6447	5518	4940	4483	5672	6562	6913	7007	7181	7175	6521	5975	6581
Reserves													
Contingency Reserve	**575**	**540**	**540**	**575**	**600**	**600**	**600**	**575**	**575**	**575**	**575**	**540**	**540**
Replacement Reserve (On-System)	200	150	200	150	200	200	250	350	450	250	200	200	200
Load Forecasts (MW)													
1 in 2 Peak	3948	3864	3838	3838	4146	4469	4733	5323	5836	5325	4537	4000	3970
Long/(Short)	**1724**	**964**	**362**	**(80)**	**726**	**1293**	**1330**	**759**	**320**	**1025**	**1209**	**1235**	**1871**
1 in 5 Peak	4060	3986	4113	4008	4470	4784	4961	5548	6115	5660	4862	4163	4090
Long/(Short)	**1612**	**842**	**87**	**(250)**	**402**	**978**	**1102**	**534**	**41**	**690**	**884**	**1072**	**1751**
1 in 10 Peak	4236	4146	4118	4118	4449	4795	5079	5712	6262	5714	4868	4292	4260
Long/(Short)	**1436**	**682**	**82**	**(360)**	**423**	**967**	**984**	**370**	**(106)**	**636**	**878**	**943**	**1581**
Maximum Reliable Capacity of System*	7511	7413	7403	7418	7488	7488	7488	7458	7458	7458	7448	7448	7448

Note: Shortages of Capacity are Supplemented with Wholesale Market Purchases

* Assumes No Units Taken Out of Service for Scheduled Maintenance and includes Green Renewable Reliable Capacity and Other Sources.

4. Summer 2010 Reliability Assessment

a. Assumptions

The assumed load is a summer peak Net Power for Load of 6058 MW, without PDCI losses, and 6258 MW with PDCI losses. The assumed load is the 2010 peak load from "Receiving Station and Distributing Station Load Forecast – 2009 to 2018" dated February 25, 2010. The load distribution for the assessment is scaled up 200 MW from the July 24, 2006 all-time peak load hour to match that of the load forecast.

This study assumes Burbank and Glendale generation at 300 MW and 89 MW, respectively; also, there is 300 MW of firm energy available to DWP from the Pacific Northwest on the Pacific DC Intertie.

b. Reliability Criteria

The minimum generation required for transmission reliability during the 2010 summer peak is defined to be that generation either synchronized or available with 2 hours such that the following criteria are satisfied.

1) All circuit loadings shall be less than the circuits' continuous ratings, and all voltages shall be normal.
2) Following the worst single generation or transmission contingency, the loading on the most severely stressed transmission circuit shall be less than that circuit's 2-hour rating, and the voltage on the transmission side of all load banks shall be at or above 95% of normal voltage.
3) Assuming the worst single contingency is not restored within 2 hours, sufficient LADWP generation shall be available within 2 hours to relieve loading on all circuits to the circuits' continuous ratings, and restore voltage to 100% of normal.

c. Summary of Results:

Local generating Units required to satisfy the above criteria under the assumed conditions are as follows.
Haynes 1, 2, 5, 8, 9, 10
Scattergood 1 **or** 2, and 3
Valley 6, 7, and 8
Harbor Units 1 **or** 2, and 5
Also, Harbor Units 10 through 14 shall be available for full load within 2 hours
Castaic generation is 732 MW

The minimum basin generation required for 2-hour security is:

NOB	HAY	SCA 1&2	SCA 3	VAL	HAR 1&2	HAR 5, 10-14	TOTAL
0	797	165	293	299	Off	Off	1554
2990	622	77	271	239	Off	Off	1209

The minimum basin generation required for continuous security is:

NOB	HAY	SCA 1&2	SCA 3	VAL	HAR 1&2	HAR 5, 10-14	TOTAL
0	1050	174	445	228	162	301	2360
2990	1164	174	445	297	81	262	2423

Note: Under simultaneous conditions of high PDCI injection into Sylmar, high Castaic generation, and high Valley generation, loss of either VAL-TOL circuit will stress the remaining circuit due to the RS-E bypass. To relieve loading on the remaining VAL-TOL circuit, reduce VAL-GS generation.

To prevent post-contingency basin voltage from falling below 95% of nominal following the loss of ADL-TOL 1, maintain RS-E 230-kV voltage no lower than **231-kV**.

d. Critical Contingencies

There are critical contingencies that require special consideration under specific conditions, if the contingency is not restored within 2 hours. For example, at the assumed peak hour, if Haynes CC is not available, and if ADL-TOL 1 relays and is not restored within 2 hours, then the reliability criteria could not be met even after all remaining Haynes units and all Valley and Harbor units are dispatched at maximum.

5. Security Assessment Group (SAG) Reliability Study Procedure

a. Objective

The purpose of this document is to specify the assumptions, procedures, criterion, and results involved when the Security Assessment Group (SAG) performs Reliability Studies.

b. Process

Reliability Studies are performed off-line and consist of the following steps:

1) Obtain the latest appropriate WECC full loop power flow base case and modify it for use in near-term operational studies. At a minimum, use the latest Heavy Summer operating base case for summer studies, and the latest Heavy Winter operating case for non-summer studies. In both cases, replace the planning model of the LADWP system with the operating model as developed and maintained by SAG.

2) Determine the operational planning horizon.

3) Aggregate relevant transmission and generation outages in the LADWP and neighboring systems during the planning horizon.

4) Develop the credible worst-case load distribution, generation pattern and major AC and DC transmission path stress for the planning horizon. When performing studies on non-summer periods, evaluate both the day peak load distribution **and** the PM peak load distribution in determining the worst-case load distribution.

5) Model the above system conditions in an off-line power flow computer program. SAG uses Power Technologies' PSS/E Version 30 power flow program.

6) Run a battery of single transmission and generation contingencies on the base case that models the system conditions assumed during the planning horizon.

7) Identify the worst single generation and transmission contingencies and determine how to restore nominal system conditions should the contingency not be restored.

8) Identify the minimum LADWP local generation commitment such that the LADWP Reliability Criterion is met for any and all single generation and single transmission contingencies.

9) Report results to Load Dispatching in a meaningful and useful computer-based application.

c. LADWP Reliability Criterion

1) The planning horizon base case including all scheduled outages, all circuit loadings shall be less than the circuits' continuous ratings, and all voltages shall be nominal.

2) Following the worst single generation or transmission contingency, the loading on the most severely stressed transmission circuit shall be less than that circuit's 2-hour rating, and the voltage on the transmission side of all load banks shall be at or above 95% of nominal voltage.

3) Assuming the worst single contingency is not restored to normal, sufficient LADWP generation shall be available within 2 hours to relieve loading on all circuits to the circuits' continuous ratings, and restore voltage to 100% of nominal.

d. Study Report

SAG shall prepare a report describing the system load and significant line and equipment outages assumed in the study. The report shall specify the minimum pre-contingency unit loading required to satisfy Reliability Criterion 1 and 2 at the expected peak. Also, the report shall specify the minimum post-contingency generator unit loading provided by on-line and quick start units required to satisfy Reliability Criterion 3.

e. Dispatcher Tools

SAG shall utilize study results in preparing a dynamically updating Excel spreadsheet to real-time dispatchers. The worst contingencies and the resulting stressed circuits identified through the study process shall be listed in the spreadsheet. Post-contingency loading resulting from each contingency shall be predicted from actual line flows linked to SCADA and contingency distribution factors obtained during the study process. The predicted post-contingency flows shall be compared to the 2-hour ratings of the stressed circuits so that Load Dispatching can adjust generation if necessary to always ensure that no stressed circuit exceeds its 2-hour rating following any single contingency. SAG shall provide injection distribution factors for all local generation and the Scattergood Phase-Shifting transformer to Load Dispatching to assist in generation (or tap) adjustment.

f. Voltage Stability Studies

In performing the annual Ten-Year Transmission Assessment, LADWP Transmission Planning has conducted extensive voltage stability studies and has found that there is no risk of voltage instability within the LADWP internal system or in the Victorville-to-Los Angeles system as long as post-contingency voltage does not drop below 0.95pu This is due to the facts that LADWP loads are highly compensated, its load tap changers are able to adjust within the setting ranges, and its generating sources are closely connected to its load centers. For daily transmission reliability analysis and within normal operating boundaries, LADWP transmission Planning believes that it is unnecessary for SAG to perform voltage stabilities so long as the post-contingency voltage does not drop below 0.95pu in the power flow analysis.

g. Dynamic Stability Studies

LADWP Transmission Planning has conducted exhaustive dynamic stability studies and has found no evidence of dynamic instability within LADWP internal system or in the Victorville-to-Los Angeles system. This is due to the fact that LADWP generating sources and its load center are closely connected and angular differences are very small. For daily transmission reliability analysis and within normal operating boundaries, LADWP Transmission Planning believes that it is unnecessary for SAG to perform dynamic stability studies.

6. LADWP Power Load Forecast

Section 2.0 (Load Forecast and Resources) of the 2010 Power Integrated Resource Plan (IRP) is included as Attachment A.

> The Power Load Forecast has been provided in this reliability report to reflect the variables that cause increases or decreases in future system loads.

Please note: information in this section is subject to change.

7. LADWP Power Reliability Program

Appendix E Power Reliability Program (PRP) of the 2010 Power IRP is included as Attachment B

> The PRP has been provided in this reliability report to reflect the investments that are planned to ensure reliability of the transmission, generation, and distribution systems. PRP includes a wide variety of elements including repowering old

generating units, replacing transmission cables, and replacing power poles, cables, and transformers thus reducing frequency and duration of power outages.

Please note: information in this section is subject to change.

2.0 LOAD FORECAST AND RESOURCES

2.1 Overview

Through an IRP, utilities forecast the demand for energy and determine how that demand will be met. Meeting forecasted demand is accomplished by the planning and delivery of electric power generating ("supply-side") resources through transmission and distribution systems. Another key part of the IRP process is determining how to reduce energy needs and increase the efficiency of the utility customer's use of electricity, known as "demand-side resources."

LADWP Public Benefits Program

A program that affects all aspects of the IRP is the Public Benefits Program. In 1996, Assembly Bill 1890 restructured California's electric industry and established mechanisms to maintain the benefits of public purpose programs for energy efficiency, research and development, renewable energy and low-income services.

LADWP funds its own Public Benefits Program that concentrates on environmental conservation, community improvement and educational initiatives. Several initiatives address renewables technology, research and development, energy efficiency, and support of low income programs. The 2009-2010 annual budget for the Public Benefits Program is currently $92.8 million, collected from 2.85 percent of LADWP's retail Power Fund Revenues, plus any interest earned on those funds. LADWP's Board has voted to extend the Public Benefits Program through 2011. LADWP has not increased electric rates to fund this program.

Since the inception of the Public Benefits Program in 1998 through June 2009, the following expenditures have been made:

Program Expenditures (in millions)	
Demand Side Management, including Energy Efficiency	*$226*
Renewable	*$ 115*
Research & Development and Demonstration Projects	*$ 69*
Low Income & Lifeline, and Youth Services Academy	*$270*
Total Expenditures	***$680***

This section of the IRP addresses the following:

- Forecasting of future energy demand
- Demand-side Resources (DSR), including Energy Efficiency, Demand Response, and combined heat and power (CHP)
- Supply-side Resources
- Transmission/Distribution
- Reserve requirements

The discussions include the technical, regulatory, and economic factors that affect LADWP's planning and execution of programs and projects.

Data for this analysis came from publicly available reports from organizations like the California Energy Commission (CEC), California Public Utilities Commission (CPUC), the North American Electric Reliability Council (NERC), the Federal Energy Regulatory Commission (FERC), industry forecasts, and internal LADWP sources. Also highlighted in this IRP are additional studies that are either underway or will be performed in the near future to provide additional clarity regarding the boundaries and needs of the system.

2.1 Forecast of Future Energy Needs

For this IRP, LADWP developed a forecast of customer demand for energy over the next 20 years (the complete 2010 load forecast is included in Appendix A). Econometric models are used to forecast retail sales and peak demand. Net Energy for Load (NEL) is defined as the production necessary to serve retail sales. NEL, and its allocation across various times of the day, are functions of the retail sales and peak demand forecasts. The retail sales forecast is the sum of seven separate customer class forecasts. The classes are residential, commercial, industrial, plug-in hybrid electric vehicle (PHEV), intradepartmental, streetlight, and Owens Valley. The drivers in the retail sales models include normalized weather, population, employment, construction activity, and personal consumption. The NEL forecast is derived from the retail sales forecast by applying a normalized loss factor of 11.5 percent. Losses can vary depending on the sources of energy production. NEL load growth becomes a driver of the peak demand forecast. Peak demand is also a function of temperature, heat buildup, and time of year. The NEL forecast is allocated using the Loadfarm algorithm developed by Global Energy. The inputs into the algorithm are NEL, peak demand, minimum demand, and system load shape.

2.1.1 2010 Retail Electrical Sales and Demand Forecast

The effect of the recent recession depressed electricity sales by approximately 4 percent in 2009 and 2010. Losses in sectors such as construction, real estate, retail, and leisure are forecasted to recover as the economy expands.

The electricity consumption within LADWP's service territory is predicted to continue to decline slowly over the next two years by another 0.6 percent and start to increase slightly in 2012-2013 by 0.7 percent, which includes accumulated energy efficiency and customer solar savings. The load forecast predicts an increase of 1.6 percent in 2013-14 due to the expected completion of large mixed-use projects. The growth in annual peak demand over the next twenty years is predicted to be about 1.3 percent—approximately 100 MW per year—with less growth over the next few years due to the current recession. After 2016, some of the growth will not be realized at the meter depending on the adoption of energy efficiency and distributed generation technologies.

The April 2010 Forecast is LADWP's official Power System forecast. This forecast is used as the basis for LADWP Power System planning activities including, but not limited to, Integrated Resource Planning, Transmission and Distribution Planning, and Wholesale Marketing. The forecast is a public document that uses only publically available information.

Table 2-1 summarizes the data sources used to develop the forecast and where these data sources have been updated from previously published forecasts.

Table 2-1: Load forecast data sources

Data Sources	Updates
1. Historical Sales through March 2010 are reconciled to General Accountings Consumption and Earnings Report.	*Historical Sales, Net Energy for Load and weather data is updated through March 2010.*
2. Historical NEL, Peak Demand and Losses through March 2010 are reconciled to Energy Accounting data.	
3. Historical weather data is provided by the National Weather Service and Los Angeles Pierce College.	*Weather is updated through March 2010.*
4. Historical Los Angeles County employment data is provided by the State of California Economic Development Division using the March 2008 Benchmark.	*Employment data is updated through March 2010 using the March 2009 Benchmark.*
5. Historical population and forecasts is provided by the State of California Department of Finance.	Population data is updated through January 2009.
6. The long-term Los Angeles County economic forecast is provided by UCLA Anderson Forecast.	
7. The construction activity forecast is provided by McGraw-Hill Construction.	*Building permit data is updated through March 2010.*
8. The plug-in hybrid electric vehicle (PHEV) forecast is based on the CEC statewide PHEV forecast.	
9. The port electrification forecast is provided by the Port of Los Angeles.	
10. The housing forecast is informed by the City of Los Angeles "Housing that Works" plan.	

2.2.2 Five-year Sales Forecast

The Retail Sales Forecast through 2016 represents sales that will be realized at the meter. Available in-house is the Gross Forecast, which forecasts sales before the impacts of energy efficiency and solar rooftop program. The purpose of the Gross Forecast is to allow modeling of different energy efficiency and distributed generation scenarios.

In the forecast, energy efficiency and solar savings are expected to occur uniformly throughout the year as a simplifying assumption. Installation schedules are difficult to prepare because they rely on the customers allowing the installation to occur.

Energy efficiency and customer solar installations cause about a two percent drop in retail electricity sales. The remaining decreases in the next two years are attributed to economic conditions. Personal consumption should decrease as personal income flattens and savings and tax rates increase. Vacancy rates in the commercial sector are expected to increase short term. Manufacturing jobs are forecast to continue to decline. Retail electricity growth will lag growth in the economy somewhat. Businesses will become more efficient and begin to increase their operating margins as the economy turns. As shown in Figure 2-1, once the operating margins increase, new hiring will begin again and then retail electricity sales will begin to grow.

Table 2-2 shows projections of short-term retail sales growth.

Table 2-2: Short-term growth

Fiscal Year	Retail Sales		Additional Load if not for EE & Solar Savings
Ending June 30	**(GWH)**	**YOY Growth Rate**	**(GWH)**
2009-10	23,491	-4.2%	10
2010-11	23,493	0.0%	214
2011-12	23,586	0.4%	477
2012-13	23,814	1.0%	732
2013-14	24,093	1.2%	1,027

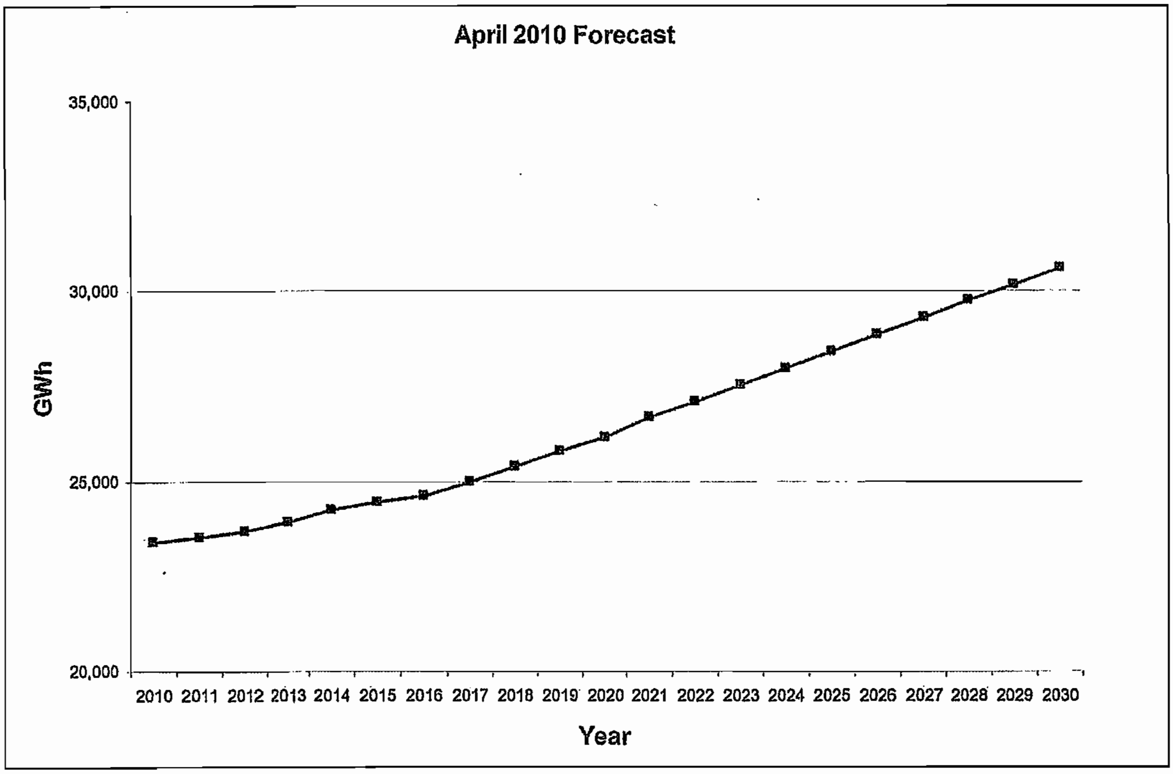


Figure 2-1: Retail sales net of energy efficiency and distributed generation

2.2.3 Electrification

A result of AB 32 will be to encourage increased electrification as a means to reduce GHG emissions. This has added a degree of uncertainty to the forecast of future electricity needs in terms of both additional resulting load and the speed of implementation of electrification programs.

In the transportation sector, fuel switching from diesel and gasoline to electric power can result in air quality improvements if the sources of electric power are clean. As indicated above, the advent of PHEVs will result in an increase in LADWP's load. Figure 2-2 shows the forecasted number of PHEVs within the LADWP service area over the next 20 years.

Other agencies in the LA air basin have initiatives underway for "electrification" to replace existing diesel fueled trucks and gasoline powered cars with electric power. In addition, planned expansions to light railway and the metro system would add additional electric load to the system.

One example of transportation sector electrification is the Clean Air Action Plan developed jointly by the Port of Los Angeles and the Port of Long Beach to reduce air pollution from their many mobile sources as well as some fixed sources. This includes trucks, locomotives, ships, harbor craft, cranes, and various types of yard equipment. One of the programs, Alternative

Marine Power (AMP), allows AMP -equipped container vessels docked in port to "plug-in" to shore-side electrical power instead of running on diesel power while at berth.

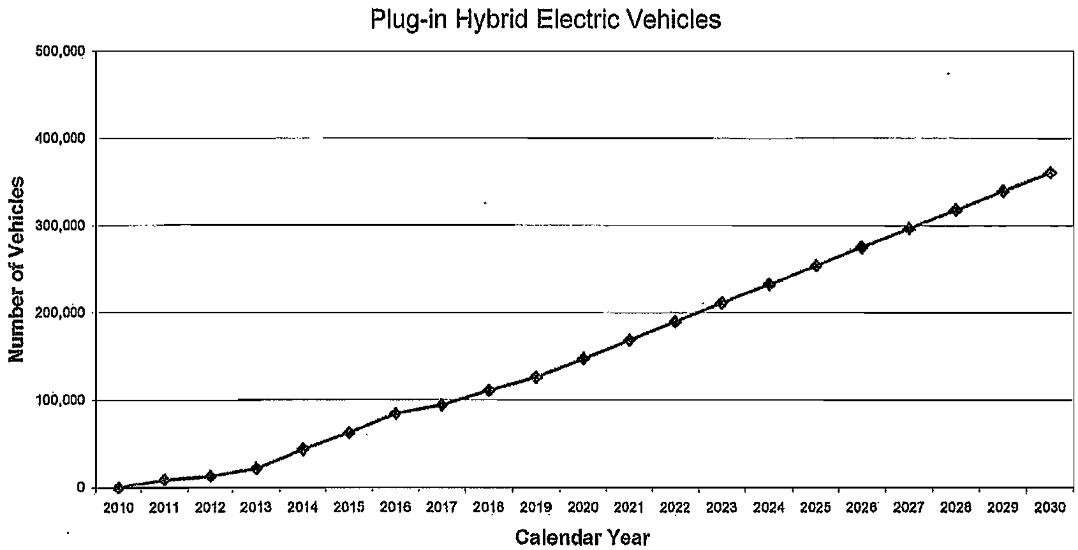


Figure 2-2: Forecasted number of plug-in hybrid electric vehicles.

2.2.4 Peak Demand Forecast

Growth in annual peak demand over the next ten years is 0.8 percent as shown in Table 2-3.

Table 2-3: Forecasted growth in annual peak demand

Fiscal Year End June 30	Base Case Peak Demand (MW)	Growth rate Base Year 2007-08	One-in-Ten Peak Demand (MW)
2009-10	5896[1]		6326
Forecast			
2014-15	6040	0.5%	6479
2019-20	6546	1.1%	6917
2029-30	7570	1.3%	8116
2039-40	8716	1.3%	9494

Note [1] – Weather-normalized. Actual peak was 5709 MW

In summer 2009, the Power System set its calendar year annual peak at 5709 MW on September 3, 2009. Figure 2-3, which presents the 1-in-10 peak demand forecast, is used for this IRP. The 1-in-10 case provides a ninety percent confidence that the forecasted peak demand will not be exceeded in any given year.

Climate change is reflected in the 1-in-10 peak forecast in two ways. First, consumers will react to the slow rise in mean temperature by purchasing more and larger air conditioning equipment. Air conditioning saturation in residential homes is lower in Los Angeles than the rest of the state. This is partially due to older housing stock in Los Angeles. Second, climate change will lead to longer, more frequent extreme weather events. Longer heat storms mean higher peak demands based on historical analysis.

Plug-in Hybrid Electrical Vehicles (PHEVs)

Large scale deployment of electric vehicles is one of the most important ways to achieve goals of energy conservation and renewable energy. It is estimated that by 2015, the United States will have one million EVs in deployment, 10% of which is expected to be in California. The introduction of electric vehicles in Southern California brings a challenging set of planning, regulatory and cost issues. Because EVs require a unique infrastructure, including specialized charging equipment and adequate electric service, it is essential to anticipate and predict the grid impact in Southern California from the EV deployment.

Regulated utilities in California are now responding to regulatory direction to submit plans for large-scale EV initiative with full delineation of costs and benefits. This regulatory initiative is an aggressive step, seeking to promote accelerated adoption of EVs. The EV deployments and the associated utility customer features are proceeding throughout the State of California. Energy needed for PHEVs will come partially from the utility electric grid. It is expected that the "fuel shift" from traditional transportation fuels will affect customers' demand for electricity from the electric grid.

LADWP will use a recent $62 million stimulus grant award from DOE to demonstrate the integration of electric vehicles into the LADWP-managed electric system. The demonstration will use internal fleet equipment and will include electric vehicle fleets from both UCLA and USC. These complementary fleets provide the opportunity to test EVs in both the controlled environment of a corporate fleet and the "real world" usage of individuals. These opportunities will test the integration of EVs into the grid, along with acquisition of EV communications to the grid management system.

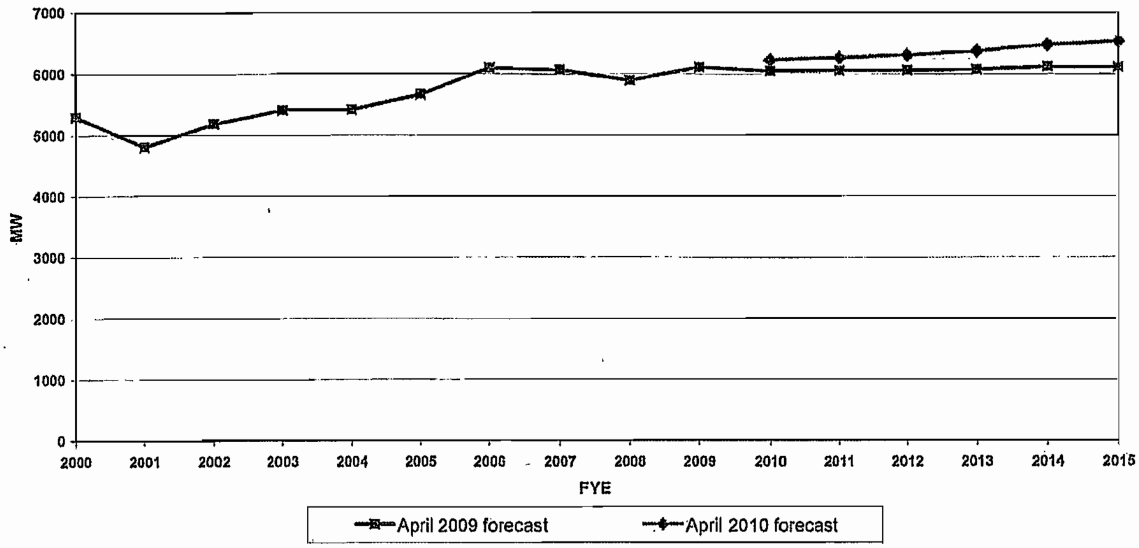


Figure 2-3: One-in-ten peak demand comparisons

Appendix E Power Reliability Program

E.1 Overview

This Appendix describes LADWP's existing power reliability programs, which has provided high quality service to customers for more than 90 years. Recommendations are then presented for programs and actions to ensure high reliability in the future. Finally, statistical information is provided on the progress of the Power Reliability Program (PRP).

E.2 Historic Reliability of LADWP System

Reliable electric power has been a cornerstone objective of LADWP since it began offering municipal electricity in 1917. Historically, LADWP's Power System reliability has consistently placed in the top quartile of the electric utility industry, and it is LADWP's goal to continue this into the foreseeable future. However, as a result of aging electrical distribution infrastructure, there are significant challenges for LADWP to continue to maintain these reliability goals.

The City of Los Angeles (City) was founded in 1781 and incorporated in 1850. Since then, Los Angeles has grown to the Nation's second largest City with a population of almost 4 million residents. Historically, most of this growth occurred between 1920 when there were roughly 580,000 residents and 1970 when the City had grown to over 2.8 million residents. This incredible growth of 2.2 million residents (roughly 56 percent of today's population) coincided with the mass electrification of homes and businesses throughout the Country and specifically the City. During this time, LADWP installed tremendous amounts of electrical infrastructure to ensure that these growing numbers of new homes and businesses were supplied with reliable electric service. Figure E-1 shows the number of electrical distribution poles that were historically installed and demonstrates that the installation of these poles (and the related electrical distribution infrastructure) was directly related to the population growth.

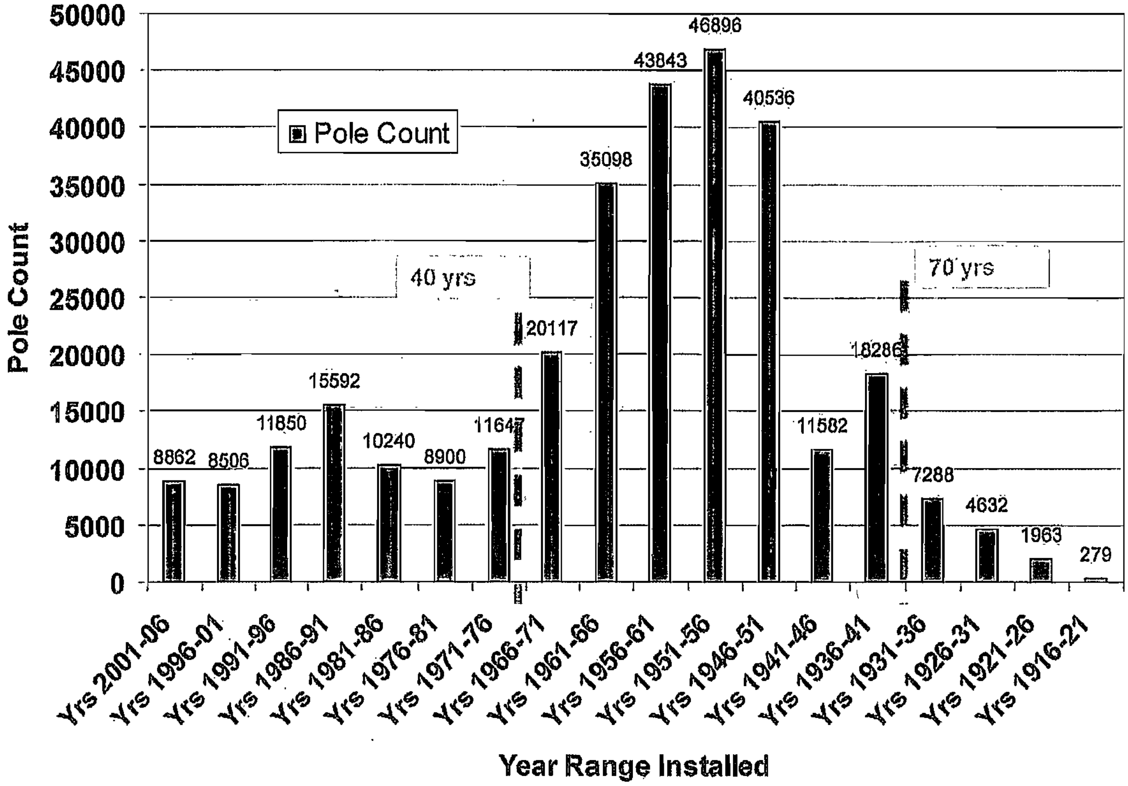


Figure E-1: Pole Count by Year Range Installed

As a testimony to the initial design and installation of this electrical infrastructure, it has reliably served the residents of the City over the last 40 to 70 years. However, data now shows that reliability is beginning to deteriorate. In the past few years, outage rates have increased, including several high profile outages, demonstrating that this equipment is at the end of its service life. As more of the infrastructure ages and there is related performance deterioration, it will create a significant backlog of deferred maintenance and require increased levels of reliability-enhancing capital work. Existing staffing and funding levels will not be sufficient to replace the infrastructure that is needed to maintain the reliability that LADWP customers have come to expect.

E.3 Recommendations to Improve System Reliability

System reliability can be measured in terms of the key SAIDI and SAIFI performance indicators, defined below:

- SAIFI – System Average Interruption Frequency Index -Total number of sustained customer interruptions divided by the total number of customers, expressed in interruptions per customer per year.
- SAIDI – System Average Interruption Duration Index -Total minutes of sustained customer interruption divided by the total number of customers, expressed in minutes per customer per year.

Power System staff and independent industry experts have reviewed the overall system and have developed the following set of initial recommendations to improve reliability. These are summarized in the following subsections.

E.3.1 Operations and Maintenance (O&M) Programs

- Abnormal Circuits and Open Circuits: Abnormal Circuits and Open Circuits are cables that have been temporarily repaired and not in an as designed condition. These temporary repairs were made in the interest of restoring service in a timely manner rather than making permanent repairs, which were planned later. However, because temporary repairs are increasing, more staff is needed to make permanent repairs. Expanding Distribution Construction and Maintenance (DC&M) crews and proceeding with the Cable Replacement program will facilitate timely permanent restoration.
- Station Equipment Maintenance: The current maintenance practice is generally reactive to failures, not proactive and/or preventative. There is a large backlog of maintenance jobs. Maintenance practices should be modified, increasing maintenance frequency and adjusting staffing as appropriate.
- Overhead Transmission Maintenance: There is substantial deferred maintenance and a large volume of new capital work. Maintenance frequency should be increased and staffing adjusted as required.

Figure E-2 shows the SAIDI per Calendar year, both achieved to date and projected, and the impact of the ongoing PRP to reduce the SAIDI to the long term goal of 60 minutes by 2015.

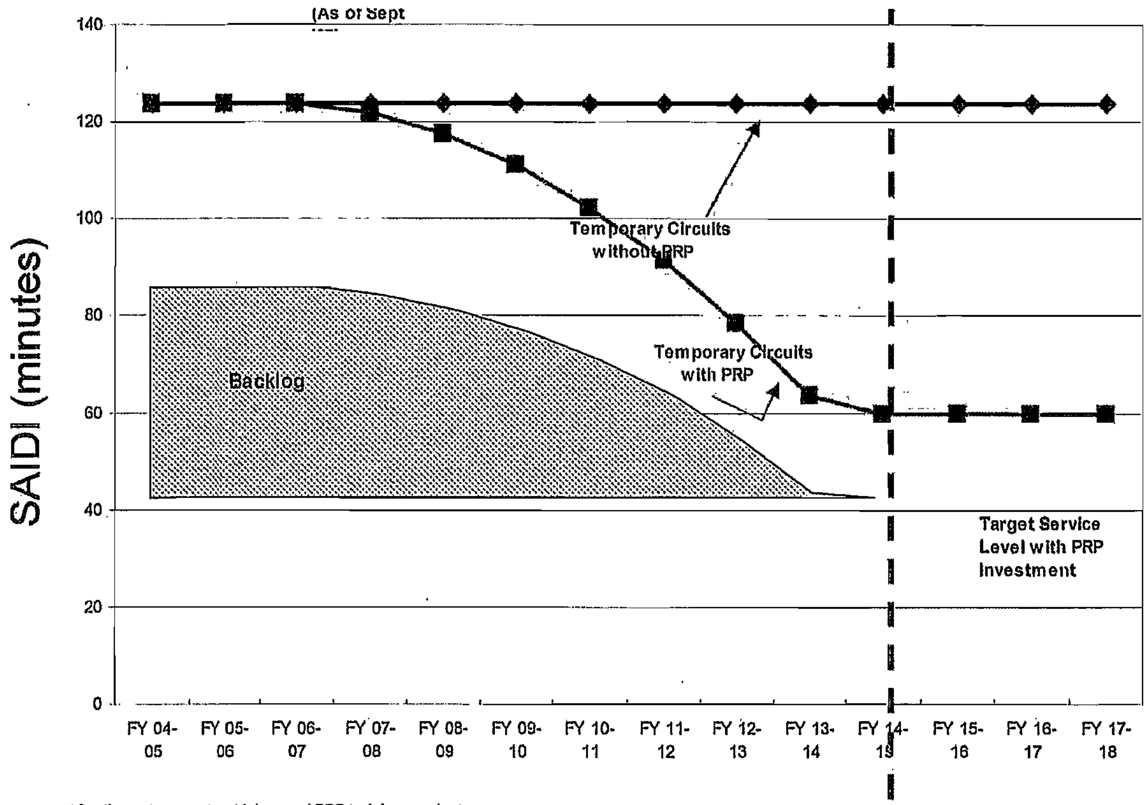


Figure E-2: Temporary Circuit restoration and Worst Performing Circuits and Stations

E.3.2 Capital Projects:

- Pole Replacement: The number of poles replaced annually should be increased with the goal of achieving an overall replacement cycle of 60 years.
- Cable Replacement: The amount of underground cable replacements should be increased from 40 miles per year to 60 miles, representing a 75-year replacement cycle. LADWP's Underground Transmission section is also planning to replace one 138-kV underground line per year.
- Distribution Transformers: A transformer management program is required to closely monitor transformer loading. Priority based transformer replacements take into account various factors such as loading, number of customers, age, and neighborhood conditions.
- Load Growth: Construction of new lines and stations to support load growth is a very important infrastructure improvement. Construction resources should be increased to support the timely installation of new facilities. Limited engineering staffing is restricting sufficient numbers of work packages for load growth, maintenance, and construction jobs. A 58,000 labor-hour backlog exists for various records, and approximately 60,000 as-built drawings from the Integrated Resource Plan require processing.

- Deteriorated Vaults & Obsolete Equipment: Over 900 substructures require repair. Much of this work is deferred due to lack of resources. Various obsolete equipment has been identified as needing replacement. Necessary resources and funding should be provided.
- Station Transformers: There are 846 main transformer banks in Distribution, Receiving and Switching stations, some over 60 years old. We are currently changing 2 transformer banks per year. Increased funding is recommended to replace this aging equipment.
- Reliability Engineering Work Group: LADWP should establish this group and develop work processes for structured analysis of failure rates, outage rates, and testing data as input to prioritize the maintenance basis and capital jobs for transmission and delivery (T&D) reliability.
- Generation Reliability Engineering: Staffing should be increased in select generation engineering groups to improve analysis and evaluation of generation unit performance and other reliability related programs and projects.

E.3.3 Distribution Infrastructure Undergrounding Program

- In addition to aesthetic considerations, undergrounding overhead lines has a reliability benefit of reducing the frequency of outages to almost half that of overhead. Undergrounding of 8-miles per year is proposed. This program will require Council approval.

E.3.4 Funding and Resources

The recommendations above are based on the initial observations of the Power System staff and industry experts. As these programs are implemented, prioritizations and/or resources will be directed to the programs that will result in the maximum amount of increased reliability. LADWP's equipment was installed with significant resources over a long period of time; the program to replace the infrastructure will also require a long-term commitment.

In order to ensure that this program is implemented with the maximum impact on reliability and in the most efficient manner possible, LADWP has established a Power Reliability Oversight Committee. This committee conducts quarterly reviews of all facets of the reliability program and makes changes as needed to improve its effectiveness. This includes a review of percent completion of milestones, cost metrics, and impacts that the program is having on reliability metrics.

E.4 Current Power Reliability Program

As discussed in Section E.1, the PRP provides a blueprint for ensuring continued reliable energy service for future generations of Los Angeles residents. LADWP implemented the PRP through a two-pronged approach—rebuilding infrastructure and providing proactive maintenance—and will invest more than $1 billion in the program over the next 5 to 15 years. The program is funded through a power reliability surcharge. Figure E-3 shows the historic and future planned PRP expenditures.

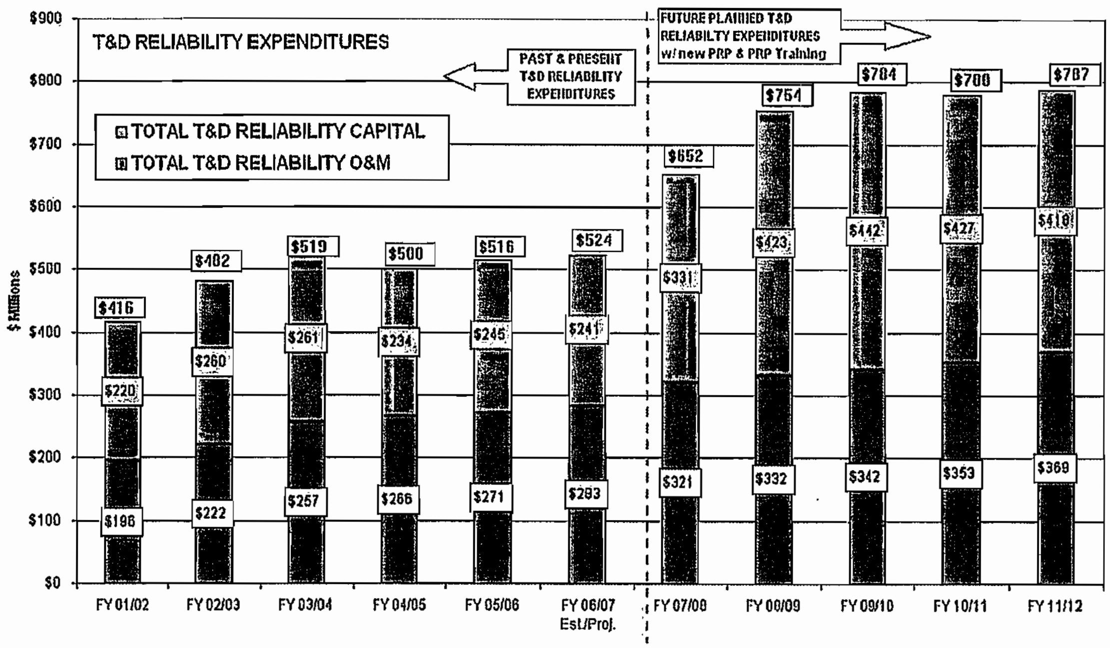


Figure E-3: PRP Expenditures

The goals of the program include: 1) mitigating problem circuits and stations based on the types of outages specific to the facility, 2) implementing proactive maintenance and capital improvements that take into account system load growth and the inspections and routine maintenance that must take place to identify problems before they occur, and 3) establishing replacement cycles for facilities that are in alignment with the equipment's life cycle

***The tables and* figures** below detail the progress of the Power Reliability Program. Table E-1 and Table E-2 present the reliability achieved in terms of the SAIDI and SAIFI performance indicators.

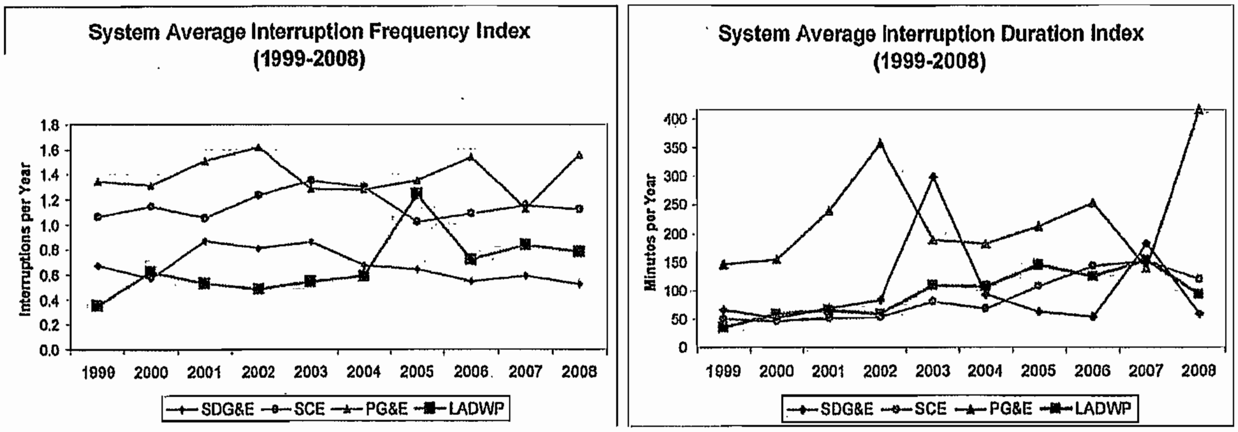


Figure E-4: LADWP PRP Reliability Comparisons with Cal Investor Owned Utilities (IOUs)

Table E-1: LADWP SAIDI/SAIFI Indicators

Key Performance Indicators	Units	2007	2008	2009
SAIFI	Outages / Year	0.84	0.78	0.73
SAIDI	Minutes / Year	152.3	93.1	81.2

Investor Owned Utility data from CPUC

Table E-2: Utility Comparison (2008)

Key Performance Indicators	Units	LADWP	SCE	PG&E	SDG&E
SAIFI	Outages / Year	0.78	1.12	1.56	0.52
SAIDI	Minutes / Year	93.1	119.2	416.8	59.1

Table E-3 summarizes the PRP activity as of December 1, 2009 while Figures E-4 to E-9 present actual progress compared to PRP target for key elements of LADWP's PRP program..

Table E-3: LADWP PRP Activity Updates as of December 01, 2009

Key Performance Indicators	Units	07-08 Final	Current Count FY 08-09	June 30, 2009 08-09 Target
System Average Interruption Frequency Index (SAIFI)	Outages / year	0.79	0.69	0.72
System Average Interruption Frequency Index (SAIDI	Minutes out / year	122	78.1	125.3
	System Total			
Abnormal & temporary 4.8KV Circuit backlog Total	1630 Circuits	152	129	118
Priority A Circuits carrying extra load due to failed components	-		43	-
Priority B Circuits that have failed components	-		40	-
Priority C Circuits carrying extra load due to field work	-	-	45	-
New Priority is being determined	-		1	-
Poles Replaced & Reinforced	303,000 Poles	2395	2745	2975
Distribution Transformers Installed	126,000 Transformers	2981	3014	2400
Underground Transmission Cables replaced	Cables	1	In Design	I Cable
Length of underground cables replaced	Miles	49.47	46.15	40
Preventive Maintenance-Receiving, Distribution, Customer Stations		20%	25.7%	20%
Power System Staffing, Hiring, Training-as Of 11/29/2009	Program Duration	Classes in Session	Current Trainees	08-09 Goal (Avg)
Electrical Distribution Mechanical Trainee	45 Months	9	102	98
Electrical Mechanical Trainee	36 Months	5	81	50
Steam Plant Assistant	24-48 Months	5	56	31
Electrical Station Operator	24 Months	4	55	48

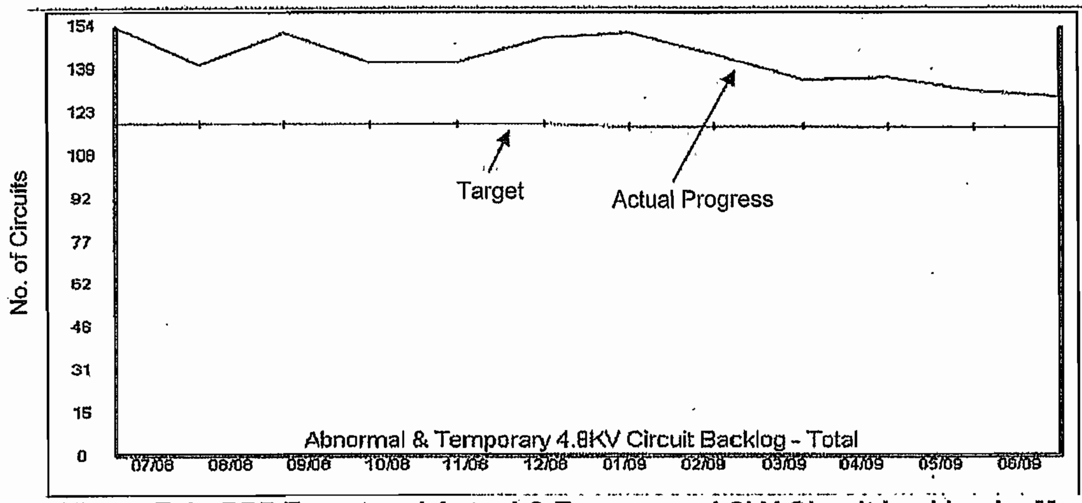


Figure E-4: PRP Target and Actual & Temporary 4.8kV Circuit backlog by Month

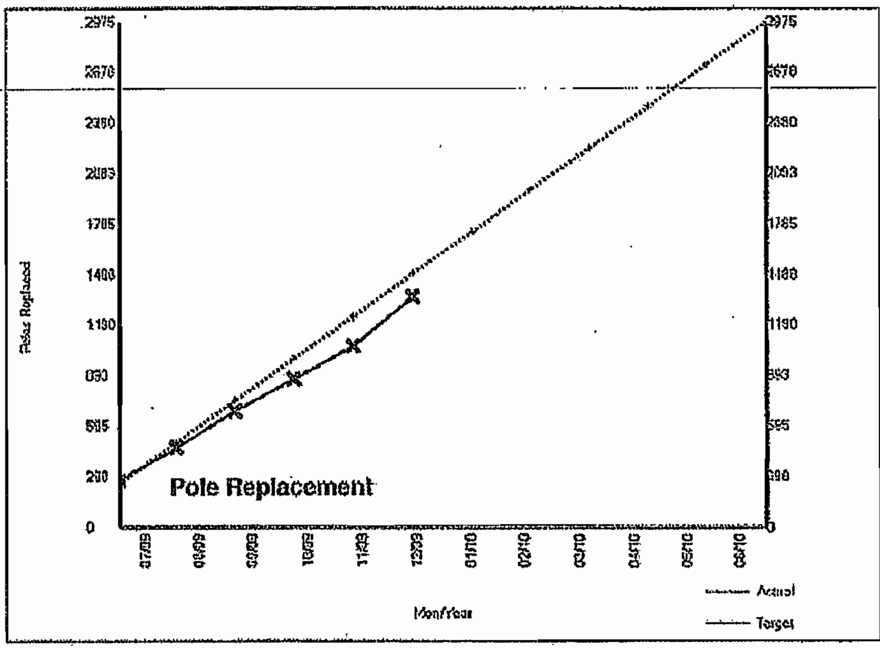
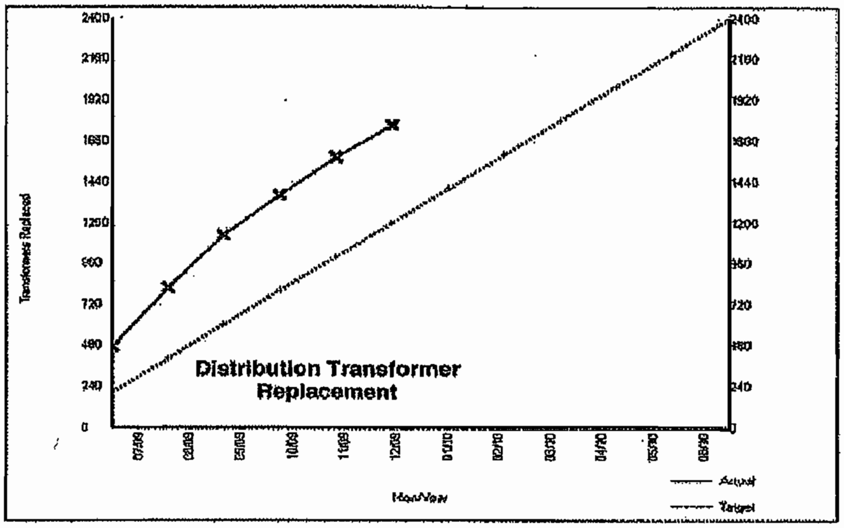


Figure E-5: PRP Target and Actual Pole Replacement by Month

Figure E-6: PRP Target and Actual Distribution Transformer Replacement by Month



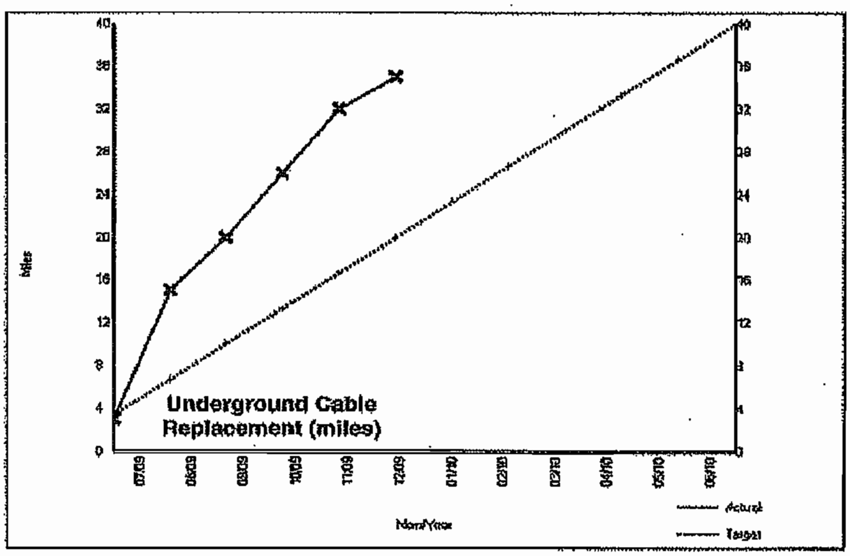


Figure E-7: PRP Target and Actual Underground Replacement by Month

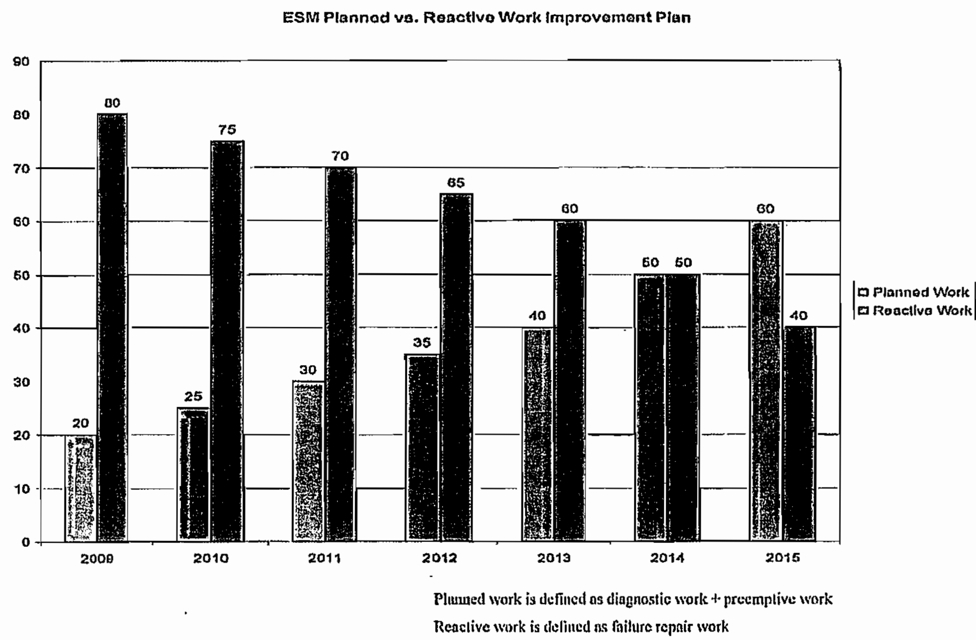


Figure E-8: Circuit Load Growth and Substation Maintenance

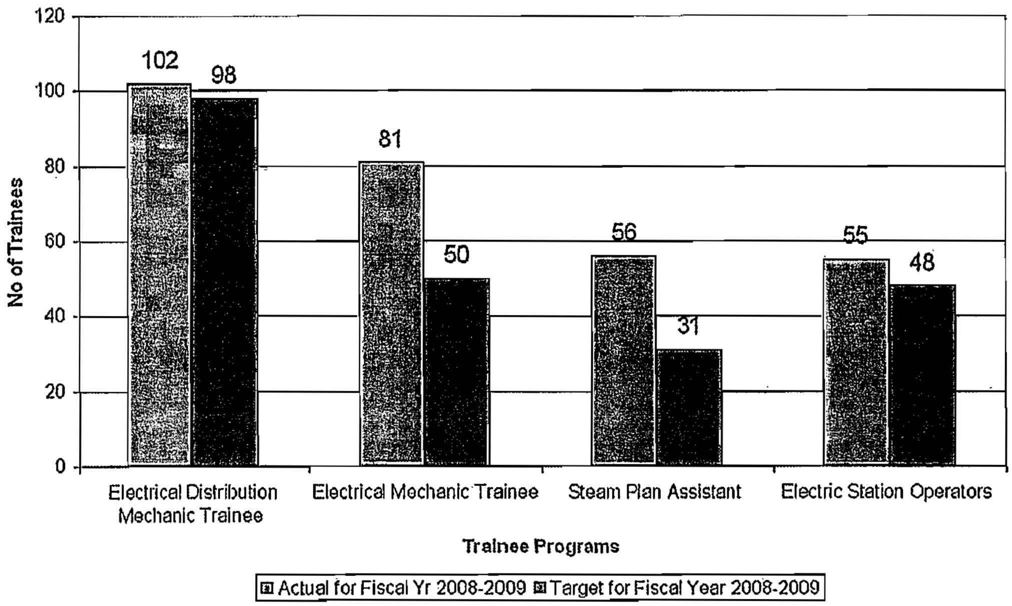


Figure E-9: Power System Trainee Program