

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.

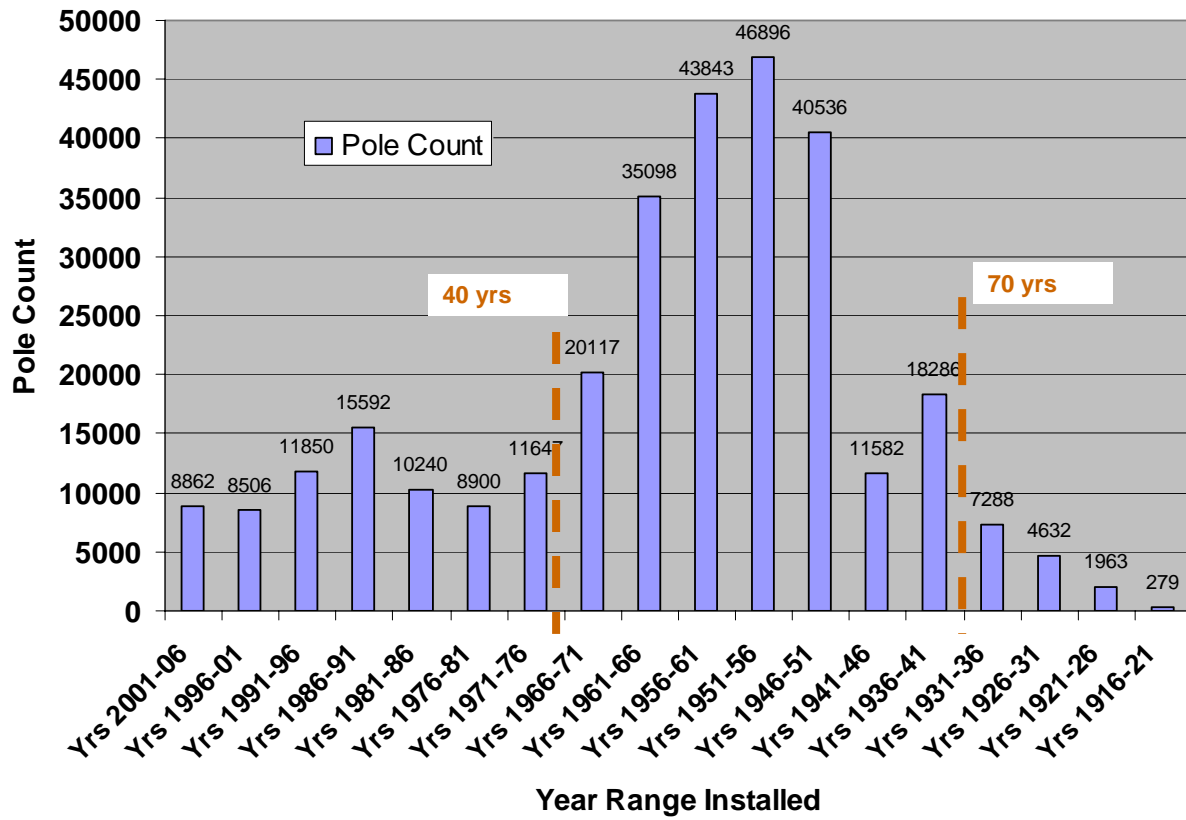


Figure E-1: Pole Count by Year Range Installed

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.

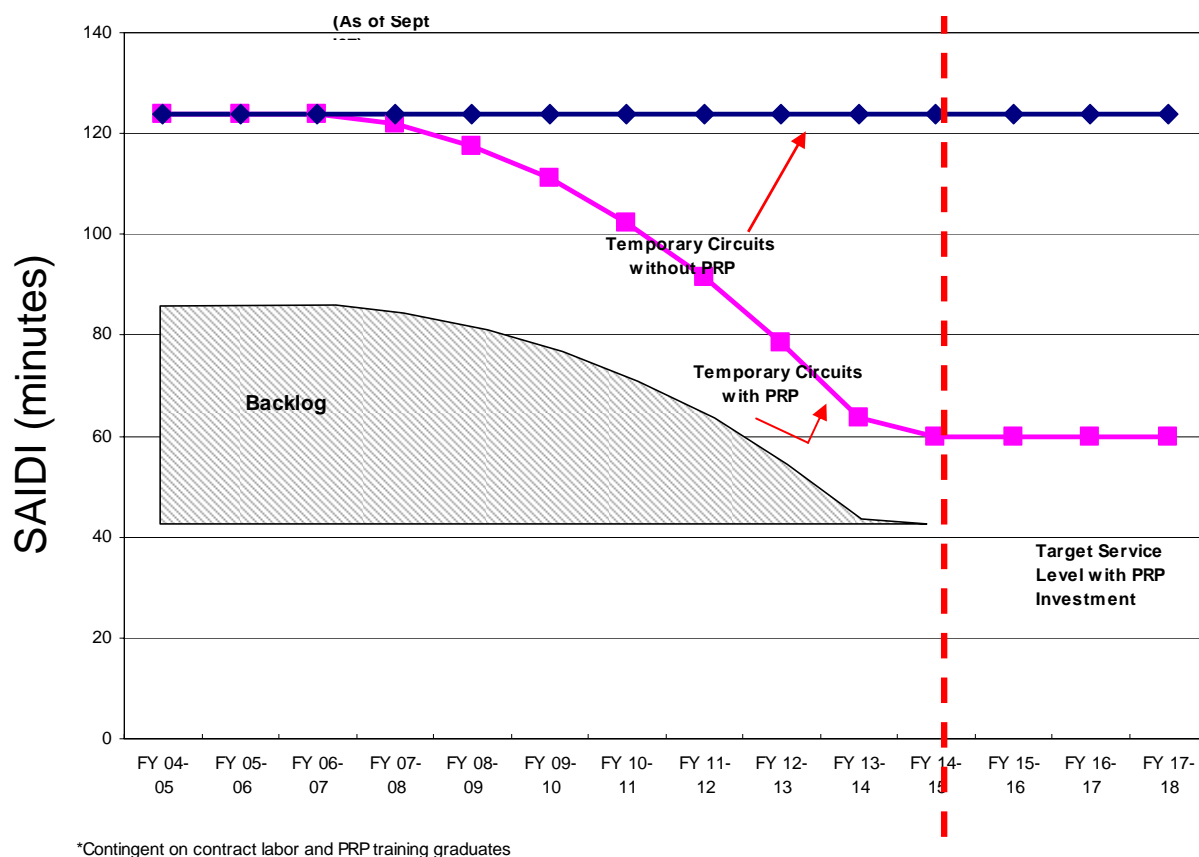


Figure E-2: Temporary Circuit restoration and Worst Performing Circuits and Stations

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.

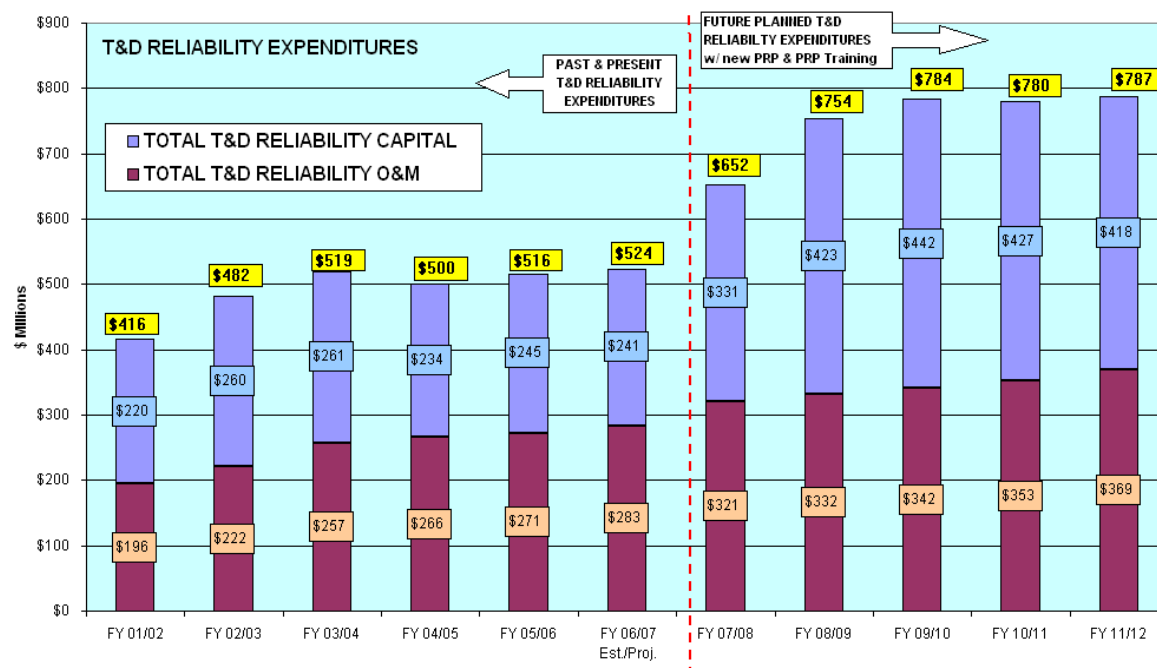


Figure E-3: PRP Expenditures

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.

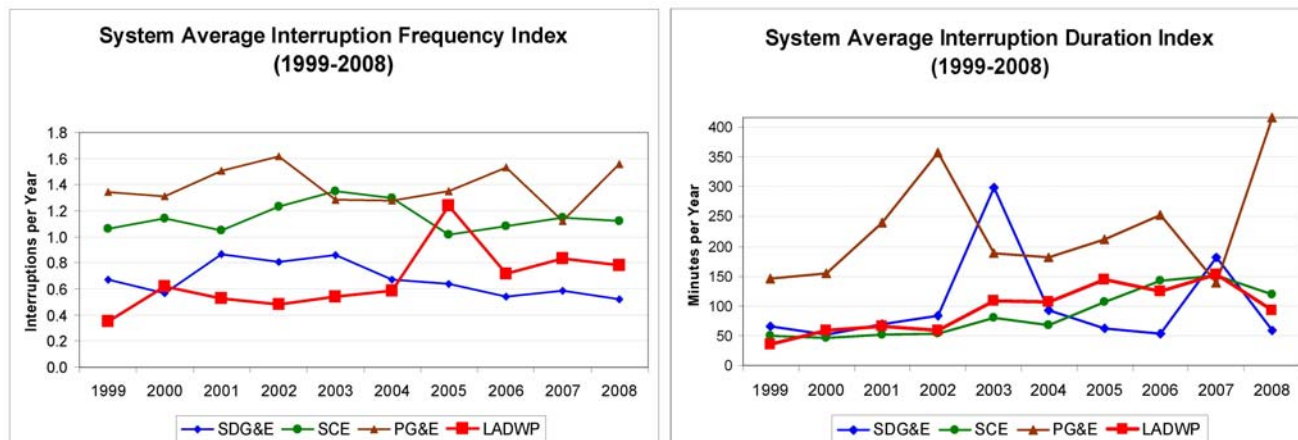


Figure E-4: LADWP PRP Reliability Comparisons with Cal Investor Owned Utilities (IOUs)

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	1 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

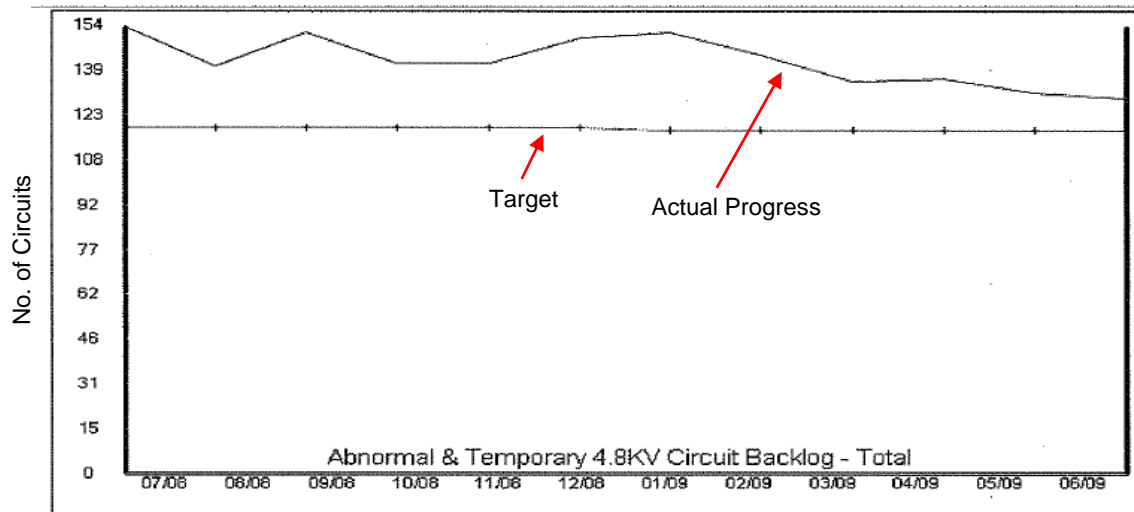


Figure E-4: PRP Target and Actual & Temporary 4.8kV Circuit backlog by Month

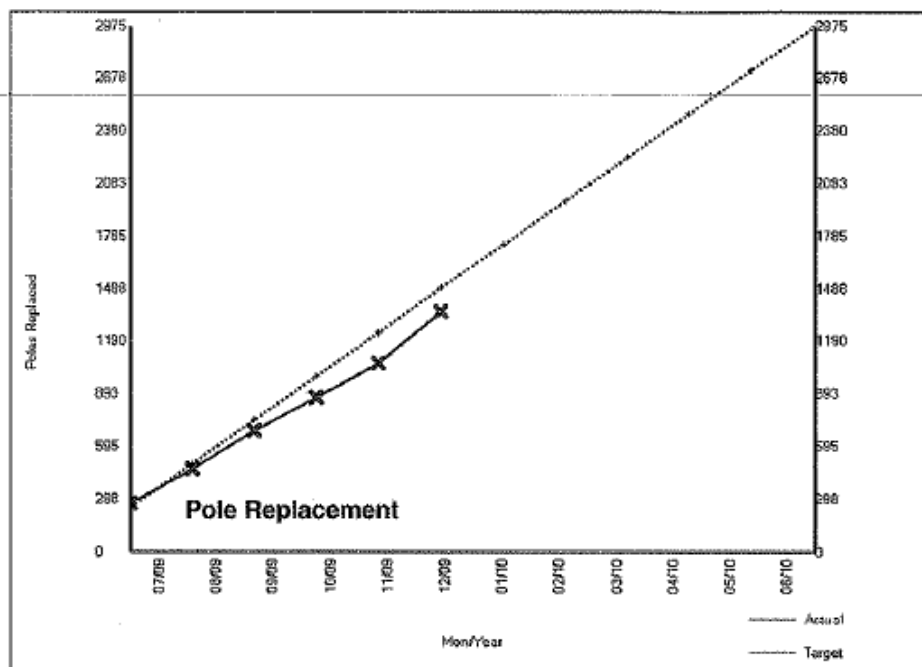


Figure E-5: PRP Target and Actual Pole Replacement by Month

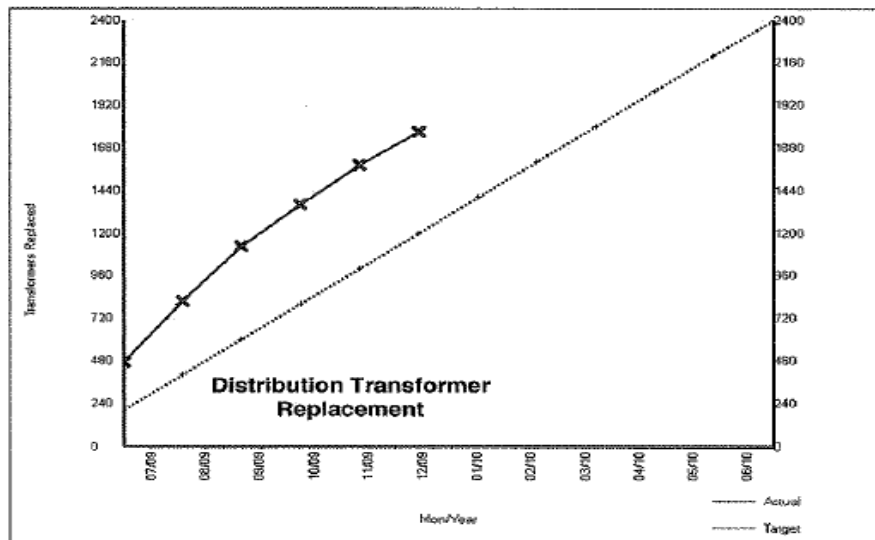


Figure E-6: PRP Target and Actual Distribution Transformer Replacement by Month

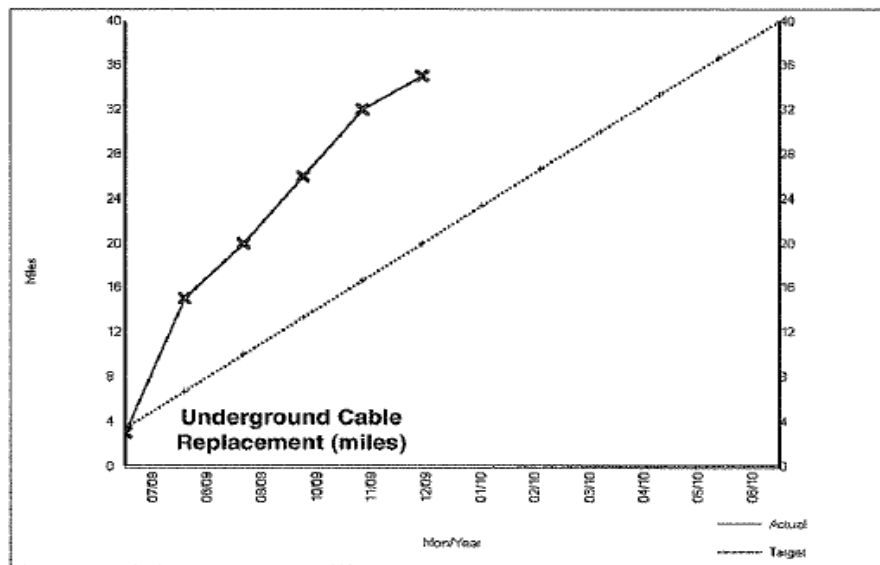


Figure E-7: PRP Target and Actual Underground Replacement by Month

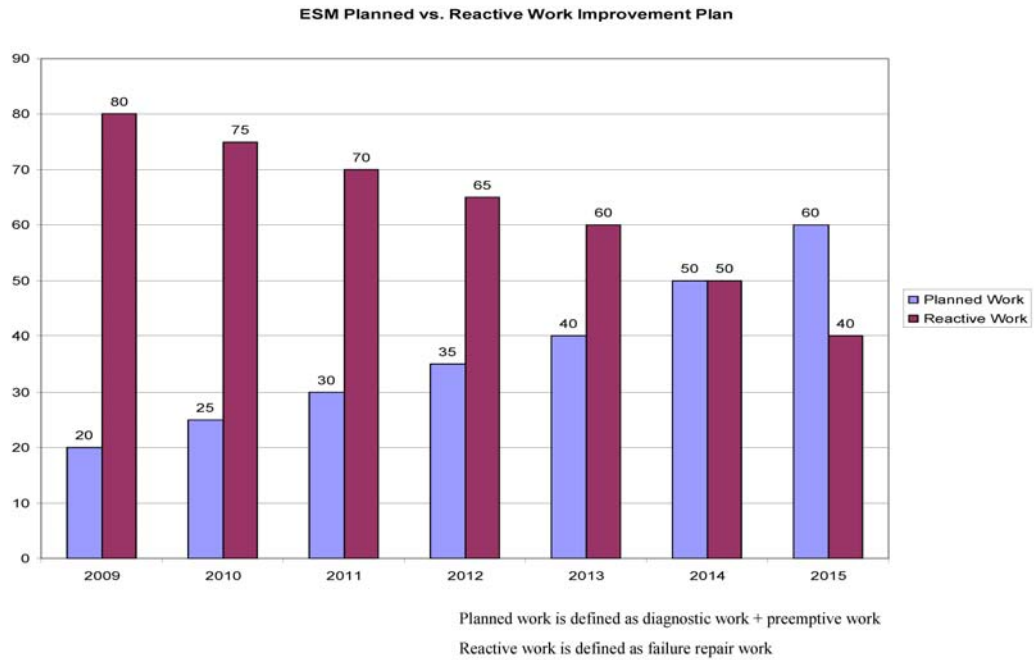


Figure E-8: Circuit Load Growth and Substation Maintenance

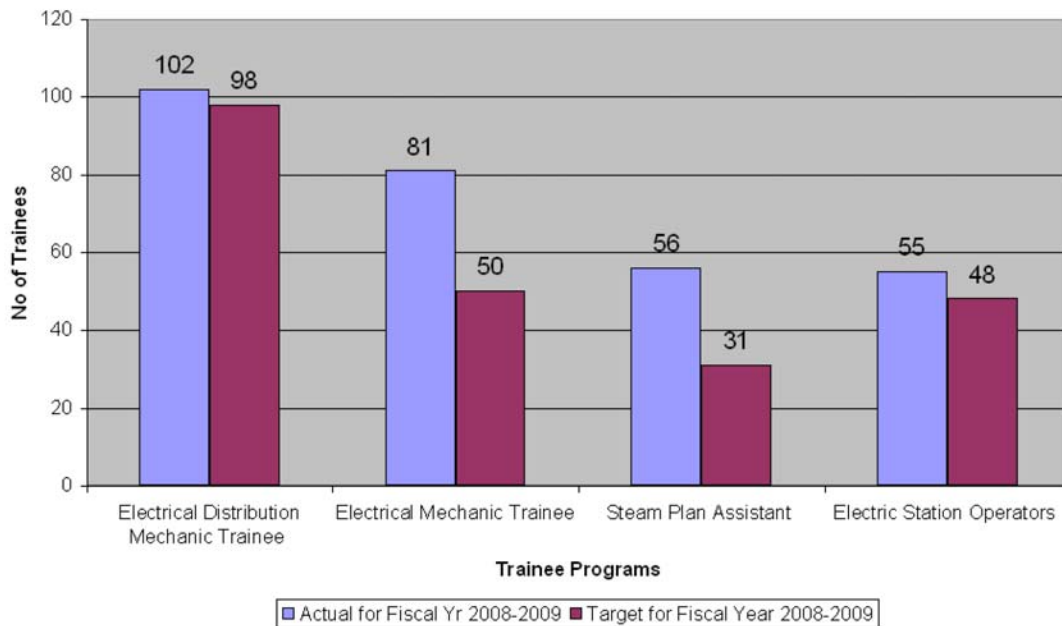


Figure E-9: Power System Trainee Program

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