Company: San Diego Gas & Electric Company (U902M)
Proceeding: 2016 General Rate Case
Application: A.14-11-___
Exhibit: SDG&E-10

SDG&E

DIRECT TESTIMONY OF JONATHAN T. WOLDEMARIAM

ELECTRIC DISTRIBUTION OPERATIONS AND MAINTENANCE

November 2014

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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SUMMARY

O&M	2013 ($000)	2016 ($000)	Change
Non-Shared	$107,482	$141,598	$34,116
Total Non-Shared	$107,482	$141,598	$34,116

Summary of Request

SDG&E is requesting the Commission adopt its Test Year 2016 (TY2016) forecast of $141,598,000 for Electric Distribution Operations and Maintenance. SDG&E is also requesting the Commission adopt its forecast for O&M expenditures in 2014 and 2015 of $126,327,000 and $131,009,000 respectively. The expenses described in my testimony are intended to maintain the delivery of safe and reliable service to our customers. SDG&E prioritizes its work to comply with applicable laws and regulations and to provide system integrity and reliability in accordance with our commitment to safety. SDG&E's longstanding commitment to safety focuses on three primary areas – public safety, customer safety and employee safety. This safety-first culture is embedded in the manner in which we carry out our work and build our systems – from initial employee training to the installation, operation and maintenance of our utility infrastructure, and to our commitment to provide safe and reliable service to our customers.

My testimony addresses the forecasted costs associated with operating the SDG&E electric distribution system in order to provide safe and reliable service to our customers. The O&M electric distribution costs are broken down into 26 primary cost categories, four of which comprise the majority (71%) of the overall forecast. The four major categories are Distribution Operations (11%), Electric Regional Operations (27%), Vegetation Management (20%), and Construction Services (13%). Each specific work category is described in greater detail in my testimony.

In preparing its projections for TY2016 requirements, SDG&E analyzed historical 2009 to 2013 spending levels, considered underlying cost drivers and developed an assessment of future requirements. Forecast methodologies were selected based on future expectations for the underlying cost drivers, and include:

- Forecasts based on historical averages;
- Forecasts based on the base year (2013) adjusted recorded spending; and

- Forecasts based on zero-based cost estimates for specific projects.

In addition, my testimony identifies work requirements incremental to levels of historical spending and necessary to maintain the safe and reliable operations of the distribution system. Funding requirements for these new or more extensive work elements are forecasted based on historical spending plus incremental expense requirements for new or more extensive work elements.

SDG&E DIRECT TESTIMONY OF JONATHAN T. WOLDEMARIAM
ELECTRIC DISTRIBUTION O&M

I. INTRODUCTION

A. Summary of Costs

My testimony demonstrates that San Diego Gas & Electric Company's (SDG&E's) forecasts of expenses required to operate and maintain its electric distribution system are reasonable and should be adopted by the California Public Utilities Commission. This forecast supports SDG&E's fundamental philosophy to achieve operational excellence while providing safe, reliable delivery of electric energy at the lowest reasonable cost to the ratepayer while meeting all regulatory requirements and customer expectations. SDG&E requests the Commission adopt its TY 2016 forecast of $141,598,000 for Electric Distribution Operations and Maintenance (O&M) expenses, set forth in this chapter. For matters related to SDG&E's Electric Distribution capital requests, please see the testimony of Mr. John Jenkins, Exhibit SDG&E-09.

A summary of Electric Distribution O&M expenditures is shown below in Table 1.

TABLE 1

Test Year 2016 Summary of Total Costs

Dollars in Thousands

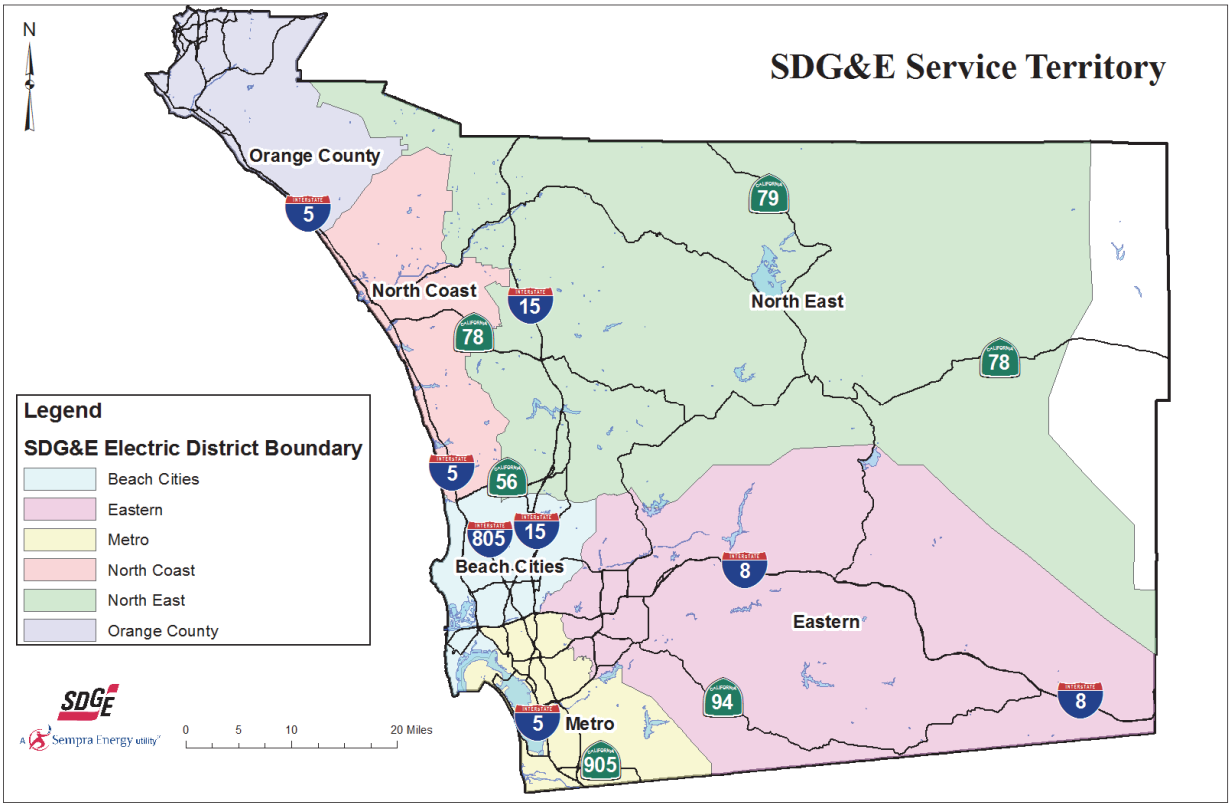
Functional Area: ELECTRIC DISTRIBUTION			
Description	2013 Adjusted-Recorded	TY2016 Estimated	Change
Total Non-Shared	*$107,482*	*$141,598*	*$34,116*
Total O&M	*$107,482*	*$141,598*	*$34,116*

B. Summary of Activities

This section provides an overview of the operation and maintenance (O&M) expense requirements resulting from SDG&E's forecasted electric distribution activities for TY2016. Except where otherwise indicated, expenses are expressed in direct, constant year 2013 dollars. The following electric distribution expenses are for the operation, maintenance, supervision and engineering for SDG&E's electric distribution overhead and underground facilities and are categorized as described by their respective workpaper group activities. By 2016, total annual electric distribution O&M cost is forecast to increase by $34,116,000. The drivers to these increases are discussed further in later testimony.

C. Challenges Facing Operations

SDG&E operates and maintains an electric distribution system that serves approximately 3 million persons, using 1.4 million meters, and spans more than 4,100 square miles from the California-Mexico border to Southern Orange County. SDG&E's system includes 287 distribution substations, 1,016 distribution circuits, 230,197 poles, 10,290 miles of underground system, 6,569 miles of overhead systems, and various other pieces of distribution equipment.



SDG&E's distribution system (at year-end 2013) is further characterized by a customer mix by count of approximately 1.25 million residential, 154,243 commercial and industrial, and 5,094 street light customers. There is an average of 1,375 customers per circuit. In addition, there are approximately 450,000 trees in the proximity of SDG&E overhead lines maintained through SDG&E's vegetation management program. The system construction configuration consists of a predominantly underground system, approximately 60%. This percentage is much larger than that of other large California Investor Owned Utilities (IOUs). The primary distribution voltage is predominantly 12 kV, with some large areas of 4 kV, which are being converted through attrition and as maintenance conditions warrant.

SDG&E's service territory includes a geographic mixture of urban and rural

communities, consisting of 26 cities, two counties and 15 major military facilities. The distribution facilities can be found in geographic locations ranging from bay and coastal developments to inland valleys, mountain and desert communities.

This combination of a predominantly underground system and diverse geographic service territory creates a unique environment for the delivery of high quality, reliable electric service to our customers. SDG&E's high proportion of underground system has evolved over many years as the result of local undergrounding ordinances, new business underground extension rules and aggressive overhead to underground conversion programs (Rule 20A projects). The approval of Rule 20D is expected to influence additional underground system conversions or installations as a mitigation option to fire threat concerns in certain areas. An underground system, while aesthetically pleasing for customers, introduces challenges that affect the cost of doing business and service reliability. An underground system is significantly more expensive to install as compared to an overhead system, has a shorter equipment life expectancy, requires more time to troubleshoot problems, and takes longer to repair problems once found.

SDG&E's urban service territory has high customer density, with the majority of customers being served via underground service. SDG&E's rural service territory is characterized by inland valleys and significant wildland and mountainous areas, with lower density development, and the majority of customers living in smaller communities. This area is predominantly served by an aging overhead electric distribution system that is subject to the most extreme weather in the service territory.

In addition to performance and safety challenges brought on by winter rain, snowstorms, and aging infrastructure, SDG&E is addressing as a top priority the safety and operational challenges caused by the extreme Santa Ana wind conditions throughout SDG&E's service territory. Fire risk is extremely high during Santa Ana wind events, and the consequences of a fire can be catastrophic. The firestorms of 2003 and 2007 devastated the community and caused severe damage and disruption to the electric distribution system.

Urban areas of SDG&E's service territory also face substantial fire risk due to Santa Ana wind events. In May 2014, strong and widespread wind gusts hit San Diego County from the coasts to the mountains. A series of significant fires occurred during this event, with the predominance of fires occurring on the western half of the county, and a few of the fires near the coast. During the May 2014 event, over 60,000 customers lost power, largely due to wind. At

the height of the event, nearly 13,000 customers were simultaneously without power. SDG&E enlisted all available crews and several contract crews to help restore power and replace approximately 130 poles in affected communities.[1] SDG&E crews coordinated with emergency services to safely work around the-clock in order to restore service to the affected customers.

Every time a wind event threatens fire, SDG&E responds. As discussed further in my testimony below, the Emergency Operations Center (EOC) and/or the Electric Distribution Operations (EDO) Storm Desk activate to monitor and respond to system risks, when the U.S. National Weather Service (NWS) issues a Red Flag Warning,[2] or when SDG&E determines that an Elevated Wind Condition exists. The May 2014 red flag warning event was the fifth experienced in SDG&E's service territory this year. The fourth 2014 red flag warning was called in April, when SDG&E responded to widespread winds that caused 69 outages, affecting 63,242 customers. The results of red flag conditions are unpredictable, but as history has shown, red flag conditions can be a catalyst for catastrophic wildfires. SDG&E must activate its emergency response protocol and respond to evolving emergency conditions. Regardless of whether there are active fires when red flag conditions materialize, SDG&E must respond to these conditions quickly to maintain safety and reliability and to address fire risks.

SDG&E has been aggressively seeking ways to improve the operations and maintenance of the electric distribution system in these high fire threat zone areas, especially in relation to high fire risk Santa Ana conditions. In order to help ensure the safety of the community and the integrity of the electric distribution system, SDG&E seeks the resources necessary to meet this challenge and implement steps that will result in significant progress toward achieving this common goal shared by employees, regulators, customers and the public at large.

Despite these challenges, SDG&E consistently has been recognized for having a very reliable electric system. Beginning in 2005, SDG&E has been ranked "Best in the West" in reliability by PA Consulting Group,[3] earning their regional ReliabilityOne award for eight consecutive years. SDG&E also received PA Consulting Group's National Award for

[1] 186 Emergency Operations Center (EOC) responders reported during the May 13-18 time period, taking shifts that totaled 2,353 hours.

[2] A Red Flag Warning is a forecast warning issued by the U.S. National Weather Service to inform area firefighting and land management agencies that conditions are ideal for wildland fire ignition, and rapid propagation. *See* http://www.weather.gov/.

[3] *See* http://www.paconsulting.com/introducing-pas-media-site/releases/pa-consulting-group-recognizes-north-american-utilities-for-excellence-in-reliability-and-customer-service-21-november-2013/.

Outstanding Reliability Performance in 2010. Although SDG&E's electric system continues to be very reliable, maintaining existing equipment, fixing service problems and restoring service constitute major job functions for SDG&E's field employees. The operation, maintenance and administration of SDG&E's electric distribution system require many activities. Among these activities are:

- Routine maintenance and new construction;
- Inspection and associated repair;
- Dispatch and electric system control;
- Project planning and design;
- Skill training of the workforce;
- Development of standards, strategic planning and distribution reliability functions;
- Management of contract construction forces;
- Public affairs communication and liaison activities with local, state and federal agencies; and
- Development, implementation, operation and maintenance of distribution system related Information Technology (IT) systems.

D. Cost Drivers Introduction

With respect to electric distribution system management, SDG&E seeks to maintain a safe system operation for employees and customers, a high level of service quality and reliability and a high level of customer satisfaction.

In order to achieve these objectives, SDG&E balances the expenses of system maintenance and operations with reasonable replacement strategies and optimizes those expenses within desired levels of service and system design. SDG&E's commitment to public safety, employee safety, reliability performance, and customer satisfaction are direct results of this pursuit.

SDG&E has identified seven major factors which impact the Test Year 2016 expenditures. These drivers are the standout issues that have been identified as impacting most or all of the activity in Electric Distribution Maintenance and Operations accounts. Some of the drivers below have already been identified in SDG&E's previous TY2012 filing, and the passage of time has increased their impact.

- Public and Employee Safety, System Maintenance and Reliability

- Environmental & Regulatory Compliance
- Workforce Development
- Technology Utilization
- New Systems
- Maturing & Aging Equipment
- Fire Risk Mitigation

E. Risk Management Practices in Electric Distribution Operations and Maintenance

The above-mentioned costs support the mitigation of key risks that could potentially affect the safety, security and reliability of electric operations. The risk policy witnesses, Diana Day (Exhibit SDG&E-02), David Geier, and Doug Schneider (Exhibit SDG&E/SCG-03), describe the safety culture at SDG&E and how risks are assessed and factored into processes and decision-making on an enterprise-wide basis, currently and moving forward. Mr. Geier also describes risk assessment and management within electric operations and identifies key risks that affect the electric operations at SDG&E.

While the costs I describe reflect SDG&E's budgetary requirements to run our day-to-day operations, several of those costs support risk mitigation activities, including those related to addressing fire risks. Day-to-day operations and fire risk mitigation are often inextricably linked. The Fire Risk Mitigation (FiRM) electric distribution capital projects sponsored in Mr. Jenkins' testimony (Exhibit SDG&E-09) are associated with O&M activities that are crucial to the implementation of this fire risk mitigation program. Moreover, a portion of my costs contribute to the core formation and operations of the Reliability Improvements for Rural Areas Team (RIRAT), which conducts the systematic risk-based analysis targeted at minimizing impacts of fire risks. The RIRAT often evaluates aging equipment and utilizes new systems and technology in order to mitigate these fire risks while taking public safety and reliability into account. Details of the RIRAT process are also outlined in Mr. Jenkins' testimony.

In addition to these two major contributions to fire risk mitigation activities, the costs I support contribute to fire risk preparedness and response activities that control the impacts of wildfires. Such activities are discussed in greater detail under Electric Regional Operations in my testimony and include Red Flag Warning Operations, Elevated Wind Condition Operational Procedures and Protocol and Safety Patrol Costs for Restoration of Outages in high risk fire

areas. During these high fire risk events, SDG&E implements a crew mobilization plan to increase standby staffing such as observers, contracted fire response teams, helicopter surveillance, Electric Trouble Shooters and Electric Construction Crews in areas adjacent to identified risks within the service territory on stand-by around the clock as appropriate. The purpose of these resources is to respond to any damage events that may occur during the Red Flag Warning as quickly as possible in order to reduce the risk and consequence of a catastrophic fire occurring in areas of concern. The number of deployed personnel and the area that is covered is dependent upon a joint risk analysis performed by Electric Distribution Operations, the Meteorology group and the Fire Coordination group. The presence of fire weather, the curing of fuels and the current system configuration are all factors that are considered in fire risk mitigation analysis and decision-making.

Another risk control area for which I sponsor costs is vegetation management, which mitigates fire risks as well as risks of outages caused by vegetation contact. The specific activities that implement this control include tree trimming and pole brushing programs and are further discussed in later sections of my testimony. The following factors are considered when determining the risk of vegetation growing near SDG&E equipment: current tree clearance, minimum line clearance, line voltage, location of tree, expected tree growth rate, condition of the tree, line sag, and wind sway. While these vegetation management programs are mainly driven by regulatory compliance, SDG&E prides itself in reducing outages attributable to vegetation and our outstanding electric reliability. SDG&E's vegetation management activities have proven to be very successful and have resulted in a 75% decrease in distribution outages due to vegetation contact in the last 5 years at SDG&E.

Part of SDG&E's commitment to safety is the continuous implementation of safety training and education of SDG&E's workforce to ensure the safe operations of our electric system for the benefit of the public as well as the workers. Several costs supported in my testimony contribute to workforce development training programs (for example, the Behavior Based Safety (BBS) training), as well as training in other areas as my testimony further describes.

II. NON-SHARED COSTS

A. Discussion of O&M Activities

A description of each of the individual O&M activities appearing in Table 2 under

"Categories of Management" follows. The labels used in the table are short versions of the headings that appear in corresponding numerical order.

TABLE 2
Non-Shared O&M Summary of Costs
(Thousands 2013 Dollars)

ELECTRIC DISTRIBUTION			
Categories of Management	**2013 Adjusted-Recorded**	**TY2016 Estimated**	**Change**
1. Electric Regional Operations	*31,749*	*38,338*	*6,589*
2. Troubleshooting	*7,525*	*7,965*	*440*
3. Skills Training	*3,660*	*5,087*	*1,427*
4. Project Management	*482*	*1,368*	*886*
5. Service Order Team	*846*	*883*	*37*
6. Regional Public Affairs	*1,687*	*1,687*	*0*
7. Grid Operations	*148*	*348*	*200*
8. Substation Construction & Maintenance	*5,896*	*6,912*	*1,016*
9. System Protection	*1,545*	*1,711*	*166*
10. Distribution Operations	*10,938*	*15,315*	*4,377*
11. DistOps EGISS	*2,091*	*2,647*	*556*
12. Kearny Operations Services	*1,838*	*2,239*	*401*
13. Construction Services	*5,226*	*18,865*	*13,639*
14a. Vegetation Management (Tree Trim)	*23,104*	*24,559*	*1,455*
14b. Vegetation Management (Pole Brush)	*3,752*	*4,292*	*540*
15. Compliance & Asset Management	*2,458*	*2,702*	*244*
16. Distribution Engineering	*1,319*	*1,909*	*590*
17. Technology Innovation & Development	*327*	*882*	*555*
18. Reliability & Capacity Analysis	*538*	*618*	*80*
19. Information Management Support	*261*	*376*	*115*
20. Major Projects	*78*	*147*	*69*
21. Technology Utilization	*1,287*	*1,948*	*661*
22. Admin & Mgt	*209*	*324*	*115*
23. Officer	*518*	*476*	*-42*
Total	***107,482***	***141,598***	***34,116***

1. Electric Regional Operations (ERO)

a. Activity Description:

Electric Regional Operations (ERO) includes all electric distribution crews located in six districts and two satellite operating centers (Ramona and Mountain Empire), which covers SDG&E's entire electric distribution system and service territory of approximately 1.4 million customers in San Diego and southern Orange counties. The primary job functions include: 1)

inspect and maintain the electric distribution system in compliance with CPUC General Orders (G.O.) 95, 128, 165 and the SDG&E Standards; 2) restore service due to outages; and 3) repair service problems and address other customer issues. ERO consists of electric lineman, apprentices, line assistants, dispatchers, office support personnel, supervisors and management.

ERO Compliance training consists of required training from various organizational units including Distribution Standards, Fleet, Safety, Environmental, various governmental agencies (CPUC, OSHA, State of California), as well as a review of standards and practices that have evolved as a pattern from operational incidents. ERO personnel complete most of their compliance training at the SDG&E Skills Training Center.

The table below provides the ERO estimated operating costs and change between the 2013 base year and the 2016 test year. These costs are represented in thousands of dollars.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Electric Regional Operations (ERO)	*$31,749*	*$38,338*	*$6,589*

b. Forecast Method

Labor costs are based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology was utilized in order to capture future increases in Red Flag fire preparedness, elevated wind conditions and outage patrolling during high fire risk periods. Additional staffing in the form of Apprentice Linemen, Construction and Operations (C&O) Planners and Supervisors, Schedules and Dispatch personnel is anticipated in order to meet the demands of increased compliance work.

Non-Labor is also based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology records the increased traffic control measures, intrusive wood pole inspections, fire-resistant shirt change-outs for field personnel, and upward pressures to refine work management processes and system enhancements.

c. Cost Drivers

The following contribute to upward incremental cost changes:

- **Public and Employee Safety, System Maintenance and Reliability**
- **Safety & Regulatory Compliance**
- **Fire Risk Mitigation**
- **Workforce Development**

- **System Growth**
- **Operating Efficiencies**

Public and Employee Safety, System Maintenance and Reliability

The focus of the company is to continually develop and improve safety leadership by all levels of employees, which encourages a stronger accountability to drive safer performance and to build a stronger safety culture. Several initiatives have been implemented, which ERO believes will further improve safety performance.

Behavior Based Safety (BBS)

BBS is a proven safety program consisting of several key components, including engineering, enforcement, education, culture management and behavior management. The Electric Division has had an active BBS program since 2002. BBS changes individual safety behavior by applying principles of positive reinforcement and giving immediate feedback. There are several essential elements in a behavior-based program: 1) identify behaviors, 2) perform observations, 3) provide feedback, 4) track behaviors and 5) remove barriers. Behavior management and culture management are necessary safety tools and essential for the Electric Division to make gains in safety performance and to ensure that employees return home safely to their families each day. The Company has had great success with this program and plans to continue the development of the employee safety leaders through the implementation of additional analytical tools available from BBS to establish and maintain a strong safety-focused culture.

Grassroots Safety Leadership

SDG&E recognizes the significant role that organizational culture plays on safety performance. In 2009, efforts began to improve the organizational culture through frontline employee leadership using Grassroots Safety Leadership. By using its tools, methods and workshop interventions, the goal is to drive employee accountability and engagement by addressing organizational culture. SDG&E's Electric Regional Operations was the first operational group in the Company to use this program and in 2009 created "Grassroots Teams" in two of the six electric operating districts. Frontline employee teams are working on a variety of safety culture projects. Today, all six SDG&E service territory districts have Grassroots Teams and projects underway.

Overhead Connector Program

Overhead connectors are mechanical devices used to join overhead wires. SDG&E's Overhead Standards have evolved over the years to revise various connection types to correspond to leading practices in the industry. Previously approved connection methods are typically grandfathered in the system. These legacy connections deteriorate over time and may result in failure of the connector and eventually a downed conductor. This overhead connector program will replace some of the previously approved connection methods to be more in line with current industry standards in order to improve safety and system reliability, and contribute to fire risk mitigation measures by removing these connectors prior to failure.

Safety & Regulatory Compliance

Intrusive Wood Pole Inspection Load Calculations

Over the next three years, additional pole loading calculations will be required for each inspected pole in order to ensure that all pole safety factors are meeting G.O. 95 requirements, with a particular focus on the intrusive wood pole inspections. This requirement is expected to increase annual pole loading calculation numbers by 50%.

Fire Risk Mitigation

Red Flag Warning Operations

The U.S. National Weather Service declares Red Flag Warnings, which indicate higher fire risk due to weather conditions in any of the six climate zones in the San Diego service territory. Warnings can be declared for a combination of high winds coupled with low humidity or for dry lightning conditions. Outages and damage calls occurring under these conditions receive heightened response. Between three and six Red Flag Warnings are expected in an average year, with an average event duration lasting thirty-six hours. As of June 2014, SDG&E has already experienced 5 Red Flag Warnings within its service territory for the year. The height of the fire season is typically late August through early November, so SDG&E expects 2014 to bring more Red Flag Warnings than in an average year. During these events, SDG&E implements a crew mobilization plan to increase standby staffing such as observers, contracted fire response teams, helicopter surveillance, electric troubleshooters and electric construction crews in areas adjacent to identified risks within the service territory, on stand-by, around the clock as appropriate. In addition to supplemental resources, special operating condition protocols and procedures are also considered: 1) automatic reclosers are disabled, 2) sensitive relay settings are enabled, and 3) work restrictions are implemented. The purpose of these

actions is to respond to any damage events that may occur during the Red Flag Warning as quickly as possible, in order to reduce the risks and consequences of a catastrophic fire and address other safety and reliability risks as they arise, in areas of concern.

Elevated Wind Condition Operational Procedures and Protocol

In 2009, SDG&E began to implement procedures, as outlined in SDG&E's Fire Prevention Plan,[4] for evaluating wildfire potential within the service territory. The procedures call for implementing a crew mobilization plan for areas and times when severe risk is assessed. The crew mobilization plan increases standby staffing at locations adjacent to the risk areas, such as standby linemen, contract fire response teams and helicopter surveillance. This mobilization plan is similar to what is described in the Red Flag Warning Operations section above and has been successful in addressing issues that arise in a very timely and efficient manner. The special operating condition protocols and procedures are also considered, similar to what is described in the Red Flag Warning Operations section above. To date, this plan has been successful in helping SDG&E to avoid any catastrophic fires since its implementation.

Up to two elevated wind condition events are expected in an average year, with an average event duration lasting ten hours. As of June 2014, SDG&E has not yet experienced an elevated wind condition (without a Red Flag Warning), year-to-date. Typically, this request assumes normal weather, with the cost forecast adjusted accordingly.

Safety Patrol Costs for Restoration of Outages

In high fire risk areas, SDG&E evaluates wind conditions, on a circuit by circuit basis. The method of evaluation is further explained in SDG&E's Fire Prevention Plan and the associated costs with forecasting the conditions are described in the Electric Distribution Operations section of my testimony. If a circuit in the SDG&E fire threat zone experiences an outage, the entire circuit will need to be patrolled in order to safely re-energize it. Standby crews, available helicopter resources and additional patrolmen will be utilized in order to efficiently return these circuits to service in a safe manner.

Workforce Development

Construction & Operations Planners and Supervisors

[4] Resolution E-4576 approved SDG&E's Advice Letter 2429-E, which contained SDG&E's Fire Prevention Plan (FPP), pursuant to the Phase 2 decision in the Electric Safety OIR (D.12-01-032).

Additional C&O planners will be required in order to support efficient fielding and design work practices going forward. These positions will support the electric construction supervisors by processing job packages through the work management systems, while the electric construction supervisors are supporting and enforcing safety for the field crews constructing the designed work. The C&O Planners will require training, which will largely be conducted on the job in order to ensure cost efficiencies are maintained.

Successful leaders need both strong technical and leadership skills. Technical skills can vary by responsibility, location and individual job tasks, while leadership skills are more universal. Hands-on training will be designed for working foremen, relief working foremen and supervisors on all aspects of their technical role and responsibilities, such as emergency response, job preparation, doing the work and closing out the paper and computer work; while the leadership training focuses on the legal aspects of supervision, as well as the ability to motivate, instruct, coach, discipline and develop individuals and teams to perform at their best every day. The hands-on training material will also help accelerate the development of potential candidates to field leadership positions and give them the opportunity to "test drive" a leadership role to determine if supervision is the right path for them and the company. In addition, the continued advancements in technology have become more important for this type of training to focus on these advancements and educate people in leadership roles in the use of computer programs and other systems. It is also critical that this training be provided in a consistent manner to ensure all employees receive the same information. Consistent and repeatable training is important to mitigating public and employee safety risk. To that end, on-line training will be created to ensure consistency in the delivery of the information. The labor costs for this training will be captured in ERO work papers at Skills and Compliance Training.

Area Resource Scheduling Organization (ARSO) Staffing:

The Area Resource Scheduling Organization (ARSO) organizes, schedules and dispatches all gas and electric distribution work within the SDG&E system, along with required maintenance and regulation (M&R) for SDG&E's gas distribution system. To accomplish this, the ARSO employs a sophisticated scheduling software application (ClickSoftware) to examine available resources and match them up with the work required. In doing so, work efficiencies have been gained by correlating tasks in a logical progression, by incorporating field force skill sets, location of the work required, drive time, etc. The system also provides one central point of

contact for all gas and electric distribution work along with gas related M&R work for all field supervisors, employees, contractors, city departments and customers, so as to increase communication as well as to maximize customer satisfaction. The current mix of schedulers and dispatchers has been evaluated and it has been determined that the ARSO will require one additional scheduling resource and one additional dispatching resource. These resources are required in order to fully support the efficient scheduling and dispatching requirements for the C&O Districts. The scheduler and dispatcher will be trained on the job in order to ensure maximum efficiencies are obtained.

System Growth

Badge Access to Military Bases:

The military bases in San Diego County imposed more restrictive access to federal properties in 2009. A Rapid Gate Pass is renewed annually and needed for each SDG&E employee to gain entrance on the military bases, regardless of whether the employee is performing routine or emergency work. The Rapid Gate Pass is important to ensure SDG&E's ability to timely access its critical infrastructure, to ensure safe and reliable service to its military and other customers, and to promote the safety of SDG&E employees and the public. SDG&E's O&M testimony includes the additional expenses associated with the Rapid Gate Pass requirement, including administration of the program.

Electric Personnel Tools and Equipment:

Climbing gear is purchased for each new line assistant, to ensure that each new line assistant has the proper tools and equipment to safely and efficiently perform work. Additionally, approximately 20% of SDG&E's line assistants need to renew or replace various tools and equipment each year. These equipment replacement costs are necessary to ensure each crew member is properly outfitted with the tools and safety equipment required to conduct their job in a safe and efficient manner.

Additional Vehicles:

My testimony requests several new vehicles and work equipment to enable the work described. The costs associated with these incremental vehicles are found in the testimony of Carmen Herrera, Exhibit SDG&E-16.

- Additional light duty subcompact pickups (16 during 2014-2015 and 2 in 2016) are required in order to conduct patrols and QC inspections on the distribution system.

SDG&E requires these vehicles due to changes in the inspection process, in order to meet regulatory deadlines for these patrols and QC inspections.

- 42-foot reach capability light duty aerial lift trucks (7 during 2014) will also be required in order to conduct the 2-Man CMP follow-up work. This need is due to the patrol process backlog workload that has increased.

Fire Resistant Shirt Replacements:

SDG&E has determined that Fire Resistant (FR) shirts for all existing line assistants need to be replaced. To comply with recently updated OSHA standards, SDG&E must transition to an FR shirt with a Type 2 Hazard Risk Category (HRC). SDG&E is currently meeting OSHA standards by requiring employees to wear a cotton shirt underneath the existing FR shirt, which falls in the Type 1 HRC.

After this one-time replacement for existing line assistants, only new line assistants will be outfitted with the new FR shirts.

Operating Efficiencies

Jurisdictional Permitting and Overtime Drivers:

Jurisdictional permitting (e.g., traffic control) and work time limitations are continuing to become more onerous and challenging for conducting company business and serving customer safety and reliability needs. Jurisdictions are restricting work windows to minimal time frames during the day or two after regular work-day shift hours, e.g., night work, which is less productive and more costly. Jurisdictions also have moratoriums during holidays and summer months, which creates scheduling constraints. These requirements are causing schedules to be delayed and increasing costs to complete routine maintenance and construction work. SDG&E is working to more effectively coordinate reasonable work requirements with these permitting jurisdictions, to ensure that both the jurisdiction's requirements and customer safety and reliability requirements are met. Some examples of mitigation efforts include negotiating annual permits (instead of permitting for individual projects) for: (1) routine maintenance; (2) notification efforts; and (3) inspection efforts with custom traffic control plans. Most recently, SDG&E's Regional Public Affairs partnered with ERO to meet with the City of Escondido and successfully negotiated an annual permit for routine work. SDG&E plans to use the City of Escondido agreement as an example for how we can operate more efficiently and productively, in meeting with other agencies throughout San Diego and Orange counties.

At this time, SDG&E's ERO is processing and obtaining 700 to 800 permits per year, at an average cost of $700 / permit. An analysis of recent permit activities shows an increase in costs of approximately 10% per year, which is projected to continue over the next several years, as the jurisdictions continue to increase permit requirements. Permits are also increasing work requirements for completing construction, particularly related to traffic control costs. Traffic control costs for conducting routine maintenance and reliability work have been projected to increase approximately 10% each year as a result of the increased permit requirements by local government agencies. These permit requirement increases are creating schedule delays and increased construction costs, which affects work efficiencies and productivity.

2. Troubleshooting

a. Activity Description:

The Operations & Engineering (O&E) workgroup covers six districts and two satellite locations within SDG&E's service territory. The O&E workgroups for each of the six districts consist of Electric Troubleshooters, engineers, a planner, technical assistants and management supervision. The O&E workgroup is responsible for engineering and system troubleshooting to ensure reliable and safe electric service to SDG&E customers.

Electric Troubleshooters are a key resource, acting as SDG&E's first responders. The Electric Troubleshooters have the specific skills necessary to timely restore electric service during emergencies and unplanned interruptions while protecting public and employee safety. During service interruptions, Electric Troubleshooters are tasked with isolating affected areas of SDG&E's distribution system and implementing restoration efforts that will minimize the impact of any service interruptions to SDG&E customers. During emergencies, Electric Troubleshooters work closely with emergency response agencies to protect the public and SDG&E's employees from potentially hazardous conditions. Electric Troubleshooters act as the primary interface with customers who are experiencing service problems. Electric Troubleshooters perform a variety of additional tasks including substation and field switching, substation patrols, and routine safety patrols related to SDG&E's inspection and maintenance Compliance Management Program (CMP).

The remainder of the O&E workgroup provides necessary engineering, planning, administrative and supervisory support, all essential to providing safe and reliable service.

The table below provides the ERO estimated operating costs and change between the 2013 base year and the 2016 test year for the O&E workgroup. These costs are represented in thousands of dollars.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Troubleshooting	*$7,525*	*$7,965*	*$440*

b. Forecast Methodology:

Labor costs are based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology was utilized to identify need for additional Troubleshooting personnel in the field due to system growth.

Non-Labor is also based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology identifies the additional training, tools and equipment needed as the field employee personnel level increases.

c. Cost Drivers:

The following cost drivers contribute to the upward incremental cost changes:

- **Fire Risk Mitigation**
- **System Growth**
- **Workforce Development**

Fire Risk Mitigation

Elevated Wind and Red Flag Warning Conditions:

During Elevated Wind Conditions and Red Flag Warning Conditions, Electric Troubleshooters are positioned in targeted areas of high fire potential (typically in substations located close to those areas) to expedite response to service interruptions or other electrical system problems that may occur. Deployment in the targeted areas is maintained on a 24-hour basis by rotating personnel. During a recent 5-day wind event in May 2014, Electric Troubleshooters worked tirelessly to provide 24-hour coverage. They are the first responders that will often work cooperatively with emergency responders, such as police and fire, in order to ensure public safety.

Additionally, SDG&E will visually patrol all facilities involved if power is interrupted in select high fire risk areas. These patrols require additional ERO O&M resources and equipment.

System Growth

System growth is caused by new customer growth and load growth from existing customers. Customer load growth drives the installation of new and upgraded facilities, circuits and substations, all of which have associated O&M requirements.

Customer growth (as measured by the number of new meter installations) is expected to increase at an average rate of 0.9% per year (years 2013-2016). The growth in meters and associated customers results in a greater number of customer-related electrical events that require response by an Electric Troubleshooter. Please see the testimony of Mr. Ken Schiermeyer, Exhibit SDG&E-31 for additional details.

Electric Troubleshooters act as first responders to a wide range of distribution system events. The time associated with troubleshooting and isolating problems and restoring service on an undergrounded distribution system is greater than that associated with an overhead system. As a result, the total labor hours necessary to troubleshoot the distribution system continue to increase annually, at a rate greater than the growth in underground facilities.[5] Increased distribution system growth results in increased patrol inspections, as mandated by General Orders 165 and 95. Staffing levels within the Operation and Engineering workgroup have remained relatively unchanged for the past several years. Additional resources will be required in order to continue protection of public and employee safety and system reliability while keeping pace with the system growth.

Workforce Development

Electric Troubleshooter Training

As noted in the Skills and Compliance Training section of this testimony, an additional Electric Troubleshooters training class will be needed in 2014, 2015 and 2016. The Electric Troubleshooter labor costs for this training are captured in ERO workpapers, and the instruction costs are captured in Skills and Compliance Training workpapers.

[5] This is due to the additional time required to troubleshoot underground outages.

3. Skills and Compliance Training

a. Activity Description:

The Skills and Compliance Training organization is responsible for the development and training of the ERO workforce. The ERO workforce consists of electric field personnel, non-electrical support personnel and first line supervision. Subject matter experts (SMEs) borrowed from the field comprise eighty percent of the instructor workforce. Using SMEs from the field to train promotes a skilled and expert workforce in leading practices, new technology, current operating procedures, and construction standards. Skills and Compliance Training programs support a workforce with the required skills to safely and reliably maintain and operate the electric distribution system, in compliance with General Orders 95, 128, 165 and SDG&E standards, work methods and operating procedures. Core training consists of the programs described below.

Electric Linemen Development

SDG&E has a three-year state-approved apprenticeship program for the development of journeymen electrical workers, with certification by the Joint Apprentice Committee (JAC).

Compliance Training

SCT provides annual training required by existing federal, state, local safety, and environmental regulations. All electric field personnel are required to maintain proficiency regarding (1) emergency rescue techniques, (2) safety and environmental policies and procedures applicable to individual work responsibilities, (3) non-commercial and commercial vehicle operator training (initial and refresher) for safe driving practices.

Equipment Operations and Commercial Drivers' Training

All qualified SDG&E employees with valid Class "A" and "B" driver licenses must undergo training required by both state[6] and federal[7] regulations and agencies. Employees learn all necessary driving and maneuvering skills to safely operate SDG&E's regulated vehicles and specialty equipment. In recent years, there have been three major changes to the Commercial Driver's Training program at SDG&E:

1) A new 40-hour class was developed and piloted in 2013 (implemented in

[6] E.g., the California Code of Regulations and the Department of Motor Vehicles.
[7] E.g., the U.S. Department of Transportation and the Federal Motor Carrier Safety Administration.

2014) that prepares employees to obtain a new commercial driver license. This class is called Commercial Driver's Education Training. This class covers all of the prerequisite components for student drivers before the student is trained "behind-the-wheel" in a commercial vehicle.

2) A new Smith Driver's Training class for new commercial drivers was introduced. SDG&E's current trainers became certified Smith Driver's trainers, and the classroom portion of Smith Driver's Training was incorporated into SDG&E's Commercial Driver's Education Training class. The observed drive portion of the training has been incorporated into SDG&E's behind-the-wheel driver's training class.

3) Any commercial driver that is involved in a Controllable Motor Vehicle Incident (CMVI) is required to complete both the classroom portion of Smith Driver's Training for commercial drivers and an observed drive in the same type of commercial vehicle they were driving when the incident occurred.

This training also includes a program to develop equipment operators that support field crews operating specialty equipment, as required by federal law.[8] Some examples of the specialty equipment SDG&E employees operate that requires special training include:

- mobile cranes (boom trucks);
- articulating cranes;
- stringing and pulling overhead and underground electrical wire;
- operating a production digger (auger) for removal of wooden power poles;
- skid steers;
- backhoes;
- dump trucks;
- water trucks;
- motor graders for grading gas and electric distribution lines; and
- material hauling combination vehicles (tractor trailers).

Additional Ancillary Training

SCT also supports training for other business units, such as Advanced Metering Operations (AMO), Gas Operations, Project Management and other organizations.

[8] Occupational Safety and Health Act, 29 C.F.R. part 126.

System and Process Initiatives

For ERO field personnel, SCT is incorporating new processes and procedures into existing training classes and developing new media for training delivery.

Specialized task-specific development and training programs

These programs are conducted for Relief Electric Troubleshooters, Relief Fault Finding Specialists, Electric Meter Test Electricians and lead cable splicers. Relief Electric Troubleshooters and Relief Fault Finding Specialists are Journeymen Linemen that fill Electric Troubleshooter and Fault Finding Specialist shifts when permanent Electric Troubleshooters or Fault Finding Specialists are unavailable due to sickness, vacation, or holidays. They also periodically work as Relief Electric Troubleshooters on a "training shift" in order to maintain their troubleshooting skills.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Skills & Compliance Training	*$3,660*	*$5,087*	*$1,427*

b. Forecast Method:

Labor costs are based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology outlines the increased workforce and safety compliance program support along with a three-year projection for adding Instructional Designers and a structured training program for more than 25 ERO job classifications.

Non-labor costs are also based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology records the need to expand the training programs to enhance safety and environmental concerns, purchase primary and secondary metering equipment for SDG&E's Skills City[9], training technology, and funding for tools and work methods to enhance system reliability.

c. Cost Drivers:

The following contribute to upward incremental cost changes:

- **Workforce Development**
- **Technology and Methodology**
- **Aging Infrastructure and Equipment**

[9] Skills City is a mockup community that will replicate 12 residential homes and four city streets for real-life scenario-based training for utility work.

- **Safety, Regulatory & Environmental Compliance**

Workforce Development

The number of Apprentice Linemen has decreased over the past 2 years, despite having one new Apprentice Linemen class per year. SDG&E is increasing efforts to sustain its apprentice population, in order to mitigate projected Journeymen attrition and declining levels of Apprentices. Along with each Apprentice class, 22 additional Line Assistants will be required to begin training to fill the vacated positions as employees advance into the Apprentice classification. These employees will remain in this classification until the next Apprentice class begins. Electric overhead and underground training for Apprentices is required to last 155 weeks over a 3-year period. Upon successful completion of the Apprentice Program and the Linemen Journeyman's test, employees will be assigned to different districts within the SDG&E service territory. This process promotes a robust workforce that is responsive to its customers' needs as well as the system's safety and reliability.

- Additional Electric Troubleshooters training classes will be needed in 2014, 2015, and 2016, due to attrition expectations and an aging workforce. These classes train first responders for restoration needs, system reliability and public safety. The SDG&E Electric Troubleshooter course is designed to provide qualified Journeymen Linemen with the necessary skills to perform required tasks on the SDG&E electric system – professionally, competently, and safely.
- Electric Troubleshooter course module content (130 total) includes (but is not limited to) training in the following subject areas:
    - Switching in all SDG&E switch yards with voltages from 500kV down to 120V;
    - Relays and different system protection schemes;
    - Trouble calls, car-pole contacts, and storm damage;
    - Overhead and Underground electric applications;
    - Customer service: safely addressing customer issues, energy theft ,and keeping the public safe at all times;
    - Being first responders – working alone and being able to make good sound decisions, keeping safety at the forefront;
    - Working jointly and collaboratively with outside organizations such as law enforcement and fire agencies;

- Electric meter installations and removals;
- Voltage regulator operation;
- Transformers: energizing and de-energizing;
- Capacitor operation;
- Handling lengthy drive times; and
- Voltage mitigation.

Technology and Methodology

To provide the safest and most effective, up-to-date training, SDG&E requires simulators and demonstration boards for equipment operations and electric training, for equipment such as cranes, excavators, motor graders, and transformers. These simulators and training devices must be periodically updated to keep pace with ever-changing equipment and operations in the field. SDG&E's electronic vehicle inspection system (ZONAR) facilitates documenting electronic inspection, tracking, vehicle maintenance and repair work orders[10] for the safe operations of commercial and regulated vehicles and to comply with all federal and state agency and regulatory requirements.[11]

The ZONAR tool is designed to help SDG&E comply with existing and future state and federal regulations, and does the following:

- Aids in recording documentation for BIT inspections;
- Is paperless;
- Is monitored and retrievable by computer;
- Minimizes manpower cost;
- Validates how inspections are conducted (drivers are required to perform prior to vehicle usage);
- Is time sensitive;
- Allows tracking of vehicle usage by driver;
- Assists in keeping out-of-service vehicles from being used;
- Ensures a pre-trip is conducted;
- Improves communication between drivers;

[10] The Federal Motor Carrier Safety Administration (FMCSA) Hours-of-Service (HOS) regulations mandate documented inspections.

[11] *See e.g.,* the Code of Federal Regulations (CFR): 49 CFR Parts 300-399 at 390-397; California Code of Regulations, Title 13, Motor Vehicles, Sections 34500-34520.

- Tracks repair requests; and
- Documents post-trip inspections in real time.

SDG&E also uses an ancillary electronic system, which enables commercial drivers to meet tracking requirements for their hours of service. SDG&E anticipates enactment of a currently proposed U.S. Department of Transportation requirement for commercial drivers to utilize electronic logging devices, amending 49 CFR Parts 385, 386, 390 and 395.

Replacement of a 15-year-old airbrake demonstration board used for SDG&E's Commercial Driver's Training program is required. Airbrake systems have changed, such that the legacy board is obsolete and cannot be retrofitted. The updated airbrake demonstration board is an effective training tool to educate new trainees on the airbrake system and for annual refresher training.

An electric circuit modeling demonstration board shows radial, loop and alternate/back-fed systems to supplement electric theory and operational training in a classroom setting before operating in the field. The demonstration board is an important training tool that needs to be updated in order to continue its proper function.

A SMART Board system (using interactive white boards) is required to keep pace with the technology utilized to deliver compliance and course curriculum for classes at the Skills Training Center. The SMART Board system technology has been proven effective in public and private education systems and is used for digital white-boarding and instant capture of meeting and lesson notes. The SMART Board utilizes touch gestures similar to tablets. This system allows SDG&E more options to conduct interactive exercises and curriculum-sharing demonstrations. The SMART Board provides the ability to download and upload training materials across classrooms, such as learning modules and training files. Instructors can bring real-world scenarios into the training room using compelling images, multimedia content and dynamic interactivity. Whether participants are in the same room or miles apart, the use of interactive white boards allows participants to be more engaged in course content, better able to retain critical information, and better able to use the knowledge when it matters most – for example, in the field, where safety is the highest priority.

Instructional designers are now utilized to maintain and build curriculums supporting new systems and processes, such as the SMART Board. SDG&E plans to build a comprehensive portfolio of approximately 25 structured training programs for ERO job classifications, many of

which now have little or no formalized training curriculum related to new technology and processes. Approximately 49,000 development hours over a 3-year period are required to create these training programs. Instructional design is expected to be incorporated in training streams for all job classifications going forward.

Aging Infrastructure and Equipment

To keep pace with the evolution of high-voltage equipment design, function, and work methods, the Skills Training Center needs to restructure its training yard, equipment and tools to reflect current work methods. Much of the current training yard has surpassed its useful life expectancy and needs replacement and/or refurbishment, to ensure employee safety and continued effective training. Some equipment (such as transformers) has been in use at the training facility for over 25 years. Additional training equipment such as a power dolly (for training UG cable pulling) is required for employee development. Classroom video projectors and mobile data terminals (ruggedized field computers) are in need of replacement. Various high-voltage equipment, underground cables, and the overhead wiring systems need to be replaced and updated. Additional tools and current training system upgrades are needed to replicate work activities performed in the field.

Continued maintenance and renovation of the Flex Center (SDG&E's Fitness Training Facility) is required to maintain employee health and safety. This is important for maintaining overall workforce health, but also addresses the specific need to provide cardio and strength training facilities for linemen, who must maintain fitness levels to perform work activities in the field. Some of the equipment in the Flex Center dates back to 2006 and needs to be replaced or refurbished.

Additional Vehicles

I have requested in this testimony new vehicles and work equipment to enable the work described. The costs associated with these incremental vehicles are found in the testimony of Carmen Herrera, Exhibit SDG&E-16. SDG&E requires the following:

- New large- and medium-size backhoes (1 each in 2014 and 2015), to
    - maintain flexibility in job support requirements,
    - continue to provide preparedness for emergency response,
    - provide employee development opportunities as part of workforce development, and

- reduce contracted services by $650,000 a year;

- A power reel dolly (1 in 2014), to instruct Apprentices on removing and installing underground cable;
- A combo truck (1 in 2014) will instruct apprentices on removing and installing underground cable. Additionally, if the combo truck purchased is a crew cab, the truck will also be used for behind-the-wheel Smith Driver's Training.

Safety, Regulatory & Environmental Compliance

Additional personnel are needed to handle the increased workload in access road grading, to maintain the new shared access roads created during the construction of the Sunrise Powerlink. The distribution portion of these projects represents 75% of the entire cost. These personnel will also provide support to SDG&E (ongoing) operations and equipment training programs. Required distribution work includes the following:

- pole hole digging for both wood and steel pole replacement,
- replacing Manta Ray anchors,
- transporting and setting electric vaults and lids,
- excavating for both electric and gas distribution services,
- pulling overhead conductor for electric crews for re-conductor projects, and
- providing transportation services for gas and electric departments.

A new tool technician will be in charge of maintaining and operating the Skills Training Center storerooms. Responsibilities will include keeping an up-to-date inventory of all tools and materials and monitoring equipment, providing maintenance support, tracking tools and use of materials.

A new trainer/performance support analyst is needed to oversee health and wellness initiatives, including compliance, ergonomics, strength conditioning, injury prevention and BBS Training efforts. This position will promote employees' safety and a healthier workforce.

4. Project Management

a. Activity Description:

Project Management's responsibilities vary widely, but all relate to the preparation of construction orders. Department personnel perform the design and engineering necessary to developing comprehensive construction orders, from which additions and modifications to electric distribution systems are constructed. Such construction orders range from simple

services for individual customers to large complex distribution systems that serve subdivisions, commercial centers and high-rise towers. Also included are construction orders for converting electric overhead lines to underground under various programs and relocating existing facilities to accommodate both private party requestors and governmental agencies.

The construction order development process includes meeting with customers, governmental agencies and other utilities in planning and coordinating additions and modifications to the electric distribution system. Department personnel perform a variety of engineering calculations and analytical assessments and secure contracts and special agreements. In addition, Project Management personnel prepare and assemble the construction order job packages for distribution to customers, contractors, other utilities and all participating departments within SDG&E.

The construction orders developed by Project Management represent capital work. However, many capital projects include a small component of O&M. There are also some small construction orders for which the work is considered O&M as a result of its limited scope. As such, Project Management's time is generally split between Capital and O&M, with 98% of personnel time charged to Capital and 2% charged to O&M. The relatively small O&M component of Project Management is addressed here.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Project Management	*$482*	*$1,368*	*$886*

b. Forecast Method:

Labor and Non-Labor costs projected here use the recorded costs for 2013 as the base year, rather than a 3, 4 or 5-year average. This most closely represents the annual O&M expense that is only 2% of Project Management's total budget. In years when Project Management conducts Planner Training Classes, the cost of those classes are charged as 100% O&M, having a marked impact on the total O&M expenditures for that year. Because there was a class in 2011, a 3-year average would have been skewed and would not have served as a true representation of Project Management's base O&M costs.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Workforce Attrition**

- **New Planners and associated Formal Classroom Training**
- **Supplement Support Staff**
- **Returning OpEx personnel**

Workforce Attrition

Throughout the economic recession of the past 5 years, Project Management has continued to operate in spite of the loss of a number of individuals in key positions due to transfers, retirements, and resignations. Project Management's workforce has shrunk significantly during this period. As work is now expected to increase with an improving economy, this challenging situation must be remedied. In 2014, Project Management is seeking to fill 5 planner positions made vacant by recent retirements. The intent is to run a formal Planner Training Class in both 2015 and 2016, which will result in a combination of both replacements and new additions. Additions to the workforce will cause additional upward pressure on O&M from the 2% of the employee's time not charged to capital. Project Management will also incur additional O&M expenses as the result of maintaining these positions through 2016.

Formal Classroom Training for New Planners

SDG&E faces a growing workforce attrition problem due to the departure of highly experienced workers, including an increasing number of employees becoming eligible for retirement. SDG&E must continue to systematically replenish the organization with skilled individuals through hiring and development programs, in order to achieve its operational goals. In 2015, Project Management is seeking to acquire 16 individuals and put them through a comprehensive Planner Training Class. Per accounting guidelines, planners enrolled in a formal training program are to have 100% of their time charged to O&M. Planner Training is expected to last 23 weeks. It is Project Management's intent to acquire and train an additional 16 planners in 2016. As a result of anticipated attrition, Project Management expects to net only 3 additional planners per year from these classes. As those planners graduate from training and are absorbed into the regular workforce, the 2% of their time that will be charged to O&M on an ongoing basis will further add to upward pressure on anticipated O&M expenses in the ensuing years.

Supplement Support Staff

Attrition took a heavy toll on Project Management's Support Staff in 2013. Project Management intends to acquire 3 Project Management Assistants in 2014, as replacements for

those lost in 2013. As the net number of planners increases in 2015 and 2016, the need for additional support staff will increase. Project Management seeks to add 2 Project Management Assistants in 2015 and an additional 2 in 2016, to adequately support the additional planners identified above. Support Staff employees' skills will be developed through on-the-job training and mentoring rather than through formal classroom training. This addition to the Support Staff will result in an additional upward pressure on O&M of 2% of their collective salaries, consistent with the department's Capital/O&M split.

OpEx Returning Personnel

Project Management has been operating with an employee deficit, because individuals have been on special assignments. That situation has been further exacerbated by attrition due to retirements, transfers and the rapid increase in New Business related work that is following the improving economy. These highly skilled individuals will provide a tremendous resource for the department, as their assignments draw to a close and they return to their original positions. These individuals will provide much needed manpower without the added training cost.

These individuals' expenses were absorbed by the OpEx project while they were on loan, such that their return to the department brings an additional impact from those expenses. The return of those individuals represents an upward pressure from the 2% of their pay that is charged to O&M. The incremental impact per year breaks down as follows:

- 2014 - 4 returning individuals at mid-year; and
- 2015 - 5 returning individuals for the full year.

5. Service Order Team (SOT)

a. Activity Description:

The Service Order Team (SOT) is responsible for planning, overseeing and managing new additions and modifications to the electric distribution system, primarily related to services, with variations in scope. The SOT acts as the SDG&E customer representative on these projects, communicating and negotiating with internal and external entities as needed to successfully manage customer expectations, service, meter locations, and project status and costs, while ensuring customer satisfaction and project completion. The majority of the work is capital-related. The O&M expenses are the teams' support of the construction operations for storm recovery, construction maintenance programs, labor for training activities, and order preparation, including for the replacement of minor units of property.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
SOT	*$846*	*$883*	*$37*

b. Forecast Method:

Labor costs are based on the 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology was utilized to record increased staffing levels in SOT Service Planners for future years. It is anticipated that an additional six (6) SOT Service Planners will be required in business years 2014, eight (8) in 2015, and eight (8) in 2016 to support field operations.

Non-labor costs are also based on 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology records the expenses for ESCMP – Safety – Environmental training and technology training for the increased personnel anticipated for future years.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **System Growth**
- **Workforce Development**
- **Regulatory & Environmental Compliance**
- **Increased customer activity**
- **Solar Installations**

System Growth

The Service Order Teams provide a critical service for the building industry and associated trades, which are a major driver of the growing economy in San Diego County. Staffing levels must remain sufficient to avoid backlogged work during crucial time periods, when customers expect quick results and a quick turn-around. With the improving economic projections from 2009, staffing levels will need to increase, to meet customer demands and to support the anticipated growth. Current staffing levels on most teams have unfilled vacancies for both positions (SOT Planner and SOT Service Coordinator).

Workforce Development

Due to the rapidly developing technological arena, SOT employees must undergo comprehensive training with new systems designed to better serve customers' needs. As such, associated training costs have been identified as an upward pressure on this activity.

New requests for solar installations have rapidly increased and are expected to grow over the next several years. Solar applications for 2014 are expected to be at or near 20,000 applications, as compared to 11,000 solar applications in 2013. The trend is continuing upward, with an estimated 30,000 new solar applications for 2015. To keep up with increasing work requests staffing levels must also increase to prevent delays to customer projects.

Regulatory & Environmental Compliance

SDG&E has a strong operational practice that ensures compliance with the laws and regulations affecting the Service Order Team. Some examples of applicable regulatory requirements include:

- The CPUC General Orders regarding construction and maintenance standards (G.O. 95, 128, 166).
- Many times additional requirements are necessary when performing work in the various city or county jurisdictions. These requirements may include:
    - Permitting requirements;
    - Storm water management;
    - Traffic control;
    - Backfill;
    - Paving; and
    - Markout.
- Requests made to upgrade electric service to a residence or commercial business can only be completed once the city or county inspection authority has completed their inspection release and the customer has complied with all of the specifications provided by the SDG&E SOT Planner.
- Federal and state laws related to safety and environmental concerns (OSHA, EPA, Sacred Sites, Endangered Species, Avian Protection).

SDG&E's request includes incremental costs associated with increased staffing to support customer growth, training, and compliance with new laws.

SOT work must comply with all rules and regulations set forth by the municipalities. A large percentage of SOT work involves permits and traffic control, as most electric and gas facilities are located in franchise positions. Increasing customer permits issued by cities and the County of San Diego have created higher production numbers for SOT. To keep up with the increasing gas and electric service work demands, overtime and contracting work levels have risen along with cost expenditures.

6. Regional Public Affairs

a. Activity Description:

SDG&E's Regional Public Affairs group primarily supports electric and gas distribution operations through its work with regional and local governments on issues regarding proposed regulations, permitting, and emergency preparedness and response. Regional Public Affairs also educates officials at the county and city levels about utility issues that could impact customers.

In addition to communicating with governments, Regional Public Affairs serves as the point of contact in the 125 communities SDG&E serves, educating stakeholders about utility operational activities, programs and services, responding to stakeholder inquiries, resolving customer complaints, and working with underserved communities.

Typical activities in this account include:

- Working with regional and local governments on issues regarding proposed regulations, permitting, and emergency preparedness and response;
- Educating officials at the county and city levels about SDG&E issues that could impact customers;
- Educating community stakeholders about SDG&E's operational activities, programs and services;
- Responding to customer and media inquiries;
- Resolving customer complaints; and
- Working with under-represented communities.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Regional Public Affairs	*$1,687*	*$1,687*	*$0*

b. Forecast Method:

Labor costs use Base Year methodology, because it best reflects current and future operating requirements. Non-Labor costs use Base year methodology, adjusted for non-recurring costs. No incremental increases are being requested for this group.

c. Cost Drivers:

Costs in this function are driven by the level of activity within communities, projects being undertaken by the utility, community and governmental meetings, and interest on the part of local elected and nonelected officials.

7. Grid Operations

a. Activity Description:

The Electronic Control Technician is responsible for the overall installation, testing, calibration and maintenance for all Supervisory, Control & Data Acquisition (SCADA) equipment that interfaces with the transmission Energy Management Systems (EMS) and Distribution Management System (DMS), system totals, as well as the distributed generation output signals from customer facilities to SDG&E. The accuracy and availability of the SCADA system is the 24-hour responsibility of the Electronic Control Technician (ECT). Primary duties include the following: program and configure Remote Terminal Units (RTUs); check SCADA site communication lines and levels from end-to-end; respond to any RTU-related trouble calls from EMS and distribution operations; and perform schedule maintenance and troubleshooting on existing systems.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Grid Operations	*$148*	*$348*	*$200*

b. Forecast Methodology:

Due to organizational changes and added responsibilities a 3-year average forecast is most reflective of the cost to be incurred for labor and non-labor in TY 2016. The ECT group is responsible for maintaining and implementing SCADA systems for over 200 substations and 1500 field sites and providing communications capabilities to 80 distributed generating sites. From 2011 to year-end 2013, the ECT group has seen an increase in work load of approximately 15% just from new SCADA sites. All of this new activity, coupled with the responsibility to

provide assistance to the control centers during system emergencies, supports the need to increase the Grid Operations workforce.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Equipment Deployment Growth**
- **Equipment Technology**

Equipment Deployment Growth

Due to many technological changes along with SDG&E initiatives to accommodate the growth of our customer base, there will be an increase in the number of Electric Distribution and substation SCADA RTUs put into service. In addition to the devices already deployed, SDG&E will need increased planned and unplanned maintenance of the devices. By 2016, Grid Operations anticipates the need to add two additional Electronic Control Technicians.

Equipment Technology

Many of the devices currently installed in SDG&E's substations will have to be updated due to the changes in technology and the increase in regulatory requirements to meet cyber security compliance. Currently much of our distribution system is based on serial communications using Systems Northwest Communications (SCOM) or Distributed Network Protocol (DNP) protocols. Our technology vendors are moving towards IP/routable communications, which provides many additional benefits but also comes with cyber-security challenges. This type of technology can make our system more efficient and reliable when implemented with cyber security protections. In order to prevent an attacker from gaining unauthorized access to SDG&E's system, SDG&E is going to have to implement technologies such as firewalls, encryption and network monitoring systems that would prevent or alarm during a cyber-security attack. Some of this necessary work will be completed in late 2014 as distribution operations is planning on implementing IP based communications at several SCADA field sites.

8. Substation Construction and Maintenance

a. Activity Description:

The Substation Construction and Maintenance section oversees and maintains 140 distribution substations on the SDG&E system. Compliance with SDG&E maintenance programs, CPUC and other regulatory programs, and health and safety programs critical to the

safe and efficient installation, maintenance and reliability of all distribution electrical facilities is managed and implemented within the Substation Construction and Maintenance section.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Substation C&O	*$5,896*	*$6,912*	*$1,016*

b. Forecast Method:

Labor costs are based on 2013 Base Year recorded data. The Base Year recorded plus incremental increases methodology supports the necessity for personnel increases in Apprentice Electricians, North American Electric Reliability Corporation (NERC) Project Manager, and North American Electric Reliability Corporation Critical Infrastructure Protection (NERC CIP) cyber security regulations that will impact electric substations, structures and lines. Additionally, increased labor hours are associated with mandated proactive and reactive maintenance compliance regulations tied directly to distribution substation equipment maintenance.

Non-labor are also based on 2013 Base Year recorded data. The Base Year recorded plus incremental increases was used to account for the cost of Arc Flash engineering analyses to determine fault energy within electric distribution substation switchgear, which presents risk to SDG&E electrical workers. Also identified are the fire-resistant shirt replacement program and tooling for the Apprentice Electricians.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Fire Risk Mitigation**
- **Regulatory & Environmental Compliance**
- **Training**

Fire Risk Mitigation

During Elevated Fire Conditions and Red Flag Warning conditions substation electricians are positioned in areas that have high fire danger (usually at a substation) to expedite response to areas of the service territory that may experience an interruption of service or other electrical system problem caused or threatened by extreme weather conditions. Coverage is kept up on a 24-hour basis by rotating personnel on- and off-shift. This is all managed around the clock by the Substation Construction and Maintenance section.

Regulatory & Environmental Compliance

With the implementation of General Order (G.O.) 174, the CPUC has mandated that California utilities formulate uniform requirements for substation inspection programs, the application of which will promote the safety of workers and the public and service reliability. These new rules require mandatory substation inspections, annual documentation of the substation inspection program, and annual reporting summarizing completed and past due inspections with the CPUC. Compliance with the mandated substation inspection program requires an increase in support staff to comply with the inspection tracking and reporting process throughout the year and compliance staff necessary to provide annual reports to the CPUC. Additional substation maintenance will occur as the inspection program continues to evolve and corrective maintenance follow-up activity increases, to comply with the program requirements.

Training

In general, training for technical, developmental and compliance skills is provided to employees who: are new to the job, require refresher training, are newly promoted to a position requiring additional skills, or are in need of additional skills due to new equipment or technology. All training activities are divided into categories of annual, semi-annual, triennial and initial for Safety, Environmental and Workforce training sessions. Training assignments are based on work and tasks performed by each individual within the department. Assignments will vary between employees and cost centers.

Initial costs will be those associated with labor, which are incurred when crews attend refresher training classes. However, the benefits of these courses are clearly visible through a more vigilant and alert workforce, which will lead to a lower number of injuries on the job and a safer work environment. TY 2016 will see an increase in training hours due to the anticipated increase in personnel in the coming years.

To achieve Kearny Maintenance Operations goals, it is critical to continue to systematically replenish the organization with critical skills through apprenticeship and other entry-level hiring and development programs. Training is a key component of succession plans for those highly skilled positions. New training courses are continuing to be developed for the workforce that will enhance abilities to perform tasks.

Journeyman & Apprentice Development

The substation group will continue to develop training for its Journeyman and Apprentice Electricians, to allow them to refresh and learn new skills as they move through their different crew assignments. In some cases, personnel may not work with certain types of equipment on a regular basis, such that refresher course training is necessary.

Climbing

Development is ongoing to expand the current training to three separate levels of training including: orientation, qualifying, and learned skills. This will make the climbing training consistent with the line-side training program and meet regulatory requirements. Each three-week training session will provide individuals with the knowledge to work safely in the steel structures.

9. System Protection

a. Activity Description:

System Protection Maintenance (SPM) consists of two groups: the Relay Technician group and the SCADA Technician group. Relay technicians maintain protective relays and control systems within SDG&E's substations. This involves routine preventative maintenance on time-based intervals, calibrating and trip-testing protective relays. This also involves corrective maintenance and troubleshooting existing systems that alarm or fail to function properly. Relay technicians change relay settings when required and download relay records after system faults occur. Technicians provide relay data (such as distance to fault) for locating line faults. This group also maintains approximately 4500 distribution relays. Relay technicians maintain other control systems for specialized equipment that SDG&E uses, such as the Static VAR Compensator at Talega substation, or the series capacitor banks at the Imperial Valley substation.

The SCADA group, which was moved to SPM in 2012, works on installing distribution voltage regulators, capacitors, distribution reclosers, weather stations, distribution SCADA-controlled equipment and switchgear. The SCADA group also maintains substation batteries, aircraft warning lights and other technical equipment on the distribution system. There are approximately 1300 such devices in the system that this group maintains and installs. This work involves commissioning new systems that are installed, performing time-based maintenance, and responding to emergencies.

System Protection Maintenance staffing is on call during non-business hours and provides standby personnel for fire risk mitigation and system emergency response (e.g., unscheduled load shedding and earthquakes). This is a technical group that uses computer-driven test equipment. Databases are used to generate work orders and store test results.

The aging infrastructure includes old electromechanical relays that are being upgraded with microprocessor-based relays. These new relays have considerably more functionality than the older discrete single-function electromechanical units, but they require a greater degree of technical expertise and skill to maintain. In particular, computer and logic skills are essential to work with these devices. New, more complex protection schemes are being implemented for these relays, service restorers and SCADA switches, which take advantage of the increased functionality. As a result, SDG&E has increased the related training it provides to its technicians.

System Protection Maintenance department staffing consists of relay technicians, SCADA technicians, battery technicians, electrical engineers, supervisors, a system analyst and a scheduler.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
System Protection	*$1,545*	*$1,711*	*$166*

b. Forecast Method:

The Base Year recorded forecasting methodology was utilized for both labor and non-labor due to a department reorganization, which transferred the SCADA function from Substation Construction & Maintenance to System Protection Maintenance in 2012.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Fire Risk Mitigation**
- **Regulatory & Environmental Compliance**
- **System Growth**
- **Aging Infrastructure**
- **New Technology**

Fire Risk Mitigation

System Protection Maintenance is required to supply standby crews at strategic positions in the system to expedite response to areas of the service territory that may experience interruption to service during extreme Red Flag weather conditions. This standby support is provided around the clock.

In preparation for the fire season, fire-related work orders are issued, such as changes in reclosing, and the testing of IntelliRupters, which require System Protection Maintenance workforce implementation. Since 2009, 160 Intellirupter sites have been placed in remote rural regions on the distribution system to help mitigate the possibility of fire during elevated fire conditions. SCADA technicians provide technical support for proper unit operation. This support includes an annual trip test on each of these 160 IntelliRupter sites, and the annual testing of an additional 70 recloser sites in the High Fire Risk Area (HRFA). All of these sites are on a three-year control battery replacement cycle.

Regulatory & Environmental Compliance

With new NERC rules applying to maintenance tracking on the Bulk Electric System, new cyber security rules in substations, and CPUC rules related to Distribution Substations, more compliance and audit training is required for staffing.

System Growth

Substation additions and upgrades add to the total number of devices that must be maintained by System Protection Maintenance. New systems have increased technical complexity, which requires additional skills and training.

Aging Infrastructure

As infrastructure ages, there is increased call-out activity for corrective maintenance measures due to failed equipment.

New Technology

The replacement of obsolete equipment with new modern microprocessor-based devices and computer-driven test equipment, such that ongoing training is required to keep staff up-to-date. This is a significant challenge facing System Protection Maintenance**.**

10. Electric Distribution Operations

a. Activity Description:

The Electric Distribution Operations Control Center is responsible for the safe, efficient and reliable delivery of power to SDG&E's 3.4 million consumers through approximately 1.4 million electric smart meters. The control center personnel have overall operational control of the electric distribution system for planned and unplanned work on a system that consists of 1016 circuits and approximately 287 substations (132 substations and 155 step-downs). Emergency operations related to service restoration, Red Flag Warnings, storm response and G.O. 166 requirements originate in the Distribution Control Center.

Grid modernization has contributed to increased workload for the Distribution System Operators. Additionally, we continue to experience increased workload due to steady system growth, replacement of aging infrastructure, requirements to comply with CPUC General Orders including G.O. 165 and G.O. 166, integration of Micro Grid and distributed energy resources, risk mitigation efforts related to safety, reliability, and security, and increasing customer expectations for outage information. Recent technological advancements require a more technical skill set of distribution system operators. In order to effectively manage today's complex electric system the operators must be computer literate, knowledgeable of the Outage Management and Customer Information Systems, new electronic field devices and new techniques to restore electrical service. Continuous developmental and refresher training is important and essential to enhancing and keeping the Distribution System Operator's skills up-to-date.

Turnover of distribution system operators due to attrition, department transfers or retirements also continue to create upward pressures on training costs. This turnover has resulted in a relatively inexperienced distribution system operator workforce. This, coupled with the inexperience in the field, has led SDG&E to invest significantly in the training and development of its workforce.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Electric Distribution Operations	*$10,938*	*$15,315*	*$4,377*

b. Forecast Methodology:

Labor and Non-labor costs are based on a 3-year linear forecast. Increased labor costs are due to the creation of the Business Solutions and Training Team, as well as filling vacancies within the control center.

Non-labor costs include increasing maintenance costs for both hardware and software and exempt materials. These costs go up as more hardware is installed in the field, for example, for more weather instrumentation, cameras, or SCADA devices, which enhance fire, security, and reliability risk mitigation. The servers that manage and collect the data for these risk mitigation and other devices will also need upgrading and/or replacing. The exempt materials are the largest portion of non-labor in this workgroup.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Maintain Improved Safety Performance and Reliability**
- **Grid Modernization**
- **Workforce Development**
- **Fire Risk Mitigation**
- **Emergency Response**
- **Exempt Materials**

Maintain Improved Safety Performance and Reliability

SDG&E is committed to maintaining a safe working environment for employees and a safe electrical distribution system for customers and the general public. Round-the-clock supervision is required during normal operating conditions and additional management resources are required during emergency conditions (system stress, Red Flag Warnings, Elevated Fire Weather Conditions, Storms, etc.). The Technical Support Team requires one additional engineer in order to provide 24/7 technical support coverage during normal operating conditions in order to provide shift coverage for shift vacancies (vacation, sick days, jury duty, etc). An additional team lead is also required to support the preparation and training for the Community Fire Safety Program and to provide sufficient management coverage to support around-the-clock coverage during emergency conditions and to backfill the existing team lead's duties during vacations and sick days.

New Technology

Electric Distribution Operations Systems Services (EDOSS) provides technical and operational assistance necessary to operate the electric distribution system safely and efficiently.

SDG&E anticipates that the SCADA sites in the next two to three years will at least double. Additionally, the Outage Management System (OMS) and Advanced Distribution Management System (ADMS) will require modeling and continuous administrative support to validate real-time power flow information. This will require increased support staff, upgraded equipment, and adequate facilities to effectively manage these additional sites and systems.

This also applies to the Back-Up Control Center, where equipment such as computers, monitors and radio consoles will require updating to ensure an efficient and reliable work environment.

Workforce Development

The Apprentice Distribution System Operator (ADSO) training program is a two-year program that consists of both classroom and on the job training. The ADSOs are trained to become Distribution System Operators (DSOs), who are responsible for operating SDG&E's Electric Distribution System in a safe, secure, efficient and reliable manner. They adhere to procedures that promote general public and employee safety and risk mitigation during planned and unplanned outages, while being able to direct restoration of service as quickly and as safely as possible. The next ADSO class will begin in the third quarter of 2014.

Fire Risk Mitigation

Currently, SDG&E has two Meteorologists on staff. The Meteorologists provide daily reports that are critical to making real-time operating decisions to safely manage and operate the electric system. With the addition of another full-time Meteorologist, Electric Distribution Operations will be able to provide coverage on a 24-hour, 7-day per week basis and support SDG&E's Construction and Operations Centers, which require this critical information to make sound operating decisions (e.g., staging crews, increasing personnel, managing aerial operations, implementing work restrictions during adverse weather conditions, and other emergency efforts as appropriate). The meteorologists provide 24/7 operational advice supporting equipment and crew operations. This is especially important during periods of adverse weather conditions with special focus on fire risk and extreme Santa Ana weather conditions. During high fire risk periods, real time weather information support is essential to understanding the changing weather

conditions, to operate the system safely under given conditions and to minimize or eliminate risk that SDG&E equipment could be a source of ignition.

In order to prepare for emergency events, we have designed and developed mobile communication trailers that provide communication support for our crews' operations. These trailers are required to be operational at any moment in time. Most recently, two of these trailers were utilized during the 2014 fires that affected SDG&E's service territory in May. One trailer was deployed to the Pendleton area and one was deployed to the Escondido area to provide communications and support operations for SDG&E crews responding to two different fires. These trailers are especially important during the fire season. We will stage these trailers in preparation for an extreme weather event so they are close to areas that are anticipated to experience the extreme weather.

Currently, we also have cameras throughout the service territory providing visual situation awareness. These devices were introduced to support fire awareness and risk mitigation. Some of these cameras have a complex software algorithm that detects and alerts a control center regarding a potential fire. These cameras are normally located in non-populated areas where the first initial identification of a fire could be from one of these cameras.

11. Distribution Operations/Enterprise Geographic Information System Standards (EGISS)

a. Activity Description:

Enterprise GIS Services (EGISS) personnel are responsible for providing accurate real-time GIS Mapping of all assets in the fields related to electric distribution, substation and telecommunication. Accurate and timely maps are essential to safety and reliability for operational groups, including the switching center, who direct field personnel that operate equipment when restoring service or when constructing new capital projects.

The SDG&E GIS is a direct input of information into many operational and planning tools used by engineering and operations, including the Outage Management System (OMS), Distribution Management System (DMS), and SynerGEE Load Flow Program.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
DistOps EGISS	*$2,091*	*$2,647*	*$556*

c. Forecast Method:

Labor costs are based on a 5-year linear forecast due to the need to backfill positions that will address backlog work resulting from the rollout of the new Geographic Information System (GIS). The new system includes more data points and is more complex than the old system, increasing the time it takes to complete a job by at least 30%. For labor, the 3- and 4-year linear approaches show a decline in the workforce that cannot be achieved given the backlog in the new, more complex system.

For non-labor, the 5-year linear method is appropriate to use, because it is the only forecast method that shows the incremental trend of the GIS software maintenance contract. Non-labor costs are directly related to software maintenance, also based on a 5-year linear forecast.

d. Cost Drivers:

The following contributes to the upward incremental cost changes:

- **Workforce Development**

Workforce Development

Prior to the GIS implementation and the post-deployment period, SDG&E EGISS developed a large backlog of work, impacting productivity and quality control. The system backlog increase resulted from revising system maps and documentation from the legacy GFMS mapping system to the new GIS mapping system. The backlog increase was also attributed to inputting all new assets into the new GIS system. Since the GIS roll-out, at least three new software and operational tools that interface with the GIS have been rolled out. The number of jobs received in EGISS for preliminary digitizing in preparation for construction has increased and will continue to increase substantially. Once construction of these jobs is complete, EGISS will have to reconcile and finalize them in GIS. In order to keep up with the increasing job throughput, while continuing to work towards reducing the number of jobs in the backlog, two additional EGISS coordinators are needed to help support the mapping and quality control function.

Integration with New System Tools and Programs

The roll-out of the new Geographic Information System (GIS) software brought many business process improvements and will continue to do so over the long term. However, as new

software and operational tools that interface with the GIS are rolled out, the existing EGISS staff will require training to learn how to utilize the new programs.

12. Kearny Operations Services

a. Activity Description:

Kearny Operations Services includes six functional work groups, described below.

Compliance and Analysis

This group carries out its function through audits, statistical analysis and reporting requirements necessary to demonstrate compliance with regulatory agencies. Additionally, the group supports field personnel through the development of local systems and mobile data terminals (MDTs). Finally, the group maintains the relationship with the Safety and Enforcement Division (SED) to comply with CPUC requests regarding SDG&E's electrical system.

Tool Repair

This group is responsible for the maintenance, repair, fabrication and acquisition of new tooling to support the needs of Electric Regional Operations, Kearny Substation Construction and Maintenance, System Protection Maintenance and others.

Apparatus

This group is responsible for salvaging line equipment removed from service. Activities include scrapping or refurbishing equipment such as overhead and underground transformers, capacitor racks, Sulfur Hexafluoride (SF6) gas and oil switches, and the associated gas and oil reclamation and recycling activities.

Transformer Repair and High Voltage Test

This group is a North American Independent Lab certified high voltage test station that tests and confirms the electrical condition of transformers, regulators, mechanical jumpers, grounds, hot sticks and other live line tools and equipment. The responsibilities also include transformer, regulator and street light controller repair, as well as field testing new equipment received by the logistics group for quality control.

Protective Equipment Testing Laboratory

This is a North American Independent Test Lab certified to inspect and test rubber goods used for electrical worker personal protection. The Lab is responsible to inventory and provide compliant rubber goods for all of SDG&E's gloves used by workers at mandated intervals.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Kearny Operations Services	*$1,838*	*$2,239*	*$401*

b. Forecast Method:

Labor costs are based on the 2013 Base Year Recorded data. The Union Agreement requires that journeyman electrical employees are utilized for the test repair and inspection activities. The Union Agreement has resulted in increased wage rates over the past several years, which have driven operating costs.

Non-labor costs are forecasted using the 4-year average methodology. This methodology records projected tooling expenses and FR shirt replacements for union employees.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Increased Operating Costs**
- **Sulfur Hexafluoride Emissions Regulatory Compliance**

Increased Operating Costs

The Union Agreement requires that journeyman electrical employees are utilized for the test, repair and inspection activities. The Union Agreement has dictated increased wage rates over the past several years, which have driven operating costs.

Sulfur Hexafluoride Emissions Regulatory Compliance

In order to maintain continued compliance with EPA's Subpart DD and CARB's SF6 rule, SDG&E must closely track the usage and disbursement of SF6 (and installation and removal of SF6 gas-insulated switchgear equipment) in its system. This process is labor-intensive and requires retrieval of information from various internal databases and coordination with field personnel. In order to achieve higher efficiencies, implement a more robust quality assurance program, reduce the risk of errors, and make progress toward achieving and sustaining the CARB-mandated SF6 emission rate of 1 percent (by 2020), additional software tools and staffing resources will be needed. In addition, field surveys will be needed to maintain an updated inventory of gas-insulated switchgear equipment. SDG&E's Kearny Operations Services department has identified the incremental costs associated with the additional resources and measures that will be needed to maintain continued compliance with the SF6 rules. For the environmental policy drivers please see the testimony of Mr. Scott Pearson (SDG&E-18).

13. Construction Services

a. Activity Description:

Construction Services consists of four main groups which include Construction Services Construction Management, Construction Services Contracting, Aviation Services and Fire Coordination and Prevention.

Construction Services Construction Management:

The Construction Services Construction Management group provides construction management and field oversight of all construction performed by Contractors on Electric Distribution. This is to ensure that all work is built to SDG&E Design and Safety Standards and in accordance with current contracts following G.O. 95 and G.O. 128. The O&M portion of the work conducted by Construction Services includes O&M activities that are associated with completing capital project construction work, locating services, maintaining streetlights, abating graffiti, and installing or removing transformers.

Construction Services Contracting

The Construction Services Contracting group is responsible for many of the administrative activities associated with the Construction Services-managed construction work. This includes managing all job packages, such as data management, permit verification, environmental releases, purchase orders and negotiation of start and end dates. Additionally, the group interfaces with Supply Management to aid in processing jobs that meet the criteria and constitute bid work, therefore requiring request for proposals. Furthermore, Construction Services Contracting works with project managers, budget managers and contractors to manage timelines and scheduled completion dates. Contractors are also engaged when invoicing issues arise, or when there is a need for tracking jobs that must be energized with consideration to special date or time requirements. The team also monitors all "as-built" documentation packages to ensure accurate recordkeeping pertaining to SDG&E facilities. Finally, this group also coordinates with the Construction and Operations Corrective Maintenance Program (CMP) by monitoring/tracking jobs constructed by contractors, including pole and transformer replacements, quality control follow up services and fire risk mitigation services.

Aviation Services

The Aviation Services group provides oversight for construction, operations and maintenance activities that involve helicopter and fixed wing aircraft. Activities involve mission

planning, flight safety planning, safety oversight of operations, contractor and pilot qualification review, equipment review, identification of landing zones, fuel management planning and flight tracking. This group also manages the contracts for these services.

Fire Coordination and Prevention

The Fire Coordination and Prevention group is staffed with a team of individuals with extensive experience in firefighting and fire prevention. This team works closely with engineering, operations and construction to build fire safety and fire preventive measures and procedures into designs and operational and construction activities. The Fire Coordination and Prevention team serves as a liaison between the fire department and utility operations, so that emergency response is coordinated and effective. This coordination improves the overall emergency response, making conditions safer for the firefighters and first responders, utility workers and the general public. The Fire Coordination and Prevention team also oversees contract fire prevention and suppression services that are utilized by SDG&E when electric crews are working in high fire threat zones during fire season and during extreme fire weather such as red-flag Santa Ana events. This group also assists with fire safety training to electric personnel and electric safety training to first responders, and provides subject matter expert opinion in regulatory proceedings and litigation. The fire coordinators also assist with fire safety training to electric personnel and teach electric safety to first responders.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Construction Services	*$5,226*	*$18,865*	*$13,639*

b. Forecast Method:

Labor costs are based on a 5-year average. Labor includes the O&M portion of several employees whose costs are split among various plan categories. The O&M percentage of this labor ranges from 2% to 70%. Non-Labor costs are also based on a 5-year average. Non-labor includes additional "associated with Capital" O&M and Transformer installations, contracted wildfire strike team fire prevention and suppression services, contract air-crane firefighting costs, hanger lease payments for the aviation services group, as well as increased cost associated with helicopter utilization due to maintenance and inspections and an offsetting one-time insurance reimbursement.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **System Growth/ System Capacity**
- **Reliability and Safety**
- **Fire Risk Mitigation**

System Growth/System Capacity

As the economic recovery takes hold, SDG&E's service territory is experiencing resurgence in new construction developments (residential and commercial) and higher levels of infrastructure improvement construction work to roads, water lines and sewer systems. This translates into additional work and O&M expenses for SDG&E to locate services to mark-out utility equipment and infrastructure, minimizing the risk of damage during construction, which would cause public and employee safety and reliability risks. This additional development also requires SDG&E to install additional transformers associated with new customers connecting to the system and an increase in transformer change-out activity, in order to mitigate safety, security, and reliability risks due to changing electric loads and aging infrastructure. Projects to address other electric system capacity and reliability risk issues and the overhead to underground conversion program also contribute significantly to the workload and expenses in Construction Services.

Reliability and Safety

Construction Services performs significant amounts of construction work related to projects that maintain the reliability of the electric system and improve safety for both workers and the public alike. These projects are primarily capital intensive but have portions of the work that are associated with O&M activities. Project types include proactive cable replacement, fire hardening projects, deteriorated pole change-outs, switch and capacitor change-outs and upgrades, reconductors for reliability reasons and relocations for safety or franchise reasons. Associated O&M expenses in this area are anticipated to be increased consistent with the increased capital spending on pole replacements, fire hardening and equipment upgrades on the system.

SDG&E continues to highly prioritize fire and safety risk mitigation. The Company is significantly increasing its capital spending in this area. As capital spending on these projects ramps up, so will the corresponding O&M associated with this work. Construction Services will experience significant increases in O&M expenses primarily related to work completed in

association with Fire Risk Mitigation (FiRM) electric distribution capital project numbers 13247 and 14247. As the FiRM capital projects move forward, there will be associated activities that will be charged to O&M accounts. Certain non-capital upfront project activities may be charged to O&M accounts such as data acquisition, records review, LiDAR, 3-dimensional computer modelling, validation of spacing and clearance of wires, and re-creation/validation of old pole loading records. O&M activities anticipated during construction will include costs to transfer existing wire to new poles, re-connecting existing customers' services to a new transformers, and line switching operations; and on an individual basis, upgrading or changing out items such as cross-arms, fuses and other minor components. For additional information regarding the justification and details of the FiRM projects and other capital project work, please refer to the Electric Distribution Capital testimony of John Jenkins, Exhibit SDG&E-09.

Fire Risk Mitigation

Fire season is now a consideration year-round, as evidenced by the May 2014 wildfires that affected San Diego County. A significant portion of SDG&E's service territory is in the very high and extreme fire threat zone and requires special attention to appropriately manage fire risk is managed appropriately. The fire threat zone is regularly subject to extreme Santa Ana winds and red-flag fire weather conditions. The ongoing threat for fires will require a high level of Quality Control (QC) inspections and repairs in rural areas to maintain reliability and safety and reduce risks associated with the electric system. As a result, electric system hardening activities are ongoing and will require adequate resources to maintain a safe and reliable system. Construction Services incurs expenses related to fire prevention and response via internal fire coordination personnel as well as contractor fire prevention and suppression teams. Funding is required to deploy these teams alongside construction and maintenance crews when performing live line work in the fire threat zone to minimize the chance that a fire will ignite and become a wildfire. These crews are also pre-deployed to strategic locations during red flag Santa Ana events to assist field crews in their response activities. The ongoing drought and expenses for Red Flag Santa Ana wind events are contributing to the upward cost pressures in this area.

14. Vegetation Management (Tree Trimming)

a. Activity Description:

This section of testimony addresses the labor, materials and other expenses associated with SDG&E's tree pruning, tree removal, and other vegetation management expenses. The expenses are currently treated under a one-way balancing account for distribution-related work; however, SDG&E is proposing two-way balancing treatment as part of this GRC filing. As part of the 2012 GRC decision, SDG&E was allowed to raise its request for two-way balancing account treatment in the next GRC.[12]

SDG&E's expense forecast for its electrical distribution Vegetation Management Program is required to perform the vegetation management activities necessary to mitigate risks to public safety, to support fire prevention and preparedness, to maintain system reliability and to comply with G.O. 95, Rule 35, Public Resource Code, sections 4292 and 4293, and the North American Electric Reliability Corporation (NERC) FAC-003. From year to year, expenses are hard to accurately predict, due to the high variability of the number and variety of trees and vegetation requiring line clearance pruning annually and the variability in the amount of trim work required on each tree, combined with stringent environmental factors, recent regulatory changes to G.O. 95, Rule 35, and increased inspection and removal of hazard trees in response to concerns expressed by the California Department of Forestry and Fire Protection (CalFIRE). With a two-way balancing account in place, SDG&E requests that funding be maintained in line with an historical 3-year average level of spending plus a modest adjustment to account for administrative, operational and information technology-related expenses associated with SDG&E's new (2014) Powerworkz vegetation management information system.

Overview of the SDG&E Vegetation Management Program

SDG&E's Vegetation Management Program is responsible for inspecting and maintaining an inventory of approximately 450,000 trees that have the potential to encroach within the minimum required compliance distance between vegetation and overhead power lines. This work includes pruning healthy trees growing into overhead power lines as well as the pruning or removal of dead, dying, diseased, or structurally unsound trees with the potential to fall into overhead lines. Additionally, the pole brushing program inspects and maintains an inventory of approximately 86,000 poles located in areas determined to be at high risk for

[12] P. 153 of CPUC proposed decision (Rev. 1) A.10-12-005.

wildland fires. Pole brush work includes mechanical clearing, chemical treatment, and mechanical re-clear activities to maintain compliance. SDG&E requests two-way balancing account funding for its tree trim activity separate from its funding for the pole brushing program, which is treated as a regular O&M expense.

SDG&E is responsible for compliance with CPUC G.O. 95, Rule 35; Public Resources Code, sections 4292 and 4293; and NERC FAC-003. Compliance with these rules and regulations mandate a minimum clearance between vegetation and SDG&E facilities and are the primary cost drivers of the program. SDG&E's vegetation activities are coordinated through a centralized Vegetation Management Program within the Construction Services department under the Electric Operations organization. The Vegetation Program Manager and staff set the standards, guidelines, and processes for the overall program to ensure that the company is in compliance with all rules, laws and regulations governing SDG&E practices. The Vegetation Management staff includes Program Manager, Team Leads, Area Foresters, Contract Administrators, Quality Assurance Specialists, Technical Support/Analyst, and Customer Service Administrative staff.

There are two types of work which drive the tree program costs; 1) routine work and 2) field memos and hazard tree work. Routine work includes annual-cycle pruning and removal of trees. Pre-inspection contractors perform the overhead power line patrols which identify trees to be pruned and removed. Routine tree pruning and removal is typically done by a contractor and is compensated on a unit price basis.

Field memos are reactive and/or unscheduled tree pruning, and include customer refusals, hazard tree pruning and removal, environmentally or culturally sensitive pruning activities, trees which require priority pruning, district requests and customer safety checks. Due to the varied nature of these orders, this type of work is compensated on a Time & Equipment (T&E) basis when performed by a contractor. On occasion, SDG&E field personnel may perform some vegetation management activities if they are simple in nature and can be done immediately at the time of identification.

To ensure the above activities are completed in accordance with the company's contracted scopes of work, SDG&E has a quality control program to verify the completion and certification of each work activity. An automated random sampling method is used to create audit work packages, and then the auditor field reviews records for adherence to contract

specifications, quality and compliance. In conjunction with the post-prune audit, auditing activity includes a patrol of all spans of overhead power lines for any trees that may have encroached the minimum clearance zones since the last pre-inspection activity. This activity provides a higher level of compliance for the duration of the annual cycle. Due to the variability in units audited and distance between locations, audit work is compensated using Time & Equipment (T&E) rates.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Vegetation Management (Tree Trim bal.)	*$23,104*	*$24,559*	*$1,455*

b. Forecast Method:

Labor and non-labor costs are based on the most recent 3-year historical average. Labor consists of Vegetation Management staff labor and other support activities. Non-labor includes field work plus tree trim's share of contractor insurance. In spite of a host of potential upward cost pressures, the 3-year historical average plus a modest adjustment associated with the new Powerworkz information system appropriately represents forecasted expenses for this group.

c. Cost Drivers:

The following contribute to potential upward cost pressure and provides justification of the need to maintain adequate levels of funding:

- **Tree Pruning and Removal**
- **State of Emergency Resulting from the Drought Conditions**
- **Regulatory & Environmental Compliance**

Tree Pruning and Removal

To estimate the workload pressures for 2016, consideration was given to: 1) historical tree pruning and removal data; 2) the composition of fast, medium and slow growing tree species in the SDG&E tree inventory and the rate at which these trees require pruning; 3) environmental factors such as prolonged drought, beetle and borer infestation and post-wildfire tree mortality; 4) recent regulatory changes to G.O. 95 Rule 35 including the addition of Fire Threat Areas as currently defined by the rules; 5) robust levels of liability insurance coverage by contractors performing vegetation management activities; and 6) implementation of recommendations for increased hazard tree inspections. It is important to note, however, that a substantial amount of hazard tree work has been completed on dead, dying, diseased or structurally unsound trees in

recent years in order to maintain a safe overhead electric system. It is anticipated that this will continue in future years. Additionally, the CPUC has required that SDG&E continue its off-cycle inspections in the company's defined highest risk fire areas through year 2016. Because of the safety and risk mitigation benefits related to these inspections, it is anticipated that this activity will continue in 2017 and beyond.

State of Emergency Resulting from the Drought Conditions

On February 17th 2014, Governor Brown issued a "State of Emergency" due to the ongoing drought. Subsequent to that, on February 18th 2014, CPUC Safety Enforcement Division acting director Denise Tyrrell issued a letter to SDG&E regarding this matter. The letter directs the utilities to increase inspections in fire threat areas, re-prioritize corrective action items, and modify electric system fault protection schemes. Considering this letter as it relates to vegetation management, SDG&E will monitor the tree mortality resulting from the drought, assess whether any additional concerns arise beyond what is planned and respond as necessary. SDG&E's proposed two-way balancing account treatment will help to address the significant additional vegetation management costs that may be necessary to protect the public and the system from drought-related risks. These costs are difficult to accurately predict, in part due to the unknown severity and duration of the drought in future years and the potential associated vegetation management related costs. SDG&E has not requested additional funding for potential vegetation management cost increases due to the drought in this GRC, but rather relies on its proposed two-way balancing account for vegetation management to mitigate drought-related safety and reliability risks.

The tree forecast for 2016 was calculated using existing cost data and contractual pricing for tree pruning and removal services, historical tree pruning/removal data, and an estimation for T&E crews to perform field memo and hazard tree work. Weather and rainfall amounts can have both short-term and long-term impacts on workload. There have been some preliminary forecasts that the winter of 2015 could be a wet and rainy "El Nino" winter season. Should this happen, SDG&E would anticipate a higher than normal year for routine tree pruning and removal, based on a relatively wet rainy season associated with an El Nino event. However, a single year's precipitation may still not be sufficient to help many of the trees recover from the previous years of extended drought and may not improve the situation for 2016 and beyond.

Regulatory & Environmental Compliance

Recent regulatory changes to G.O. 95, Rule 35, to include the new fire threat areas will maintain or grow SDG&E's current tree inventory and maintenance requirements. The minimum clearance required at all times has been increased from 18 inches to 4 feet in Local Responsibility Areas (LRAs), which are also fire threat areas. So far, the impact of this change has been relatively minor, affecting only 5,557 trees in the SDG&E inventory. This impact has been included in the forecast of expenses. However, any future increases driven by regulatory changes and expansions of fire threat area are not included in the forecast, as they are not known at this time.

As a prudent practice, SDG&E has required that all contractors involved in vegetation management field activities acquire $200 million in excess liability insurance coverage, including wildfire coverage. SDG&E has agreed to reimburse the contractors directly for the portion of the increased cost for this insurance for the SDG&E service territory. If SDG&E did not reimburse the contractors directly, contractors would include these costs in their pricing. This pricing would likely be conservative, because there is uncertainty in the volume of work that a contractor may have in any year, such that SDG&E could overpay for this insurance coverage. Paying directly ensures that the contractors have the required insurance and that SDG&E only pays for the coverage they receive. This practice was presented and adopted in SDG&E's TY 2012 GRC. SDG&E is currently operating in this manner and plans on continuing this practice going forward.

CalFIRE has asked SDG&E and other utilities in the state to increase inspection and removal of potential hazard trees and limbs. CalFIRE has stated that utilities should conduct detailed, 360-degree inspections of any tree capable of contacting overhead power lines, regardless of the tree's distance from power lines. This same concern has been expressed by the CPUC's Safety and Enforcement Division. SDG&E has developed additional hazard tree assessment training. The purpose of this third-party training has been to further develop and enhance the skills of staff and contractors in the identification of hazard trees and the protocol for managing them. As a result of these developments, SDG&E has identified an increased number of trees that must be included in SDG&E's database for inspection. The number of hazard trees that have been identified for pruning or removal has also increased. These increases are expected to continue in future years.

In recent years, SDG&E has continued to see a decline in tree health for several species. Eucalyptus and oaks have been severely impacted from years of drought in San Diego County. Although there is potential for a wet "El Nino" winter in the short term, San Diego County is forecasted (long-term) to remain at extreme drought level (D3) for the next few years.[13] At the same time as trees are increasingly stressed from continued drought, the infestation of the long horned borer and beetle, Tortoise beetle, and the Lerp Psylid in eucalyptus have become more prevalent, leading to greater tree mortality. Oak trees are subject to mortality from the Golden Spotted oak borer and past fire damage. These factors have caused SDG&E to experience an increase in cost to manage hazard trees. Hazard tree abatement can require specialized crews and equipment to safely mitigate the hazard. These costs will still continue due to the safety hazards associated with this type of work and the special disposal treatment required for infested wood.

This high vegetation management workload has generated large amounts of biomass requiring disposal. SDG&E expects this increased biomass waste generation to continue. With the increased awareness for fires and the enforcement of fuel reduction by the state and local agencies, customers are requesting that SDG&E remove all wood generated from large tree pruning and removals. Offsite disposal not only impacts company resources and cost, but also impacts local landfill capacity. SDG&E has been active in looking for wood and chip disposal alternatives. Some alternatives include composting, co-generation, and erosion control. Additional costs for any of these activities may include tipping fees, delivery and/or pickup fees, modified material size requirements, additional grinding fees, and other necessary costs.

Ongoing vegetation management cost pressures include vegetation activities on Cleveland National Forest (CNF) to address nesting surveys. CNF has developed a protocol applicable to the vegetation management department that requires formal nesting surveys prior to any tree trim or tree removal activities during bird breeding season (December 1 through July 31). The costs for environmental surveys conducted in association with tree trim or tree removal are charged to the vegetation management Tree Trim Balancing Account.

SDG&E is nearing the final year of a five-year contract with current contractors and will be rebidding all of its vegetation management activities. This includes bidding for pre-inspection, tree trimming, auditing, biomass treatment, tree replacement, and educational

[13] US Drought Monitor, available at http://drought.unl.edu/dm/monitor.html.

outreach. Preliminary discussions with contractors indicate that SDG&E will be fortunate just to hold costs in line with normal escalation under new contracts. Contractors have indicated that they face cost pressures as a result of rising labor and equipment expense, new systems and training requirements, increased responsibilities on the contractors, and more communication and education to customers and agencies.

Tree trim vegetation management program costs, other than the field-related inspection and trim costs, are expected to stay at levels recently experienced over the last 3 years, with the exception of costs associated with the new Powerworkz information system. Powerworkz is a geographical information system (GIS) integrated work management system that SDG&E recently implemented (in 2014) for vegetation management, to provide additional functionality to improve operations and work management. Powerworkz replaced the obsolete VMS tool. Among other things, Powerworkz supports scheduling, inspections, work routing/approval/completion, audit sampling and work aggregation for invoicing. Powerworkz is able to provide the necessary functionality required to support increasing regulatory requirements, which improves compliance tracking across all work flows. Ongoing funding is necessary to pay for costs associated with operating and maintaining this system. In addition to Powerworkz, other program costs include activities such as environmental requirements, public education, staff and contractor training, SDG&E Vegetation Management staff labor, and other support activities. All of these costs are also included in this request.

SDG&E Historical Tree Trim Workload

Based on recent historical workload, Vegetation Management expenses (tree trimming related) are forecast to be near their 3-year historical average, with expenses primarily driven by required compliance levels and the need to continue with enhanced fire risk reduction strategies. SDG&E's historical tree pruning activity fluctuates from year to year due to two main factors: 1) the composition of fast, medium and slow growing tree species in the SDG&E tree inventory, which determines the varying rates at which these trees encroach the overhead lines; and 2) the impact of drought, pests and disease, causing tree mortality and decline in overall tree health system-wide. These factors are expected to continue to impact the workload for the tree program. These factors can create upward pressure and cost volatility for 2016 and beyond, compared to base year 2013. The volatility and unpredictability in this workload justifies two-

way balancing treatment, combined with the use of historical averages to determine funding levels.

SDG&E's vegetation management workload has grown significantly over the last decade. Several tables are provided below that demonstrate this growth. Table 1 below represents SDG&E's tree inventory for the last nine years, with a beginning and end of year total. Table 2 represents the total number of trees trimmed and removed for the last nine years. Table 3 represents the number of hazard / reliability tree work completed since 2007.

Table 1: Tree Inventory by Year

Year	Beginning of Year	End of Year
2005	439841	396877
2006	396877	383791
2007	383791	372676
2008	372676	367402
2009	367402	374741
2010	374741	390041
2011	390041	414868
2012	414868	454095
2013	454095	454890

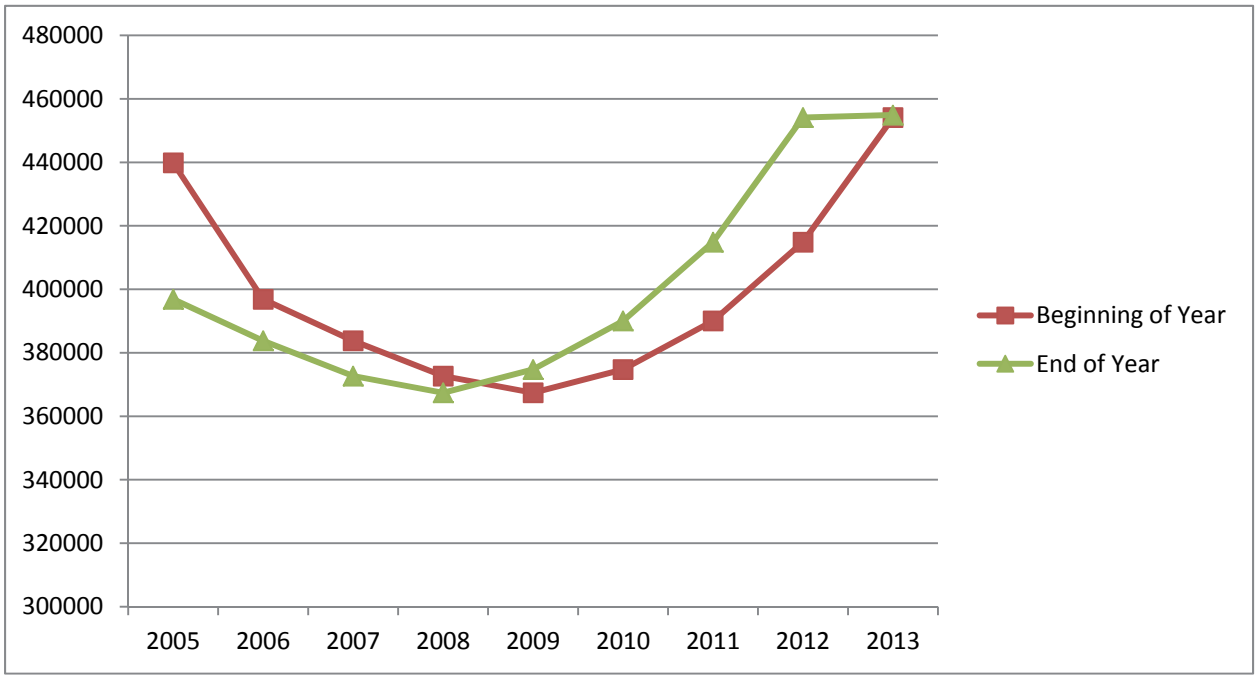


Table 2: Tree Trim and Removal by Year

Year	# of Trims (Total)	# of Removals (Total)	Combined total
2005	138874	8961	147,835
2006	155498	9168	164,666
2007	140162	9772	149,934
2008	137953	6926	144,879
2009	164608	8549	173,157
2010	155791	10584	166378
2011	171008	8060	179068
2012	179730	10156	189886
2013	170510	10160	180670

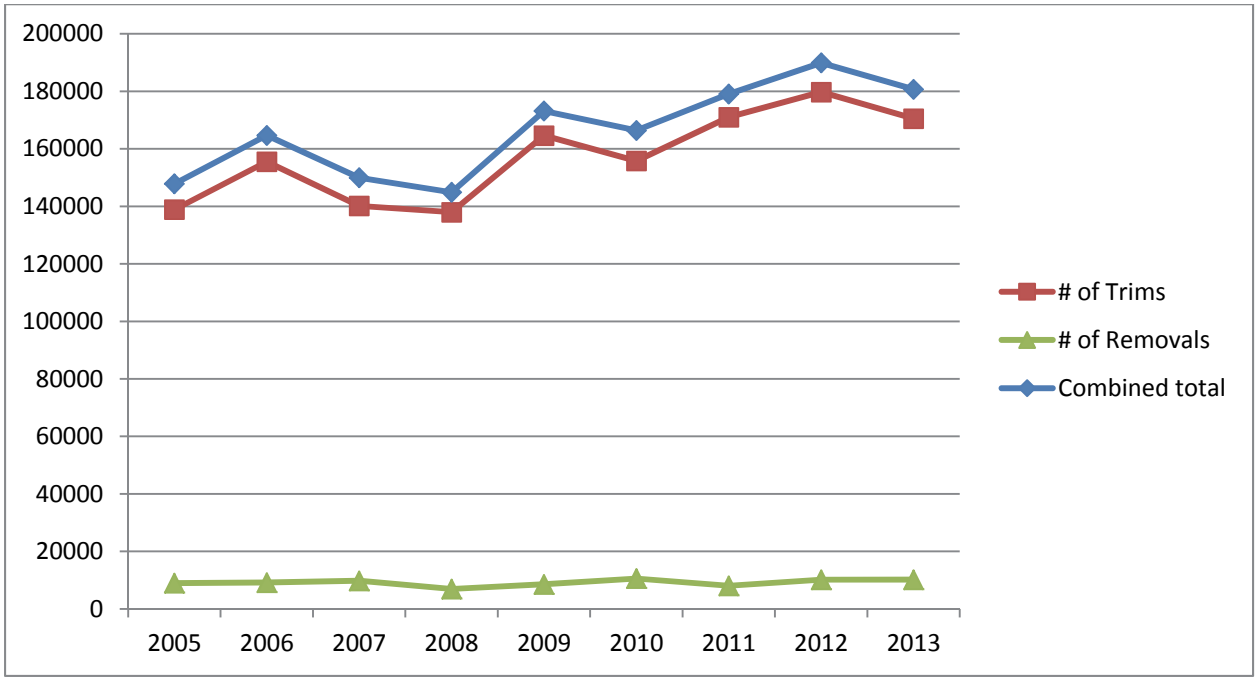
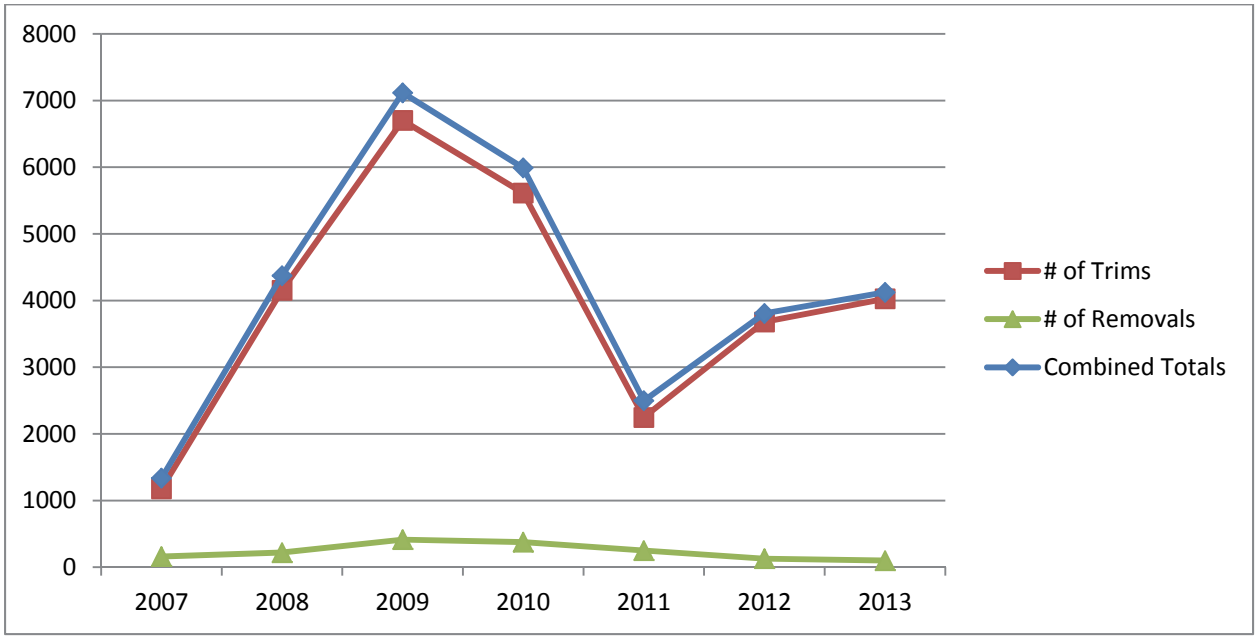


Table 3: Hazard Tree Trim and Removal by Year

Year	# of Trims	# of Removals	Combined Totals
2007	1176	160	1336
2008	4154	219	4373
2009	6702	414	7116
2010	5613	376	5989
2011	2247	250	2497
2012	3679	128	3807
2013	4026	98	4124



In spite of a growing workload and a number of issues that could result in potentially dramatic cost increases, SDG&E has requested only a two-way balancing account in lieu of forecasting cost increases associated with these issues in this GRC. The two-way balancing account will allow flexibility for SDG&E to respond to these issues as they materialize while protecting customers from cost variability. SDG&E seeks to hold funding at a level equal to the most recent 3-year average, plus a modest increase associated with the new Powerworkz information system. It is thus reasonable to grant all of SDG&E's requested funding and two-way balancing account, particularly given the potentially high upward cost pressures SDG&E is facing. Granting two-way balancing account treatment provides a fair and reasonable

mechanism to allow SDG&E to make necessary adjustments to the tree trim activity in the future. This proposal will allow SDG&E to mitigate and manage safety and reliability risks (causing upward (or downward) cost pressures) due to drought and fire safety issues as they are known, so that safe and reliable service can be maintained at a reasonable cost.

14b. Vegetation Management (Pole Brushing)

a. Activity Description:

Pole brushing for SDG&E involves the clearing of flammable brush and vegetation away from SDG&E distribution poles subject to the California Public Resource Code (PRC), section 4292. PRC 4292 is intended to prevent energized electrical hardware from igniting a fire by keeping the area under the subject poles clear of flammable vegetation at all times. Currently, there are 86,000 distribution structures that are inspected annually to comply with PRC 4292. The locations are primarily composed of Federal Responsibility Areas, State Responsibility Areas and the SDG&E Fire Threat Zone. Of the 86,000 distribution structures inspected, 34,000 poles currently have subject hardware requiring follow up maintenance work. SDG&E's maintenance cycle performs brushing twice a year to comply with federal, state and local regulations. The remaining poles do not currently require brush clearing due to several factors causing them to be exempt from PRC 4292. These include poles with no electrical equipment, poles containing PRC-exempt hardware only, poles subject to the vegetation exemption for maintained and watered landscapes and poles subject to hardscape exemptions.

All poles located in areas subject to PRC 4292 are inspected annually for compliance. Prior to 2003, SDG&E utilized mechanical pole brushing techniques (chain saws, weed whips, rakes, and other means, as appropriate) to clear the vegetation around the subject poles. This was an effective way to immediately remove the flammable brush and grasses from within the required clearance area but was not as effective on poles prone to summer rains or leaf cast from adjacent trees. In 2003, SDG&E implemented a three-phase approach to more effectively manage each subject pole. This approach includes; chemical pole brushing, mechanical pole brushing and re-clear pole brushing. Chemical pole brushing involves clearing all vegetation from around the pole base and applying an EPA-approved herbicide. SDG&E treats approximately 10,000 poles, during the fall and winter months, with a pre-emergent herbicide to minimize vegetative re-growth and reduce overall maintenance costs. Not all subject poles can be treated with herbicide due to environmental constraints, which include considerations such as

slope, proximity to water, proximity to trees and other vegetation, and customer approval. Mechanical pole brushing involves the removal of vegetation from around the pole base using mechanical means. Mechanical brushing is typically performed in the spring months. Re-clear pole brushing, performed in summer months, involves removing any additional flammable vegetation which has grown into, or blown into, the required clearance area since the last maintenance activity. In many cases, a single re-clear cycle is not adequate to maintain compliance with PRC 4292 at all times. For this reason, SDG&E completes two re-clear cycles to further ensure compliance and reduce fire risk.

As mentioned above, an initial clear and a re-clear are not necessarily enough to maintain compliance. Many of SDG&E's subject poles require multiple visits annually in order to maintain compliance. The need to revisit a subject pole multiple times is not uncommon due to leaf litter blown back into the managed clearance zone during windy conditions, and due to the growth of weeds and grasses that cannot be easily controlled by mechanical clearing or herbicide treatments. Trees adjacent to subject poles also require pruning to keep dead, dying or diseased tree limbs, branches and foliage from encroaching into the radius of the cleared circle from ground up to the height of the electrical conductors.

In order to protect the public, support fire prevention and maintain compliance, it is necessary to fund this program in line with historical average levels of spending. Pole brushing costs are anticipated to be near their three-year average, with expenses primarily driven by required compliance levels and the need to continue with enhanced fire risk reduction strategies. Compared to 4 or 5 years ago, more non-exempt poles are being brushed in Local Responsibility Areas (LRAs), using tighter fire risk mitigation criteria. Re-clear brush activities are being applied to the LRA poles as well. Requested funding not only includes the cost of contracted services to perform the pole brushing activity in the field, but also the pole brushing portion of the contractor's excess liability insurance coverage (further explained in testimony in the vegetation management tree trim section). Also included in the pole brushing costs are related field functions such as pole pre-inspection, quality control, and SDG&E staff and other support costs.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Vegetation Management (Pole Brushing)	*$3,752*	*$4,292*	*$540*

b. Forecast Method:

Labor and non-labor costs are based on a 3-year average. Labor includes a portion of several positions that administer the pole brush program. Non-labor includes field work performed by outside contractors plus the pole brushing share of contractor insurance coverage. The most recent 3-year average appears most indicative of forecasted expenses for this group, because it represents the funding level needed to complete the forecasted level of pole brush activity while accounting for slight fluctuations in year-to-year costs.

15. Compliance and Asset Management

a. Activity Description:

The Compliance and Asset Management workgroups are focused on ensuring that SDG&E maintains its compliance with internal and external regulations, policies, and procedures as they relate to operating and maintaining the electric distribution system in a safe and efficient manner. The three main subsections that comprise the Compliance and Asset Management Workgroup are the Compliance Management Group, the Program Management Group and the Aerial Marking Group. Additional information on each of the subsections and their function is presented below.

Compliance Management:

Compliance Management (CMG) is a small staff group that has the responsibility to manage regulatory compliance to G.O. 95, 128, 165 and 166. The group carries out its function through audits, statistical analysis, reporting and training of field personnel. It also maintains the relationship with the CPUC's Safety Enforcement Division (SED) to comply with CPUC requests regarding the electric distribution system. CMG also maintains responsibility for all joint utility processes related to Communication Infrastructure Providers (CIP) attachments, assuring compliance to CPUC Dec 98-10-058, SDG&E's structural licensing process, and G.O. 95.

Program Management:

Program Management is also a small staff group that has responsibility to develop and centrally manage the patrol, inspection and maintenance elements related to the G.O. 165 Corrective Maintenance Program (CMP). Functions include developing policies and procedures, training field employees, statistical reporting and analysis, budgeting, leading practice initiation and other similar program management related activities. Other related inspection/maintenance

programs overseen by the Program Management group include Avian Protection Program management, Wood Pole Inspection Program, Graffiti Abatement and Quality Control Inspections and related corrections in the fire threat zones.

Aerial Marking:

The Aerial Marking Group is a small staff organization that has responsibility to centrally manage compliance with all state and federal aerial marking requirements related to SDG&E's system. Aerial marking involves installing marker balls and/or lighting on power lines and related structures to improve safety for low-flying aircraft. Activities in this group include program development and administration of approval processes, internal procedures, leading practices and compliance with any reporting requirements.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Compliance and Asset Management	*$2,458*	*$2,702*	*$244*

b. Forecast Method:

Labor and Non-Labor costs are based on a 3-year average plus incremental adjustments for specific needs. Data from 2009 and 2010 does not reflect the current requirements of this area and are not good representations of a cost basis going forward. The 3-year average plus adjustments is the most representative methodology for estimating future labor and non-labor costs associated with this group.

c. Cost Drivers:

The following issues are driving change within the workgroups:

- **General Order 165 (G.O. 165) Regulatory Compliance**
- **OII - Phase Three 5-year intrusive requirement**
- **Continued and increasing support for CIP compliance as a result of the Electric Safety OIR requirements**

GO 165 Regulatory Compliance

G.O. 165 detail changes to Table 1 in 2012 now require patrols and inspections to be scheduled at specific intervals ranging from 12 to 15 months. This rule change requires SDG&E to make significant changes in the electric distribution maintenance plan scheduling, which in some cases sacrifices efficiencies that were available under the previous rule set. These efficiency impacts include, but are not limited to, the need to schedule inspectors and patrolmen

for inspections driven by more rigid timelines, where in the past the work could be more flexibly scheduled and better optimized for efficiency.

OII - Phase Three 5-year intrusive requirement

As a result of OII Phase Three rule changes, any poles that have not been intrusively tested in the previous five years will require a new intrusive field test before wires or equipment can be changed or added. SDG&E currently performs intrusive testing on a 10-year cycle, which means that at any given time approximately half of SDG&E's poles have intrusive inspection data that is older than five years. As a result of this 5-year or newer test data requirement, approximately half of the poles that SDG&E reconfigures with new wiring, equipment or attachments will require that a new intrusive test be performed.

Communication Infrastructure Provider (CIP) Related Issues:

The Electric Safety OIR required that the CIPs institute regular maintenance inspection programs and implement formal reporting and tracking of issues found. These programs have resulted in a significant increase in issues reported back to SDG&E that need to be resolved. Also, a more formalized and documented communication process to track both these issues and other operational CIP communications is required to properly manage these issues properly. The expanded communication process tracks notifications, resolution of those notifications, transfer requests and other field and cross communications. All of these previously mentioned activities, combined with the requirement that notifications must occur within a 10 day time frame, has added workload to SDG&E.

Over the last two years, SDG&E's Compliance and Asset Management workgroup has found it necessary to take the initial steps of augmenting its staff to address the increasing requirements and level of activity in this area. The need to further increase staffing to support the expanded record keeping and communication processes from these rule changes persists. As outlined in the work papers, SDG&E requires additional funding for added intrusive inspections as well as funding for labor related to the above mentioned drivers of change.

16. Distribution Engineering

a. Activity Description:

Electric Distribution Standards:

The Electric Distribution Standards workgroup is responsible for developing and maintaining overhead and underground construction standards to ensure safe and reliable

customer service throughout the 4kV and 12kV electric distribution system. New and revised construction standards and material specifications are needed to provide community safety and to keep pace with technology advancements in areas such as fire-preparedness, communication technology improvements, rooftop PV penetration and Plug-in EVs. The group also develops and maintains electric standard practices to establish uniform and safe work methods, procedures and inspection requirements and ensure regulatory compliance with all governing agencies. Construction standards and standard practices are used by company and contractor construction forces throughout the SDG&E electric distribution system. The costs represented are only those related to the distribution labor and non-labor.

Service Standards & Customer Generation

Service Standards is responsible for developing and maintaining the standards that apply to gas and electric metering and service equipment. The group develops and maintains safe and regulatory-compliant standards for service installations and provides regulatory and technical support to departments throughout the company on service delivery issues. The group also participates directly in developing and maintaining project management procedures.

Service Standards represents SDG&E in governmental organizations and outside agencies on California Electrical Code and other building code issues relating to gas and electric service delivery. The group responds directly to inspection authorities within the service territory on request to resolve code enforcement issues.

Currently, there is elevated code enforcement activity as a result of Smart Meter deployment that is stretching Service Standards resources beyond their limit. But this increase is expected to be temporary. Normal core business activity levels in Service Standards do not present upward pressure for costs.

The Customer Generation group is responsible for processing all customer applications for Net Energy Metering (NEM) Solar and Wind generation, as well as applications for small conventional Distributed Generation (DG) installations. This group is responsible for providing customers (or their contractors) the final approval to commence parallel operation with the grid, once all contingencies have been cleared. Out of approximately 11,000 new NEM solar customers that were authorized by SDG&E in 2013, 98% of the projects were 30kW or less. Typically these are residential customers. The vast majority of these customers will need to upgrade their electrical service panel from 100 amps to 200 amps or 200 amps to 400 amps to

accommodate the solar generation. The electric service panels are upgraded due to lack of breaker positions in the service panel, or the upgrade is driven by the National Electrical Code. The electrical service panel upgrades are under the authority having jurisdiction in the customer's local area.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Distribution Engineering	*$1,319*	*$1,909*	*$590*

b. Forecast Method:

Labor costs are based on a 4-year linear forecast due to the increasing need for support in the NEM group. Non-labor costs are based on a 3-year linear forecast due to the increase of generator storage costs associated with the Customer Fire Safety Program. The 3-year forecast was used for non-labor due to the 4-year forecast producing an amount higher than required for the program.

c. Cost Drivers

The following issues are driving change within the workgroups:

- **New Technology**
- **Technology Utilization**
- **Fire Risk Mitigation**
- **Regulatory & Environmental Compliance**
- **Workforce Development**
- **NEM Application Volume Increases**

New Technology

As utility customers adopt Plug-in Electric Vehicles (PEV), the impact of charging the vehicles will need to be mitigated. The use of so-called "smart transformers" will require the evaluation of competing technologies, and detailed performance monitoring at least in the early stages of implementation.

Technology Utilization

As new technologies are identified for application to utility distribution systems, competing technologies will need to be evaluated and monitored. Recommendations for re-engineering the system to accept bi-directional power flows while maintaining acceptable customer service voltage and power quality will, to a great extent, fall within the responsibility

of this work group. Additional system automation will likely be needed to enable the system to respond quickly to non-traditional generation resources. Work in this area includes both Construction Standards and Electric Standard Practices.

Fire Risk Mitigation

As the company responds to the need to make overhead distribution lines more robust against fire, an increased need to evaluate non-traditional materials and design software is expected. Expenses will be incurred during the evaluation of new products, such as product purchasing, lab testing, and travel costs associated with manufacturing audits/qualifications.

Regulatory & Environmental Compliance

As the need to implement improved efficiency standards for municipal streetlights become operative, increased costs are anticipated for the evaluation and approval of competing technologies, including LED and induction lighting. This includes streetlights that are municipally owned and operated, as well as utility owned and operated systems.

Workforce Development

Most of the employees in this work group are either already of retirement age or will be of retirement age during the planning window. Recruitment and training expenses are expected to increase as a result of employee demographics, as incumbents give notice of impending retirement. The background of these employees includes those with decades of utility experience, much of which is not easily replaced.

Net Energy Metering (NEM) Application Volume Increases

The NEM team has seen increasingly large growth in the number of customers installing solar photovoltaic generation. Last year there was a 108%[14] growth in authorizations for NEM customers over the prior year. In total, over the last 5 years, the Customer Generation team has seen a 446%[15] growth in the number of NEM applications authorized. A conservative forecast predicts an annual NEM growth rate through 2016 at approximately 40%.[16]

[14] SDG&E authorized 5,261 NEM applications in 2012 and 10,929 NEM applications in 2013.
[15] SDG&E had authorized a cumulative total of 5,849 NEM applications as of 12/31/08 and a cumulative total of 31,916 NEM applications as of 12/31/13.
[16] SDG&E is forecasted to reach its NEM capacity limit of 606 MW on 12/31/16. This reflects an annual growth rate of approximately 40% over the 226.1 MW of NEM generation installed as of 12/31/13.

17. Technology Innovation and Development

a. Activity Description:

The Technology, Innovation, and Development group is responsible for promoting the applied and industrial sciences relevant to the advancement of the power system's electrical, electronic, communication, and control infrastructure, including advanced distribution automation, integration of renewable energy, cost effective energy storage, the support for PEV infrastructure, customer energy management system integration into advanced technologies, and the demonstration of new energy efficiency technologies for customer use, as well as the expansion of renewable energy options in SDG&E's service territory.

The Integrated Test Facility (ITF) is also within the Technology, Innovation, and Development group. The ITF supports the demonstration and testing of hardware, software, and processes in support of advanced technologies. Testing takes place in seven labs:

- Foundational Systems;
- Communications;
- Power Systems;
- Distributed Energy Resources;
- Smart Garage;
- Home Area Networks; and
- Information Security.

In addition, the facility has a central Situational Awareness Laboratory where data can be visualized and equipment from the other labs can be operated.

The Associate Engineer program is also included in this group. The Associate Engineer program is an ongoing training program that is a key component of the effort to develop and maintain young engineers in SDG&E's workforce. The program allows new engineers to rotate through three organizations during an 18-month period. This provides a diverse, cross-functional experience and serves to accelerate the growth of our young engineering workforce. This training program includes not only labor expenses for the trainee, but also related incidental expenses.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Technology, Innovation & Development	*$327*	*$882*	*$555*

b. Forecast Method:

The 3-year linear average appears to be the most reasonable forecasting methodology for labor and non-labor. Labor costs consist primarily of engineering positions that support project management, planning, assessment, and administration activity.

c. Cost Drivers:

The following issues are driving change within the workgroups:

- **Technology Utilization**

Technology Utilization

This workgroup will continue to be challenged by the rapid pace of technological change and the continued integration of new electrical, electronic, communication, control, and information technologies into the operations and management of the electric distribution system. These challenges come at a time of higher concern for the rate impacts of implementing new technology, as well as concerns for cyber security and system safety, performance, and stability.

The ITF will achieve initial routine operations during the current GRC cycle, ending at the close of 2015. The first "wave" of test projects will be going through the ITF in late 2014 and in 2015. Initial staff positions for the ITF will have been filled in the current cycle. The approach for facility development and equipping the ITF labs has been to fund these items out of O&M and capital budgets in the smart grid deployment area. This applies to foundational resources of the ITF that are deemed useful to many prospective projects and are not specific to any one project. For items that are specific to a project, the project budget is expected to pay for the acquisition, maintenance, and ultimate removal of the items. These projects will come from several different stakeholder groups within the company that benefit from using the ITF labs. This approach for equipping the labs will be continued into the next GRC cycle. However, the extent of foundational equipment purchases should be slower in the next cycle than in the current cycle.

In the next GRC cycle, the demand for use of the ITF labs is expected to grow. This implies a need for possible additional staff positions, which are charged to the O&M budget. At this stage, it could be estimated that two more new FTEs (technical staff) will be added to the ITF in the next cycle, beyond the staff level reached in the first cycle. Additionally, the existing staff positions from the current cycle will continue to be charged to the O&M budget in the next cycle. Finally, the next GRC cycle must include an O&M budget allowance in the forecast for

ITF foundational equipment maintenance, facility maintenance and modifications, consumable supplies, utilities, and equipment retirement and removals, when needed.

18. Reliability and Capacity Analysis

a. Activity Description:

The reliability and capacity workgroups provide technical support services related to the operations and maintenance of the electric distribution system. These services are administered by two main workgroups: Technical Analysis and Distribution Planning, described below.

Technical Analysis

The Technical Analysis workgroup is made up of three separate small groups: Relibility Engineering, Fire Mitigation and Power Quality. In general, the Reliability Engineering group is responsible for the tracking and reporting of the Electric Reliability indices in accordance with CPUC decisions D. 08-07-046 and D. 96-09-045. The reliability performance of SDG&E systems are currently measured with four key performance indicators: System Average Interruption Duration Index (SAIDI) is used to measure the duration of outages, System Average Interruption Duration Index Exceeding Threshold (SAIDET) is used to measure "SAIDI exceeding a threshold" of 150 minutes, System Average Interruption Frequency Index (SAIFI) is used to measure the frequency of outages, and Estimated Restoration Time (ERT) to measure the accuracy of restoration times for customers within one hour of actual restoration. Reliability Engineering provides support for several programs that are aimed at maintaining electric reliability with key drivers such as the SCADA system expansion, the underground cable replacement program, and aging infrastructure at both the distribution line and substation levels. (Please see the discussion on proposed metrics as a result of the prior GRC decision D.13.05-010 later in this testimony at section V.)

Fire Mitigation leads the RIRAT (Reliability Improvements for Rural Areas Team) and includes managers and engineers from the Asset Management Department, the Electric Transmission and Distribution Engineering Department, the Electric Regional Operations Department, and the Electric Finance and Operations Management Department.

The RIRAT, among other things, oversees the evaluation and implementation of the various fire-hardening activities described above. Its work is guided by the following specific goals and objectives:

- Improve the distribution system in the Fire Threat Zone and Highest Risk Fire Area;

- Develop statistical measures for assessing distribution-system performance relevant to fire-related risks, to provide an understanding of the scope of the risks that must be addressed and to develop metrics for measuring improvement;
- Identify and prioritize areas posing the greatest fire-related risks;
- Develop guidelines and a portfolio of solutions to minimize fire-related risks;
- Develop a multi-year plan for the rebuilding of circuits creating the greatest and/or most probable fire-related risks;
- Review and analyze all reports of "wire-down" occurrences; and,
- Use the "wire-down" analysis to identify causes and best solutions, to minimize future occurrences and fire-related risks.

In order to meet their goals, the RIRAT adopted the following guiding principles:

- Utilize risk-based prioritizations to maximize risk-mitigation;
- Improve design specifications to reduce the potential for igniting fires;
- Consider, and, to the extent prudent and cost-effective, employ technology-based solutions to reduce fire risks and improve overall system reliability;
- Prioritize system-rebuild efforts based on a matrix of available projects, considering the most important input factors such as occurrence of a "wire-down," wind and weather conditions, fire risks, values at risk, outage history, conductor type, condition of equipment, environmental conditions, and critical customers;
- Systematically consider and evaluate the following options:
    - Fire-hardening sections of circuits or individual circuit branches;
    - Undergrounding by traditional undergrounding or cable-in-conduit;
    - Adjusting protective equipment by revising settings, balancing loads, adding reclosers, replacing expulsion fuses with fault tamers, and/or reducing fuse size; and
    - Employing new methods and/or technologies, such as spacer cables, wireless fault indicators, "off-grid" solutions, and advanced technologies;
- Replace high-risk equipment based upon statistical analytics;
- Realign circuit routings to avoid trees and dense vegetation or use tree guards and/or insulated aerial cables; and,
- Assess the costs and benefits of optional solutions for reasonableness.

The RIRAT oversees the evaluation and approval processes for the various system improvements and capital projects described above and specifically addresses system design and facilities from the perspective of minimizing fire-related risks in the rural areas included in the FTZ and HRFA. Until recently, this team also managed the capital budgets for distribution fire hardening activities. This team and associated processes have now been incorporated into the Fire Risk Mitigation (FiRM) program, which was discussed in the Construction Services category. In addition to the aforementioned responsibilities, the Technical Analysis workgroup actively supports the Emergency Operations Center as well as Construction and Operations districts during major events and storm drills. Other responsibilities include Reliability Circuit Analysis, tie capacity analysis studies, support of Community Fire Safety Program, training, managing the Underground Cable Replacement program, responding to internal and external customer data requests, and attending relevant technical committee meetings.

Distribution Planning

In general, Distribution Planning activities are related to engineering and design of designing capital projects to support capacity expansion of the electric distribution system. Costs for these activities are recorded as capital related costs and are not included in this testimony related to O&M. In addition, Distribution Planning performs operational activities related to providing administrative and technical support associated with the operations and maintenance of the electric distribution system. Typical activities include monitoring, forecasting, and responding to utilization of the electric distribution system in order to serve customers with safe and reliable electric energy. Electric distribution system load increases come in the form of new customer connections to the system and increased loads from existing customers. Customer load growth drives the installation of new and upgraded facilities, circuits and substations. Distribution Planning is tasked with forecasting, planning, and designing the electric distribution system that facilitates the construction of electric facilities to connect new customers to SDG&E's system and ultimately increase the capacity of the electric distribution system infrastructure to support new load throughout the service territory. Furthermore, Distribution Planning actively supports O&M activities including staffing the Emergency Operations Center and Construction and Operations districts during major events and storm drills. Other responsibilities include support of Community Fire Safety Program, reviewing and revising distribution planning design standards, reviewing fusing requests and providing engineering

input on planning worksheets, performing load studies, participating in distributed generation and renewable resource studies, integrating advanced technologies and Smart Meter data into the planning process, responding to internal and external customer data requests, training, and attending relevant technical committee meetings.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Reliability & Capacity Analysis	*$538*	*$618*	*$80*

b. Forecast Method:

Labor and non-labor costs are based on a 3-year average. The 3-year average is the most indicative of the current and future forecasted base-line spending of this group due to the fact that the O&M component of the costs are expected to remain fairly stable over the next several years. A higher percentage of the costs in this group are capitalized.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **New Technology**
- **Regulatory & Environmental Compliance**

New Technology

Distribution Planning utilizes an electric distribution power flow model to study and plan the electric distribution system. As a result of recent GIS upgrades and the introduction of significant numbers of distributed generation and renewable resources on the electric distribution system, the power flow software will require modification. The modifications will allow for tighter integration with the Customer Information System, Outage Management System, and Electric Data Warehouse databases. These systems contain customer billing information and loads, outage information, and advanced metering data that shall be used for planning the distribution system. In addition to this integration, new distributed generation models for photovoltaic, fuel cells, batteries, and electric plug-in vehicles systems are necessary to analyze undesirable impacts that this type of intermittent generation and loads will have on the distribution system.

Regulatory & Environmental Compliance

The effort to improve the safety and reliability of the electric distribution system in the fire threat areas has resulted in additional project work related to reducing fire risk. Two

additional electric distribution system designers/planners are needed to support increased workload for engineering projects due to the hardening of the electric distribution system such as replacing wood poles with steel poles, undergrounding overhead electric distribution lines, and replacing aging equipment in high fire risk areas. Though the majority of the designers/planners costs are related to capital, there is a small component that is O&M. The increased expenses for these new designers/planners are included in this request.

19. Information Management Support for Electric Distribution

a. Activity Description:

The Information Management workgroup includes the GIS Business Solutions (GBS) Team. This team is responsible for providing business analytics, (requirements, design, cost benefits, testing, development, etc.), associated with the maintenance and advancement of GIS technology to support existing and future SDG&E enterprise business needs. Services focus on the following applications/user interfaces: Desktop, Web and Mobile supporting the following business operations: Land, Environmental, Electric Transmission, Substation, Electric Distribution and Telecommunication. Services also include the management of GIS interface with other major and mission critical systems: OMS – Outage Management System (GIS Electric Distribution Network Models), GEARS – Environmental System (GIS Polygon Layers), SAP Work Management (GIS Electric Distribution Assets), EDW –Engineering Data Warehouse (GIS Electric Distribution Assets & Network Models), SynerGEE – Power Flow System (GIS Electric Distribution Network Models), CISCO – Customer Care System (GIS Transformer/Customer Relationships), VISA – Situational Awareness Tool (Correlates GIS asset info with near real-time data).

This group will also be responsible for supporting Graphical Work Design (GWD) once the system goes into production in 2015. GWD support will consist of fixes and enhancements to: ArcFM Designer / GWD-2 (Electric Distribution Drawing Tools), Engineering Calculations (Overhead Design Analysis, Volt Drop & Flicker and Cable Pulling), Butterfly Diagrams and Service Order drawing tools.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Information Management Support	*$261*	*$376*	*$115*

b. Forecast Method:

Labor and non-labor costs are based on the 2013 Base Year Recorded data due to this group being moved from a purely capital environment to some O&M in 2013.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **New Technology**

New Technology

The primary driver for change in this workgroup is new technology, as the GBS Team will provide business analytics in support of new technology driving ongoing upgrades or replacement to the GIS mobile and web applications. In addition, the Core GIS product will be updated to a later release that will provide improved performance and functionality. On an ongoing basis, changes will continue to be made to the GIS model applications and interfaces to support advanced technology utilization business requirements.

20. Major Projects

a. Activity Description:

Major Projects is responsible for effectively managing distribution and substation projects by focusing on a clearly defined project scope, schedule and budget. This group manages projects from project inception to project conclusion, ensuring consistent project management responsibility throughout the life of the project.

ELECTRIC DISTRIBUTION			
Categories of Management	*2013 Adjusted-Recorded*	*TY2016 Estimated*	*Change*
Major Projects	*78*	*147*	*69*

b. Forecast Method:

Zero Based forecasting methodology was used to forecast non-labor for Major Projects. The forecast utilizes 2013 recorded data with a net upward adjustment to account for the increase in the number of capital projects with distribution components.

c. Cost Drivers:

The upward incremental cost changes are primarily due to the increase in the number of projects resulting in the slight increases in anticipated miscellaneous charges, including but not limited to the following:

- **Employee Training**

Employee Training

Most projects require the team members to have unique skill sets. One way this is accomplished is through different types of employee training, which may include the following:

- Environmental Compliance – Ensures employees are sufficiently trained to perform diverse tasks in areas that may include: Air Quality, Hazardous Materials and Waste, Land Planning & Natural Resources, Storm Water Pollution Prevention Plan (SWPPP), and Water Quality.
- Safety Compliance – Employees are trained in various areas related to work safety. These include but are not limited to handling hazardous materials, fire safety, driving, equipment operation, and weather reconditioning.

21. Technology Utilization

a. Activity Description:

At SDG&E, we are utilizing technology to transform our electric system in order to deliver benefits to customers. SDG&E has been working over the past few years to make the electrical grid more reliable and able to incorporate large-scale renewables, plug-in electric vehicles and rooftop solar panels. Incorporating technology into the electric system is necessary to meet these needs. Advanced technologies will support the intermittency of large-scale wind and solar, and will help us operate our 100-year-old electric system more safely and efficiently. Customers will benefit from the reliability these technology enhancements will provide. By leveraging our forward-thinking workforce and advanced technologies, we can help our customers take advantage of new, exciting energy products such as plug-in electric vehicles, roof top solar panels, home energy management systems and energy smart appliances.

ELECTRIC DISTRIBUTION			
Categories of Management	*2013 Adjusted-Recorded*	*TY2016 Estimated*	*Change*
Technology Utilization	*$1,287*	*$1,948*	*$661*

b. Forecast Methodology:

Labor and non-labor costs are based on a 5-year linear forecast. The 5-year linear forecast provides the costs needed to backfill positions as well as escalating costs of consultants who provide additional support to the group.

c. Cost Drivers:

The following contribute to the upward incremental cost pressures:

- **Workforce Development**
- **Technology Utilization**

Workforce Development

Additional labor resources are needed to backfill a software architect position. This position leads program-wide engineering and architecture planning and strategy, driving alignment across projects and impacted organizations.

Technology Utilization

As various Distributed Energy Resources (DER) are integrated into our electric system, it is vital that these DER are properly maintained to ensure we are able to achieve their anticipated benefits. For the Borrego Springs Microgrid, this requirement means having adequate O&M to cover the manufacturer recommended preventative maintenance as well as any repairs required to maintain safe, environmentally compliant operation. Allowances must also be made to account for the required fuel for anticipated emergency operations. These funds will allow the microgrid to maintain an adequate state of readiness to respond to emergency outages by providing vital electric service to the most critical loads in the Borrego Springs area while repairs are made to the larger electric grid.

For the Advanced Energy Storage (AES) installations, this requirement means having adequate O&M to cover the manufacturer recommended preventative maintenance as well as any repairs (outside of the warranty) required to maintain safe, efficient operation.

22. Administrative and Management

a. Activity Description:

The Administrative and Management group is responsible for supporting Electric Distribution's budgeting and financial reporting system. Business Planners in this workgroup have the responsibility to support their respective business units through budget development and oversight, financial analysis, accounting guidance, analysis of cost drivers, and the production of monthly variance reports to track financial performance.

ELECTRIC DISTRIBUTION			
Categories of Management	*2013 Adjusted-Recorded*	*TY2016 Estimated*	*Change*
Admin & Mgt	*$209*	*$324*	*$115*

b. Forecast Methodology:

Labor and non-labor costs are based on a 3-year average. The 3-year average seems to be the most indicative of the current and future forecasted baseline spending, since the drivers are the same as in the past three years.

c. Cost Drivers:

The following contribute to the upward incremental cost changes:

- **Regulatory Compliance**
- **Workforce Development**

Regulatory Compliance

Additional labor resources are needed to support increased project-related work, data requests, budget analysis, metrics and value-added services performed on behalf of the Division.

Workforce Development:

The Administration and Management group has overseen the development and deployment of two separate financial applications referred to as the Performance Management Reporting (PMR) and the TM1 reporting tool that collectively are used to gather and report financial results and metrics to interested employees and users across the organization. These applications are in varying stages of deployment. We anticipate that there will be ongoing support and maintenance from internal and external sources required of these applications to ensure successful deployment and continued service quality. We anticipate O&M charges attributable to ongoing maintenance and support of the financial systems.

23. Officer

a. Activity Description:

This workgroup includes the non-labor costs for an officer (One Vice President) and one administrative assistant. The total salaries are a direct labor charge and the amount allocated to electric transmission is excluded from this account as an indirect charge and not included in the requested expenses.

Typical activities included in this account include officer activities in support of electric distribution. Non-labor expenses typically include consulting fees, benchmarking studies, office supply expenses and officer travel expenses.

ELECTRIC DISTRIBUTION			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Officer	*$518*	*$476*	*-$42*

b. Forecast Methodology:

Labor and non-labor costs are based on a 5-year average. The 5-year average is most indicative of the current and future forecasted spending of this group. The 5-year average was used because the non-labor cost drivers have not changed and the staffing levels are consistent with the past three years.

24. Exempt Materials

This activity includes the cost of exempt materials used in the construction and maintenance of gas and electric distribution facilities. Exempt materials are low-value material items that are replenished as "truck stock" as needed and are not directly charged to the O&M account or Capital Budgets on which they are used. This account represents the collector pool for all of the exempt material costs that are then allocated to the appropriate gas and electric O&M accounts and Capital Budgets as indirect charges. This account is forecasted at the 100% level for direct costs and further accounting treatment of the pools (allocation, exclusions, and distribution) is found in the testimony of Mr. Jeff Stein, Exhibit SDG&E-41.

Typical costs included in this account are material costs for exempt material items.

25. Small Tools

This activity includes the cost of purchasing and repairing small tools that are used in the construction and maintenance of gas and electric distribution facilities. Small tools are lower-value (<$5,000) tools that are not capitalized and are not directly charged to the O&M account or Capital Budgets on which they are used. The cost of these small tools is allocated to the different O&M accounts and Capital Budgets based on the direct labor hours charged to the O&M accounts and Capital Budgets. This account represents the collector pool for all small tool costs that are then allocated to the appropriate gas and electric O&M accounts and Capital Budgets as indirect charges. This account is forecasted at the 100% level for direct costs and further treatment of the pools (allocation, exclusions, distribution) is found in the testimony of witness Mr. Jeff Stein, Exhibit SDG&E-41.

Typical activities included in this account are:

- Small tools purchase; and
- Small tool repair.

26. Department Overhead Pool (DOH)

Certain costs incurred by central activities that are subsequently distributed to their respective workpaper groups are based on one or more factors such as direct labor, invoice amounts, or total direct cost. These activity costs are also called "pooled" costs. The Electric Distribution Department Overhead (DOH) pool splits into O&M and Capital. This split is determined through a study of the total labor charges against the O&M and Capital charge accounts. Currently, the Capital component represents 60% of the DOH, and is spread across Capital projects. The O&M component represents the remaining 40% and is charged directly to respective cost centers. Thus, the O&M component of DOH is escalated in the base activities and is captured in the respective workpaper groups. The mechanics of the development and distribution of the capital costs are address in the prepared direct testimony of Mr. John Jenkins, Exhibit SDG&E-09.

III. ELECTRIC RELIABILITY PERFORMANCE MEASURES

SDG&E proposes the same Electric Reliability Performance Measures in this GRC that the Commission approved in D.14-09-005, in granting a petition for modification (PFM) of D.13-05-010, Ordering Paragraph (OP) 9, which was jointly filed by SDG&E and the California Coalition of Utility Employees (CCUE).[17] D.14-09-005 adopted an alternative performance-based ratemaking (PBR) mechanism to D.13-05-010's OP 9. My testimony requests continued approval of the same measures from 2016 through the following GRC cycle.

The Electric Reliability Performance Measures adopted in D.14-09-005 allow SDG&E to focus on reliability indices that maximize reliability risk reduction, in order to continue the overall high level of reliability enjoyed by SDG&E's customers. SDG&E, which has good system reliability overall, worked with CCUE to design these more precisely targeted incentives based on SDG&E's specific reliability profile and most current reliability data. Historical data was also used to derive the proposed metric parameters. The reliability indicators allow SDG&E to seek ways to improve reliability for all of its customers.

The proposed Electric PBR includes 4 reliability indices, along with specific attributes and metrics of the indices. The four indices are SAIDI, SAIFI, Worst Circuit SAIDI, and Worst Circuit SAIFI, described below. SAIDI is an acronym for System Average Interruption Duration Index. SDG&E measures SAIDI in minutes, and therefore the index represents the average

[17] A.10-12-005 and A.10-12-006 (cons.), June 6, 2014, Joint Petition of [SDG&E] and [CCUE] for Modification of Electric Reliability Standards in Ordering Paragraph 9 of D.13-05-010.

number of minutes without power that all customers experience in a year. The initial benchmark - applicable in 2016 - for SAIDI is set by calculating the average SAIDI from the most recent available 5 years of data (2010-2014). Subsequent years (2017 through 2019) will have a benchmark that is calculated by using the average SAIDI from 2010-2014, then decrementing by the 1% Annual Improvement Factor for each year past 2016.

SAIFI is an acronym for System Average Interruption Frequency Index. The index represents the average number of outages that all customers experience in a year. The initial benchmark - applicable in 2016 - for SAIFI is set by calculating the average SAIFI from the most recent available 5 years of data (2010-2014). Subsequent years (2017 through 2019) will have a benchmark that is calculated by using the average SAIFI from 2010-2014, then decrementing by the 1% Annual Improvement Factor for each year past 2016.

Worst Circuit SAIDI is an index which focuses on circuits that have experienced the highest amount of outage duration. The worst circuits for the Worst Circuit SAIDI index are identified by analyzing all circuit's reliability performance over the previous 5-year span, then determining which 10 circuits performed the worst from a duration standpoint. The benchmark for Worst Circuit SAIDI is created by calculating the customer-weighted average of duration for the identified 10 worst circuits and reducing that number by the Historical Improvement Factor. The Historical Improvement Factor is utilized to account for natural variations in poorly performing circuits. Data indicates that the grouping of worst circuits have averaged a 15% improvement in their customer-weighted average durations. Therefore the benchmark for Worst Circuit SAIDI is created by reducing the customer-weighted average by 15%. Throughout the GRC period, at the beginning of each year, a new set of 10 circuits will be identified, as well as a new benchmark for those circuits, based on the most recent data available at that time. This ensures that a new set of 10 circuits will be identified and addressed each year.

Worst Circuit SAIFI is an index which focuses on circuits that have experienced the highest amount of outage frequency. The worst circuits for the Worst Circuit SAIFI index are identified by analyzing all circuits' reliability performance over the previous 5-year span, then determining which 10 circuits performed the worst from a frequency standpoint. The benchmark for Worst Circuit SAIFI is created by calculating the customer-weighted average of outage frequency for the identified 10 worst circuits, and reducing that number by the Historical Improvement Factor. The Historical Improvement Factor is utilized to account for natural

variations in poorly performing circuits. Data indicates that the grouping of worst circuits have averaged a 3% improvement in their customer-weighted average outage frequencies. The benchmark for Worst Circuit SAIFI therefore is created by reducing the customer-weighted average by 3%. Throughout the GRC period, at the beginning of each year, a new set of 10 circuits will be identified, as well as a new benchmark for those circuits, based on the most recent data available at that time. This ensures that a new set of 10 circuits will be identified and addressed each year.

SAIDET is an acronym for System Average Interruption Duration Index Exceeding Threshold. The index represents the minutes of sustained outages per customer, per year exceeding a defined annual threshold of 150 minutes. SAIDET will remain, but as a report-only index.

The table below summarizes the four adopted Electric PBR indices metrics. Note that the values contained in the table are based on data from 2009-2013, and apply to the year 2015. However, the data applicable to the GRC cycle (2016-2019) will be updated prior to 2016. SAIDI and SAIFI benchmarks will use data from 2010-2014 as the basis for benchmarks. Worst Circuit SAIDI and Worst Circuit SAIFI will use the most recent 5 years of data, updating the circuits and benchmarks each year.

SAIDI (minutes)	Values
2015 Target	60
Dead Band	+/- 2
Increment	1
Annual Improvement	1%
Reward Incr.	$375,000
Penalty Incr.	$375,000
Maximum	$3,000,000

SAIFI (outages)	Values
2015 Target	0.51
Dead Band	+/- 0.02
Increment	0.01
Annual Improvement	1%
Reward Incr.	$375,000
Penalty Incr.	$375,000
Maximum	$3,000,000

SAIDET (minutes)	Values
2015 Target	Report
Dead Band	
Increment	
Annual Improvement	
Reward Incr.	
Penalty Incr.	
Maximum	

Worst Circuit SAIDI (minutes)	Values
2015 Target	585
Dead Band	+/- 35
Increment	10
Reward Incr.	$125,000
Penalty Incr.	$125,000
Maximum	$1,000,000

Worst Circuit SAIFI (outages)	Values
2015 Target	4.40
Dead Band	+/- 0.35
Increment	0.10
Reward Incr.	$125,000
Penalty Incr.	$125,000
Maximum	$1,000,000

SDG&E requests continued approval of the reliability indices approved in D.14-09-005, to allow SDG&E to improve reliability in areas that have the greatest need and provide more uniform reliability while continuing the overall high level of reliability enjoyed by SDG&E's customers.

IV. CONCLUSION

The costs represented in this testimony are a reasonable and necessary forecast of the requirements to safely and efficiently manage the Electric Distribution activities of SDG&E. SDG&E continues to hold safety, reliability, and customer service as key principles for day-to-day operations. Most of the cost drivers are traditional and familiar, although among them certain new aspects have emerged and place added pressure on operating costs such as public safety, system maintenance and reliability. Forecasts were developed by using both historical

expenditures and specific project estimates, assessing upward pressures, and using all available information to develop reasonable forecasts. As described in the testimony, many of the core business activities remain the same as described in previous rate cases (with increases in most cases, due to incremental cost drivers), but there are areas of expanded focus due to the ever-changing environment. One of those areas is fire risk. Over the past 11 years, Southern California has seen a dramatic increase in catastrophic wildfire activity. Mitigating the risk associated with wildfires is a major focus for the IOUs in California, especially the Southern California utilities that experience extreme Santa Ana wind conditions. SDG&E has a comprehensive Fire Prevention Plan that describes many of the organizational and operational activities SDG&E undertakes to address the risk of fire.

Workforce development continues to be an important influence in SDG&E's operations. Workforce development keeps SDG&E's employees focused on safety by consistently training and emphasizing safety and safe work practices. It also allows SDG&E's workforce to utilize technology and new systems in order to work more efficiently.

Aging equipment is a significant contributor to safety and the reliability of our electric system. SDG&E works diligently to inspect and maintain its equipment in order to meet or exceed regulatory requirements to ensure the safety of the public, SDG&E's employees, and system reliability.

The compilation of O&M costs described in my testimony will allow SDG&E to operate its system in order to address public and employee safety, system maintenance and reliability, focus on environmental and regulatory compliance, develop its workforce, utilize technology, introduce new systems, address mature and aging equipment, and mitigate fire risk. I respectfully request the Commission to approve the cost forecasts described here. This concludes my prepared testimony.

V. WITNESS QUALIFICATIONS

My name is Jonathan T. Woldemariam. My business address is 8316 Century Park Court, San Diego, California, 92123. I am employed by San Diego Gas & Electric (SDG&E) as the Director of Transmission & Distribution Engineering. I have been employed by SDG&E since 1994. I have over 20 years of experience in the utility industry. While with SDG&E, I have held various positions in the functional areas of Electric Distribution Operations, Electric Generation, Distribution Engineering, and Construction Services.

My present responsibilities include Transmission Engineering, Distribution Engineering, Substation Engineering, Protection Engineering, Civil Engineering, and the Customer Generation Group. Before starting my current position, I was the Director of Construction Services, which included responsibility over the Construction Services Group, the Vegetation Management Group, the Fire Coordination Group, Compliance Management Group, and the Major Project Group. Before that, I was the Manager of the Engineering, Procurement, and Construction Services of the Sunrise Powerlink Project. Prior to that, I worked as a Technical Project Manager for the Sunrise Powerlink Project and before that worked as SDG&E's Manager of Generation Interconnection Projects within SDG&E's Transmission Planning group. Prior to that, I was SDG&E's Manager of Electric Distribution Standards group and was in charge of developing utility distribution standards, distribution construction methods, and overseeing the utility's distribution corrective maintenance program. Prior to that, I was Operations and Engineering Manager responsible for SDG&E's Northeast District engineering, operations, and maintenance tasks.

I earned a Bachelor of Science in Engineering in Electrical Engineering with a major field of study in Electric Power from San Diego State University. I am a registered Professional Engineer (PE) in California.

I am sponsoring the Electric Distribution Operations and Maintenance section of SDG&E's General Rate Case Application related to the Test Year 2016.

I have testified previously to this Commission.

APPENDIX A – Glossary of Acronyms

ADMS	Advanced Distribution Management System
ADSO	Apprentice Distribution System Operator
AES	advanced energy storage
AMO	Advanced Metering Operations
ANPRM	advance notice of proposed rulemaking
ARSO	Area Resource Scheduling Organization
BBS	Behavior Based Safety
C&O	construction and operations
CalFIRE	California Department of Forestry and Fire Protection
CARE	California Alternate Rates for Energy
CCUE	Coalition of California Utility Employees
CFR	Code of Federal Regulations
CHP	California Highway Patrol
CIP	Communication Infrastructure Provider
CMG	Compliance Management Group
CMP	Compliance Management Program
CMVI	controllable motor vehicle incident
CNF	Cleveland National Forest
CPUC	California Public Utilities Commission
CVC	California Vehicle Code
DER	distributed energy resources
DG	distributed generation
DMS	distribution management system
DNP	Distributed Network Protocol
DOH	department overhead pool
DOT	United States Department of Transportation
DSO	Distribution System Operator
EDO	Electric Distribution Operations
EDOSS	Electric Distribution Operations Systems Services
EGISS	Enterprise GIS Services
EMS	Energy Management System
EPA	United States Environmental Protection Agency
ERO	electric regional operations
ERT	estimated restoration time
ETDE	Electric Transmission and Distribution Engineering department
ECT	electronic control technician
EDW	Engineering Data Warehouse
ESS	Electric Systems Support
ETS	electric troubleshooter
FERC	Federal Energy Regulatory Commission
FiRM	Fire Risk Mitigation
FMCSA	Federal Motor Carrier Safety Administration
FR	fire resistant

FTEs	full time equivalents
GFMS	Geographic Facilities Management System
GIS	geographic information system
GRC	general rate case
GWD	Graphical Work Design
HRFA	High Risk Fire Area
IOUs	investor-owned utilities
ISO	Independent System Operator
IT	information technology
ITF	Integrated Test Facility
JAC	Joint Apprentice Committee
LiDAR	light detection and ranging
LRAs	local responsibility areas
M&R	maintenance and repair
MARP	Management Accounting/Finance Rotation Program
MDT	mobile data terminal
MW	megawatt
NDMC	National Drought Mitigation Center
NEM	Net Energy Metering
NERC	North American Electric Reliability Corporation
NERC CIP	North American Electric Reliability Corporation Critical Infrastructure Protection
O&E	operations and engineering
O&M	operations and maintenance
OMS	outage management system
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PDA	personal digital assistant
PE	Professional Engineer
PEVs	plug-in electric vehicles
PMR	Performance Management Reporting
PRC	Public Resource Code
QC	quality control
RD&D	research, development and demonstration
RIRAT	Reliability Improvements in Rural Areas Team
RTU	remote terminal unit
SAIDET	system average interruption duration exceeding threshold
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SAP PM	Systems Applications and Products Plant Maintenance
SAP SD	Systems Applications and Products Sales and Distribution
SCADA	supervisory control and data acquisition
SCOM	Systems Northwest Communications
SCT	Skills and Compliance Training
SDG&E	San Diego Gas & Electric Company
SDLC	Systems Development Lifecycle
SED	Safety & Enforcement Division

SF6	Sulfur Hexafluoride
SMEs	subject matter experts
SPM	System Protection & Maintenance group
SOT	Service Order Team
SWPPP	Storm Water Pollution Prevention Plan
T&E	time and expenses