Company: San Diego Gas & Electric Company (U 902 M)
Proceeding: 2019 General Rate Case
Application: A.17-10-007
Exhibit: SDG&E-04-R

REVISED

SDG&E

DIRECT TESTIMONY OF GINA OROZCO-MEJIA

(GAS DISTRIBUTION)

DECEMBER 2017

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

SDGE
A Sempra Energy utility®

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SUMMARY

GAS DISTRIBUTION (In 2016 $)			
	2016 Adjusted-Recorded (000s)	**TY 2019 Estimated (000s)**	**Change (000s)**
Total Non-Shared Services	25,778	29,533	3,755
Total Shared Services (Incurred)	0	0	0
Total O&M	**25,778**	**29,533**	**3,755**

GAS DISTRIBUTION (In 2016 $)				
	2016 Adjusted-Recorded (000s)	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
Total CAPITAL	**61,557**	**50,666**	**91,606**	**110,993**

In total, San Diego Gas & Electric Company (SDG&E or the Company) requests the California Public Utilities Commission (CPUC or Commission) adopt its Test Year 2019 (TY 2019) General Rate Case (GRC) forecast of $29,533,000 for Gas Distribution operations and maintenance (O&M) expenses. SDG&E further requests the Commission adopt its forecast for capital expenditures in 2017, 2018, and 2019 of $50,666,000, $91,606,000, and $110,993,000, respectively. SDG&E's O&M and capital requests are reasonable and fully justified in that the activities:

- maintain and enhance the delivery of safe, clean, and reliable service to customers;
- are consistent with operational laws, codes, and standards established by local, state, and federal authorities;
- support SDG&E's commitment to mitigate risks associated with hazards to customer/public and employee/contractor safety, infrastructure integrity, and system reliability;
- respond to operations, maintenance, and construction needs associated with projected customer and system growth and the demands of city, county, and state agencies under the Company's franchise agreements; and
- maintain and strengthen a qualified workforce.

The activities described in my testimony below are consistent with operational laws, codes, and standards established by local, state, and federal authorities.[1] This work safeguards the long-term safety and integrity of the system and includes compliance activities, such as facility inspections, cathodic protection maintenance, pipeline facility maintenance, and monitoring odorant levels. SDG&E anticipates this work to continue to increase as it manages an aging infrastructure and responds to changing regulatory and legislative requirements.

The activities in my testimony to maintain the delivery of safe, clean, and reliable service to SDG&E's customers. SDG&E prioritizes work to comply with laws and regulations and provide system integrity and reliability, in accordance with our commitment to safety:

> San Diego Gas and Electric's longstanding commitment to safety focuses on three primary areas – employee safety, customer safety and public safety. This safety focus is embedded in what we do and is the foundation for who we are – 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.[2]

The key work categories included in my request in support of this commitment to safety and gas system integrity are as follows:

- Leak Repairs – Main and service line leak evaluation and repair work is completed to address public safety, infrastructure condition, and material failure. Additional leak indications are expected as SDG&E increases the amount of pipeline surveyed for leaks each year.
- Locate and Mark – Gas facilities are located and marked to avoid third party damage that could create a safety hazard and/or disrupt gas service. Through the completion of this work, SDG&E provides important information to excavators to safeguard those working around gas facilities and protect the integrity of the pipeline system. Furthermore, as Senate Bill (SB) 661, the Dig Safe Act of 2016, is enforced against third-party excavators, SDG&E anticipates increased participation in the One-Call (Dig-Alert or Underground Service Alert (USA)) service, resulting in additional locate and mark tickets.

[1] Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards, 49 C.F.R. § 192 *et seq*.; Cal. Gov't Code § 4216 *et seq*.; General Order (GO) 112-F; and GO 58-A.
[2] SDG&E's Natural Gas System Operator Safety Plan, submitted Mar. 8, 2017, at 2.

- Leak Survey – SDG&E proactively surveys its gas distribution system for leakage at frequencies determined based on the pipe material involved, the operating pressure, cathodic protection type, and the proximity of the pipe to various population densities. SDG&E forecasts that the historical upward trend in this work category will continue as the system expands and as the Company utilizes new technology (*e.g.*, Geographic Information Systems) to better assess gas distribution infrastructure and meet leak survey compliance requirements. Furthermore, changes in leak survey cycle will increase the amount of pipe surveyed in TY 2019.
- System Renewal – This includes activities to replace and/or abandon pipeline facilities, such as mains, services, regulating and metering equipment, cathodic protection systems, and electronic equipment, that have reached the end of their useful lives and present risk of failure.
- High-Pressure Pipeline Documentation – SDG&E is committed to maintaining verifiable, traceable, and complete records for all high-pressure pipeline facilities. Additional recordkeeping and quality control processes have been established for high-pressure pipeline installations, including limited access to the high-pressure material storage area and an electronic pipeline documentation management system.

The activities in my testimony respond to operations, maintenance, and construction needs associated with projected customer and system growth and demands of cities, counties, and state agencies under the Company's franchise agreements. These activities support the Company's obligation to serve its customers and mitigate system reliability risks. Some examples of this work include:

- New Business – System expansion is performed primarily to provide service to new customers and includes the installation of new pipeline infrastructure. These costs are incurred as a result of SDG&E's obligation to serve a growing customer base. SDG&E anticipates this work will increase as the number of new meter set installations increases due to growth in housing starts and local employment.
- Capacity Improvements – Projects to improve system capacity, such as adding new pipelines or replacing existing infrastructure with larger systems, are completed to accommodate customer and/or load growth.

- Freeway and Franchise – This work is driven by external state, county and municipal agencies that submit requests for SDG&E to relocate pipe and associated facilities that would, in their current locations, interfere with planned construction or reconstruction of freeways, highways, streets, sewers, storm drains, and water lines. SDG&E anticipates that these agencies will continue with infrastructure improvements to address aging infrastructure and expansion needs, thus requiring an increase in SDG&E's pipeline facilities alterations.

The activities in my testimony also maintain and strengthen a qualified workforce. Safety is rooted in all phases of gas distribution training. SDG&E is taking proactive action to enhance employee training, qualification and work quality. An integral component of overall workforce proficiency is the Operator Qualification (OpQual) program. As part of OpQual compliance, employees are trained, either formally or informally, whenever significant changes occur in a work task or as required per SDG&E's Gas Standards, state pipeline safety standards under GO 112-F (formerly known as GO 112-E), and federal pipeline safety standards under the Department of Transportation's (DOT) Pipeline Safety and Hazardous Materials Administration's (PHMSA) 49 C.F.R. § 192. SDG&E forecasts several incremental activities to support this important safety aspect including new computer-based training systems, incremental employee training, additional instructors, and additional field inspection personnel.

The activities in my testimony support new technologies. As SDG&E continues to implement new technologies to improve training and operations, the organization will adapt to the changes. SDG&E forecasts incremental increases associated with training and OpQual system and process enhancements including computer-based training and field condition and equipment simulations.

REVISED SDG&E DIRECT TESTIMONY OF GINA OROZCO-MEJIA
(GAS DISTRIBUTION)

I. INTRODUCTION

A. Summary of Gas Distribution Costs and Activities

My testimony supports the TY 2019 forecasts for O&M costs for non-shared and capital costs for the forecast years 2017, 2018, and 2019, associated with the Gas Distribution area for SDG&E. There are no shared service activities included in this testimony.

In total, SDG&E requests the Commission adopt its TY 2019 forecast of $29,533,000 for non-shared service Gas Distribution O&M expenses. SDG&E further requests the Commission adopt its forecast of capital expenditures for 2017, 2018, and 2019 of $50,666,000, $91,606,000, and $ 110,993,000, respectively. Table GOM-01 summarizes my sponsored costs.

Table GOM-01
San Diego Gas & Electric Company
Test Year 2019 Summary of Total Costs

GAS DISTRIBUTION (In 2016 $)			
	2016 Adjusted-Recorded (000s)	**TY 2019 Estimated (000s)**	**Change (000s)**
Total Non-Shared Services	25,778	29,533	3,755
Total Shared Services (Incurred)	0	0	0
Total O&M	**25,778**	**29,533**	**3,755**

GAS DISTRIBUTION (In 2016 $)				
	2016 Adjusted-Recorded (000s)	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
Total CAPITAL	**61,557**	**50,666**	**91,606**	**110,993**

The purpose of this testimony is to demonstrate the reasonableness of SDG&E's Gas Distribution capital expenditure and expense forecasts to operate and maintain the gas distribution system and construct new gas distribution facilities. SDG&E's philosophy is to provide safe, clean, and reliable delivery of natural gas to customers at reasonable rates. This commitment requires that SDG&E continues to invest in its employees, pipeline assets, and

support services to mitigate risks associated with the safety of the public and employees; system reliability; and infrastructure integrity. Specifically, the activities discussed herein:

- maintain and enhance safety;
- reflect local, state, and federal regulatory and legislative requirements;
- maintain overall system integrity and reliability;
- respond to customer growth;
- comply with franchise obligations; and
- maintain and strengthen a qualified workforce.

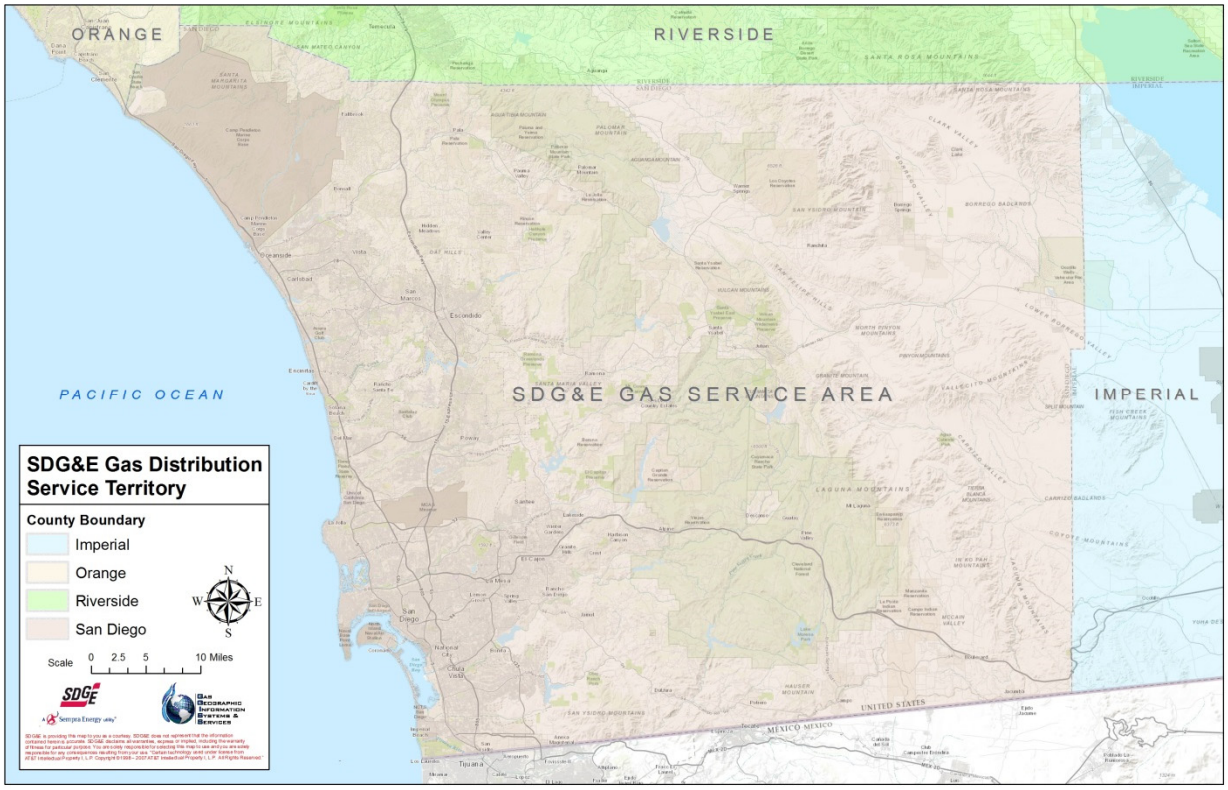
This testimony discusses non-shared expenses in support of O&M functions for gas distribution mains and services, measurement and regulator stations, customer meters, regulators and electronic equipment and includes the associated engineering, supervision, and technical support. The capital expenditures presented herein are in support of the installation, replacement and relocation of distribution pipeline infrastructure. All costs in this testimony are shown in 2016 dollars, unless otherwise noted.

In addition to this testimony, please also refer to my workpapers, Exhibit SDG&E-04-WP (O&M) and SDG&E-04-CWP (Capital) for additional information about the activities described herein.

SDG&E's gas distribution system consists of a network of approximately 14,148 miles[3] of interconnected gas mains, services and associated pipeline facilities. These mains and services, constructed of both steel and plastic materials in varying diameters, are located in most streets within SDG&E's service territory. The primary function of this distribution pipeline network is to deliver natural gas from SDG&E's transmission system to approximately 878,100 customers in an area of over 1,400 square miles, stretching from Orange County in the north to the Mexico border in the south, as depicted in Figure GOM-01, below.

[3] Total mileage that Gas Distribution operates including Distribution-operated supply lines greater than 20% Specified Minimum Yield Strength (SMYS).

Figure GOM-01 – SDG&E Gas Distribution Service Territory



SDG&E's Distribution network is composed of 8,130 miles of gas mains, which operate at either high pressure (over 60 pounds per square inch (psi)) or medium pressure (60 psi and below). This system contains numerous valves capable of isolating the total system into smaller areas for operational, construction, and emergency purposes. SDG&E operates regulator stations located throughout the system to maintain gas pressure, regulate the distribution system, and provide adequate capacity to meet customer needs. In addition, SDG&E maintains approximately 6,018 miles of service lines. The gas service lines connect the high- and medium-pressure mains to each customer meter set assembly (MSA) and "house pipeline."

SDG&E routinely performs work to maintain the daily operation of the system, connect new customers, maintain the necessary capacity to serve all customers, replace damaged or deteriorating facilities, and relocate facilities to meet customer and governmental agency needs. This workforce ranges from front-line construction crews to technical planners and engineers. There are approximately 385 distribution employees located at five operating bases and one technical office throughout SDG&E's service territory. These employees are responsible for maintaining safe and reliable operation of the gas distribution system.

My cost forecasts support the Company's goals of continuous improvement while providing safe, clean, and reliable delivery of natural gas to customers at reasonable rates, while mitigating risks associated with hazards to customer/public and employee/contractor safety, infrastructure integrity, and system reliability.

SDG&E is committed to continued long-term investment in its pipeline infrastructure to maintain the integrity of its distribution system and comply with applicable local, state, and federal laws and regulations. The Company actively evaluates the condition of its pipeline system through maintenance and operations activities, and replaces pipeline segments to preserve the safe and reliable system customers expect. With the forecasted level of funding, and by continuing to identify ways to improve gas distribution system installation, operation, and maintenance activities, SDG&E anticipated that it can continue to manage these business and operational challenges, and will continue to provide safe, clean, and reliable natural gas service at reasonable rates.

SDG&E faces a number of challenges affecting both the physical operation of the pipeline system and cost management aspects of its business that contribute to the forecasts presented in this testimony. These challenges include:

Trained and Qualified Workforce

Safety is rooted in all phases of Gas Distribution training. Maintaining a skilled, qualified, and dedicated workforce is critical to SDG&E's continued success. It is through the efforts of these employees that SDG&E can continue to deliver reliable service to customers and maintain the integrity of its pipeline infrastructure at reasonable cost. SDG&E is experiencing increased pressures associated with maintaining a highly trained and qualified workforce.

Within the workforce there is increased turnover, due primarily to retirements and employee movement as a result of promotions and transfers, which continue to pose challenges to SDG&E. In particular, SDG&E is experiencing these challenges in the areas of knowledge transfer, skills development, and overall proficiency of the replacement workforce. Gas Distribution is taking appropriate measures to maintain its highly skilled workforce, recognizing that safety and system reliability cannot be sacrificed during times of employee transition. As new and less experienced employees step in to replace highly-skilled employees, SDG&E is conscientiously training and mentoring them, giving them on-the-job experience, and providing

greater levels of supervision and quality assurance to instill a continued focus on proficiency and safety.

Furthermore, SDG&E is continuously refining its OpQual program to better align with recommendations by CPUC auditors and industry leading practices, as well as comply with GO 112-F. This includes adding new qualification elements, developing qualification materials, managing an electronic recordkeeping process, developing a computer-based training environment, and conducting training to qualify impacted employees.

Aging Infrastructure

SDG&E has a long history of delivering safe and reliable natural gas service, notwithstanding the fact that a significant portion of the pipeline infrastructure has been in service for over 50 years. Good maintenance practices have allowed SDG&E to safely and reliably operate these pipeline facilities for this extended period, but this cannot continue forever. As the Company's pipeline infrastructure continues to age, it requires higher levels of maintenance, which results in higher costs. SDG&E attempts to maintain a reasonable balance between increased maintenance needs and eventual replacement.

In addition to aging pipelines, SDG&E is also addressing the aging of other pipeline infrastructure, such as Measurement and Regulation (M&R) equipment, electronic systems, and cathodic protection system components, such as anode beds and rectifiers. All components of the gas distribution system have a finite useful life that must be observed, and repairs must be anticipated to avoid service interruptions, non-compliance situations, or adverse safety conditions.

System Expansion

SDG&E's pipeline system continues to expand as new construction adds to the customer base and the need for pipeline infrastructure. New facilities add to the inventory of assets that require operations and maintenance attention. Pipelines must be leak surveyed to monitor asset condition and any identified deficiencies must be corrected. Facilities must be located and marked to minimize potential damage from outside sources. System valves, meters, and regulators must be inspected, operated, and maintained. Each of these actions must be completed in accordance with federal and state regulations and are critical to maintaining a safe and reliable distribution system for a growing base of customers.

Customer and Load Demands

As a public utility, SDG&E has an obligation to provide natural gas service to customers within its service territory. As the customer base grows and expands, new demands are placed on existing infrastructure. For example, customer load growth creates the need for facility upgrades, increasing customer density can require the relocation of existing infrastructure, and general business improvements require the Company to protect its infrastructure from potential damage due to third-party construction. Field experience indicates that more favorable economic conditions lead to increases in various work requirements. SDG&E anticipates that as the economy continues to grow with housing demand remaining high,[4] this will impact activities related to customer and load demands.

State and Municipal Agency Construction Requirements

The construction, operation, and maintenance of SDG&E's vast pipeline system require interaction and compliance with numerous agencies. These agencies continue to impose new and often more stringent administrative, planning, and field construction operating conditions that can result in increased cost pressures to maintain the gas distribution system. This includes increased costs associated with permits, traffic control plans, paving repair requirements, and restricted work hours. SDG&E works diligently with these agencies to find solutions that are in the best interest of customers and agencies. Nevertheless, these rules often result in cost increases.

Regulatory Requirements

The activities described in my testimony are consistent with operational laws, codes, and standards established by local, state, and federal authorities.[5] These requirements continue to increase necessitating changes in work processes and the addition of resources to complete impacted operations, maintenance and construction work. Some of these incremental pressures are associated with the implementation of GO 112-F and SB 661.

Effective January 1, 2017, GO 112-F is the State of California's code governing the design, construction, testing, operation and maintenance of natural gas lines. Some of the upward pressures associated from the updated General Order include:

[4] IHS [Global Insight] US Markets Metro Economies—West, Spring 2017 (San Diego section).
[5] Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards, 49 C.F.R. § 192 *et seq*.; Cal. Gov't Code § 4216 *et seq*.; GO 112-F; and GO 58-A.

- Increase leak survey frequency for high-pressure pipelines (DOT-defined transmission lines) from every year to every 6 months. In Gas Distribution, these lines are known as supply lines.
- Additional requirements for managing encroachments, including notifications and development of written plans.
- Additional monitoring, reporting, and recordkeeping, including new parsing of leak repair and response time data (*e.g.*, response time to make safe and arrive on scene captured in 5 minute intervals up to 45 minutes, 45-60 minutes, and greater than 60 minutes); new monitoring and reporting of timeliness to update maps; new criteria and notification for over-pressure incidents; and new parsing of excavation damage data (*e.g.*, damages and costs related to homeowners).

In 2016, the California Governor signed SB 661, named the Dig Safe Act of 2016, which added enforcement to the digging law by establishing the California Underground Facilities Safe Excavation Board. The Board is authorized to take action against those parties who violate the excavation law under California Government Code Section 4216. The Dig Safe Act is expected to require more excavators to notify USA, which will add upward pressure to an already increasing USA ticket volume in California. Other notable impacts of the Dig Safe Act include the requirement for marking the presence of known abandoned lines and keeping abandoned line records, which will increase time spent locating each ticket and create additional work for supporting activities.

The Commission's recent Decision (D.) 17-06-015 established more stringent repair timelines under SB 1371 to reduce methane emissions from natural gas leaks. In order to comply with the requirements of the recently adopted SB 1371, in lieu of a system-wide three-year leak survey cycle in areas where GO 112-F, or its successors, requires surveying every five years, SDG&E will propose a risk-assessment based, more cost-effective methodology for conducting gas distribution pipeline leak surveys at a less frequent interval and justify this alternative in its SB 1371 Compliance Plan filing in March 2018, subject to Commission approval. This cost is not included in the TY 2019 GRC request; instead, it will be addressed in a separate proceeding as discussed by the Environmental Services testimony of Nancy Clancy (Exhibit SDG&E-23).

SDG&E anticipates that the level of funding requested in this testimony will provide the resources to comply with these incremental regulatory requirements.

B. Summary of Safety- and Risk Assessment Mitigation Phase-Related Costs

Certain of the costs supported in my testimony are driven by activities described in Southern California Gas Company (SoCalGas) and SDG&E's November 30, 2016 Risk Assessment Mitigation Phase (RAMP) Report.[6] The RAMP Report presented an assessment of the key safety risks of SoCalGas and SDG&E and proposed plans for mitigating those risks. As discussed in the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively), the costs of risk-mitigation projects and programs were translated from that RAMP Report into the individual witness areas.

In the course of preparing the Gas Distribution GRC forecasts, SDG&E continued to evaluate the scope, schedule, resource requirements, and synergies of RAMP-related projects and programs. Therefore, the final representation of RAMP costs may differ from the ranges shown in the original RAMP Report. Tables GOM-01A and GOM-01B provide a summary of the RAMP-related costs supported by my testimony:

Table GOM-01A
San Diego Gas & Electric Company
Summary of RAMP O&M-Related Costs

GAS DISTRIBUTION (In 2016 $)			
RAMP Risk Chapter	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins	2,542	560	3,102
SDG&E-3 Employee, Contractor, and Public Safety	3,148	0	3,148
SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure	7,829	217	8,046
SDG&E-17 Workforce Planning	0	319	319
Total O&M	**13,519**	**1,096**	**14,615**

[6] I.16-10-015/I.16-10-016 Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, November 30, 2016. Please also refer to Exhibit SCG-02/SDG&E-02, Chapter 1 (Diana Day) for more details regarding the utilities' RAMP Report.

Table GOM-01B
San Diego Gas & Electric Company
Summary of RAMP Capital-Related Costs

GAS DISTRIBUTION (In 2016 $)			
RAMP Risk Chapter	**2017 Estimated RAMP Total (000s)**	**2018 Estimated RAMP Total (000s)**	**2019 Estimated RAMP Total (000s)**
SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins	256	256	256
SDG&E-3 Employee, Contractor, and Public Safety	4,053	4,053	4,053
SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure	9,728	47,157	67,212
Total Capital	**14,037**	**51,466**	**71,521**

My testimony includes costs to mitigate Gas Distribution risks primarily associated with customer/public and employee/contractor safety, system reliability, regulatory and legislative compliance, and pipeline system integrity. Specific risks, mitigating measures, and associated costs are further discussed in Section II of my testimony.

C. Summary of Costs Related to Fueling Our Future Policy (FOF)

As described in the testimony of Fueling Our Future Policy testimony of Hal Snyder and Randall Clark (Exhibit SCG-03/SDG&E-03), the utilities began the FOF initiative in May 2016, to examine operations across the Company and identify opportunities for efficiency improvements. Through this process, ideas were generated, reviewed, analyzed, and targeted for implementation from 2017 through TY 2019. The cost savings resulting from FOF improvement ideas in Gas Distribution are primarily attributed to transferring 15C size meter work in Pipeline Operations to Customer Service Field; implementation of ITS software, which allows switching from paper to electronic format for classroom and OpQual testing; transferring field supervisor administrative tasks to technical / clerical positions; and improvements in construction materials availability and location tracking. Table GOM-01C provides a summary of the FOF cost efficiencies described in my testimony.

Table GOM-01C
San Diego Gas & Electric Company
Summary of FOF Costs (+) / Savings (-)

GAS DISTRIBUTION (In 2016 $)			
FOF O&M	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
FOF-Implementation	-20	0	0
FOF-Ongoing/<Benefits>	-242	-512	-517
Total O&M	**-262**	**-512**	**-517**

Specific cost saving elements are discussed in further detail in Section III of my testimony.

D. Support To and From Other Witnesses

My testimony also references the testimony or workpapers of several other witnesses, either in support of their testimony or as referential support for mine. Those witnesses are Diana Day (Exhibit SCG-02/SDG&E-02, Risk Management and Policy), Omar Rivera (Exhibit SDG&E-05, Gas System Integrity), Hal Snyder and Randall Clark (Ex. SCG-03/SDG&E-03, Fueling Our Future), Maria Martinez (Exhibit SDG&E-11, Pipeline Integrity for Transmission and Distribution), William H. Speer (Exhibit SDG&E-15, Electric Distribution - O&M), Gwen Marelli (Exhibit SDG&E-17, Customer Services – Field and Meter Reading), Carmen Herrera (Exhibit SDG&E-21, Fleet Services), Nancy Clancy (Exhibit SDG&E-23, Environmental Services), Denita Willoughby (Exhibit SCG-22/SDG&E-20, Supply Management, Logistics, & Supplier Diversity), James Vanderhye (Exhibit SCG-34/SDG&E-32, Shared Services & Shared Assets Billing, Segmentation, & Capital Reassignments), and Rose-Marie Payan (Exhibit SDG&E-37, Gas Customer Forecast).

1. Small Meter and Regulator Purchases

I sponsor the capital costs associated with the purchase of both Gas Distribution and Customer Services meters and regulators. The labor costs associated with the replacement of small meters and regulators, typically at residential and small commercial sites, is addressed by Ms. Marelli (Ex. SDG&E-17). Additional information about these capital purchases may be found in Section IV.C (Meter and Regulator Materials) of my testimony.

2. New Meter Set Forecast

Gas Distribution's New Business construction capital costs, and related meter and regulator unit purchases, are driven by the number of new customer meter set installations. Details on the forecast of new meter set installations can be found in the workpapers of Ms. Payan, Exhibit SDG&E-37-WP. Additional information about the forecasts of new meter sets may be found in Section IV.A (New Business) of my testimony.

3. Incremental Vehicles

In order to perform the incremental work associated with the forecasted level of O&M and capital activities, SDG&E is adding vehicles, as required, within applicable workgroups and capital budget codes. The costs associated with these vehicles is addressed by Ms. Herrera (Ex. SDG&E-21).

4. Electric Support

Labor and non-labor expenses are incurred by Gas Distribution crews that have been specially trained to provide traffic control support services for Electric Distribution crews performing Corrective Maintenance Program inspections. Additional information about the electric Corrective Maintenance Program is addressed by Mr. Speer (Ex. SDG&E-15).

5. Economic Growth

Gas Distribution relied on total employment growth, as reported by IHS Global Insight, as a directional indicator for general economic conditions and potential economic growth. This IHS Global Insight[7] employment forecast is shown in the workpapers of Ms. Payan, Ex. SDG&E-37-WP.

6. Distribution Integrity Management Program Activity Moving to Gas Distribution Operations.

A leak survey activity currently funded through 2018 as part of the Distribution Integrity Management Program (DIMP) and covered by Ms. Martinez (Ex. SDG&E-11) will become part of routine Gas Distribution operations in TY 2019. This activity is discussed further in my testimony in Section III.A.2 (Leak Survey).

[7] Total mileage that Gas Distribution operates including Distribution-operated supply lines greater than 20% SMYS.

II. RISK ASSESSMENT MITIGATION PHASE AND SAFETY CULTURE

A. Risk Assessment Mitigation Phase

As illustrated in Table GOM-01D, part of my requested funds is linked to mitigating top safety risks that have been identified in the RAMP Report. These top risks were identified through the RAMP process described in the RAMP Report and are associated with activities sponsored in my testimony. These risks are summarized in Table GOM-01D below:

Table GOM-01D
San Diego Gas & Electric Company
RAMP Risks Summary

RAMP Risk ID/Chapter	Description
SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins	This risk relates to the potential impacts from dig-ins resulting from third-party activities; and is focused on the more serious results of third- party damage that lead to a release of natural gas with the possibility of hazard to life and property. The release of natural gas may not just occur at the time of the damage. A leak or rupture may also occur after the infrastructure has been damaged and reburied but becomes weakened over time.
SDG&E-3 Employee, Contractor, Customer, and Public Safety	This risk covers conditions and practices which may result in severe harm to employee, contractor, customer, and/or public safety such as driving, customer premises, and appliance conditions, as well as non-adherence to company safety policies, procedures, and programs.
SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure	This risk relates to the public safety and property impacts that can result from failure of medium-pressure pipelines (60 psi and less).
SDG&E-17 Workforce Planning	Loss of employees with deep knowledge, understanding and experience in Operations due to retirements or turnover.

In developing my request, priority was given to these key safety risks to assess which risk mitigation activities Gas Distribution currently performs and what incremental efforts are needed to further mitigate these risks. How my request was influenced by these key RAMP risks is further explained below by risk.

In the course of developing the GRC forecasts, SDG&E evaluated the scope, schedule and resource requirement, and synergies of RAMP-related projects and programs to determine costs already covered in the base year and those that are incremental increases expected in the TY 2019. RAMP-related costs and activity descriptions are further described in Sections III and IV below as well as in my workpapers. The general treatment of RAMP forecasting is described by Ms. Day and Ms. York (Ex. SCG-02/SDG&E-02, Chapters 1 and 3, respectively). Table GOM-01E also provides a summary of RAMP-related O&M costs by workgroup or budget code. Table GOM-01F also provides a summary of RAMP-related O&M costs by workgroup or budget code:

Table GOM-01E
San Diego Gas & Electric Company
RAMP O&M Summary Breakdown of Costs

GAS DISTRIBUTION (In 2016 $)			
SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
1GD000.002, Field O&M - Locate & Mark	2,542	560	3,102
Total	**2,542**	**560**	**3,102**
SDG&E-3 Employee, Contractor, and Public Safety	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
1GD000.001, Field O&M - Leak Survey	211	0	211
1GD000.007, Field O&M - Supervision & Training	1,875	0	1,875
1GD004.000, Operations Management & Training	1,062	0	1,062
Total	**3,148**	**0**	**3,148**
SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
1GD000.001, Field O&M - Leak Survey	1,629	0	1,629
1GD000.003, Field O&M – Main Maintenance	1,250	0	1,250
1GD001.000, Asset Management	242	217	459
1GD002.000, Measurement & Regulation	2,400	0	2,400
1GD003.000, Cathodic Protection	1,500	0	1,500
1GD004.000, Operations Management & Training	808	0	808
Total	**7,829**	**217**	**8,046**

SDG&E-17 Workforce Planning	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
1GD000.007, Field O&M - Supervision & Training	0	319	319
Total	**0**	**319**	**319**

Table GOM-01F
San Diego Gas & Electric Company
RAMP Capital Summary Breakdown of Costs

GAS DISTRIBUTION (In 2016 $)			
SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins	**2017 Estimated RAMP Total (000s)**	**2018 Estimated RAMP Total (000s)**	**2019 Estimated RAMP Total (000s)**
005010.003, RAMP - Base / Risk ID 2 - Locate and Mark Field Activities	225	225	225
005010.004, RAMP - Incremental / Risk ID 2 - Locate and Mark Field Activities	18	18	18
005080.004, RAMP - Base / Risk ID 2 - Excavation Standby	13	13	13
Total	**256**	**256**	**256**
SDG&E-3 Employee, Contractor, and Public Safety	**2017 Estimated RAMP Total (000s)**	**2018 Estimated RAMP Total (000s)**	**2019 Estimated RAMP Total (000s)**
009020.004, RAMP - Base / Risk ID 3 - Traffic Control	3,700	3,700	3,700
009020.005, RAMP - Incremental / Risk ID 3 - Traffic Control	353	353	353
Total	**4,053**	**4,053**	**4,053**
SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure	**2017 Estimated RAMP Total (000s)**	**2018 Estimated RAMP Total (000s)**	**2019 Estimated RAMP Total (000s)**
005000.003, RAMP - Base / Risk ID 16 - Odorization of New Pipeline	45	45	45
005060.002, RAMP - Base Risk ID 16/SDG&E Medium-Pressure Pipeline Failure	300	300	300

005060.003, RAMP - Incremental Risk ID 16/SDG&E Medium-Pressure Pipeline Failure	435	214	25
005080.002, RAMP - Incremental / Risk ID 16 - Early Vintage Steel Replacement	1,901	5,488	7,385
005080.003, RAMP - Incremental / Risk ID 16 - Early Vintage Threaded Main Removal	0	7,385	14,774
005080.005, RAMP - Base / Risk ID 16 - Leak Repair	1,000	1,000	1,000
005080.006, RAMP - Incremental / Risk ID 16 - Leak Repair	46	46	46
005080.007, RAMP - Base / Risk ID 16 - EPOCH Planned Replacement of Pipe with Recurring Leak History	2,000	2,000	2,000
005080.008, RAMP - Incremental / Risk ID 16 - EPOCH Planned Replacement of Pipe w/Recurring Leak History	-36	259	597
005100.002, RAMP - Incremental / Risk ID 16 - Dresser Mechanical Couplings	926	6,952	7,877
005100.003, RAMP - Incremental / Risk ID 16 - Oil Drip Piping Removal	0	9,275	9,275
005100.004, RAMP - Incremental / Risk ID 16 - Buried Piping in Vaults	0	0	7,719
005100.005, RAMP - Incremental / Risk ID 16 - Closed Valves Between High and Medium-Pressure Pipes	0	3,520	0
009020.002, RAMP - Incremental Post Filing / Risk ID 16 - RAMP Proposed Projects Overhead	600	6,928	9,989
009020.003, RAMP - Incremental / Risk ID 16 - CP System Risk Algorithm Development	0	1,027	3,349
009020.006, RAMP - Base / Risk ID 16 - Gas Standards Review	68	68	68
009020.007, RAMP - Base / Risk ID 16 - New Construction QA/QC	383	383	383
125510.002, RAMP - Base / Risk ID 16 - Maintain CP Assets	1,095	1,095	1,095
125510.003, RAMP - Incremental / Risk ID 16 - Maintain CP Assets	965	1,172	1,285
Total	**9,728**	**47,157**	**67,212**

The RAMP risk mitigation efforts are associated with specific actions such as programs, projects, processes, and technology. For each of these mitigation efforts, an evaluation was made to determine the portion, if any, that was already performed as part of historical activities (*i.e.*, embedded base costs) and the portion, if any, that was incremental to base year activities.

Furthermore, for the incremental activities, a review was completed to determine if any portion of incremental activity was part of the workgroup's base forecast methodology (*i.e.*, base year, trending, averaging, etc.). The result was what SDG&E considers to be a true representation of incremental increases over the base year expenses.

While the starting point for consideration of the risk mitigation efforts and costs was the RAMP Report, as described above, further evaluation may have resulted in changes to the scope, schedule, and costs; therefore, the incremental costs of risk mitigation sponsored in my testimony may differ from those first identified in the RAMP Report.

My incremental request supports the ongoing management of these risks that could pose significant safety, reliability, and financial consequences to our customers and employees. The anticipated risk reduction benefits that may be achieved by RAMP incremental work elements or activities are summarized in Sections III and IV of my testimony.

1. SDG&E-2 Catastrophic Damage Involving Third-Party Dig-Ins

SDG&E operates and manages a natural gas network of over 14,000 miles of distribution pipe in a service territory of approximately 1,400 square miles, exposing this pipe system to third-party dig-ins. Across the spectrum, third-party damage to pipelines can range from minor scratches or dents, to ruptures with an uncontrolled release of natural gas, presenting the potential for serious consequences.

As noted in the RAMP Report, damages resulting from excavation activity is the number one RAMP risk and represents the greatest safety threat to SDG&E's pipeline infrastructure with potential for catastrophic consequences to public safety.[8] SDG&E manages the risk of third-party dig-ins through mitigation actions that have been developed and implemented over many years, including:

- Training – While training activity is pervasive throughout the Company, the mitigation covered in my testimony consists of programs that provide personnel the knowledge to perform activities associated with locating and marking pipelines, such as (1) Locate and Mark training, and (2) Locate and Mark Operator Qualification. Adequately preparing and qualifying personnel to perform their jobs gives them the

[8] SED's Risk and Safety Aspects of Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, dated Mar. 8, 2017, at 30.

ability to follow applicable policies and procedures in a safe manner. This, in turn allows SDG&E to operate and maintain its system in a safe manner, thus protecting employees, contractors, and the public from a damaged pipeline.

- Locate and Mark Activities – This mitigation comprises two main activities covered in my testimony that are related to performing or supporting locate and mark work: (1) Locate and Mark, and (2) Pipeline Observation (stand-by). Other activities such as Staff Support and Public Awareness Programs are covered by Mr. Rivera (Ex. SDG&E-05).
    - Locate and Mark is the work performed by SDG&E personnel required to respond to over 150,000 USA notifications per year. To complete this activity, SDG&E physically goes to the job site, locates all pipelines in the vicinity of the excavation, and appropriately marks its location. Knowing the location of the pipeline allows the third party to avoid that area or carefully perform the excavation work to avoid contact with the pipeline. This activity is mandated by state law (California Government Code Section 4216) and federal law (Code of Federal Regulations (C.F.R.) Title 49 Part 192.614). As discussed above, SB 661, an update adding enforcement provisions to California's excavation law, is expected to compel more excavators to call USA, which SoCalGas anticipates will add upward pressure to an already increasing ticket volume in its service territory.
    - Pipeline Observation (stand-by) is performed in accordance with the requirements of 49 C.F.R. § 192.935, Pipeline Observation (stand-by), which requires a qualified Company representative to be present any time excavation activities take place near a covered pipeline segment. SDG&E requires this activity for all pipelines operating at high pressure (pressure above 60 psi). Pipeline observation helps to verify that contractors protect high-pressure pipelines located near construction activity. The purpose is to decrease the likelihood of an event occurring by having another pair of qualified eyes observing the work being done. This is a best practice in the gas industry and is also critical to another top RAMP risk – the safety of employees/contractors and the public/customers. With the rise in USA tickets, external construction activity

and more stringent excavation laws, SDG&E anticipates there will be an increased need for pipeline observation.

The costs associated with training and Locate and Mark mitigation activities are covered in the base year and base forecast of the Field Operations and Maintenance –Locate and Mark and Supervision and Training workgroups discussed in Sections III.A.3 and III.A.8 of my testimony. Additionally in Section III of my testimony, supplementing these mitigating measures described above in the base expense, incremental additional RAMP expenses have been added to address the recommendations in the RAMP Report which identified the need to increase work activities associated with locate and mark training, OpQual certification, staff to translate federal and state regulations into Company Gas Standards, and standby personnel for surveillance of excavations near high-pressure gas lines to prevent damage.

2. SDG&E-3 Employee, Contractor, Customer, and Public Safety

At SDG&E, the safety of employees, contractors, customers, and the public in the communities it serves is a core value. The Company safety culture has evolved over 135 years and underpins the Company's programs, policies, procedures, guidelines, and best practices. As stated above, the Employee, Contractor, Customer, and Public Safety risk entails an employee and/or contractor who does not adhere to Company policies or procedures, which then results in a safety-related incident. SDG&E manages this risk through mitigation actions that have been developed and implemented over many years, as well as proposed incremental projects, programs, and processes. Below is a description of some of the mitigation actions performed by Gas Distribution personnel to mitigate this RAMP risk.

- Employee Training – New hires, transfers, or newly-assigned employees are required to complete and pass initial training, such as defensive driver's training for positions where the employee is expected to drive more than 3,000 miles per year on Company business. Refresher training is another important element of managing this risk. This includes weekly reviews of relevant policies and procedures, safety tailgates to discuss workplace hazards, work plans and responsibilities, safety stand-downs to discuss safety incidents, close call reviews, safety bulletins, safety committee meetings to develop and present material on various safety topics, and dialogue meetings with the Company and department leadership.

- Personal Protective Equipment (PPE) and Safety Equipment – SDG&E provides its employees with the PPE required to safely perform work (*e.g.,* flame-retardant suits, eye protection, gloves, etc.). Additionally, job-specific tools are provided as required to safely perform work.
- Gas Facility and Pipeline Inspections – SDG&E inspects its pipeline systems pursuant to the applicable rules and regulations.[9] These inspection activities include: leak surveys, pipeline patrols, internal and external corrosion control, valve inspection, underground vaults, pipeline crossings, and pressure-relief devices.

Alternative Considered:

While it is possible for SDG&E to continue to use current equipment and PPE for a longer duration, this would not be prudent to address the safety of our field employees and contractors performing high-risk functions. SDG&E has formed safety and equipment committees designed to routinely evaluate tasks performed, associated safety hazards, and identify the optimal tools and PPE for the tasks. This process typically involves evaluation and testing of several alternative tools or personal protective gear offerings before a final selection is made.

The costs associated with activities supporting the RAMP SDG&E-3 Employee, Contractor, Customer, and Public Safety mitigation measures are discussed in the following Sections of my testimony: Field O&M, Leak Survey, Section III.A.2 - mandated leak patrolling and leak surveys; Field O&M, Supervision and Training, Section III.A.8 - traffic control for construction work; Operations Management and Training, Section III.C.1 - job skills training and the Skills Training Center.

3. SDG&E-16 Catastrophic Damage Involving Medium-Pressure Pipeline Failure

SDG&E Gas Distribution operates over 14,000 miles of medium-pressure main and service pipes serving over 878,000 customers throughout its service territory. SDG&E manages this risk through mitigation actions that have been developed and implemented over many years. As in the case of the risk associated with catastrophic damage involving high-pressure pipeline

[9] *See e.g.,* 49 C.F.R. § 192 *et seq*. and GO 112-F.

failure, SDG&E manages this risk through compliance with applicable federal and state regulations, including the following activities included in my testimony:

- CFR 49 § 192 Subpart M – Maintenance – SDG&E performs maintenance activities in accordance with federal and state requirements, including performing leak survey, pipeline patrol, bridge, and span inspections; and meter set assemblies, valve and regulator station inspection and maintenance on a regular basis. These preventive measures address potential conditions that otherwise could lead to a failure.
- CFR 49 § 192 Subpart N – Qualifications of Pipeline Personnel – SDG&E trains, evaluates, and qualifies employees and contractors for covered tasks through the OpQual and Training organization. Additionally, the OpQual and Training organization maintains qualification records and continuously updates training material to reflect most recent procedures and standards. Providing employees and contractors with training and qualification is intended to address the threat associated with incorrect operations.
- CFR 49 § 192 Subpart I – Requirements for Corrosion Control – SDG&E routinely monitors cathodic protection (CP) areas by evaluating rectifier and test point reads, remediates CP areas that are out of tolerance, and pursues preventative CP system installations and modifications to proactively avoid out of tolerance areas. These activities are intended to address internal and external corrosion threats.
- CFR 49 § 192 Subpart L – Operations – SDG&E routinely performs locate and mark activities to identify company facilities in areas of construction, pipeline odorization and odorant sampling, and emergency response / preparedness activities. Locate and mark activities are specific to addressing third-party damage threats while emergency preparedness and pipeline odorization are intended to address all threats.
- CFR 49 § 192 Subpart P – Gas Distribution Pipeline Integrity Management (DIMP) – SDG&E has implemented Pipeline and Hazardous Materials Safety Administration (PHMSA) established DIMP requirements to enhance pipeline safety by having operators identify and reduce pipeline integrity risks for distribution pipelines.

SDG&E will continue with its baseline activities described above. In addition to these long-standing mitigation actions, SDG&E is proposing to expand and add new mitigations to further address the risk of a medium-pressure pipeline failure.

- Expansion of DIMP – Increasing the replacement of early vintage plastic pipe. This item is discussed by Ms. Martinez (Ex. SDG&E-11).
- Dresser Mechanical Couplings – This new mitigation effort consists of removing or encapsulating 1920-1930s era Dresser mechanical couplings. These couplings were utilized instead of welding on a mixture of distribution and supply lines in the downtown San Diego vicinity. These mechanical couplings are more prone to leaks as compared to welded pipe, and pose a potential risk of separation in the event of a strong earthquake or exposure of long lengths of the pipeline during routine company, private, or franchise projects in the vicinity. The removal or encapsulation of these couplings is the most effective and cost-efficient mitigation method allowing for the remaining pipeline to remain in service. This will support the risk mitigation of a medium-pressure pipeline failure and is further discussed in Sections III.B. and IV.K of my testimony.
- Oil Drip Piping – This mitigation effort consists of identifying and removing unnecessary buried oil drip piping facilities. These facilities are at risk of excavation damage as their location and configuration historically was not captured on facility maps and therefore not marked out as a part of locate and mark requests. To most effectively mitigate the risk of medium-pressure pipeline failure associated with unmapped below grade oil drip facilities, SDG&E will perform a thorough work order records search, field verification, and map or remove unnecessary oil drips. This is further discussed in Sections III.B. and IV.K. of my testimony.
- Buried Piping in Vaults – This mitigation effort will consist of records and field verification of pipe segments, fittings, or valves exposed within a below grade vault, which are at risk for accelerated atmospheric corrosion due to potential of water accumulation, pipe coating failure, and decreased CP effectiveness as these components within the vault are not buried and are exposed to the atmosphere. To most effectively support the risk mitigation of a medium-pressure pipeline failure associated with buried piping in vaults, SDG&E will replace or relocate the identified buried piping in vault segments. This is further discussed in Sections III.B. and IV.K. of my testimony.

- Closed Valves Between Medium-Pressure and High-Pressure Systems – SDG&E has identified 51 valves in the closed position which separate high-pressure from medium-pressure systems. This condition is a result of a maximum allowable operating pressure (MAOP) uprating of a pipeline which was previously interconnected to a distribution system and operated at a lower MAOP. There is inherent risk should the valve be operated in error, operated in an act of sabotage, or the valve leaks pressure downstream to the lower MAOP system potentially causing an overpressure condition of the downstream system. To most effectively mitigate the risk of medium-pressure pipeline failure associated with closed valves separating medium- and high-pressure systems, SDG&E will physically remove these valves permanently separating medium- and high-pressure pipeline networks. This is further discussed in Section IV.K. of my testimony.
- CP Reliability Program – SDG&E will initiate a mitigation effort to perform a detailed CP evaluation, including the development of a relative risk algorithm to assess the "health" of the CP system. The information will feed into a relative risk-ranking tool for pipeline segments that are under CP protection. The CP system analysis will include enhanced documentation and expanded analysis of the system's routine maintenance records collected per 49 C.F.R. §192 Subpart I – Requirements for Corrosion Control. The result of the CP reliability analysis will be an ongoing risk ranking and project list to prioritize CP station and pipe replacement projects. This new mitigation effort is intended to address internal and external corrosion threats potentially contributing to the risk of a medium-pressure pipeline failure. This is further discussed in Section IV.M. of my testimony.
- Early Vintage Steel Replacement – SDG&E will initiate a mitigation effort to increase the replacement of pre-1947 steel pipes with a history of corrosion leakage or other degradation issues. In early vintage steel mains, cold tar asphaltic wrap was used as the first layer of corrosion protection. Over time, the early generation pipe wrap degrades causing cathodic protection current to leave the pipe around the disbanded coating thereby not providing adequate protection. This effort supports the risk mitigation of a medium-pressure pipeline failure due to corrosion leaks and is further discussed in Section IV.I. of my testimony.

- Pre-1933 Threaded Steel Main Removal – SDG&E will initiate a mitigation effort to replace early vintage medium-pressure steel pipelines which were threaded together rather than welded during installation. Prior to 1933, piping in the gas distribution system was joined by treaded couplings. This practice was later abandoned in favor of welding the pipe. The threaded pipe is prone to higher rate of leakage due to susceptibility to corrosion at the threaded joint. This effort will support the risk mitigation of a medium-pressure pipeline failure due to corrosion leaks and is further discussed in Section IV.I. of my testimony.

Alternatives Considered:

SDG&E considered two alternatives when developing the proposed plan for this Catastrophic Damage Involving Medium-Pressure Pipeline Failure risk, including further acceleration of unprotected steel main work and acceleration of pipeline replacement. The strategy for large scale replacement of families of pipe is covered by Ms. Martinez (Ex. SCG-14). The alternatives associated with the removal of Dresser mechanical couplings, oil drip piping, buried piping in vaults, and closed valves between medium- and high-pressure systems primarily consist of project timing and prioritization variations. Pipeline infrastructure improvement execution is in alignment with the Company's safety culture. Work elements are managed based on a variety of risk factors and work drivers, such as federal and state regulatory requirements, customer and pipeline growth expectations, franchise obligations, permitting requirements, and conditions found during inspections. These work elements are prioritized based first, on immediate safety and compliance considerations, and then, work is actively prioritized considering factors including overall infrastructure condition, general equipment reliability, design obsolescence, and construction methodology. This approach may identify lower cost or alternative risk reduction mitigations. Examples include repair versus replace, asset no longer needed, emergence of new technologies, or construction methods.

My incremental request supports the ongoing management and mitigation of risks identified by the RAMP Report and discussed above that could pose adverse safety and reliability consequences to our customers, employees, and contractors. Each of the mitigation activities are further discussed in Sections III and IV of my testimony.

4. SDG&E-17 Workforce Planning

Workforce Planning is the risk of the loss of employees with deep knowledge, understanding, and experience in operations due to retirement or turnover. The departure of employees who fill critical operational roles could affect employee and/or public safety, as their knowledge and experience are essential to safely operating and maintaining SDG&E's gas and electric systems. Included in SDG&E's Gas Distribution baseline mitigation activities for this Workforce Planning Risk are two activities that are addressed throughout my testimony. These include training and compliance/inspection further described below:

- Training and Knowledge Transfer Programs – SDG&E uses its formal and informal employee field skills training efforts and field supervision and management to support knowledge transfer. Included in this process is the direction and management of the Skills Training Center and Skills City training facility. Skills City is an interactive scenario-based training facility where students can put classroom learning into action, and practice skills in a safe and controlled environment that simulates real-work scenarios as well as unexpected real-world events they may encounter while in the field. Furthermore, included in employee training are the requirements, awareness, goals, monitoring, and verification related to all applicable environmental, health and safety laws, rules and regulations, and Company standards.

At the core of baseline mitigation of the Workforce Planning Risk are the activities described in the Field Operations and Maintenance – Supervision and Training workgroup in Section III.A.8; the Operations Maintenance and Training workgroup in Section III.C.1 of my testimony

- Compliance and Inspection Programs – SDG&E inspects its pipeline systems in compliance with the applicable rules and regulations governing operators of natural gas systems.[10] This is the foundation of Gas Distribution's operations for addressing public and employee safety risks. These inspection activities include: leak surveys, pipeline patrols, internal and external corrosion control, valve inspection, underground vaults, pipeline crossings, and pressure-relief devices.

[10] *See* 49 C.F.R. § 192 *et seq*.; GO 112-F; GO 58-A.

Compliance and Inspection are primarily addressed in the Field Operations and Maintenance workgroups: Leak Survey (Section III.A.2), Locate and Mark (Section III.A.3), M&R (Section III.A.9), and Cathodic Protection (Section III.A.10) of my testimony.

SDG&E will continue with its baseline activities described above. In addition to these long-standing mitigation actions, SDG&E is proposing to expand and add a new mitigation to further address the Workforce Planning risk.

- Supervisor University – The key to recognizing where the loss of knowledge and skills for safe operation is occurring is the first-line supervisor. An incremental risk mitigation measure is Gas Distribution's proposed Supervisor University. To facilitate structured and consistent development of Field Supervision, SDG&E will implement a dedicated training group and curriculum specific to field supervisor development. This program known as "Supervisor University" will train gas supervisors on processes, procedures, construction management, leadership, and communications skills required to support the Gas Distribution workforce, customers, and external agencies. The curriculum will take approximately two years to complete and will include classroom courses, personal and career development courses, on-the-job training, and ride-a-longs with business partner organizations. Forecasted expenses for the resources to support this program are described in Field Operations and Maintenance – Supervision and Training Section III.A.8 of my testimony.

My incremental request supports the ongoing management of the risks identified by the RAMP Report and discussed above that could pose significant safety and reliability consequences to SDG&E's customers, employees, and contractors. The anticipated risk reduction benefits that may be achieved by my incremental request are summarized in Sections III and IV of my testimony.

B. Safety Culture

SDG&E's longstanding commitment to safety focuses on three primary areas: (1) employee/contractor safety, (2) customer/public safety, and (3) the safety of the gas delivery system. This safety focus is embedded in what we do and is the foundation for who we are – from initial employee training, to the installation, operation and maintenance of our utility infrastructure, and to our commitment to provide safe, clean, and reliable service to our customers.

SDG&E regularly assesses its safety culture and encourages two-way communication between employees and management as a means of identifying and managing safety risks. In addition to the reporting of pipeline and occupational safety incidents, there are multiple methods for employees to report close calls/near misses. At SDG&E safety is a core value, so we provide all employees with the training necessary to safely perform their job responsibilities, such as the Smith Driver refresher course, regular discussion on Illness Prevention, regular enforcement of "Stop the Job," and the importance of covering all PPE at all times.

As noted in the RAMP Report, third-party dig-ins pose the greatest hazard to our system and the safety of the communities we serve. As explained above, public safety is a top priority for SDG&E. Distribution O&M covers the management of the programs designed to mitigate the frequency and impact of third-party dig-ins. Additionally, SDG&E responds to any emergency to its infrastructure. The Emergency Operations Center, the Distribution Gas Emergency Centers, and Transmission Command Center activate as needed to monitor, coordinate, communicate, and support our field crews and support personnel responding to emergencies.

SDG&E takes an integrated approach to pipeline safety and integrity, beginning with the design and construction of facilities and followed by continual evaluation and improvement of operation and maintenance activities, public communication and awareness, emergency response, safety programs and practices, the implementation of new technologies, defined procurement processes that facilitate materials traceability, and a workplace that encourages continual open and informal discussion of safety-related issues.

On a daily basis, O&M and capital work elements are managed based on a variety of risk factors and work drivers, such as federal and state regulatory requirements, customer and pipeline growth expectations, franchise obligations, permitting requirements, and conditions found during inspections. These work elements are prioritized based first, on immediate safety and compliance considerations, and then, work is actively prioritized considering factors such as regulatory compliance deadlines, customer scheduling requirements, and overall infrastructure condition. Safety and compliance considerations are captured throughout the Company's policies and procedures.

Generally, examples of O&M activities categorized as safety and compliance include: leak survey and patrols; leak repairs; locate and mark, stand-by observations, and depth checks;

inspections of valves, bridges, spans, and M&R facilities; and maintenance of CP systems. These elements are generally prioritized ahead of work that can be safely managed to occur within a more flexible schedule. For example, in the case of Code 1 (hazardous) leaks,[11] Gas Distribution crews are required to take immediate and continuous action until the hazard has been mitigated. Activities with more flexible schedules that are also required to safeguard the integrity of the pipeline system include: main and service alterations; compliance work self-audits; and employee training. Additionally, there are a number of support activities necessary to complete work. These include: dispatch and work scheduling; supervision; technical support; tools; technology systems; and quality assurance.

In addition to O&M activities, to maintain safe and reliable service, SDG&E makes a variety of capital improvements, including pressure betterment projects to improve areas of low pressure, pipeline renewals to replace deteriorated pipelines or obsolete equipment, installations and replacements of CP systems, and the purchase of electronic monitoring devices for pressure tracking. The specific factors considered in the prioritization process of capital work that is performed to mitigate these RAMP risks may vary depending on the type of project. The prioritization of pipeline projects (*e.g.,* mains, services, cathodic protection, valves, and regulator station replacements) is driven by a review of maintenance activities and findings, results of field workforce inspections, and records of condition. These inspection evaluation elements are some of the factors used to determine replacement needs.

Other factors considered for the replacement of assets include the age of the infrastructure, general equipment reliability, and/or design obsolescence. In addition, during the evaluation of distribution main and service replacements, field and technical staff consider the results from a computational model used to help assess the risk rank of pipeline segments.

Since capital work is dynamic, ongoing assessment of system operations is necessary. For example, construction timelines can be affected by permitting, material availability, customer schedules, other construction-related factors, and/or additional work requirements that may arise throughout the year in response to maintenance, inspection, and other routine activities. These real-time operational situations are considered when evaluating and subsequently addressing daily distribution pipeline safety and reliability risks.

[11] Leaks are prioritized for ongoing field response based on a number of factors, including location, concentration of gas, and hazard to the public and property.

Not only does an effective safety culture know and understand its responsibilities and objectives, it does so by building and maintaining a qualified workforce and by mitigating risks associated with public and employee safety hazards, system integrity, and reliability. The OpQual program in Gas Distribution addresses employee training, qualifications, and work quality. It is an integral part of an overall workforce proficiency effort and is key to SDG&E's safety culture. OpQual compliance is closely monitored and employees are trained whenever significant changes occur. The OpQual program aligns with recommendations by the CPUC auditors and industry leading practices, and it complies with SB 705, which requires pipeline operators to establish and update a Gas Safety Plan that is consistent with leading practices and federal statutes.

SDG&E is in the process of implementing the Operational Field & Emergency Readiness (OFER) program. The objective of the OFER program is to align all operational groups on a flexible, scalable, sustainable, and measurable scene management process that is Incident Command System (ICS) compatible. The program is built on the concepts of the National Response Framework (NRF) and is compatible with the National Incident Management System. OFER is designed to be incorporated into the safety culture of SDG&E and be utilized on all worksites, incidents, emergencies, crisis, and disasters where SDG&E personnel, facilities, and infrastructure are impacted. The program includes a strong Quality Assurance/Quality Improvement component that will support the sustainability of effective incident command, control, communications, and scene safety practices.

III. NON-SHARED COSTS

Introduction

Operations and maintenance activities are routinely performed on over 14,148[12] miles of gas distribution main and service pipeline and associated facilities in response to federal and state regulatory agency codes and standards,[13] customer and pipeline growth expectations, franchise obligations, and to sustain safe and reliable operation of the pipeline system. This work includes leakage surveys, leak repairs, maintenance on mains and services, application of corrosion control measures, valve maintenance, regulator station maintenance, monitoring meter accuracy, gas odorant monitoring, supervision and training for these O&M activities, and locating and marking buried pipes to avoid damage caused from excavation by others. In addition, there is a variety of supporting work necessary to complete this field operations and maintenance work. Examples of support work include: maintaining pipeline maps and related gas system attribute information, administering and implementing city permitting and traffic control requirements, and maintaining engineering models of system flows and pressures. Investment in these activities supports SDG&E's commitment to mitigate risks associated with hazards to public and employee safety, infrastructure integrity and system reliability.

The level of funding requested in this testimony is consistent with compliance with pipeline safety regulations and the continued safe and reliable operation of SDG&E's gas distribution pipeline system.

Spending to comply with federal DIMP regulations governing distribution pipeline integrity is addressed by Ms. Martinez (Ex. SDG&E-11).

Unique cost centers are used to record the cost of O&M activities performed within Gas Distribution operations. Collectively, over 100 cost centers are used in recording the costs shown within this testimony. To facilitate an analysis of historical spending and to complete an evaluation of projected expenditures, cost centers are aggregated into "workgroups" representing similar functions and/or having similar cost drivers. These more than 100 cost centers are thus aggregated into 12 workgroups which will be reviewed within this testimony under the following categories:

[12] SDG&E's Natural Gas System Operator Safety Plan, submitted Mar. 8, 2017, at 2.
[13] Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards, 49 C.F.R. § 192 *et seq*.; Cal. Gov't Code § 4216 *et seq*.; GO 112-F; and GO 58-A.

- Field Operations and Maintenance;
- Asset Management – Pipeline O&M Planning; and
- Operations Management and Training

In preparing projections of the TY 2019 requirements, SDG&E Gas Distribution reviewed historical spending levels, including units of work, and developed an assessment of future requirements and associated risks. This analysis entailed a review of the historical 2012 through 2016 spending and consideration of the underlying cost drivers. Depending on future expectations for the underlying cost drivers, a primary forecast methodology was selected. Selected methods include forecasting based on historical averages, simple linear trending of historical data, and 2016 adjusted recorded base year spending. In addition, work requirements that are incremental to levels of historical spending and necessary to maintain the safe and reliable operation of the distribution system and supporting work processes were identified. An analytical calculation was then performed to determine the funding requirement of these new or more-extensive work elements. The overall result is a forecast that has its foundation based on the historical representation, to which incremental expense requirements have been added.

In summary, Gas Distribution requests the Commission adopt a TY 2019 forecast of O&M expenses for non-shared services of $ 29,533,000, as summarized in Table GOM-02 below. This is an increase of $3,755,000 over the 2016 adjusted recorded base. This increase is driven by system expansion, infrastructure renewal, field technical skills and training, improved documentation and control of pipeline materials, and the integration of new technology. Table GOM-02 below summarizes the total non-shared O&M forecasts for the listed cost categories.

Table GOM-02
San Diego Gas & Electric Company
Non-Shared O&M Summary of Costs

GAS DISTRIBUTION (In 2016 $)			
Categories of Management	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
A. Field Operations & Maintenance	20,120	22,854	2,734
B. Asset Management	1,719	2,169	450
C. Operations Management & Training	3,939	4,510	571
Total Non-Shared Services	**25,778**	**29,533**	**3,755**

The Commission should find this forecast reasonable and fully justified in that: (1) the activities support continued delivery of safe and reliable service; (2) activities are consistent with local, state, and federal regulations; (3) activities respond to operations, maintenance, and construction needs associated with projected growth and demands of city, county and state agencies; (4) the forecast amounts are reasonable in light of historical spending and anticipated work increases, and (5) the activities support SDG&E's commitment to mitigate risks associated with hazards to public and employee safety, infrastructure integrity and system reliability.

A. Field Operations and Maintenance

Table GOM-03
San Diego Gas & Electric Company
Field Operations and Maintenance

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. Other Services	362	202	-160
2. Leak Survey	1,571	1,841	270
3. Locate & Mark	3,026	3,589	563
4. Main Maintenance	2,965	3,422	457
5. Service Maintenance	1,634	1,867	233
6. Tools Fittings & Materials	923	1,010	87
7. Electric Support	417	425	8
8. Supervision & Training	3,520	3,993	473
9. Measurement & Regulation	3,873	4,216	343
10. Cathodic Protection	1,829	2,289	460
Total	**20,120**	**22,854**	**2,734**

Included in this section of my testimony are activities and associated O&M expenses to address the physical condition of the gas distribution system. As discussed above in Section I.A (Summary of Costs and Activities), Gas Distribution Operations conforms to a regional organization structure. Similar activities are completed out of five operating bases located throughout the 1,400 square-mile service territory. The activities completed at these operating bases form the essence of this category, Field Operations and Maintenance. They can be described as preventative, corrective, or supportive in nature. Preventative work is generally completed on a scheduled basis. It includes the activities and associated costs shown within the workgroups of Locate and Mark, Leak Survey, and M&R. Corrective work is generally reactive to a situation or facility condition. This would include the activities and associated costs shown

in the workgroups of Cathodic Protection, Main Maintenance, and Service Maintenance. Finally, supportive elements are necessary for completing work assignments and include activities and associated costs discussed in the Supervision and Training, Electric Support, Tools, Materials and Fittings, and Other Services workgroups.

1. Other Services

The Other Services workgroup consists of miscellaneous expenses associated with Gas Distribution field operations not captured in other major workgroups. Table GOM-04 below summarizes Gas Distribution O&M costs associated with Other Services activities.

Table GOM-04
San Diego Gas & Electric Company
Field O&M – Other Services

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. Other Services	362	202	(160)

a. Description of Costs and Underlying Activities

Other Services workgroup activities include leak investigations of customers' house lines, leak surveys of transmission mains, landscaping repair, and support of the installation of cathodic test stations for high-pressure main evaluation.

b. Forecast Method

In developing this forecast, historical expenditures for 2012 through 2016 were evaluated. Because of the wide range of activities recorded in this workgroup, as well as the cost fluctuations from year to year, a five-year average was selected to forecast future costs. The selection of the five-year average methodology results in a decrease of $160,000 from the 2016 adjusted recorded base in TY 2019.

c. Cost Drivers

As indicated above, this group captures a wide array of activities. Therefore, the cost drivers are also diverse and have few, if any, common traits. Examples of cost drivers include:

- The number of leak investigation calls requiring customer houseline evaluation, which can be driven by unseasonable weather conditions or homeowner construction activity;
- Minor meter relocation and modification work and associated planning;
- Transmission main special leak surveys or patrols, which can be driven by regulatory requirement changes or Company policy changes; and
- General level of construction activity on services that requires landscaping repair, which is driven by changing economic or new business conditions.

2. Leak Survey

Recorded to this workgroup are the labor and non-labor expenses associated with federal and state pipeline safety regulation,[14] which requires SDG&E to survey its gas distribution system for leakage. Table GOM-05 below summarizes Gas Distribution O&M costs associated with Leak Survey activities.

Table GOM-05
San Diego Gas & Electric Company
Field O&M – Leak Survey

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
2. Leak Survey	1,571	1,841	270

a. Description of Costs and Underlying Activities

SDG&E pipelines are routinely leak surveyed at intervals of one, three, or five years. The frequency of this survey is determined by the pipe material involved (*i.e.*, plastic or steel), the operating pressure, whether the pipe is under cathodic protection, and the proximity of the pipe to various population densities. For example, annual surveys are scheduled in business districts, which are defined as a principal business area in a community where large numbers of people regularly congregate to engage in business activities, and near public service establishments, such as schools, churches, and hospitals.[15] Three-year survey cycles are used for

[14] 49 C.F.R. § 192.723 (Distribution systems: Leakage surveys); GO 112-F.
[15] *See* 49 C.F.R. § 192.723(b)(1)(2).

all cathodically unprotected mains and services. Five-year survey cycles are typically used for plastic and cathodically protected steel mains and services installed in residential areas. In order to comply with the requirements of the recently adopted SB 1371, in lieu of a system-wide three-year leak survey cycle in areas where GO 112-F, or its successors, requires surveying every five years, SDG&E will propose a risk-assessment based, more cost-effective methodology for conducting gas distribution pipeline leak surveys at a less frequent interval and justify this alternative in its SB 1371 Compliance Plan filing in March 2018, subject to Commission approval. This cost is not included in the TY 2019 GRC request; instead, it will be addressed in a separate proceeding as explained by Ms. Clancy (Ex. SDG&E-23). Furthermore, SDG&E will accelerate leak surveying of pre-1986 plastic pipe (Aldyl-A) from a 5-year cycle to an annual cycle. The costs for 2017 and 2018 are covered by Ms. Martinez (Ex. SDG&E-11). The costs needed to cover this activity in TY 2019 are included in my testimony.

In addition to routine leak surveys, the Company performs special leak surveys, as needed, and on more frequent cycles than those discussed above (*e.g.,* two, three, or six months). Examples of this work include conducting leak surveys ahead of street improvements to address pending leaks prior to street moratoriums; after the occurrence of any significant incident (*e.g.*, train derailment, explosion, earthquake, flooding, landslides, etc.) over or adjacent to high-pressure pipelines or related facilities; when increasing the maximum allowable operating pressure of a pipeline; when routine survey requirements are not considered adequate because of pipe condition or limited opportunity for gas to vent safely; or when there is a need to monitor pipe condition for special situations, such as material evaluations.

During the survey, the field employee patrols above the identified location of SDG&E's distribution subsurface main and service pipelines with a leak detector to identify, classify, and generate an immediate repair work order, when necessary. SDG&E currently has over 14,000 miles of main and service pipeline that require leak survey.

The leak survey activity is a mitigation measure supporting two top safety risks identified in the RAMP Report and discussed in Section II above: (1) Employee, Contractor, Customer and Public Safety, and (2) Catastrophic Damage Involving Medium-Pressure Pipeline Failure. The leak survey cost supports the safety and reliability of SDG&E's system by performing the fundamental compliance and safety process of leak surveying pipelines to monitor for leakage in the pipeline system. Furthermore, this activity supports SDG&E's commitment to mitigate risks

associated with hazards to public and employee safety, infrastructure integrity, and system reliability.

b. Forecast Method

To reflect the most current conditions for leak survey, SDG&E's base forecast for this workgroup is the 2016 adjusted recorded level of spending. Added to this base expenditure level are incremental additions necessary to adequately fund the operation in TY 2019. This method is appropriate because labor and non-labor expenses increased from 2014 to 2016 due to increased compliance requirements and increased customer area odor call-outs taking priority over routine work. Year 2016 was chosen as the base expense for future years as this level of activity is expected to continue. In addition, SDG&E plans to increase survey cycle requirements for all pre-1986 plastic pipe (Aldyl-A) from a five-year survey cycle to an annual survey cycle. The incremental cost for 2017 and 2018 are covered by Ms. Martinez (Ex. SDG&E-11). By 2019, it is anticipated that this change in survey cycle will be integrated into routine work and as such, the costs for 2019 are shown as an incremental add in my testimony. This base level plus incremental additions forecast results in an increase of $270,000 over the 2016 adjusted recorded base in TY 2019.

The incremental additional work element is described below.

i. <u>Enhanced Leak Survey - Early Vintage Plastic Pipe</u>

SDG&E began accelerating the leak survey of pre-1986 plastic pipe (Aldyl-A) mains and services. This annual Aldyl-A leak survey was initiated in 2017 as a DIMP activity and is moving to routine O&M beginning TY 2019. This change adds a mitigation measure in support of RAMP risk: Catastrophic Damage Involving Medium-Pressure Pipeline Failure. Aldyl-A is a polyethylene plastic pipe material widely used in the gas industry. Early vintages of this material (1970s and 1980s) can experience brittleness as they age increasing the risk for leakage. Further details on pre-1986 plastic pipe, are addressed by Ms. Martinez (Ex. SDG&E-11).

The accelerated leak survey provides an opportunity to detect leaks that may be due to brittle-like cracking and reduce the risk of a potential failure. This incremental effort will require three additional leak patrollers. The incremental funding needed over the base forecast for this upward pressure is $270,000 for TY 2019.

c. Cost Drivers

The cost drivers supporting this forecast are the compliance requirement for the three-year atmospheric corrosion monitoring survey, and the six-month, one-year and five-year frequency leak surveys, as well as special leak survey activities, and follow-up leak investigations. Follow-up leak investigation orders are issued to leak survey personnel by a service technician unable to locate the source of a possible customer reported leak. In order to close the leak investigation order, leak survey personnel must survey all underground gas facilities within 150 feet of initial location where the leak or odor was reported.

As previously discussed in Section I.B, leak survey is a risk prevention activity and supports the RAMP[16] mitigation elements. Those elements include basic code mandated periodic leak surveys, inspections of bridges and spans, pipeline patrolling as well as repairing leaks as a result of these inspections and patrols.

3. Locate and Mark

Locate and Mark is the process mandated by 49 C.F.R. §192.614 (Damage prevention program) and the California One Call Statute,[17] where the owner of underground facilities, when notified by the USA One-Call Center of a planned excavation, must respond within two working days and mark the location of those underground facilities that conflict with the planned excavations. Table GOM-06 below summarizes Gas Distribution O&M costs associated with Locate and Mark activities.

Table GOM-06
San Diego Gas & Electric Company
Field O&M – Locate and Mark

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
3. Locate & Mark	3,026	3,589	563

a. Description of Costs and Underlying Activities

The activities completed under this cost workgroup are preventative in nature and are required to avert damages caused by third-party excavators working near gas underground

[16] Please refer to Ms. Day's testimony (Ex. SCG-02/SDG&E-02, Chapter 1) for more details.
[17] *See* Cal. Gov't Code § 4216, *et seq.*

substructures. To comply with the Locate and Mark regulatory and legal requirements cited above, employees use an electronic pipe-locating device to identify the location of SDG&E's underground pipelines and utilize substructure maps and service history records to aid in verifying the location of the gas lines.

Conducting stand-by observations of other entities excavating near SDG&E's pipelines is another important damage prevention activity included in this workgroup. Generally, this involves an employee inspecting construction job sites to confirm that excavators are aware of the location of critical SDG&E gas facilities. The State of California enacted regulations in 2007 that mandate a preconstruction meeting with excavators requesting Locate and Mark support and require continuous monitoring of all excavations within ten feet of high-pressure pipelines.[18]

In 2016, the California Governor signed SB 661, named the Dig Safe Act of 2016, which added enforcement to the digging law by establishing the California Underground Facilities Safe Excavation Board. The Board is authorized to take action against those parties who violate the excavation law under California Government Code Section 4216. The Dig Safe Act is expected to require more excavators to notify USA, which will add upward pressure to an already increasing USA ticket volume in California.

b. Forecast Method

In developing the TY 2019 forecast, historical expenditures and work units for 2012 through 2016 were evaluated. The cumulative expense trend of labor and non-labor has increased from 2012 to 2016 due to increased stand-by and mark-out requests to meet city franchise work; and an increased amount of customer Dig Alert tickets. SDG&E expects a continued rise in this activity due to implementation of SB 661. In addition to regulatory drivers, Locate and Mark activity is driven by general construction activity in public and private rights-of-way and customer growth, which generally fluctuate with economic conditions. Gas Distribution selected total employment growth, as reported by IHS Global Insight, as a directional indicator for general economic conditions and potential economic growth, which generally drive construction activities. This IHS Global Insight employment forecast is shown in the workpapers of Ms. Payan, Ex. SDG&E-37-WP.

[18] *See* Cal. Code Regs., tit. 8, § 1541(b)(1)(B) (2007).

For these reasons, the Locate and Mark forecast is based on the linear trend observed the last five years (2012 through 2016). Using a historical average or base year forecast would not appropriately account for the increase in work anticipated over the forecast period. Thus, to reflect these changing conditions and increase in Locate and Mark work, a five-year (2012 through 2016) linear trend was used to calculate the cumulative labor and non-labor request for this group. Added to this five-year trend expenditure level is an incremental work element necessary to adequately fund the operations for the forecast years 2017 through 2019. This work element is described below.

The total funding required over the 2016 adjusted-recorded base including the incremental additions in this workgroup is $563,000 in TY 2019.

i. RAMP – Risk ID 02/SDG&E Dig Ins -Locate & Mark training, surveillance and Staff support.

The RAMP Report identified the need to increase work activities associated with locate and mark training and OpQual certification; staff to translate federal and state regulations into Company Gas Standards; and standby personnel for surveillance of excavations near high-pressure gas lines to prevent damage.

A portion of this RAMP element is included in the five-year linear trend base expense. The cost portion that is included in the base expense has been deducted from the total RAMP expense for this work element resulting in a net RAMP incremental expense.

The net incremental funding needed for this RAMP related workgroup element is $420,000 over the forecast base for TY 2019.

c. Cost Drivers

The cost drivers supporting this forecast are primarily driven by construction and infrastructure maintenance activities in the public and private sectors. Examples of these types of construction activities include private construction projects, such as commercial and industrial centers, strip malls, residential remodeling projects, and city projects such as street improvements and storm drain, water and sewer pipeline relocation work.

Furthermore, the RAMP Report identified the need to increase work activities that mitigate risk through Locate & Mark certification, training, staff support and excavation standby as described above.

These cost drivers support the safety and reliability of SDG&E's gas system. Properly locating and marking gas facilities, as well as performing stand-by observations, are activities completed to avert damage by third-party excavators that can interrupt gas service and pose a risk to public and employee safety.

4. Main Maintenance

Recorded to this workgroup are the labor and non-labor costs associated with investigating and repairing leaks in distribution mains and moving, lowering, and raising short sections of gas distribution mains, vaults, and related structures. The main maintenance work in this workgroup is designed to meet federal (49 C.F.R. §192) and state (GO 112-F) pipeline safety regulations and to extend the life of distribution main pipelines and related infrastructure. Table GOM-07 below summarizes Gas Distribution O&M costs associated with Main Maintenance activities.

Table GOM-07
San Diego Gas & Electric Company
Field O&M – Main Maintenance

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
4. Main Maintenance	2,965	3,422	457

a. Description of Costs and Underlying Activities

As required by GO 112-F, SDG&E periodically surveys its entire pipeline system for leaks using specialized leak detection equipment. Information on all leaks identified must be recorded and classified and hazardous leaks repaired promptly. SDG&E's maintenance crews investigate these leak indications and make repairs as needed. Completing leak repairs generally requires excavating in paved streets and landscaped areas to determine the exact location of the leak. This work often involves pavement cutting, trenching, and then repair of pipe facilities, followed by backfilling the excavation, compacting the soil, and making permanent repairs to pavement and landscaping as needed. Main leak evaluation and repair work is generally completed to mitigate risks associated with hazards to public safety, and to address infrastructure condition, and material degradation.

In addition to leak repairs, improvements by municipalities and other outside agencies can trigger the requirement to perform maintenance on gas mains and related equipment. This includes street widening, sewer and water line maintenance or replacement, and street resurfacing. In the case of street resurfacing, SDG&E's crews must locate buried gas facility vault lids that have been paved over, then uncover them or raise them so they are flush with the new street surface. Municipality and local/state agency improvements are normally a function of availability of local funding, often a sign of stronger economic conditions. The cost associated with main maintenance supports SDG&E's commitment to mitigate risks associated with hazards to public safety, infrastructure integrity and system reliability.

b. Forecast Method

A variety of factors influence the level of spending on main maintenance in a given year. These factors include increasing government regulations, aging infrastructure, public safety, municipality requirements, material failure, infrastructure, and economic conditions. The labor and non-labor Main Maintenance costs have experienced an upward trend in costs associated with multiple work drivers, as discussed in the Cost Drivers section below. SDG&E does not see this trend reversing.

Regulatory/legislative pressures continue to increase, the infrastructure is getting older, and municipality work and general construction continues to increase. Therefore, a five-year (2012 through 2016) historical linear trend was used to forecast base expense for this workgroup. Using a simple average forecasting method would not be appropriate for this work category, as it would not sufficiently fund critical compliance and maintenance work for the anticipated growing work requirements.

The total funding required over the 2016 adjusted-recorded base in this workgroup including efficiency savings listed below is $457,000 in TY 2019.

i. <u>FOF – Contracting/Procurement Efficiencies</u>

As addressed by Ms. Willoughby (Ex. SCG-22/SDG&E-20), the FOF Group 101 focuses on optimizing procurement strategies for business units across the companies. FOF Group 101 benefits for Gas Distribution are $457,000 in TY 2019.

c. Cost Drivers

The work completed in this workgroup is driven by federal and state pipeline safety regulatory requirements and SDG&E's efforts to protect the integrity of the pipeline system through activities that extend its life. These activities support SDG&E's commitment to mitigate risks associated with hazards to public safety, infrastructure integrity, and system reliability. As outlined above, a variety of factors influence the level of spending on main maintenance in a given year. These factors include:

- The number of leaks evaluated and repaired each year – This work is generally completed to address public safety, infrastructure condition, and material degradation. As previously discussed, leaks are found by employees conducting leak survey and other field activities or by customers who call reporting a gas odor.
- The level of repairs associated with damages to pipeline facilities by third parties – This cost is driven by the number and severity of the damage. For example, damage to a service line is less costly than damage to a high-pressure line which may require multiple days of work and many personnel to address. Damages are driven by the level of construction in the private and public sector, which is typically driven by economic conditions.
- The level of work completed by municipalities – Typical municipality projects include street resurfacing, widening or reconstruction; and sewer and water pipeline maintenance, replacement or new installations. Per applicable franchise agreements, SDG&E is required to complete associate maintenance, such as raising or lowering valve casings and lids; altering the elevation of pipeline segments in their present locations; or relocating pipeline segments or related facilities completely. The impact to SDG&E can vary significantly, depending on the availability of municipality funds, which are typically driven by economic conditions. As economic conditions continue to improve, construction by municipal agencies is likely to increase.

5. Service Maintenance

Recorded to this workgroup are the labor and non-labor costs associated with service alterations, investigating, and repairing leaks in distribution services. The service maintenance work in this workgroup is designed to meet federal (49 C.F.R. §192) and state (GO 112-F) pipeline safety regulations and to extend the life of distribution main pipelines and related

infrastructure. Table GOM-08 below summarizes Gas Distribution O&M costs associated with Service Maintenance activities.

Table GOM-08
San Diego Gas & Electric Company
Field O&M – Service Maintenance

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
5. Service Maintenance	1,634	1,867	233

a. Description of Costs and Underlying Activities

Service Maintenance work is generally corrective in nature and is required to keep the natural gas system operating safely and reliably. The work in this workgroup is designed to meet federal (49 C.F.R. §192) and state (GO 112-F) pipeline safety regulations, extend the life of the distribution service pipeline system, and mitigate risks associated with hazards to public safety. This includes excavating to determine the exact source of a leak, changing service valves, checking the condition of coating at the MSA, testing service pipe for leaks, inspecting and testing service pipe after repairs have been made, and installing, maintaining, and removing temporary feeds such as "by-passes" or temporary supply sources.

In addition, expenses associated with the repair of service risers—the portion of the pipeline segment located above ground just below the meter and connected to the service pipe—are recorded to this service maintenance workgroup. Repairs to the riser are often required due to atmospheric corrosion of the piping system.

Service Maintenance includes costs for moving, lowering, and raising shorter sections of distribution services, vaults, and related structures. Changing the location of an existing service may be required due to alterations in buildings or grounds, and municipal improvements, such as street widening or sewer or water system work. These activities typically involve excavation in paved or landscaped areas, for which there must be a corresponding restoration effort as part of completing the work. The cost associated with Service Maintenance supports SDG&E's commitment to mitigate risks associated with hazards to public safety, infrastructure integrity and system reliability.

b. Forecast Method

In developing the TY 2019 forecast, historical expenditures and work units for 2012 through 2016 were evaluated. A variety of factors influence the level of spending on Service Maintenance in a given year. These factors include increasing government regulations, aging infrastructure, public safety, municipality requirements, material failure, infrastructure, and economic conditions. The labor and non-labor Service Maintenance costs have experienced an upward trend in costs associated with multiple work drivers, as discussed in the Cost Drivers section below. SDG&E does not see this trend reversing.

Regulatory/legislative pressures continue to increase, the infrastructure is getting older, and municipality work and general construction continues to increase. Therefore, a five-year (2012 through 2016) historical linear trend was used to forecast base expense for this workgroup. Using a simple average forecasting method would not be appropriate for this work category, as it would not sufficiently fund critical compliance and maintenance work for the anticipated growing work requirements.

The total funding required over the 2016 adjusted-recorded base in this workgroup is a $233,000 increase in TY 2019.

c. Cost Drivers

The work completed in this workgroup is driven by the requirement to meet federal and state pipeline safety regulations and to protect the integrity of the pipeline system through activities that extend its life. These activities support SDG&E's commitment to mitigate risks associated with hazards to public safety, infrastructure integrity, and system reliability. As outlined above, multiple factors influence the level of spending on service maintenance in a given year. These factors include:

- The number of leaks evaluated and repaired each year. This work is generally completed to address public safety, infrastructure condition, and material failure. As discussed previously, leaks are found by employees conducting leak survey, and other field activities or by customers who call reporting a gas odor.
- The level of repairs associated with damages to pipeline facilities by third parties, outside sources, or causes such as fire or flooding. This cost is driven by the number and severity of the damage. Damages are typically driven by the level of construction in the private and public sector, which is typically driven by economic conditions.

- Requirements to alter gas service lines and MSAs to correct unsafe conditions or changes in customer load usage. This also includes work to change, raise, or lower service valves; and repair or replace curb valves or meter boxes.
- The level of work completed by municipalities. Typical municipality projects include street resurfacing, widening or reconstruction; and sewer and water pipeline maintenance, replacement or new installations. Per applicable franchise agreements, SDG&E is required to complete associated maintenance, such as: raising or lowering valve casings and lids; altering the elevation of pipeline segments in their present locations; or relocating pipeline segments or related facilities completely. The impact to SDG&E can vary significantly, depending on the availability of municipality funds, which are typically driven by economic conditions. As economic conditions continue to improve, construction by municipal agencies is likely to increase.

6. Tools, Fittings, and Materials

Recorded to this workgroup is the purchase of small tools, small pipe fittings, miscellaneous pipeline materials, and miscellaneous installation materials used during construction and maintenance activities and those held in inventory as vehicle truck stock. Table GOM-09 below summarizes Gas Distribution O&M costs associated with Tools, Fittings and Materials activities.

Table GOM-09
San Diego Gas & Electric Company
Field O&M – Tools, Fittings and Materials

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
6. Tools Fittings & Materials	923	1,010	87

a. Description of Costs and Underlying Activities

The tools, fittings and materials purchased under this workgroup are necessary to obtain complete and safe work results. Included within each category of materials are items, such as:

- Small tools, including screw drivers and wrenches;

- Pipe materials used in maintenance and construction activities, such as service alterations, service leak repairs, riser repairs and replacements, and maintenance of meter and regulator facilities on distribution services;
- Miscellaneous installation and pipeline materials, such as pipe wrap, gaskets, washers, bolts, stakes, and pipe straps used by field employees to complete pipeline maintenance and replacement activities; and
- Pipe fittings, two-inch pipe size and smaller, commonly used during construction and maintenance work; and coveralls, uniforms, and charges for rental and laundering of these garments.

b. Forecast Method

The forecast method developed for this cost category is a five-year average for the period 2012 through 2016. This method is most appropriate because this is a grouping of expenses that can fluctuate from year to year, depending on the level of construction and maintenance activities. The total funding required over the 2016 adjusted-recorded base in this workgroup is $87,000 in TY 2019.

c. Cost Drivers

The rate of consumption of the materials covered in this workgroup is primarily driven by construction and maintenance activity, which in turn, is often a reflection of economic conditions. Other drivers include the level of field workforce that requires tools and materials, as well as the cost at which SDG&E can obtain tools, fittings and materials used by its employees. As these cost pressures increase, they impact the overall cost for this activity.

7. Electric Support

Recorded to this workgroup is the labor and non-labor expense incurred by Gas Distribution crews that have been specially trained to provide traffic control and construction support services for Electric Distribution crews during inspections under the Corrective Maintenance Program and general construction activities. Table GOM-10 below summarizes Gas Distribution O&M costs associated with Electric Support activities.

Table GOM-10
San Diego Gas & Electric Company
Field O&M – Electric Support

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
7. Electric Support	417	425	8

a. Description of Costs and Underlying Activities

GO 165 mandates specific inspection cycles for electric distribution facilities. Other inspections are covered by GO 95 (Overhead Electric Line Construction) and GO 128 (Underground Electric Supply Construction), which direct utilities to frequently and thoroughly inspect electric distribution equipment. These inspections are part of SDG&E's Electric Distribution Corrective Maintenance Program (CMP) and require some trenching and excavation support from the Gas Distribution workforce. The CMP is further described by Mr. Speer (Ex. SDG&E-15). In addition, Gas Distribution field crews provide excavation support to the Electric Distribution organization following storm damage on the electric system.

b. Forecast Method

In preparing the forecast for this workgroup, SDG&E reviewed 2012 through 2016 historical spending levels for gas crews assisting Electric Distribution maintenance and storm damage recovery activities. The forecast method developed for this cost category is a three-year average for the period 2014 through 2016. This method is appropriate because the level of activity in this workgroup can fluctuate from year to year, depending on the level of the Electric Distribution Corrective Maintenance Program work. Years 2012-2013 were not considered appropriate to include in an average because beginning in 2014 changes were made in how the Company handles expenses associated with traffic control. Prior to 2014 the electric support forecast area included expenses for traffic control; beginning in 2014 traffic control expenses are charged to Electric Distribution directly.

The total funding required over the 2016 adjusted-recorded base in this workgroup is $8,000 in TY 2019.

c. Cost Drivers

The cost drivers behind this forecast are electric Corrective Maintenance Program activities utilizing Gas Distribution resources for traffic control and small modifications or repairs to gas mains, services, and other facilities.

8. Supervision and Training

Recorded to the Supervision and Training workgroup are labor and non-labor expenses for employee field skills training, field supervision and management, and miscellaneous expenses related to SDG&E's gas operations. Table GOM-11 below summarizes Gas Distribution O&M costs associated with Supervision and Training activities.

Table GOM-11
San Diego Gas & Electric Company
Field O&M – Supervision and Training

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
8. Supervision & Training	3,520	3,993	473

a. Description of Costs and Underlying Activities

Field skills training for SDG&E's Gas Distribution personnel accounts for the majority of the 2016 adjusted-recorded base spending in this workgroup. Gas construction employees attend training because they are new to their job, require operator qualification, need refresher training, are promoted to a position requiring additional technical skills, or need additional training due to the deployment of new equipment with new technology or changes in regulations. These field expenses include general training costs for SDG&E District Operating Centers and Gas Technical Services personnel.

The second significant source of expenditure in this workgroup is in the area of field supervision. Field supervisors have one of the most challenging and critical positions at SDG&E. They are responsible for the supervision and inspection of field construction and maintenance work performed by both SDG&E crews and by contractor crews. They are in a position of influence with front-line employees and are responsible for coaching and mentoring

these employees to work safely, follow Company procedures, and maintain and build a safe and reliable natural gas delivery system.

The final area of expense contribution for this workgroup is comprised of miscellaneous operating expenses. These non-labor expenses include office supplies, telephone expenses, mileage expenses, and professional dues.

b. Forecast Method

In 2016, SDG&E increased field supervision for additional oversight in field activities and increased training for gas personnel due to new and more intensive training requirements and schedules resulting in an increase in labor and non-labor costs. Furthermore, an increase in skills development and operator qualifications training and program development that began in 2013 and continued through 2016 is expected to continue in the forecast years.

Given this increase in supervision, training and operations qualification activity, and anticipated continued upward pressures, a historical average would not represent future resource needs. For this reason, 2016 adjusted recorded base was selected as the appropriate forecast methodology. Added to this 2016 base expenditure level are incremental additions necessary to adequately fund the activities in this workgroup in TY 2019. These incremental work elements are described below.

The total funding required over the 2016 adjusted-recorded base including the incremental additions in this workgroup is $473,000 in TY 2019.

i. <u>Addition of Field Supervision</u>

Three Field Supervisors will be added beginning in 2018 to address growth in O&M and capital work. These positions will charge 40% of their time to O&M and will be responsible for providing supervisory oversight of Company and contract employees, coaching and mentoring these employees to work safely, follow Company procedures, and maintain and build a safe and reliable natural gas delivery system.

The total incremental funding needed for this workgroup element is $154,000 over the forecast base for TY 2019. The Field Supervisor positions forecasted in this area require SDG&E to add three incremental light-duty trucks in 2018. The costs associated with these vehicles are described by Ms. Herrera (Ex. SDG&E-21).

ii. RAMP – Risk ID 17/SDG&E Workforce Planning - Leadership Training, Supervisor University

The RAMP Report identified the need to provide additional supervisor leadership training and program support. As discussed above, Field Supervisors serve a critical role managing and mentoring the workforce as well as coordinating between internal and external resources and customers to bring construction projects to fruition. To facilitate structured and consistent development of Field Supervision, SDG&E will implement a dedicated training group and curriculum specific to field supervisor development. This program known as "Supervisor University" will train gas supervisors on processes, procedures, construction management, leadership, and communications skills required to support the Gas Distribution workforce, customers, and external agencies. The curriculum will take approximately two years to complete and will include classroom courses, personal and career development courses, on-the-job training, and ride-a-longs with business partner organizations. To support this ongoing program, SDG&E will require three additional resources to develop, structure, manage, and execute.

The total incremental funding required for this activity is $319,000 over the forecast base for TY 2019.

c. Cost Drivers

Services provided within the Supervision and Training workgroup are driven by the amount of field work to be completed, the number of employees and associated supervision and management workforce, and training and OpQual requirements, as further described below:

- The level of field work completed to meet internal and external requirements. This drives the required workforce which in turns drives the level of supervision needed. Internal requirements are driven by work elements completed to operate and maintain the safety and integrity of the system as well as to comply with local, state, and federal codes. External requirements are driven by customer request and level of general construction work in the private and public sectors. External construction activity is generally driven by economic conditions.
- Increase in employee training and qualification requirements. This cost is normally driven by an increase in workforce, increase in employee movement, changes in regulatory requirements, or changes in work practices. SDG&E expects that employee OpQual training will continue to undergo further refinement. Additional

details regarding the OpQual program are provided below in Section II. D (Operations Management and Training).

- The level of office materials, equipment, and services needed to support Gas Distribution personnel completing operations and maintenance work. This encompasses such items as general office supplies, business forms, pagers, cell phones, and employee expenses. This cost is also driven by the level of workforce in need of these materials, as well as the cost at which SDG&E can acquire these items.
- Leadership training on processes, procedures, construction management, leadership, and communications skills required to support our Gas Distribution workforce, customers, and external agencies.

9. M&R

Recorded to the M&R workgroup are labor and non-labor expenses for inspection and maintenance of distribution regulator stations, valve maintenance, meter set inspections, electronic instrumentation maintenance, company Compress Natural Gas (CNG) station maintenance, and meter removals for accuracy checks to maintain compliance with GO 58-A. Table GOM-12 below summarizes Gas Distribution O&M costs associated with M&R activities.

Table GOM-12
San Diego Gas & Electric Company
Field O&M – M&R

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
9. Measurement & Regulation	3,873	4,216	343

a. Description of Costs and Underlying Activities

Regulator stations reduce the pressure of gas entering the distribution system from high-pressure supply pipelines to the lower pressures used in the distribution pipeline network. SDG&E has approximately 481 regulator stations. Federal pipeline safety regulation 49 C.F.R. §192.739(a) requires annual inspections and maintenance of all regulator stations, including both underground vaults and above-ground regulator station enclosures. Pressure checks are made to verify that the station is operating as intended and that the station's over- and under- pressure protection devices perform as designed. If a station does not perform properly, internal

maintenance and inspections are performed, consisting of disassembling the regulator devices and inspecting the internal components for worn or damaged parts. Any faulty parts are replaced and the regulator is cleaned and inspected for corrosion. Activities for repairing damage to regulator station vaults caused by general deterioration or long-term exposure to heavy traffic, and rebuilding pressure regulators and pressure relief valves, are additionally charged within this workgroup.

Regulator stations are critical control elements in the gas distribution system. Failure of a regulator station could result in under- or over-pressurization of the gas distribution system, resulting in reduced service to customers and/or jeopardizing public safety. Therefore, proactive maintenance of these facilities is a priority. In addition, regulator stations are part of our aging infrastructure. Presently 70% of our operating regulator stations are 24 years or older. The average age of a distribution regulator station is 29 years. This aging will translate into increased maintenance expense over future years.

Furthermore, valves maintained within this workgroup have several important purposes including: fire valves at regulator stations to isolate the high- and medium-pressure systems; emergency valves to isolate segments of pipelines in case of pipe damage or for operational purposes; and isolation valves to segment portions of the system in the event of a widespread emergency, such as an earthquake. Expenses for the inspection and calibration of electronic pressure monitors used to measure and record distribution system pressures are also included.

Also included are expenses for the inspection and calibration of electronic pressure monitors used to measure and record distribution system pressures, gas volume correctors used to record gas consumption, and ten-year rotary meter changes or calibrations to comply with GO 58-A for large customers. The activities covered in this workgroup support SDG&E's commitment to mitigate risks associated with hazards to public and employee safety, infrastructure integrity, and system reliability.

b. Forecast Method

In developing the TY 2019 forecast, SDG&E evaluated the historical expenditures for 2012 through 2016 for the M&R workgroup. Labor and non-labor expenses increased collectively from 2012 to 2016 due to the continued expansion of the workforce to meet work demands stemming from an increase in construction activities, system growth, and increased maintenance due to equipment age. Given the continued increases in work requirements and

associated expense over the historical period, a historical average would not represent future resource needs. Therefore, a five-year linear trend best represents the funding required to support increased maintenance due to aging station components, gas system growth adding additional stations to maintain, and increased construction activity.

The total funding required over the 2016 adjusted-recorded base including efficiency savings in this workgroup as described below, is $343,000 in TY 2019.

i. FOF – Savings in Pipeline Operations in 2017

The FOF initiative identified cost savings in the M&R workgroup from transferring 15C size meter work in Pipeline Operations to Customer Service Field. Customer Service historically was responsible for small meters up to 11C in size. Given that the 15C meter is identical in flange to flange installation dimensions to 11C, it was determined that the work could be performed by the Customers Services work group. This effort will result in efficiencies by combining meter installation and houseline purge work in one operating group rather than multiple groups. The total impact from this efficiency gain for this workgroup element is a decrease of $70,000 to the forecast base for TY 2019.

c. Cost Drivers

Work activities within the M&R workgroup are driven by regulatory requirements, as well as the need to mitigate risks associated with hazards to public and employee safety and system reliability. Cost drivers associated with this workgroup include:

- The number of inspections and follow-up maintenance that must be completed at each of the facilities maintained by the M&R team. These facilities include regulation stations, valves, MSAs, pressure/volumetric correctors, and electronic pressure monitors.
- The volume of recurring routine, scheduled maintenance work, and unscheduled maintenance work. Unplanned work includes, for example, work driven as a result of the malfunction of a device.
- Emergency support requirements. This includes the activities for responding to a shutdown caused by pipeline damage, a pressure incident, or major event as in the case of an earthquake, and support of general operations requirements, for example, test shut downs to determine system behavior under specific conditions.

- The age and type of equipment installed. Generally, older or obsolete equipment requires more frequent and more extensive maintenance work.
- Other cost drivers. These include customer requests associated with measurement issues at MSAs and regulatory requirements for additional or stricter standards.

Furthermore, the RAMP Report identified the need to increase regulator station and MSA inspections to evaluate and confirm that over-pressure protection is in place in these facilities. The costs associated with this activity are included in the base forecast for TY 2019.

10. Cathodic Protection

Expenses for activities recorded to the Cathodic Protection workgroup are for the inspection, evaluation, and monitoring of the CP system on SDG&E's steel distribution pipelines to maintain and operate the system in accordance with state and federal regulations. Table GOM-13 below summarizes Gas Distribution O&M costs associated with Cathodic Protection activities.

Table GOM-13
San Diego Gas & Electric Company
Field O&M – Cathodic Protection

GAS DISTRIBUTION (In 2016 $)			
A. Field Operations & Maintenance	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
10. Cathodic Protection	1,829	2,289	460

a. Description of Costs and Underlying Activities

Buried steel pipelines will corrode and revert back to their natural state as an iron oxide without proper intervention. Corrosion on pipelines increases the potential for leaks and may reduce the pipeline's useful life. In addition to the application of coating and electrical isolation, cathodic protection is one method for mitigating external corrosion on steel pipelines. CP combats corrosion by imposing an electric current flow toward the surface of the pipeline, which keeps the pipeline negatively charged (cathodic) with respect to the surrounding soil. CP systems are at risk of interference from construction or operations of nearby utilities, such as water lines, telephone, or cable television ground systems, and electric railway power systems, all of which can reduce the performance of the CP system. The CP system requires continual

monitoring for interference, measurement of its performance, and maintenance of its associated equipment to maintain adequate levels of protection.

These efforts are undertaken to maintain the longevity and performance of SDG&E's distribution steel pipeline system and are performed by system protection specialists responsible for maintaining compliance with appropriate regulations. Inspection, evaluation, and monitoring of the pipelines' CP system can include: checking rectifiers for proper operation, identifying the location of interface bonds, evaluating "short circuits," identifying locations for installation of anodes for continued pipe protection, and taking pipe-to-soil reads to evaluate electric current levels. Based on the results of these monitoring activities, replacement, upgrade, or alteration of the CP system components may be planned. Diminished CP effectiveness could lead to increased corrosion, a more rapid deterioration of the steel pipeline and subsequently increased leakage, thus leading to potential risks associated with public safety and infrastructure integrity.

b. Forecast Method

SDG&E's base forecast for this compliance workgroup is the 2016 adjusted recorded base level of spending. Labor and non-labor expenses have collectively increased year over year due to incremental resources needed to meet code compliance requirements for a system that continues to age and requires additional maintenance work. Furthermore, as the Company's Geographic Information System (GIS) continues to expand and include more asset information, we are finding and addressing gaps in the cathodic protection system. Because of these recent changes in work level and associated funding requirements, a historical average would not represent future resource needs. Therefore, 2016 was chosen as the base forecast for future years as it best represents the current and anticipated work level. Added to this base expenditure level are incremental additions necessary to adequately fund the operation in TY 2019. These incremental work elements are described below.

The total funding required over the 2016 adjusted-recorded base including the incremental additions in this workgroup is $460,000 in TY 2019.

<u>Separately-Protected Service Line Project</u>

PHMSA enforcement guidance published in January 2013 clarified PHMSA's interpretation of CFR 192.465, which pertains to a required annual survey cycle for more than one steel riser electrically-connected and cathodically protected by a common magnesium anode or a series of interconnected magnesium anodes. Since the early 1970s, SDG&E has been

treating steel risers cathodically protected with this method as an individually-protected steel pipe segment and surveying 10% of the entire population of steel risers every year; thus each riser was surveyed once every ten years, to comply with CFR 192.465 for steel pipeline segments less 100 feet in length. These segments are referred to as "CP10s."

SDG&E's practice of interconnecting steel risers together using tracer wire and magnesium anodes (or "daisy chaining" risers) began in 1971 when the Company first began installing polyethylene mains and services in the service territory, and continued until 1982, when the practice was stopped and anodeless risers were installed on polyethylene services.

Once SDG&E became aware of this clarification in interpretation, it promptly began researching and analyzing the best process to gain alignment with the PHMSA interpretation.

Daisy-chained risers were only installed on new polyethylene main and service systems, and SDG&E estimates 60,000 risers exist today that require an annual survey. SDG&E has initiated a process to survey these steel risers annually to meet compliance requirements.

i. Addition of CP Electricians

To reach full alignment with the adopted PHMSA interpretation described above, SDG&E will require additional Cathodic Electrician C classification resources to conduct the annual surveys of 750 newly established magnesium cathodic protection areas consisting of the "daisy chained" risers.

On average, each CP Electrician is capable of surveying and maintaining approximately 200 magnesium cathodic protection systems per year; therefore, four CP Electricians (two CP Electricians in 2017 and an additional two in 2018) are required in order to perform annual reads on the new magnesium anode areas containing "daisy chained" risers.

The total incremental funding needed for this incremental addition is $340,000 over the forecast base for TY 2019.

ii. Addition of a Technical Advisor

One Technical Advisor will be added beginning in 2018 to provide ongoing CP system integrity analysis and prioritization of work activities. Currently the Electrician field workforce is responsible for day to day troubleshooting of CP systems, performing periodic CP reads, and establishing and evaluating test point locations. Currently, when an impressed current CP station begins to fail, to adequately protect the piping system due to deteriorating pipe condition or depleting anode ground-beds, that station is turned in for a renewal of the ground-bed or the

station is split into multiple impressed current CP systems. This approach is generally reactive, and can take 6 to 12 months to complete the process which often requires planning, permits, excavation, and acquisition of new equipment.

The new Technical Advisor position will proactively gather CP read data for each station and consistently evaluate the voltage, amperage, short, and soil resistance data to predict time to CP station failure, issuing the stations for ground-bed renewal or station splits in advance prior to protection levels falling close or below minimum criteria. Additionally, this position will complement the proposed RAMP activity discussed in Section IV.M. and maintain the new CP system model / algorithm once it has been established. This CP system model will be utilized to simulate current flows and pipe to soil potentials to represent test points locations with the lowest protection levels. The total incremental funding needed for this workgroup element is $120,000 over the forecast base for TY 2019.

c. Cost Drivers

The basic cost drivers for this workgroup include the number of inspections and associated evaluations (troubleshooting) that must be completed each year for each CP area and isolated CP segment. Based on the results of these monitoring activities, follow-up maintenance action is often necessary. These maintenance activities may include replacing, upgrading, or altering components of the CP system, such as anodes, rectifiers, beds, bonds, test points, electric drops, anode wells, and insulators. Many of these activities are driven by the age of the system components, with older elements generally requiring more maintenance.

Furthermore, the typical life of anodes, a critical component of the CP system, can vary depending on a number of drivers including the weather, soil conditions, the pipeline length it is protecting, and the effectiveness of the pipe's coating. Anode depletion is accelerated by drought conditions, as dry soil does not allow the current to travel as far and protect as much pipe. In addition, some soils are more resistive than others, causing anodes to deplete at a higher rate.

CP maintenance work is often reactive to activities of municipalities, other utilities, and construction firms as they complete projects of street reconstruction, widening, or resurfacing; or sewer and water line maintenance and replacement as these activities can lead to CP component damage. In addition, pipes can come into contact with water lines or with third-party grounding systems that can drain current from the pipeline, thus reducing the level of protection and

depleting anodes. Customers placing metal objects against an MSA riser can have the same effect as shorting out the CP current.

In addition, the RAMP Report identified the need to increase the maintenance of cathodically protected assets by repairing, or retrofitting components. The costs associated with this activity are included in the base forecast for TY 2019.

B. Asset Management – Pipeline O&M Planning

Table GOM-14
San Diego Gas & Electric Company
Asset Management – Pipeline O&M Planning

GAS DISTRIBUTION (In 2016 $)			
B. Asset Management	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. Asset Management	1,719	2,169	450
Total	**1,719**	**2,169**	**450**

1. Asset Management

a. Description of Costs and Underlying Activities

Asset Management includes activities and associated O&M expenses incurred in the evaluation of the condition of the distribution system. This includes maintaining asset records, identifying corrective maintenance solutions, and coordinating with field personnel on completion and recording of O&M activities.

Recorded to this workgroup are labor and non-labor expenses for pipeline maintenance technical planning office personnel, regional engineering, pipeline mapping personnel, various analytical and administrative support positions, and associated supervision. SDG&E's Technical Planning Office provides many of the technical and administrative services needed for the successful and timely completion of the O&M activities discussed in Section III.A above. Activities performed by this planning office include items such as:

- Identify construction design requirements;
- Evaluate pressure specifications;
- Coordinate pipeline planning;
- Provide project drawings;

- Identify material selection;
- Prepare work order estimates;
- Acquire third party contract services (e.g. paving, traffic control plans, and operated equipment);
- Obtain permits for construction from city, county, state, and federal agencies; and
- Verify that services provided by third parties meet Company standards.

The Technical Planning office also coordinates the regions' emergency response efforts by managing the Gas Emergency Center, which is located at the Gas Technical Services office. The Gas Emergency Center is the regional command center that is activated during a significant event (*e.g.*, fire, earthquake, pipeline damage, customer outage) to support field operations with engineering, pipeline planning, mapping, logistics, and office resources that are vital in returning SDG&E's facilities back to normal operations.

This workgroup additionally includes expenses to map the pipeline facilities. As gas system construction projects are completed throughout SDG&E's service territory, accurate pipeline data must be captured and records kept for the life of the pipeline, consistent with GO 112-F and 58-A. Projects requiring mapping and database records work include all new business activity, pipeline relocations, main extensions, pressure betterment projects, pipeline replacements, and various other operational activities that change the gas system configuration. GIS based mapping system adds the capability to capture pipeline attribute data, and this data is added to the facilities when mapped in GIS. GIS mapping personnel are responsible for updating all distribution infrastructure maps whenever facilities in the field are constructed, modified, or replaced. The timely maintenance of these Gas Distribution system records is a critical risk mitigation measure in preventing hazards to public and employee safety, infrastructure integrity, and to the reliable delivery of natural gas to SDG&E's customers.

b. Forecast Method

Labor and non-labor expenses increased collectively in 2016 due to incremental planning, engineering, and facility mapping activities as the level of maintenance work, general construction activity, municipality work, and customer generated activity increased. Due to these recent incremental cost drivers, a historical average would not represent future business needs. Therefore, 2016 was chosen as the base level of expense for future years. Added to this base are incremental work elements necessary to support the growth in activity in the Gas

Graphical Information Systems (GGIS) workgroup, the workgroup responsible for SDG&E's gas GIS system, and Technical Services workgroup. These elements are described below.

The total funding required over the 2016 adjusted-recorded base including the incremental additions in this workgroup is $450,000 in TY 2019.

i. Addition of Technical Services Assistants

The addition of four Technical Services Assistants (TSAs) is required in the Technical Services group. These positions will charge 10% of their time to O&M. With the projected increase in Gas Operations maintenance and capital work, the addition of four Technical Services Assistants is required to offset administrative tasks from the higher skilled Field Utility Specialist (FUS) focused on project management and utility conflict check tasks. These offset tasks include creating base maps for initial design drawings; filing for environmental reviews, traffic control and permits; and creating, processing, and tracking simple work orders for jobs not requiring fielding. These new TSAs will allow the Field Utility Specialist to focus on fielding, designing, and coordinating construction projects. The total incremental funding needed for this workgroup element is $24,000 over the forecast base for TY 2019.

ii. Addition of GIS Technicians and Analysts

Four GIS Technicians and two GIS Analysts will be added in the Gas GIS workgroup beginning in 2018 to support an increase in projects requiring mapping and records work driven by new business activity, pipeline relocations, main extensions, pressure betterment projects, pipeline replacements, main and service maintenance, new GO 112-F reporting requirements, and various other operational activities that impact the gas system configuration. GIS is the system of record for Gas Distribution facilities, containing a graphical representation of the facility location and facility attributes.

The newly implemented GO 112-F requires that:

> At the same time [annually] that copies of reports required by Section 123.1 are submitted, the following information shall be submitted to demonstrate to the Commission and the public and Operator's efforts towards minimizing the risk from system leaks and failures: … the amount of time it takes for changes, repairs, or new facilities to be finalized and updated, per the Operator's procedures, to the Operator's facilities maps segregated into less than 14 days, 14

to 30 days, 30 to 90 days, 90 to 180 days, 180 to 360 days, and more than 360 days.[19]

The addition of four GIS Technicians and two GIS Analysts will allow SDG&E to meet the Company's goal of capturing attributes and mapping the facilities or changes within 180 days. The GIS Technicians capture and catalogue up to 30 attributes into a GIS database for each mapped facility. Examples of recorded attributes include pipe diameter, material, installation year, installation work order, maximum allowable operating pressure, leak survey cycles, pressure district number, and cathodic protection system attributes.

These positions will charge 52% of their time to O&M. The total incremental funding needed for this workgroup element is $209,000 over the forecast base for TY 2019.

iii. RAMP - Risk ID 16/SDG&E Medium-Pressure Pipeline Failure - Oil Drip Piping

The RAMP assessment identified the need to verify the location of above-ground and buried oil drip lines and containers. This effort will require the review of 44 work orders, estimated at 176 hours followed by field verification of above-ground and buried oil drip lines and containers. Once the location is validated, an engineering evaluation will identify those facilities that are no longer needed. The buried facilities are at risk of excavation damage as their location and configuration is not captured on facility maps. The capital removal of these buried facilities is captured in Section IV.K. It is estimated there are approximately 120 oil drips in the system requiring removal.

Labor expenses for this activity is estimated to be $14,000 in 2017 for one year only. The total incremental funding needed for this incremental addition is $0 over the forecast base for TY 2019.

iv. RAMP - Risk ID 16/SDG&E Medium-Pressure Pipeline Failure Dresser Mechanical Couplings

In the 1920-1930s era, Dresser mechanical couplings were utilized instead of welding on a mixture of distribution and supply line network in the downtown San Diego vicinity. These mechanical couplings are prone to leaks compared to welded pipe, and pose a potential risk of separation in the event of a strong earthquake or exposure of long lengths of the pipeline during

[19] GO 112-F, Section 123.2(e), at 7-9.

routine company, private, or franchise projects in the vicinity. The O&M portion of this project will include the review and field validation of 195 work orders containing the use of Dresser mechanical couplings on a distribution and supply line network in the downtown San Diego area. It is estimated that there are approximately 100 locations where Dresser mechanical couplings need to be removed or encapsulated. This project is necessary to complete the review of 195 work orders to determine and validate the field locations of these Dresser mechanical couplings. Once identified, they will be excavated and repaired as discussed in Capital Section IV.K.

This project will include the assessment of the use of a weld housing to encapsulate the Dresser mechanical couplings and the prioritization of repairs based on population density. Labor expenses for this activity is estimated to be $62,000 in 2017 for one year only. The total incremental funding needed for this incremental addition is $ 0 over the forecast base for TY 2019.

v. RAMP - Risk ID 16/ SDG&E Medium-Pressure Pipeline Failure - Buried Piping in Vaults

This project is to complete the review of 1,357 work orders to determine the locations of all vaults containing medium- and high-pressure facilities; field verify the coating and surface conditions of the above-ground and below-ground facilities within the vaults; and determine need for mitigation or replacement of piping at these sites. Any pipe, fitting, or valve within a below grade vault but not buried is at risk for accelerated atmospheric corrosion due to potential of water accumulation, pipe coating failure, and decreased cathodic protection effectiveness. These components within the vault are not buried and therefore are considered exposed to atmosphere. Further details are provided in Capital Section IV.K. The total incremental funding needed for this O&M portion incremental addition is $217,000 over the forecast base for TY 2019.

c. Cost Drivers

As discussed above, Asset Management work is driven by the level of operations and maintenance activity in other workgroups covered in this testimony. Field O&M Planning is experiencing an increase in general construction and customer-generated activity, which requires additional planning time. In addition, work in the public right-of-way requires the Technical Services offices to perform more planning work required for pipeline relocations.

Additional Planning Section labor is required due to regulatory agencies, including the National Transportation Safety Board (NTSB), PHMSA, and the Commission, having recently directed pipeline operators to focus on the documentation of high-pressure gas pipelines. This recommended that operators of gas pipelines verify that the records used to calculate maximum allowable operating pressure or maximum operating pressure for their pipelines are reliable and directing that these records "should be traceable, verifiable and complete."[20] This impacted design, construction, pressure test records, and project close out and mapping of new or altered pipeline facilities.

The RAMP assessment identified the need for additional evaluation and repair of higher risk piping and pipe components; and annual review of regulator information.

C. Operations Management and Training

Table GOM-15
San Diego Gas & Electric Company
Operations Management and Training

GAS DISTRIBUTION (In 2016 $)			
C. Operations Management & Training	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. Operations Management & Training	3,939	4,510	571
Total	**3,939**	**4,510**	**571**

1. Operations Management and Training

a. Description of Costs and Underlying Activities

Described in this section of testimony are activities representing leadership and operations support providing vision and guidance to the organization responsible for gas distribution. Within this workgroup are labor and non-labor expenses associated with developing and maintaining distribution construction standards; evaluating new field technologies; assisting with field training; training distribution welders; providing code required welder testing; providing welding inspection; managing the OpQual program; and managing the Welding School. Costs in this workgroup also include Gas Technical Services Miramar

[20] *See* NTSB Advisory Bulletin ADB-11-01, 76 Fed. Reg. 1506 (Jan. 10, 2011).

management, administrative and support positions. It includes expenses from multiple cost centers within the workgroup of Operations Management and Training.

b. Forecast Method

In projecting the future expense requirements for these functions, SDG&E reviewed the 2012 through 2016 historical spending for this entire workgroup. In general, operations leadership, field management, operations support, and personnel training increase as levels of work and workforce increase; as new programs, processes, and technologies are implemented; and as regulatory or compliance requirements change. An increase in training and OpQual program development and expansion began in 2013 and continued through 2016. This increased level of training and operator qualifications activity is expected to continue in the forecast years. Because of these recent work elements and associated expense level changes, a historical average would not represent future resource needs. For this reason, the 2016 adjusted recorded base was selected as the appropriate forecast methodology. Added to this 2016 base expenditure level are incremental additions necessary to adequately fund the activities in this workgroup in TY 2019. These incremental work elements are described below.

The total funding required over the 2016 adjusted-recorded base including the incremental additions for this workgroup is $571,000 in TY 2019.

i. ITS and Veriforce Setup and Licensing

As the OpQual program continues to expand, SDG&E will implement computer terminal based training and testing (CBT) for employees to be operator qualified. The ITS training environment will provide the trainee with CBT online training modules and OpQual testing.

Veriforce is an outside training organization that provides a records management system for monitoring and tracking contractor employee OpQual and Drug and Alcohol testing records. All of the contract employee task based positions currently deal directly with Veriforce for qualification. Funds are required to set up Veriforce software at Company based interface sites allowing the contract employee to process qualifications through SDG&E first putting SDG&E in the loop. The records are then entered into the Veriforce system. With the contract employee dealing directly with the Company, the process is more efficient and provides the opportunity for the Company to add oversight to the contractor OpQual process.

Non-labor expenses will be required for the initial ITS and Veriforce software setup and for annual licensing of the software. An initial setup expense of $70,000 will be required in

2017 and an annual licensing fee for ITS and Veriforce software of $60,000 in 2018 and TY 2019 and thereafter.

ii. Three positions for training design and development

One position (Instructional design) will be required beginning in 2018 to develop training for the Field Utility Specialists (FUS) who provide pipeline relocation and new installation design and project management. The Instructional Designer will develop, maintain, and revise FUS training. This involves creating new FUS training materials, and revamping existing training materials. This includes compliance training related to High Consequence Area surveys, class location changes, and OpQual tasks. Currently, FUS training occurs on the job and with limited training materials. Given the complexity of the job and compliance requirements, it is prudent to move to a more formalized training program consisting of instructor-led training and CBT. In addition to expanding existing limited training material, a great number of new courses require development to cover new procedures used by the FUSs. The addition of this position will result in a $120,000 increase to this work group over the base forecast for TY 2019.

A second position (Instructional design) will be required to develop training for Gas Transmission and Moreno Compressor station personnel beginning in 2018. Existing training materials for the Gas Transmission and Moreno Compressor Station will be updated and new training materials will be created for new tools, procedures, and updated for new Gas Standards. There is a need to have an Instructional Designer work with an instructor subject matter expert (SME) (discussed below) to create or update these training materials. The addition of this position will result in a $120,000 increase to this work group over the base forecast for TY 2019.

A third position (Instructor) will be required to conduct training for Gas Transmission and Moreno Compressor Station personnel. This position will split its activities between instruction and subject matter expert (SME) support for the development of training materials for the Gas Transmission and the Moreno Compressor Station. Specific employee groups to be trained are Gas Transmission Instrument Technicians, Moreno Station Instrument Technicians, Moreno Station Operators, and Moreno Station Mechanics. Materials will be created for new tools, procedures, and updated for new Gas Standards. A SME with task-specific knowledge is necessary to help an Instructional Designer create and update the associated training materials. This training has previously occurred primarily on the job. In addition, this position will provide

OpQual testing and general compliance training for these groups. The addition of this position will result in a $120,000 increase to this work group over the base forecast for TY 2019.

iii. One Shop Assistant – Customer MSA, Reg Stations and Shop Tool maintenance.

Increases in the number of Meter Set Assemblies (MSAs), regulator stations, and valve assemblies requiring shop pre-fabrication will require a Shop Assistant to procure and assemble materials, provide post-welded assembly of pipeline components, and QC leak testing. Legacy regulator stations are being replaced with new, welded-style regulator stations. Adding to the increased labor requirements, MSA complexity has increased due to the addition of instrumentation, retrofitting existing facilities, and Automatic Meter Reading modules.

The Shop Assistant will charge 25% of the time to O&M, the rest to capital. The addition of this position will result in a $22,000 increase to this work group over the base forecast for TY 2019.

iv. One Project Manager – API 1173

One Project Manager will be required to begin implementing SDG&E Gas Distribution's approach to compliance with API 1173 and Pipeline Safety Management System (PSMS) objectives. As discussed by Mr. Rivera (Ex. SDG&E-05), implementing a company-wide pipeline safety management system in response to American Petroleum Institute's Recommended Practice (API RP 1173) will reinforce the safety culture. Through the implementation of API RP 1173, the organization will improve the integration of the needs of the business and the risks of operations in a more systematic and systemic manner. By adopting the 10 tenets of the API RP 1173 standard, asset, investment and risk decisions will become more optimized and repeatable thus improving the safety performance of the organization and safety culture of our employees. This will require a Project Manager dedicated to SDG&E beginning in 2018 and thereafter. The addition of this Project Manager will result in a $110,000 increase in expense reported to this workgroup over the base forecast for TY 2019.

v. Emergency Response Advisor

Currently the responsibility of maintaining an emergency response command structure, a response process development and improvement, providing the availability of backup equipment, maintaining a trained respondent pool, and training for the Gas Emergency Center resides within Gas Technical Services. The responsibilities are shared between multiple management and

engineering employees and are incremental to their respective roles. Centralizing these responsibilities under one dedicated Emergency Response Advisor will streamline the GEC activities, maintain a consistent training schedule, monitor GEC response equipment and respondent availability, and further the integration of the Incident Command System (ICS) into the GEC. The ICS concept, recently adopted by the field response personnel, is a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries. In addition, implementation of the GO 112-F requirements also calls for using ICS as a framework for responding to and managing emergencies and disasters involving multiple jurisdictions or multiple agency responses. The ICS utilized by the utility must be compatible with that used by the first responder community within California. The Emergency Response Advisor will oversee this ICS integration and compatibility with the first responder local communities.

The addition of the Emergency Response Advisor will result in a $120,000 increase in expense reported to this workgroup over the base forecast for TY 2019.

vi. GO 112-F Compliance Project Specialist

This position serves as a key point of contact in supporting compliance with the new GO 112-F regulations and related programs or projects. Emphasis will be on federal and state compliance requirements associated with Gas Operations. The Project Specialist will track compliance progress and provide compliance process management. In addition, this position will provide analytical support in the preparation of compliance audit materials; compile and complete compliance reports and post audit responses; and perform regulatory analysis and interpretations of new and existing standards and regulations.

The addition of the GO 112-F Project Specialist will result in a $60,000 increase to this workgroup over the base forecast for TY 2019.

vii. FOF – Savings in Field Administrative Tasks

Currently, Field Supervisors spend 70% of their time performing office related tasks, transitioning 20 of these tasks to an Operations Assistant position based at each of the five operating districts will allow Field Supervisors to focus on coaching, mentoring, and construction oversight in the field. Continuous improvement in task optimization among

appropriate skillset levels will result in savings. These combined savings represent a decrease of $161,000 to the base forecast for TY 2019.

c. Cost Drivers

The forecast for the Operations Management and Training workgroup is driven by costs in four major areas: operations leadership, field management, operations support, and personnel training. In general, costs in these areas increase as levels of work and workforce increase; as new programs, processes and technologies are implemented; and as regulatory or compliance requirements change. As such, the work environment within Operations Management and Training is increasingly influenced by, and evolving with multiple drivers:

- Adoption of new regulations. Since the San Bruno incident in Northern California, SDG&E has experienced increased regulatory pressure to establish more strict compliance assurance mechanisms. This was evidenced by the issuance of GO 112-F with an effective date of January 1, 2017. This drives costs associated with emergency response, more quality assurance oversight into operations, and a need for additional compliance technical advisors and assistants for analysis and implementation of the new regulations into operation procedures and standards.
- The need to maintain a trained and qualified workforce. SDG&E is taking proactive action to address employee training and qualification through the continued expansion of its OpQual program; additional instructors, established subject matter experts, and instructional designers for training program development.
- The need to support new field technologies and to facilitate the integration of these tools within the field and overall management practices. This drives costs associated with increased technical business support and identification and implementation of system enhancements. Included in this is the new GO 112-F requirement that equipment and facilities used by an operator for training and qualification of employees must be identical, or very similar in operation to the equipment and facilities which the employee will use, or on which the employee will perform the covered task.
- The need to maintain data integrity and leverage new information depositories. This drives costs associated with reports and tools that will gather, consolidate, and summarize newly available data to develop compliance reports and to monitor the

effectiveness of operations and identify future business improvements. It should be noted here that implementation of GO 112-F has added 25 additional reporting requirements.

- Increased workforce turnover. Workforce turnover presents issues of knowledge transfer, skills development, and overall proficiency of the replacement workforce. This drives costs related to training, Operator Qualification, technical support, and Quality Assurance.
- Introduction of new construction and maintenance methods into office and field functions. The introduction of new construction and maintenance methods drives costs associated with the personnel needed to revise Gas Standards and training materials, conduct refresher training, provide technical support, and conduct assessments and enhancements of business processes.

Furthermore, the RAMP assessment identified the need to provide additional job skills training and qualification, welding construction training, and quality control inspections on pipeline systems.

IV. CAPITAL

Introduction

The driving philosophy behind SDG&E's capital investment plan is to provide safe, reliable delivery of natural gas to customers at reasonable cost. This commitment requires that SDG&E invests in its infrastructure and support services to mitigate risks associated with the safety of the public and employees, service reliability, and gas system integrity. SDG&E installs new pipeline mains, service lines, and meter set assemblies (MSA) to meet the needs of the growing population in the service territory. To maintain system reliability and safety, SDG&E makes a variety of other capital improvements, including pressure betterment projects to improve areas of low pressure, pipeline renewals to replace deteriorated pipelines or obsolete equipment**,** installation and replacement of CP systems**,** and the purchase of electronic pressure monitoring devices for pressure tracking and monitoring. Other improvements include pipeline relocations to accommodate public infrastructure improvements such as street and highway widening, and relocations caused by the construction of new water, sewer, and railway facilities. To accomplish these activities, SDG&E continuously monitors the condition of approximately 14,148[21] miles of distribution main and service pipelines. By using technology and the professional judgment of experienced, skilled, and well-trained employees, SDG&E utilizes capital in the most prudent, responsible manner consistent with local, state, and federal codes and regulations.

In preparing the forecast for capital expenditures, SDG&E Gas Distribution reviewed 2012 through 2016 historical spending levels, including work units, and developed an assessment of future requirements and associated risks. This analysis considered underlying cost drivers to determine if historical patterns of spending should be expected to continue, as well as the degree of impact of associated risk mitigations. Gas Distribution also evaluated future work requirements that were incremental to levels of historical spending, yet necessary to maintain the safe and reliable operations of the distribution system. Thus, the forecasting methodologies varied depending on the type of activity being analyzed and the expectations of future system needs. These methods included forecasts based on historical averages, on historical growth and estimated future growth, on identified projects or materials, and a combination of project specific

[21] SDG&E's Natural Gas System Operator Safety Plan, submitted Mar. 8, 2017, at 2.

justification and analysis of historic spending. SDG&E's Gas Distribution capital expenditure forecasts are rooted in a historical review of spending and are adjusted, where appropriate, for elements of new work or changes in operating conditions and risk mitigation which would not have been reflected in the past spending patterns. As such, forecasts address actions that must be taken to manage risks associated with the safety of the public and employees, service reliability, and gas system integrity.

To continue to provide safe and reliable service, while mitigating associated risks, SDG&E requests the Commission adopt forecast capital costs of $50,666,000, $91,606,000, and $110,993,000 for 2017, 2018 and 2019, respectively.

Table GOM-16 provides a summary of the total capital costs for the forecast years.

Table GOM-16
San Diego Gas & Electric Company
Capital Expenditures Summary of Costs

GAS DISTRIBUTION (In 2016 $)				
Categories of Management	**2016 Adjusted-Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
A. New Business	7,557	6,376	8,217	7,805
B. System Minor Additions, Relocations and Retirement	9,390	3,694	3,694	3,694
C. Meter and Regulator Materials	4,097	7,077	7,468	7,283
D. Pressure Betterment	1,637	1,695	1,695	1,695
E. Distribution Easements	12	38	38	38
F. Pipe Relocations - Franchise and Freeway	14,952	6,665	6,665	6,665
G. Tools and Equipment	2,098	2,219	2,219	2,219
H. Code Compliance	737	2,549	1,149	1,174
I. Replacement of Mains and Services	5,618	5,968	16,940	26,226
J. Cathodic Protection	2,804	5,450	5,656	5,861
K. Regulator Station Improvements and Other	624	1,688	20,509	25,633
L. CNG Station Upgrades	2,634	0	2,617	2,617
M. Local Engineering	9,397	7,247	14,739	20,083
Total	**61,557**	**50,666**	**91,606**	**110,993**

The following sections provide, by activity, a description of the specific work to be completed, the benefits of such work, the forecast methodology, expected expenditures and cost drivers. These expenditures are necessary to maintain regulatory compliance and the continued safe and reliable delivery of natural gas.

In addition to this testimony, please also refer to my capital workpapers, Ex. SDG&E-04-CWP for additional information on the capital projects described here.

A. New Business (Budget Code 500)

Table GOM-17
San Diego Gas & Electric Company
New Business

GAS DISTRIBUTION (In 2016 $)				
A. New Business	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. New Business		5,383	6,938	6,590
2. CIAC Collectible		993	1,279	1,215
Total	**7,557**	**6,376**	**8,217**	**7,805**

1. New Business

a. Description of Costs and Underlying Activities

The New Business Budget Code provides for changes and additions to the existing gas distribution system to connect new residential, commercial, and industrial customers. This includes installations of gas mains and services, meter sets, and the associated regulator stations necessary to provide service to the customer. The material cost of meters and regulators are addressed under Budget Code 502, in Section IV.C (Meter and Regulator Materials).

These forecasted capital expenditures support the Company's goals of providing a safe and reliable gas distribution system and responding to its obligation to serve the growing customer base, thus mitigating the risk of reduced service reliability.

b. Forecast Method

A zero-based forecast for New Business expenditures was developed using the projected number of new meter sets added to the Gas Distribution system. SDG&E forecasts a continued growth in new customer meter installations. Table GOM-18 below shows the quantity of new meter sets SDG&E installed in the period 2012 through 2016 and the new meter installation

forecasts for the years 2017 through 2019. For additional details on the calculation of new meter set installations, please refer to the workpaper of Ms. Payan, Ex. SDG&E-37-WP.

Table GOM-18
San Diego Gas & Electric Company
New Business Meter Installation History and Forecast

Year	2012	2013	2014	2015	2016	2017	2018	2019
Number of New Meter Set Installations	4,618	5,258	3,083	5,109	5,260	4,827	6,221	5,909

The expenditures for this budget code were forecasted by multiplying a five-year average (2012 through 2016) adjusted recorded labor and non-labor cost per meter installation by the meter forecast quantities in years 2017, 2018, and 2019. The gross forecast of expenditures was separated into two components: the "non-collectable" construction cost for labor and non-labor necessary to install new business additions, and the "collectable cost" or Contributions In Aid of Construction (CIAC) portion that supports these installations. The collectable cost of a project (or CIAC) is an amount of money collected from the customer that is applied toward the cost of construction for services rendered and/or facilities installed. The collectable costs for a project vary from project to project. Therefore, in order to forecast this fluctuating portion of new business expenditures, it is necessary to derive a factor that represents the average percentage of direct CIAC per direct construction costs. This factor was developed by dividing the annual direct CIAC credits collected by the total direct construction costs in a given year and averaged over the 2012 through 2016-time period. This factor was applied to the 2017 through 2019 gross forecast of construction costs, yielding the New Business Collectable component of the forecast.

Forecasted total (gross) expenditures for New Business in years 2017, 2018, and 2019 are $6,376 ,000, $8,217,000 and $7,805,000, respectively. The forecasted collectable expenditures for New Business in years 2017, 2018, and 2019 are ($993,000), ($1,279,000) and ($1,215,000), respectively. The remaining forecasted non-collectable expenditures for New Business in years 2017, 2018, and 2019 are $5,383,000, $6,938,000 and $6,590,000, respectively.

c. Cost Drivers

New Business work is driven by the volume and type of new construction required to provide service to new residential, commercial and industrial customers, thus mitigating the risk

of reduced service reliability and complying with the Company's obligation to serve. As described above, this includes the installation of new mains and services as well as "header" pipe (larger-diameter, medium-pressure pipe that can carry gas longer distances) to bring gas to new developments. In some cases, it is also necessary to build high-pressure supply lines and associated regulator stations.

In SDG&E's experience, new construction increases as the economy improves. SDG&E forecasts an increase in new business growth in the next several years, and it is therefore reasonably anticipated that demand for construction resources and material will increase.[22] The underlying cost drivers for this capital category relate to Company labor, contractor services, third party services, paving services, and materials such as pipe and fittings. All or a combination of these construction elements are necessary for performing New Business facility installations.

An additional cost driver for this workgroup, identified in the RAMP Report is the odorization of new pipelines. This cost is included in the base forecast for this work category.

B. System Minor Additions, Relocations and Retirements (Budget Code 501)

Table GOM-19
San Diego Gas & Electric Company
System Minor Additions, Relocations, Retirements

GAS DISTRIBUTION (In 2016 $)				
B. System Minor Additions, Relocations and Retirement	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. System Minor Additions, Relocations and Retirement		2,739	2,739	2,739
2. CIAC Collectible		955	955	955
Total	**9,390**	**3,694**	**3,694**	**3,694**

1. System Minor Additions, Relocations and Retirements

a. Description of Costs and Underlying Activities

This budget code captures expenditures not covered in other work categories that are required to maintain the continued integrity of SDG&E's Gas Distribution system. Examples of

[22] Total mileage that Gas Distribution operates including Distribution-operated supply lines greater than 20% SMYS.

expenditures include gas distribution main and service additions, main and service abandonment, and main and service relocations due to customer requests or Company requirements.

b. Forecast Method

In developing the forecast, historical expenditures for 2012 through 2016 were evaluated. Due to the wide range of activities recorded in this workgroup, as well as the cost fluctuations from year to year, a five-year (2012 through 2016) average was selected as the best method to forecast future costs.

In developing the forecast for this budget code, labor and non-labor components were evaluated separately. The labor component contains the historical Company labor charges associated with construction projects within this budget category. A five-year average (2012 through 2016) was utilized as the forecasting methodology for this component.

Within non-labor, there are two distinct cost components: construction materials and services; and CIAC credits. The first non-labor component, materials and services, was forecasted using a five-year average (2012 through 2016). The second component, CIAC credits, was also calculated based on a five-year average (2012 through 2016). As previously discussed in the New Business Budget Code, the collectable cost portion of a project (or CIAC credits), is an amount of money collected from the customer that is applied toward the cost of construction for services rendered and/or facilities installed. Forecasted gross expenditures for Budget Code 501 in years 2017, 2018, and 2019 are $3,694,000 per year. The forecasted collectible expenditures for Budget Code 501 in years 2017, 2018, and 2019 are ($955,000) per year. The remaining forecasted non-collectible expenditures for Budget Code 501 in years 2017, 2018, and 2019 are $2,739,000 per year.[23]

[23] During the research for discovery request ORA-SDG&E-026-MRK, a component of CIAC (Contributions In Aid of Construction) was found to not have been excluded from historical data in preparation of the estimates for New Business. CIAC is a credit posting for customer deposits for construction, and reduces the total cost of the project. Forecast estimates are shown in workpapers in two parts; New Business Non-Collectible Expenses and New Business Collectible Expenses (CIAC), which together represent the total project cost. The collectible portion is used to calculate overheads, and both it and the overheads are later omitted from ratebase modeling (see the testimony of Craig Gentes, Exhibit SDG&E-33). By not excluding that CIAC component in the historical costs in this testimony, those credits are in effect applied twice, thereby understating the revenue requirement. The amount of CIAC that was not excluded is approximately $48,000, and is distributed primarily across New Business budgets. Although SDG&E has become aware of this understatement of expense, SDG&E does not seek increased revenue requirement related to it.

c. Cost Drivers

The costs included in this budget code relate to expenditures not covered in other work categories that are required to maintain the continued integrity of SDG&E's Gas Distribution system. Costs are primarily driven by the volume and type of construction required to address the needs of property owners requesting SDG&E to move its facilities from their property; or to meet the Company's need for minor additions, facility relocations or abandonments to address conflicts, integrity, or reliability concerns. Examples include the number of customer house-lines or gas service lines to be relocated and/or abandoned, which is generally driven by economic conditions.

The underlying cost drivers for this capital work category relate to Company labor, contractor service, third-party services, paving services, and materials, such as pipe and fittings. All or a combination of these construction elements are necessary for performing pipeline installations for this budget category.

An additional cost driver for this workgroup are activities identified in the RAMP Report and included the field activities to locate and mark underground facilities to prevent damages due to unsafe excavation practices. The costs associated with these activities are covered in the base forecast for this work category.

C. Meter and Regulator Materials (Budget Code 502)

Table GOM-20
San Diego Gas & Electric Company
Meter and Regulator Materials

GAS DISTRIBUTION (In 2016 $)				
C. Meter and Regulator Materials	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Meter and Regulator Materials	4,097	7,077	7,468	7,283
Total	**4,097**	**7,077**	**7,468**	**7,283**

1. Meter and Regulator Materials

a. Description of Costs and Underlying Activities

This budget code provides for the capital material expenses for purchasing new residential, commercial, and industrial gas meters and pressure regulators. Meters and regulators installed or replaced are grouped in three general categories:

- New business installations;
- Routine replacements; and
- Planned meter and regulator replacements.

These purchases, and the subsequent installations, are necessary for accurate billing, reliability, and safe operation. The expenditures included here are for the materials costs only. The associated installation expense is covered in other applicable budget categories (*e.g.*, New Business capital and Code Compliance).

Meters and regulators are purchased for installation at new customer's premises. Purchases in this category are consistent with forecasts discussed in Section IV.A (New Business) of this testimony.

A routine replacement is a reactive replacement of the meter resulting from either a Company or customer-identified problem with meter accuracy or operation such as customer trouble calls, customer billing complaints, and replacements due to meter failures or damage. Routine meter changes have remained relatively constant from year to year. Small meter routine replacement labor is addressed by Ms. Marelli (Ex. SDG&E-17).

Planned meter and regulator replacements are proactive replacements based on results of a statistical sampling of meter accuracy, age, and performance. These replacements are targeted based on a program to achieve gas measurement accuracy. GO 58-A requires that gas meters employed by SDG&E measure gas volume to a certain level of accuracy or be removed from service for repair or replacement. Meters are removed consistent with the Gas Meter Performance Control Program which is addressed by Ms. Marelli (Ex. SDG&E-17).

b. Forecast Method

Forecasted expenditures for meters and regulators are based on forecasted quantities for new business, the trending of usage for routine replacements, as well as planned meter replacements and therefore is a zero-based forecast. The forecasted usage is multiplied by the current meter and regulator contract prices to estimate future expenditures. The details on the calculation of new meter set installations are provided in the workpapers of Ms. Payan, Ex. SDG&E-37-WP. Small meter routine replacements and planned meter replacements are based on the information covered by Ms. Marelli (Ex. SDG&E-17).

Forecasted expenditures for Meter and Regulator Material in years 2017, 2018, and 2019 are $7,077,000, $7,468,000 and $7,283,000, respectively.

c. Cost Drivers

The main cost drivers for this capital work category consist of meeting projected new business requirements, routine meter replacements, and planned meter replacements. New business meter and regulator purchases in this category are consistent with installations discussed in Section IV.A. (New Business), and displayed in Table GOM-18. Meters purchased for routine replacements are in response to Company or customer-identified problems due to meter accuracy, age, or operation. Planned meter replacements are meter families in the Gas Meter Performance Control Program that fail accuracy limits, based on meter statistical sampling.

D. Pressure Betterment (Budget Code 503)

Table GOM-21
San Diego Gas & Electric Company
Pressure Betterment

GAS DISTRIBUTION (In 2016 $)				
D. Pressure Betterment	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Pressure Betterment	1,637	1,695	1,695	1,695
Total	**1,637**	**1,695**	**1,695**	**1,695**

1. Pressure Betterment

a. Description of Costs and Underlying Activities

Recorded in this budget code are expenditures for Gas Distribution pressure betterment projects performed on an ongoing basis to maintain system reliability and service to all customers. Pressure betterment projects are performed in areas where there is insufficient capacity or pressure to meet load growth. Pressure Betterment projects are necessary to maintain reliable service to existing customers as new gas load is added to the gas distribution system.

Once a pipeline system is designed and installed, the capacity remains relatively fixed. However, as load increases from new business activities or from expansion of existing customer loads, over time the existing pressure decreases which reduce the available volume for new and existing customers. If the diminishing pressure is not addressed, gas service to customers could be interrupted.

To determine areas in need of pressure betterment, growth information is gathered from customers, builders, city, county, and state agencies. In addition, SDG&E collects data from

electronic pressure data recorders. This information is used to run model simulations on system flow and identify capacity constraints. Based on analysis of these constraints, region engineering personnel identify specific pressure betterment projects and the estimated year in which the project will need to be constructed. The projects are constantly reprioritized as the timelines for new developments change and economic conditions fluctuate. These projects typically involve installing new mains and, when necessary, regulator stations, or upgrading existing mains and regulator stations to a higher pressure.

Pressure betterment capital expenditures support the Company's goals of providing safe, reliable service to customers, thus mitigating the risk of adverse impacts to system reliability. This work category addresses critical areas of the distribution pipeline network that are most susceptible to pressure drops to alleviate the potential risk of loss of service to customers.

b. Forecast Method

SDG&E's gas infrastructure is a large dynamic system of pipelines and pipeline connections, with continual changes in customer load and construction activity. Specific betterment projects are normally identified for a period of less than two years so that the latest load and growth information is used. In addition, the timing to complete each project can be unpredictable due to the need for detailed planning requirements, acquiring the required permits, and coordination and scheduling of resources. Therefore, the cost forecast for the years 2017 through 2019 is based on a historical five-year average of recorded expenditures for the years 2012 through 2016. This average captures the yearly variations in system pressure betterment requirements which vary with constantly changing new construction development schedules, economic conditions, and large customer system impacts. Forecasted expenditures for Pressure Betterment in years 2017, 2018, and 2019 are $1,695,000 per year.

c. Cost Drivers

The main drivers for pressure betterment projects are the growth in gas load as a result of new customers and the increased gas usage of the existing customers. This work supports the Company's need to mitigate system reliability risk and to comply with the Company's obligation to serve. After years of customer growth, many systems operate close to their maximum capacity and additional gas load creates system constraints increasing the need for pressure betterment thus mitigating reliability risk and the potential for customer outages.

As previously discussed, a driver of new customer growth is economic conditions. Thus, as the economic conditions continue to improve over the forecast period,[24] it is reasonable to expect a continued need for pressure betterment improvements.

The underlying cost drivers for the Pressure Betterment capital budget code relate to company labor, contractor services, third party services, paving services and material cost. All or a combination of these construction elements are necessary for performing facility installations for pressure betterment.

E. Distribution Easements (Budget Code 504)

Table GOM-22
San Diego Gas & Electric Company
Distribution Easements

GAS DISTRIBUTION (In 2016 $)				
E. Distribution Easements	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Distribution Easements	12	38	38	38
Total	**12**	**38**	**38**	**38**

1. Distribution Easements

a. Description of Costs and Underlying Activities

This budget code provides funding to obtain gas distribution pipeline and facility easements on private property or public lands. Typical work performed includes completing survey and mapping functions, document research, document preparation, and negotiations for the acquisition of easements to allow for the installation of gas distribution facilities on private property or public lands.

b. Forecast Method

Due to the cost fluctuations from year to year in this budget category, a three-year (2014 through 2016) average was selected as the best method to forecast future costs.

Forecasted expenditures for Distribution Easements in years 2017, 2018, and 2019 are $38,000 in each year.

[24] *Id*.

c. Cost Drivers

The cost driver for this capital budget category relates to the need to acquire easements for SDG&E facilities. Although SDG&E typically installs gas distribution facilities in city franchise locations this it is not always feasible, an example would be an easement through private property.

The underlying cost drivers for this capital work category relate to company labor, contractor services, and documentation fees. All or a combination of these elements are necessary for acquiring easements.

F. Pipeline Relocations - Franchise and Freeway (Budget Code 505)

Table GOM-23
San Diego Gas & Electric Company
Pipe Relocations - Franchise and Freeway

GAS DISTRIBUTION (In 2016 $)				
F. Pipe Relocations - Franchise and Freeway	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Pipe Relocations - Franchise and Freeway	14,952	6,665	6,665	6,665
Total	**14,952**	**6,665**	**6,665**	**6,665**

1. Pipeline Relocations – Franchise and Freeway

a. Description of Costs and Underlying Activities

The Pipe Relocation-Franchise and Freeway budget code provides funding for the required relocation of existing gas facilities when necessitated by public improvements. Generally, the work involves a change in alignment or elevation of existing gas pipelines and associated facilities and is driven by local and state agency requirements. At the local level, SDG&E has franchise agreements that require the gas infrastructure to be moved if it conflicts with city and county projects. These agreements obligate SDG&E to perform this work.

The City of San Diego has been one of the largest drivers of funding required for this budget code. The level of typical relocation work driven by city projects has remained reasonably stable during the 2012 through 2016 timeframe with an increase in railway expansion related relocations. In addition to the City of San Diego's projects, SDG&E serves 17 additional cities and one county within its service territory that also impact this budget code with relocation

projects. Future improvement projects from these municipalities will continue to contribute to the expenditures in this capital account.

These forecasted capital expenditures support compliance with the provisions of applicable third-party utility agreements.

b. Forecast Method

The timing and the number of franchise pipeline projects is driven by outside agencies; therefore, expenditures in this budget category are dependent on the number, extent, and timing of these requests, and are largely outside of the Company's control. However, when projects do occur, SDG&E must complete its portion of the work while minimizing schedule delays for the agencies involved. In addition to typical relocation projects in response to street and highway realignments, sewer pipe replacements, and water line renewals, there has been an increase in railway and mass transit expansion driven pipeline relocation work. In 2015-2016 the Mid-Coast Corridor trolley expansion project required a major relocation of a high-pressure distribution supply line. The supply line had to be relocated due to conflicts with new railway infrastructure and other utilities. Currently, SDG&E is in the early pipeline relocation design stages for the Inland Rail Trail project, another example of mass transit system improvement driven pipeline project. Given the recent experience with pipe relocation projects and the anticipated continuing transit improvement projects, one example being the large Mid-Coast Corridor trolley expansion expense in 2016, a five-year historical average of recorded expenditures for the years 2012 through 2016 best represents the base forecast for the GRC period, 2017 to 2019. This average captures the yearly variations in franchise and freeway relocation requirements as economic conditions and city, and Caltrans (California Department of Transportation) funding fluctuate. Forecasted expenditures for Freeway and Franchise in years 2017, 2018, and 2019 are $6,665,000 per year.

c. Cost Drivers

As previously discussed, franchise relocation projects are driven by the volume and type of construction required in response to the requests of the external agencies, such as the City and County of San Diego, and the California Department of Transportation. These agencies submit requests to relocate pipe that would in its current location, interfere with the planned construction or reconstruction of freeways and public roads. The work in this budget category includes expenditures associated with compliance with the provisions of its utility franchise agreements.

The degree of complexity of each relocation request varies, and often the outside agency's construction schedules change which have a direct impact on SDG&E's costs.

The underlying cost driver for this capital work category relate to company labor, contractor services, third party services, paving services, and materials such as pipe and fittings. All or a combination of these construction elements are necessary for performing franchise and freeway relocation projects for mains, services, and associated facilities.

G. Tools and Equipment (Budget Code 506)

Table GOM-24
San Diego Gas & Electric Company
Tools and Equipment

GAS DISTRIBUTION (In 2016 $)				
G. Tools and Equipment	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Tools and Equipment	2,098	2,219	2,219	2,219
Total	**2,098**	**2,219**	**2,219**	**2,219**

1. Tools and Equipment

a. Description of Costs and Underlying Activities

This budget code captures expenditures for new tools and equipment required by field personnel to construct, operate, and maintain the gas distribution system. New tools and equipment are replaced due to failure, age, and advances in technology. In addition, SDG&E invests in new tools that provide innovative ways of completing the maintenance and repair of its facilities in order to minimize customer disruptions, improve pipeline facility documentation, improve gas system safety, and improve employee safety.

b. Forecast Method

In developing the forecast, historical expenditures for 2012 through 2016 were evaluated. Tool purchase requirements vary year to year and are identified during the year, as part of the regular course of maintenance and construction activities. SDG&E expects routine tool purchases to continue as existing tools and equipment reach their useful life expectancies and the level of construction and maintenance activities increase, adding to the number of new employees that must be equipped with tools and equipment. In addition, increases in other capital and O&M work categories drive the need for personnel and therefore, the tools they use

to perform their job. SDG&E evaluates field tools and equipment based on safety, functionality, cost and quality. Costs are minimized by encouraging sharing between employees and crews when appropriate, and by repairing tools when it is safe to do so. A five-year average was chosen for the base forecast as this average captures the year to year variations in tool purchase requirements. Forecasted expenditures in years 2017, 2018, and 2019 are $2,219,000 per year.

c. Cost Drivers

The main driver for capital tools and equipment purchases is the need to continuously equip SDG&E's employees with safe and reliable tools and equipment. Tools and equipment are used by the distribution field personnel for the maintenance and repair of gas pipeline systems. As previously discussed, SDG&E's tools and equipment are exposed to rigorous environments which impact their useful life. Many of the tools and equipment being utilized in the field and training facilities contain sensitive components that are subject to shock, vibration, rain and dusty conditions which are factors that contribute to the deterioration of the equipment. Furthermore, work increases in other Capital and O&M work categories increase the need for personnel and therefore the tools they will use to perform their job.

Additional cost drivers for this capital work category include expenditures associated with the purchase of capital tools to replace existing tools due to condition, failure, age, advances in technology, and to improve safety and ergonomics. In addition, SDG&E invests in new tools that provide innovative ways of completing the maintenance and repair of its facilities to minimize customer disruptions, improve pipeline facility documentation, improve gas system safety, and improve employee safety.

Furthermore, the RAMP Report identified the need to minimize risk through the purchase of training props to be used in the Skills City at the Skills Training Center to simulate real-world scenarios while qualifying personnel. Tools and equipment purchased and then used in training and qualification of personnel must be identical or very similar in operation to the equipment the employee will be using on the job compliant with GO 112-F.

H. Code Compliance (Budget Code 507)

Table GOM-25
San Diego Gas & Electric Company
Code Compliance

GAS DISTRIBUTION (In 2016 $)				
H. Code Compliance	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Code Compliance	737	2,549	1,149	1,174
Total	**737**	**2,549**	**1,149**	**1,174**

1. Code Compliance

a. Description of Costs and Underlying Activities

This budget code provides funds for upgrades or additions to facilities to maintain compliance with minimum federal safety standards for gas pipelines, 49 C.F.R. §192 and state safety standards under GO 112-F.

There are four main areas that comprise the expenditures represented by the base portion of this budget code and include the following:

- Labor for the Regulator Replacement Program for pre-1982 American Meter Type K-Regulators to be removed in compliance with 49 C.F.R. § 192.197(b);
- Labor and materials necessary for the installation of barricades to protect MSAs from vehicular traffic in compliance with 49 C.F.R. § 192.353(a);
- Labor and materials necessary for the installation of distribution system electronic pressure monitoring devices in compliance with 49 C.F.R. § 192.741(a)-(b); and
- Isolation valves necessary for safe operation of the gas distribution system in compliance with 49 C.F.R. § 192.747.

The four main expenditure components for the base portion of Budget Code 507 are described in more detail below:

i. <u>Regulator Replacement Program</u>

As previously discussed in the Meter and Regulator Materials Budget Code (BC 502), since 1983, SDG&E has been installing regulators that contain an over pressure protection feature. When the regulator senses pressure building within the customer's houseline (i.e., should the pressure level coming out of the regulator increase beyond acceptable levels), this

feature allows the regulator to release the excess pressure through a vent while maintaining an acceptable level of houseline pressure. Regulators installed prior to 1983 (also known as Type K) did not generally possess this feature. In an effort to minimize inconvenience to customers, SDG&E currently replaces these regulators when an employee is on a customer's premises to change the gas meter or when a gas service has been isolated for house pest fumigation as scheduled by the pest control company. The labor cost associated with these regulator replacements are accounted for within this budget code in the historical expenditures. The cost of the regulator material is included in the Meter and Regulator Materials Budget Code (BC 502).

ii. Barricades to Protect MSAs

Another contribution to this budget code's expenditures is the installation of barricades to protect meter sets from vehicular damage. Barricades are installed to protect the MSA from vehicular traffic at existing customer locations in accordance with 49 C.F.R. § 192.353(a) and GO 112-F. The installation of meter barricades creates a more secure environment at the MSA location, which in addition to increasing public safety, results in increased longevity and performance of the MSA equipment. Furthermore, the increased growth in the SDG&E service territory brings increased population density, creating a higher probability for conflicts with vehicular traffic at MSA locations. Recent trends in architecture to maximize saleable square footage have resulted in less room for MSAs, increasing the demand for meter barricades to protect MSAs.

iii. Isolation Valve Installations

The distribution system continues to grow with the installation of gas mains due to new business. With this comes the need for installation of isolation valves for emergency response or safe operation of the system. Frequently these valves are installed with the installation of the new business main. However, due to the complexity of the network of interconnected gas mains, it is necessary to periodically evaluate the system to provide for adequate valve installations for proper system isolation. If a valve is identified through this process to be necessary for safe operation of a distribution system, a valve is installed and expenditures accounted for within this budget code.

iv. Electronic Pressure Monitors

Expenditures are included in this budget code for the installation of electronic pressure monitoring devices in the service territory. Electronic pressure monitors are used by SDG&E to remotely monitor distribution pipeline pressures in support of gas system capacity analysis and as a warning system to communicate pipeline system gas pressures that may be outside of normal limits supporting SDG&E's capability to recognize abnormal operating conditions and meet regulatory reporting timeline requirements should overpressure or under pressure condition occur. The primary purpose of the electronic pressure monitor network is system safety and compliance with 49 C.F.R. § 192.741.

b. Forecast Method

The historical expenditures were evaluated separately for each of the four principal base budget components listed above. In developing this forecast, historical expenditures for 2012 through 2016 were evaluated. Because of the wide range of activities recorded in BC 507, as well as the cost fluctuations from year to year, a three-year average was selected to forecast future costs. Added to this base expenditure level are incremental additions necessary to adequately fund the activities in this workgroup in TY 2019. These additional incremental work elements are described below.

i. EPM Deployment

SDG&E currently has approximately 140 pressure districts, or hydraulically independent systems operating at a common pressure downstream of a single or multiple pressure regulator station. Of these 140 pressure districts, approximately half are large systems serving 99% of the overall customer base, the remaining half of the pressure districts are small systems supplied by a single regulator station serving between 1 and 1,000 customers each. Electronic pressure monitors (EPM's) will be deployed in these remaining 70 gas distribution pressure districts for abnormal operating condition monitoring and reporting purposes. The total forecasted incremental funding for this EPM deployment is $225,000 for 2017 and $225,000 for 2018 and $450,000 for TY 2019.

ii. Replacement of Isolation Valves

SDG&E has discovered 16 problematic critical / curtailment valves in the service territory. These valves are typically utilized to isolate pre-determined isolation zones during a

gas system emergency, and therefore they need to be replaced with state-of-the-art valves. As a temporary workaround, SDG&E has identified alternative methods of control; however, this typically involves additional valve closures or pressure control methods resulting in potentially greater customer impact during an emergency. Therefore, the 16 critical valve replacements are planned for 2017 and 2018. The total forecasted incremental funding for valve replacement is $1,600,000 for 2017 and $200,000 for 2018 with no expense in TY 2019.

Total forecasted expenditures for BC 507, Code Compliance, including the incremental additions in years 2017, 2018, and 2019 are $2,549,000, $1,149,000, and $1,174,000, respectively.

c. Cost Drivers

The Code Compliance budget code is driven by costs associated with each of its principal work components. The main drivers for electronic pressure monitor installations are the need to provide coverage at sites where system pressure is under monitored; and the need to replace existing electronic pressure monitors due to electronic component malfunctions. Meter barricade installation work is driven by conditions surrounding the location of an existing meter set assembly. Meter barricades are installed to protect the MSA when it is apparent that activity on the property creates a potentially hazardous environment to the MSA. The driver for replacing Type-K regulators is the number found while employees perform other work at the MSA. The driver for isolation valves is the number needed for emergency response and for the safe operation of the system.

The underlying cost drivers for this capital work category relate to company labor, contractor services, third party services, paving services, and materials such as pipe and fittings. All or a combination of these construction elements are necessary for performing upgrades or additions to facilities to maintain compliance with minimum federal safety standards for gas pipelines.

I. Replacement of Mains and Services (Budget Code 508)

Table GOM-26
San Diego Gas & Electric Company
Replacement of Mains and Services

GAS DISTRIBUTION (In 2016 $)				
I. Replacement of Mains and Services	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Replacement of Mains and Services	5,618	5,968	16,940	26,226
Total	**5,618**	**5,968**	**16,940**	**26,226**

1. Replacement of Mains and Services

a. Description of Costs and Underlying Activities

Funding in this budget code is required to address compliance requirements for the elimination of potentially hazardous conditions due to leaking or deteriorated gas pipelines. This budget code provides for the replacement of deteriorated Gas Distribution system pipelines to maintain public safety and system reliability. Expenditures in this budget code range from minor pipe replacements to more complex projects. Most minor projects are completed in association with leak investigation and repair work. Other more extensive projects are scheduled as planned replacements based on evaluation of criteria such as observed condition of the pipe, coating deterioration, leak history, age of the pipe, construction methods originally used, and location relative to places of gathering. When the pipe condition is found to be hazardous or the pipeline has conditions similar to pipelines with a history of failures, the field and technical staff determines replacement options.

The forecasted capital expenditures support the Company's goals of maintaining system integrity and reliability, thus mitigating safety and loss of service risks. Additional main replacement funding required in response to federal DIMP regulations is addressed by Ms. Martinez (Ex. SDG&E-11).

b. Forecast Method

In developing the main and services replacements forecast, historical expenditures for 2012 through 2016 were evaluated. Spending in this budget category has fluctuated over this period due to the variation in the number of identified main replacement projects; however, there is a general upwards trend in main replacement spending from 2012 through 2016 due to aging

pipeline infrastructure, increase in city driven projects with long lasting post project moratoriums accelerating pipeline replacement, and refined pipe condition data collection processes from routine field maintenance and construction activities supporting the need for pipeline replacement. Furthermore, the timing of individual projects is based on several factors including the need for review of operating conditions, detailed planning requirements, acquiring the required permits, risk assessment, and coordination and scheduling of resources.

Given the degree of variability observed in the historical expenses for this work category, SDG&E selected the three-year average approach. Therefore, as a foundational forecast, the base forecast of 2017 through 2019 capital expenditures is based on the three-year average for the 2014 through 2016 historical spending pattern. This forecast methodology used best represents the cyclical volume of work qualified on an annual basis and captures the various challenges encountered during the construction of main replacements as well as this work category's dependency on the condition of the pipe as observed during maintenance activities.

Added to this base expenditure level are incremental additions necessary to adequately fund the incremental activities in this workgroup during the GRC forecast period. These incremental additions are described below.

i. RAMP – Risk ID 16[25]/SDG&E Medium-Pressure Pipeline Failure - Early Vintage Steel Replacement

This program is to increase the replacement of pre-1947 non-piggable high-pressure pipelines as well as early vintage medium-pressure steel mains. In early vintage steel mains, cold tar asphaltic wrap was used as the first layer of corrosion protection. Over time, the early generation pipe wrap degrades and disbonds from the pipe, causing cathodic protection current to leave the pipe around the disbanded coating thereby not providing adequate protection. Ultimately, this lack of corrosion protection will lead to increased leakage. This program proactively prioritizes and increases the replacement of early vintage steel pipe.

The projected expenditures for early vintage steel replacement for 2017, 2018, and 2019 are $1,900,000, $5,485,000, and $7,385,000, respectively.

[25] *See* SDG&E's Risk Assessment and Mitigation Phase (RAMP), *Catastrophic Damage Involving Medium-Pressure Pipeline Failure*, Ch. 16 at SDGE 16-15 (Nov. 30, 2016).

ii. RAMP – Risk ID 16[26]/SDG&E Medium-Pressure Pipeline Failure -Pre-1933 Threaded Steel Main Removal

Early vintages medium-pressure steel pipelines were threaded together rather than welded. Prior to 1933, piping in the gas distribution system was joined by treaded couplings. This practice was later abandoned in favor of welding the pipe. The threaded pipe is prone to higher rate of leakage due to susceptibility to corrosion near the threaded joint and offers less corrosion allowance than the standard welded pipe due to the thread cuts. This project is to proactively prioritize and increase the replacement of threaded pipe in the system. The projected expenditures for pre-1933 threaded steel main removal for 2017, 2018, and 2019 are $0, $7,385,000, and $14,770,000, respectively.

Total forecasted expenditures for BC 508, Replacement of Mains and Service, including the incremental additions in years 2017, 2018, and 2019 are $5,968,000, $16,940,000, and $26,226,000, respectively.

c. Cost Drivers

The primary cost drivers in this category are the number of leak indications that can impact the integrity of the pipe leading to pipeline repairs and replacements. Other drivers include:

- compliance with cathodic protection requirements;
- the deterioration of pipe material, pipe wrap, or coating;
- a main found to have active corrosion;
- a pipeline location in relation to population density, such as places of gathering, where a failure presents a potential risk to public safety; and
- a pipeline's condition that is unfit for service due to manufacturing or other defects or construction methods originally used.

The underlying cost drivers for this capital work category relate to Company labor, contractor services, third party services, paving services and material cost. All or a combination of these construction elements are necessary for performing pipeline installations for main replacement work.

[26] *Id*.

Furthermore, the RAMP Report identified the need to increase work activities that mitigate risk through the removal of vintage steel pipelines; removal of pre-1933 threaded steel mains; leak repairs; replacement of pipelines with high leakage rates; and standby and inspections during excavation activities near high-pressure gas mains to prevent damage.

J. Cathodic Protection (Budget Code 509)

Table GOM-27
San Diego Gas & Electric Company
Cathodic Protection

GAS DISTRIBUTION (In 2016 $)				
J. Cathodic Protection	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Cathodic Protection	1,710	1,535	1,741	1,946
2. Cathodic Protection Enhancements (BC12551)	1,094	3,915	3,915	3,915
Total	**2,804**	**5,450**	**5,656**	**5,861**

1. Cathodic Protection and Cathodic Protection System Enhancement

a. Description of Costs and Underlying Activities

The Cathodic Protection budget code includes expenditures associated with the installation of new and replacement CP systems and equipment in accordance with state and federal pipeline corrosion control standards (49 C.F.R. § 192, Subpart I–Requirements for Corrosion Control and GO 112-F). Examples include the installation of impressed current stations, deep well anode beds, magnesium anode systems, and the purchase of CP instrumentation and monitoring equipment.

Buried steel pipelines, not well protected, will corrode and revert to their natural state as iron oxide without proper intervention. Corrosion on pipelines increases the risk for leaks and may reduce the useful lives of the pipelines. In addition to the application of coating and electrical isolation, CP is one method for mitigating external corrosion on steel pipelines. CP combats corrosion by imposing an electric current flow toward the surface of the pipeline, which keeps the pipeline negatively charged (cathodic) with respect to the surrounding soil. This results in reduced corrosion on the pipeline system.

CP system shorts and current interference typically occur as SDG&E's pipeline components come into contact with water lines or with third-party grounding systems that can

drain current from the pipeline; or near customer meter set assemblies and risers, from improperly grounded customer owned electrical systems and dog or bicycle chains wrapped around risers and meter sets, thus reducing the level of protection and depleting anodes. SDG&E continues to identify necessary modifications to CP systems to accomplish this effort. Associated work includes the installation of insulating unions separating CP systems, new rectifiers, anode beds and test points allowing the CP technician to take CP reads.

These forecasted capital expenditures support the Company's goal of preserving the integrity of steel pipelines by protecting them from external corrosion, thus supporting the mitigation of risks associated with infrastructure integrity, system reliability, and public safety.

b. Forecast Method

SDG&E has approximately 3,659 miles of steel main and approximately 267,000 steel services that are cathodically protected. Expenditures in this work category are associated with new installation and replacement of major CP components and equipment to maintain the integrity of the CP system on these mains and services. Expenditures in this area tend to fluctuate depending on the health of surrounding CP stations, soil conditions, and effective resolution of system shorts. The piping infrastructure continues to age, permitting fees are increasing, drilling prices continue to increase, and the need for new or renewed CP stations continues to rise. Furthermore, expenditures in the Cathodic Protection budget code continue to steadily increase as many stations originally installed in the 1970-1990 era are approaching the end of their useful life. CP station splits, renewals, or new additions are required to provide an adequate level of cathodic protection to the aging steel pipeline system.

Given the continuing need to invest in an aging system, a five-year (2012 through 2016) linear trend was selected to forecast future base costs. The forecasted expenditures based on the five-year linear trend for the Cathodic Protection (Budget Code 509) in years 2017, 2018, and 2019, are $1,535,000, $1,741,000, and $1,946,000, respectively.

Added to this base expenditure level are incremental additions necessary to adequately fund the activities in this budget category in the GRC forecast period, 2017 to 2019. These incremental additions are described below.

i. Cathodic Protection System Enhancement

The CP System Enhancement incremental addition (internally identified as budget code 12551) tracks projects specifically associated with creating dedicated high-pressure and medium-pressure distribution pipeline CP systems. Currently, SDG&E CP station coverage areas often include a mixture of high-pressure and medium-pressure pipelines. Typically, CP systems protecting medium-pressure pipelines are more susceptible to shorts compromising CP protection levels. SDG&E has embarked on creating dedicated CP systems for high-pressure pipelines where any adverse conditions due to corrosion pose a higher risk. The Cathodic Protection System Enhancement budget code 12551 was created in 2012 to track projects specifically dedicated to separating high-pressure and medium-pressure CP systems and other specialty CP system improvement surveys above and beyond the typical activities in budget code 509. Since the inception of budget code 12551, SDG&E has identified an increasing number of areas that need dedicated CP systems or CP system improvements. This effort to create isolated high-pressure and medium-pressure pipeline CP systems is an ongoing long-term effort. Since activity in this budget code 12551 aligns closely with budget code 509, it was merged here and identified as an incremental addition to budget code 509. The incremental increase associated with this upward pressure is $3,915,000 in each of the years 2017, 2018, and 2019.

Total forecasted expenditures for Cathodic Protection (Budget Code 509), including the incremental system enhancements (internally identified as budget code 12551) in years 2017, 2018, and 2019 are $5,450,000, $5,656,000, and $5,861,000, respectively.

c. Cost Drivers

As previously discussed, the main driver for Cathodic Protection work is compliance with DOT Regulation 49 C.F.R. § 192, Subpart I, and GO 112-F, which set forth the minimum standards or regulations for corrosion control as well as the need to safeguard the integrity of the pipeline system thus mitigating risks associated with infrastructure integrity, system reliability, and public safety.

The age of the CP system component is also an important cost driver for this work category. As the system components age, their effectiveness decreases, driving the need for additional replacement work. Another work driver is the rate at which anodes deplete, which is impacted by a number of factors including soil moisture and type, electric current interference, and pipe coating effectiveness. An additional driver is the need to protect the distribution

pipeline system by having dedicated, separate CP systems for high-pressure pipelines and distribution pipelines.

The underlying cost driver for this capital work category relates to Company labor, contractor services, third-party services, paving services, and materials. This includes new rectifier (impressed current) sites along with associated anode installations including the necessary CP instrumentation and remote monitoring equipment; anode bed well replacements for existing rectifier systems; as well as installation of surface bed magnesium anode systems. All or a combination of these construction elements are necessary for cathodic protection projects and to maintain the integrity of the pipeline system.

K. Regulator Station Improvements and Other (Budget Code 510)

Table GOM-28
San Diego Gas & Electric Company
Regulator Station Improvements and Other

GAS DISTRIBUTION (In 2016 $)				
K. Regulator Station Improvements and Other	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Regulator Station Improvements and Other	624	1,688	20,509	25,633
Total	**624**	**1,688**	**20,509**	**25,633**

1. Regulator Station Improvements and Other

a. Description of Costs and Underlying Activities

The Regulator Station Improvements and Other budget code provides funding for capital projects (not captured under other budget codes) that improve safety, provide required code compliance, and improve gas system performance or reliability through the replacement of aging gas pipeline system operating equipment. Projects completed under this budget code typically involve upgrades to distribution fittings, valves, regulator stations, relocating regulator stations out of traffic due to growth, and other safety improvements to gas distribution facilities. Regulator Stations are critical components of control equipment on the SDG&E pipeline network that support the mitigation of risks associated with infrastructure integrity, system reliability, and public safety.

Regulator stations, consisting of valves and regulators, reduce and control the pressure of the gas entering the distribution system from higher pressure pipelines to provide the lower pressures used on the distribution pipeline network. Failure of a regulator station could over-pressure or shut down the gas distribution system which may impact customer service or public safety. SDG&E currently operates and maintains approximately 481 regulator stations and installs or replaces approximately three to five stations annually. SDG&E will continue its current practice of replacing deteriorating stations before operations and safety issues arise. These forecasted capital expenditures support the Company's goals of maintaining the safety, integrity, and reliability of the system.

b. Forecast Method

Spending in this budget category fluctuates from year to year due to the variation in the number, complexity, and timing of identified regulator station and system improvement projects. Given the aging of regulator stations and system components, it is anticipated that the general upward spending trend observed from 2012 through 2016 will continue in the GRC forecast period 2017 to 2019. Furthermore, the timing of individual projects is based on several factors including the need for review of operating conditions, detailed planning requirements, acquiring the required permits, risk assessment, and coordination and scheduling of resources. To account for the variation and complexity of projects and associated costs and the continuing need for system renewal, a three-year historical average of recorded expenditures for the years 2014 through 2016 was used to forecast base costs in the GRC period 2017 to 2019. The forecasted base level expenditures based on a three-year average for Regulator Station Improvements and Other in years 2017, 2018, and TY 2019 is estimated to be $762,000 per year.

In addition, added to this three-year average base level forecast are four incremental additions necessary to improve the safety and reliability of the system and reduce risk as identified in the RAMP Report. These incremental additions are described in more detail below:

i. <u>RAMP - Dresser Mechanical Coupling Removal</u>

In the 1920-1930s era, Dresser mechanical couplings were utilized instead of welding on a mixture of distribution and supply lines in the downtown San Diego vicinity. These mechanical couplings are prone to leaks compared to welded pipe, and pose a potential risk of separation in the event of a strong earthquake or exposure of long lengths of the pipeline during routine company, private, or franchise projects in the vicinity. It is estimated that there are

approximately 100 locations where Dresser mechanical couplings need to be removed or encapsulated. This project will follow the review of 195 work orders validating the field locations of these Dresser mechanical couplings. Anticipated expenditures for the Dresser mechanical coupling removal effort for the years 2017, 2018, and TY 2019 are expected to be $926,000, $6,952,000 and $7,876,000, respectively.

ii. RAMP - Oil Drip Piping Removal

The buried oil drip piping facilities are at risk of excavation damage as their location and configuration historically were not captured on facility maps and therefore not marked out as a part of locate and mark requests. Gas Distribution has gathered partial historical oil drip location data and marked the approximate location of these facilities in GIS; however, this effort needs additional validation. This capital project will follow the review of 44 work orders and field validation of above ground and buried oil drip lines and containers. It is estimated that approximately 120 oil drip lines and containers that are no longer necessary will be removed from the system thus improving the safety and reliability of the system as identified in the RAMP Report.

The projected expenditures for the Oil Drip Piping Removal project for 2017, 2018, and TY 2019 are $0, $9,275,000 and $9,275,000, respectively.

iii. RAMP – Replace Buried Piping in Vaults

Any pipe segment, fitting, or valve exposed within a below grade vault is at risk for accelerated atmospheric corrosion due to potential of water accumulation, pipe coating failure, and decreased cathodic protection effectiveness as these components within the vault are not buried and are exposed to the atmosphere. This RAMP incremental addition follows the review of 1,357 work orders determining the locations of all vaults containing medium- and high-pressure facilities and the need for mitigation or replacement. It is estimated that approximately 50 locations will require replacement thus improving system safety and reliability as identified in the RAMP Report. The forecasted expenditures for this incremental addition in years 2017, 2018, and TY 2019 are, $0, $0, and $7,719,000, respectively.

iv. RAMP - Closed Valves Between Medium-Pressure and High-Pressure Systems

SDG&E has identified 51 valves in the closed position which separate high-pressure from medium-pressure systems. This condition is a result of a maximum allowable operating pressure

(MAOP) uprating of a pipeline which was previously interconnected to a distribution system and operated at a lower MAOP. Simply closing and locking the valve between high- and medium-pressure systems is no longer an acceptable practice as there is inherent risk should the valve be operated in error, operated in an act of sabotage, or the valve leak pressure downstream to the lower MAOP system potentially causing an overpressure condition of the downstream system. This project will verify valve locations in the field, excavate, and remove the closed and locked valves currently connecting high-pressure piping to medium-pressure piping thus improving the safety and reliability of the system as identified in the RAMP Report. The forecasted expenditures for this incremental addition in years 2017, 2018, and TY 2019 are $0, $3,520,000, and $0, respectively.

Total forecasted expenditures for Regulator Station Improvements and Other (budget code 510), including the incremental system enhancements in years 2017, 2018, and 2019 are $1,688,000, $20,509,000, and $25,633,000, respectively.

c. Cost Drivers

Work activities within the Regulator Station Improvements budget category are driven by regulatory requirements as well as the need to safeguard the safety and integrity of the pipeline system and mitigate risks associated with infrastructure integrity, system reliability, and the safety of employees and the public.

The underlying cost driver for this capital work category relate to Company labor, contractor services, third-party services, paving services, and materials such as controls, electronics, valves, pipe and fittings. All or a combination of these construction elements are necessary for performing regulator station improvements.

Furthermore, the RAMP Report identified the need to increase work activities that mitigate risk through the excavation and removal/encapsulation of Dresser mechanical couplings; mitigation of pipe corrosion in vaults; removal of unnecessary above ground and buried pipeline oil drip piping components; and excavation and removal of closed valves that connect high-pressure to medium-pressure systems.

L. CNG (Budget Code 553)

Table GOM-29
San Diego Gas & Electric Company
CNG

GAS DISTRIBUTION (In 2016 $)				
L. CNG	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. CNG	2,635	00	2,617	2,617
Total	**2,635**	**00**	**2,617**	**2,617**

1. CNG

a. Description of Costs and Underlying Activities

This budget code provides funds for upgrades or installations of company public access CNG stations. SDG&E recently performed a customer survey at the company owned public access CNG stations. The survey results indicated that while CNG customers viewed the fuel pricing favorably, a better station design comparable to a typical gas station was strongly desired. Customers demanded that CNG stations have multiple fast fill high-pressure capable pumps, adequate driveway space for safe navigation of larger vehicles, and additional lighting for nighttime safety.

Company owned public access CNG stations serve the increasing use of CNG vehicles throughout Southern California both in the private, business, and industrial sectors. These stations are used by private vehicle owners, the City of San Diego refuse trucks, military base vehicles, University of California San Diego buses, and companies such as Red Bull, Republic Services, and several taxi companies.

b. Forecast Method

Spending in this budget category fluctuates from year to year due to the variation in the number, complexity, and timing of identified company public access CNG station installations or station upgrade improvement projects. In developing this forecast, historical expenditures for 2012 through 2016 were evaluated. A zero-based forecast methodology was selected based on the average project cost for a single CNG station project. The forecasted expense represents the construction and installation of one natural gas vehicle (NGV) station per year at additional sites in years 2018 and 2019.

Forecasted total expenses needed to cover the construction of new NGV stations for years 2017, 2018, and TY 2019 are $0, $2,617,000, and $2,617,000, respectively.

c. Cost Drivers

The underlying cost drivers for this capital work category relate to Company labor, contractor labor, contractor services, engineering, pressure testing, third-party services, paving services, and materials such as controls, electronics, compressors, valves, pipe and fittings. All or a combination of these construction elements are necessary for performing CNG station installation or improvements. SDG&E initiated the CNG station upgrade initiative to improve customer experience. The initial effort focused on enhancing all three public-access CNG fueling stations SDG&E operates and SDG&E is looking to continue expanding the number of public access sites going forward.

M. Local Engineering Pool (Budget Code 902)

Table GOM-30
San Diego Gas & Electric Company
Local Engineering Pool

GAS DISTRIBUTION (In 2016 $)				
M. Local Engineering	**2016 Adj. Recorded (000s)**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
1. Local Engineering	9,397	7,247	14,739	20,083
Total	**9,397**	**7,247**	**14,739**	**20,083**

1. Local Engineering

a. Description of Costs and Underlying Activities

The Local Engineering Pool work category provides the labor and non-labor funding for a broad range of services to support Gas Distribution field capital asset construction. This budget code represents the forecasted costs associated with the Gas Distribution Local Engineering Pool. Certain costs are incurred by capital projects that originate from central activities which are subsequently distributed to those capital projects. These central activity costs are also called "pooled" or "indirect" costs. The distribution of these costs is based on a number of factors such as Company labor, contracted services, and Applicant installations. The mechanics of the distribution of indirect costs onto project direct costs, resulting in total project costs, is addressed by Mr. Vanderhye (Ex. SCG-34/SDG&E-32).

The Local Engineering Pool is composed of three cost categories: technical planning, project management, and engineering activities.

i. Technical Planning and Project Management

Technical planning refers to all activities that take place in the Region Technical and Project Management offices in support of a capital project. These support work activities include, but are not limited to, the following:

- Planning the Project – This includes conducting field visits to assess job site requirements; retrieving available drawings for the proposed site to determine construction options; coordination with customers, municipalities and government agencies; selecting material, job specifications and method of installation; developing traffic control procedures and obtaining the required permits.
- Producing Project Drawings – This includes completing drawings required to obtain construction permits that are used by SDG&E and contractor field crews for asset installation and documenting the project in SDG&E records. It also includes updating drawing information following project completion necessary for documenting accurate records in SDG&E's electronic and physical archives.
- Acquiring and Managing Third Party Services – Construction oversight for acquiring third-party services such as paving, steel plates and equipment. This is necessary to provide oversight of third-party services to maintain compliance with Company specifications.
- Estimating Work Order Cost – This includes providing work order cost estimates and cost analysis for each capital project.

ii. Engineering Activities

Included in this pool's expenditures is the work performed by local engineering personnel to perform gas network analysis, develop construction designs and pressure control specifications, and conduct assessments of construction impacts on the reliability of the gas distribution system.

Adequate funding for personnel charging time to the Local Engineering budget code is critical to the execution of capital projects. To prepare a project for field construction, personnel charging this work category initiate, plan, design, and schedule the project for field construction.

Once the job is in construction, field management oversees the crews and is responsible for making field decisions that are compliant with Company standards and policies. After the project has been constructed, there is the remaining task of reconciling the construction as-built information, which also involves the personnel charging to this work category. These forecasted capital expenditures support the Company's goals of promoting public safety, integrity, and reliability of the natural gas system.

b. Forecast Method

Collectively, the level of support activities in the Local Engineering pool can fluctuate with the level of capital construction activity. Generally, the greater the volume of construction activity, the larger the support costs. Because of this relationship, the forecast was developed on a zero-based basis by evaluating the Local Engineering pool's historic capital expenditures with respect to the total direct expenditure across all Gas Distribution capital budget codes except for the Meter and Regulator Materials (Budget Code 502) and the Tools and Equipment Budgets (Budget Code 506). This produced an annual relationship of the percentage of Local Engineering to total direct capital expenditures. The five-year (2012 through 2016) average of this historical ratio was then applied to the forecasted total capital expenditures (less those budget codes discussed above) to determine the 2017, 2018, and TY 2019 forecast for Local Engineering. The forecast was separated into three components: Local Engineering expenditures driven by routine capital work; Local Engineering expenditures for capital projects identified in the RAMP Report; and expenditures to fund the incremental activities identified in this workgroup in the GRC forecast period 2017 to TY 2019.

Forecasted Local Engineering expenditures necessary to support routine capital work in years 2017, 2018, and 2019 are $6,647,000, $6,784,000, and $6,745,000, respectively. Local Engineering expenses needed to support incremental activities identified in the RAMP Report (in budget codes 508 and 510) in years 2017, 2018, and 2019 are $600,000, $6,928,000, and $9,989,000, respectively.

The third cost element that is included in the total Local Engineering forecast is an incremental addition necessary to improve the safety and reliability of the system and reduce risk as identified in the RAMP Report. This incremental addition is described below.

i. RAMP – Risk ID 16/SDG&E Medium-Pressure Pipeline Failure – Cathodic Protection Reliability

SDG&E will develop a model to simulate the status of its cathodic protection system. The model will include the development of a risk algorithm capable of assessing the health of the CP system. This effort will require a detailed CP system evaluation, including the modeling of the 546 CP stations. The CP effectiveness model results will be validated using current, voltage, and soil resistance readings from the field. Once validated, the model will be kept up to date with the latest data from field inspections, with the purpose of anticipating the likelihood of CP station failure and proactively replacing or splitting stations to minimize station down time and associated impact to the level of CP protection on the system. Additionally, the CP model will be utilized to evaluate areas of aging steel pipelines and contribute data to early vintage steel pipe replacement prioritization efforts. The total incremental funding needed for this activity in years 2017, 2018, and 2019 is $0, $1,027,000, and $3,349,000, respectively.

Total forecasted expenditures for Local Engineering, including incremental increases, in 2017, 2018, and 2019 are $7,247,000, $14,739,000, and $20,083,000, respectively.

c. Cost Drivers

As discussed above, collectively, the level of support activities for field capital support can fluctuate with the level of capital construction activity. Generally, the greater the volume of construction activity, the larger the support costs. The underlying cost drivers for this capital budget relate to the necessary capital project support personnel contributing to capital construction. Given this relationship, the cost drivers impacting construction in other Gas Distribution budget codes, as described in the capital section in this testimony, will also impact the Local Engineering pool.

Furthermore, the RAMP Report identified the need for work activities that reduce risk by increasing the level of replacement of aging and non-state of the art steel infrastructure. This in turn drives the need for incremental Local Engineering support.

V. CONCLUSION

SDG&E requests the Commission adopt its TY 2019 forecast of $29,533,000 for Gas Distribution O&M expenses. This is an increase of $3,755,000 over the 2016 adjusted recorded base. This increase is driven by increased agency regulations and requirements, economic conditions, system expansion, infrastructure renewal, field technical skills training and qualification, risk mitigation activities, and integration and support of new tools.

SDG&E further requests the Commission adopt its forecast of $50,665,000, $91,606,000, and $110,993,000, in 2017, 2018, and 2019, respectively. The primary factors influencing the capital forecast are anticipated increases in new business-related activity and pipeline system renewal work.

These forecast expenditures support Gas Distribution's fundamental philosophy of maintaining operational excellence while providing safe, reliable delivery of gas energy at a reasonable cost to customers. The Commission should find this request reasonable in that:

- The activities maintain and enhance the delivery of safe, clean, and reliable service that SDG&E has been providing customers for many years;
- The activities are consistent with laws, operational codes and standards established by local, state, and federal legislators and agencies;
- The activities respond to operations, maintenance, and construction needs associated with projected customer and system growth and demands of cities, counties, and state agencies under the Company's franchise agreements; and
- The forecast amounts are reasonable in light of historical spending and anticipated work increases.

SDG&E faces several challenges affecting both the physical operation of the pipeline system and cost management aspects of its business. Operations and maintenance requirements increase as the system expands; additional maintenance and replacement work is required to continue to maintain reliability of an aging infrastructure; agencies and regulatory bodies continue to impose operating conditions that increase the cost of doing business; and with this all employees must be trained and ready to respond. The forecast presented in this testimony reflects SDG&E's best judgment of work and the associated costs required to:

- Operate and maintain its gas distribution system in a manner that safeguards the safety of the public and employees.

- Construct new gas distribution facilities in accordance with the Company's obligation to serve and to maintain system reliability.
- Replace existing facilities that are experiencing deterioration to safeguard infrastructure integrity and public safety.
- Respond to customer and governmental agency requests to remain in compliance.

Accordingly, SDG&E's TY 2019 forecast is a reasonable estimate of future requirements and should be adopted by the Commission.

This concludes my prepared direct testimony.

VI. WITNESS QUALIFICATIONS

My name is Gina Orozco-Mejia. My business address is 555 West Fifth Street, Los Angeles, California, 90013-1011. I am employed by SoCalGas as Vice President Gas Operations, with dual responsibility for the SoCalGas and SDG&E gas distribution systems. I have been employed by SoCalGas since 1990. I have 27 years of experience in the utility industry. While at SoCalGas, I have held various staff and line positions in the functional areas of Gas Distribution Field Operations and Technical Services, Gas Engineering, Gas Operations Services, Gas System Operations and Human Resources.

My present responsibilities include providing leadership to a team of professionals responsible for the safe and reliable delivery of gas energy through the distribution pipeline network, including the operation, maintenance, installation, and replacement of the gas distribution system at SoCalGas and SDG&E. I also provide leadership for a group that provides technical support for gas distribution project management and construction activities. This includes gas distribution planning and system design; emergency preparedness, response and recovery; the preparation and management of O&M and capital budgets; and implementing large-scale distribution integrity projects.

I earned a Bachelor of Science Degree in Electrical Engineering from California State University, Los Angeles and an Executive Masters of Business Administration from Claremont Graduate University.

I sponsor the TY 2019 GRC testimony for SDG&E's Gas Distribution O&M expenses and capital spending plan.

I have previously testified before the Commission.

LIST OF ACRONYMS

BC	Budget Code
Caltrans	California Department of Transportation
CBT	Computer terminal based training
C.F.R.	Code of Federal Regulations
CIAC	Contributions In Aid of Construction
CMP	Corrective Maintenance Program
CNG	Compressed Natural Gas
CP	Cathodic protection
CPUC	California Public Utilities Commission
DIMP	Distribution Integrity Management Program
DOT	Department of Transportation
EPM	Electronic pressure monitors
FOF	Fueling our Future
FUS	Field Utility Specialist
GGIS	Gas Graphical Information Systems
GIS	Geographic Information System
GO	General Order
GRC	General Rate Case
ICS	Incident Command System
M&R	Measurement and Regulation
MAOP	Maximum allowable operating pressure
MSA	Meter set assembly
NGV	Natural Gas Vehicle
NRF	National Response Framework
NTSB	National Transportation Safety Board
O&M	Operations and Maintenance
OFER	Operational Field & Emergency Readiness
OpQual	Operator Qualification
PHMSA	Pipeline and Hazardous Materials Safety Administration
PPE	Personal Protective Equipment

psi	Pounds per square inch
PSMS	Pipeline Safety Management System
RAMP	Risk Assessment Mitigation Phase
SB	Senate Bill
SDG&E	San Diego Gas & Electric Company
SME	Subject matter expert
SMYS	Specified Minimum Yield Strength
SoCalGas	Southern California Gas Company
TSA	Technical Services Assistant
TY	Test Year
USA	Underground Service Alert

SDG&E 2019 GRC Testimony Revision Log –December 2017

Exhibit	Witness	Page	Line or Table	Revision Detail
SDG&E-04	Gina Orozco-Mejia	GOM-7	22-28	Clarifying that SDG&E will propose a risk-assessment based, more cost-effective alternative to a system-wide three-year leak survey cycle in its SB 1371 Compliance Plan filing in March 2018.
SDG&E-04	Gina Orozco-Mejia	GOM-8	Table GOM-01A	Changed Summary Total for RAMP embedded costs for Risk ID SDG&E-3, based on revision of embedded costs in 1GD000.001 – Leak Survey. Changed from "$4,237" to "$3,148" for 2016 Embedded Base Costs and Total. These changes resulted in Total O&M changes from "$14,608" to "$13,519" and "$15,704" to "$14,615."
SDG&E-04	Gina Orozco-Mejia	GOM-13	Table GOM-01E	Changed Summary Breakdown Table for RAMP embedded costs for Risk ID SDG&E-3 and SDG&E-16. For Risk ID SDG&E-3, the 2016 Embedded Base Costs in 1GD000.001 – Leak Survey changed from "$1,300" to "$211," resulting in changes to Total. For Risk ID SDG&E-16, leak repairs included in 1GD000.001, Field O&M - Leak Survey moved to 1GD000.003, Field O&M – Main Maintenance ($1,250), resulting in an added line item.
SDG&E-04	Gina Orozco-Mejia	GOM-34	2-8	Clarifying that SDG&E will propose a risk-assessment based, more cost-effective alternative to a system-wide three-year leak survey cycle in its SB 1371 Compliance Plan filing in March 2018.
SDG&E-04	Gina Orozco-Mejia	GOM-74	Footnote 23	Footnote 23 added, CIAC exclusion