Company: Southern California Gas Company (U 904 G)
Proceeding: 2019 General Rate Case
Application: A.17-10-008
Exhibit: SCG-09-R

REVISED

SOCALGAS

DIRECT TESTIMONY OF DEANNA R. HAINES

(GAS ENGINEERING)

December 2017

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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LIST OF ACRONYMS

SUMMARY

GAS ENGINEERING (In 2016 $)			
	2016 Adjusted-Recorded (000s)	TY 2019 Estimated (000s)	Change (000s)
Total Non-Shared Services	7,786	12,226	4,440
Total Shared Services (Incurred)	9,437	14,403	4,966
Total O&M	**17,223**	**26,629**	**9,406**

GAS ENGINEERING (In 2016 $)				
	2016 Adjusted-Recorded (000s)	Estimated 2017 (000s)	Estimated 2018 (000s)	Estimated 2019 (000s)
Total CAPITAL	**12,583**	**12,622**	**13,361**	**14,101**

The purpose of Gas Engineering is to establish and oversee the engineering aspects of the gas infrastructure for satisfying federal and state environmental and safety requirements; for implementing industry best practices; and for optimizing infrastructure and end-use equipment performance for both Utilities. Gas Engineering supports all groups within both Southern California Gas Company (SoCalGas) and San Diego Gas & Electric (SDG&E) (jointly referred to as "the Utilities") that need engineering support or guidance related to the gas infrastructure or end-use equipment including but not limited to the key operating groups such as Transmission, Distribution, Storage, and Customer Services. Gas Engineering provides engineering programs, training, guidance, policies, designs, and data analytics focused on providing safe, compliant, reliable, resilient and cost-effective energy infrastructure for both Utilities. Gas Engineering also manages the land services and right-of-way function and related capital for SoCalGas.

These activities are described in this testimony under the following broad categories:

- Gas Engineering: Gas Engineering provides technical and engineering support and oversight to various groups at both Utilities. The department establishes programs and policies to facilitate compliance with the multitude of state and federal regulations related to the engineering issues around design of pipe and their appurtenances, compressors, instrument and controls, and other gas facilities. Gas Engineering also performs testing for gas and material quality to ensure they meet specifications, regulatory requirements and contractual obligations. This testimony supports the capital and operations and

maintenance (O&M) GRC requests for, but not limited to, nondestructive testing program for verifying integrity of pressure vessels and pipeline welds; the development of engineering data analytics to optimize performance of the system; and, the cross-utility initiatives and programs such as natural gas vehicle (NGV) station maintenance, meter and regulator technical support, and the engineering that supports compliance with state and federal safety and environmental regulations such as those related to cathodic protection or California Air Resources Board's Assembly Bill (AB) 32 (aka Global Warming Solutions Act of 2006).

- Land Services and Right-of-Way: The Land and Right-of-Way group manages the necessary property rights that allow for the access, operation, and maintenance of our pipeline infrastructure on public and private properties. This group is responsible for the complex discussions related to the renewal of the expiring rights-of-way for three transmission lines and distribution facilities located on the Morongo reservation. Cost recovery for the Morongo Right-of-Way renewal activities, which are directly related to SoCalGas' service, can be best managed by implementing a two-way balancing account because while SoCalGas can reasonably forecast it will incur costs in the upcoming GRC cycle to maintain operation of these lines, there is still material uncertainty on what those activities and related costs will be. A separate memorandum account for pre-construction costs related to a complete transmission relocation around the Morongo reservation is also proposed.
- Research, Development and Demonstration (RD&D): This area addresses the gas operations research, development and demonstration programs that can mitigate environmental impacts, enhance safety, increase reliability or optimize the gas infrastructure.
- Gas Engineering-Related Capital for Transmission and Storage: This area addresses the capital investments in tools, equipment, land rights, and the Supervision and Engineering Pool that support operations to provide safe, resilient and reliable delivery of natural gas to customers at a reasonable cost.

REVISED SOCALGAS DIRECT TESTIMONY OF DEANNA R. HAINES (GAS ENGINEERING)

I. INTRODUCTION

A. Summary of Gas Engineering Costs and Activities

My testimony supports the Test Year (TY) 2019 forecasts for O&M costs for both non-shared and shared services for both Utilities. My testimony also supports the capital costs for the forecast years 2017, 2018, and 2019 associated with the Gas Engineering area for SoCalGas. Table DRH-1 summarizes my sponsored costs. Costs in this testimony are presented in 2016 dollars, unless otherwise noted. In addition to this testimony, also refer to my workpapers, Exhibits SCG-09-WP (O&M) and SCG-09-CWP (capital), for additional information on the activities described here.

Table DRH-1
Southern California Gas Company
Test Year 2019 Summary of Total Costs

GAS ENGINEERING O&M (In 2016 $)			
	2016 Adjusted-Recorded (000s)	TY 2019 Estimated (000s)	Change (000s)
Total Non-Shared Services	7,786	12,226	4,440
Total Shared Services (Incurred)	9,437	14,403	4,966
Total O&M	**17,223**	**26,629**	**9,406**

GAS ENGINEERING CAPITAL (In 2016 $)				
	2016 Adjusted-Recorded (000s)	Estimated 2017 (000s)	Estimated 2018 (000s)	Estimated 2019 (000s)
Total CAPITAL	**12,583**	**12,622**	**13,361**	**14,101**

The purpose of Gas Engineering is to establish and oversee the engineering aspects of the gas infrastructure for satisfying federal and state environmental and safety requirements; for implementing industry best practices; and for optimizing infrastructure and end-use equipment performance for both Utilities. Gas Engineering supports all groups within both Utilities that need engineering support or guidance related to the gas infrastructure or end-use equipment including but not limited to the key operating groups such as Transmission, Distribution, Storage, and Customer Services. Gas Engineering provides engineering programs, training, guidance, policies, designs, and data analytics focused on providing safe, compliant, resilient,

reliable and cost-effective energy infrastructure for both Utilities. Gas Engineering also manages the land services and right-of-way function and related capital for SoCalGas.

To better understand the expansiveness of Gas Engineering's areas of responsibility, a brief description of the SoCalGas' and San Diego Gas & Electric's (SDG&E's) gas operations and the size of both natural gas systems is provided. The map in Figure DRH-1 depicts the extent of both Utilities' gas operations.

SoCalGas System Overview

The SoCalGas natural gas system encompasses transmission pipelines, underground storage fields, and distribution pipelines. The SoCalGas gas system is comprised of approximately 3,455 miles of transmission pipeline, 11 compressor stations and four underground storage fields. The system is designed to receive natural gas from interstate pipelines and various California production sources from both offshore and onshore. The gas quantity is measured, analyzed for quality, and then allowed to flow through the pipeline network. This pipeline quality gas is delivered to the Company's distribution system, gas storage fields, and non-core customers.

The SoCalGas distribution system is comprised of approximately 100,000 miles of mains and service lines and 5.9 million meters[1]. SoCalGas is the largest natural gas distribution operation in the United States based on miles of mains and miles of services, providing service to twelve counties.

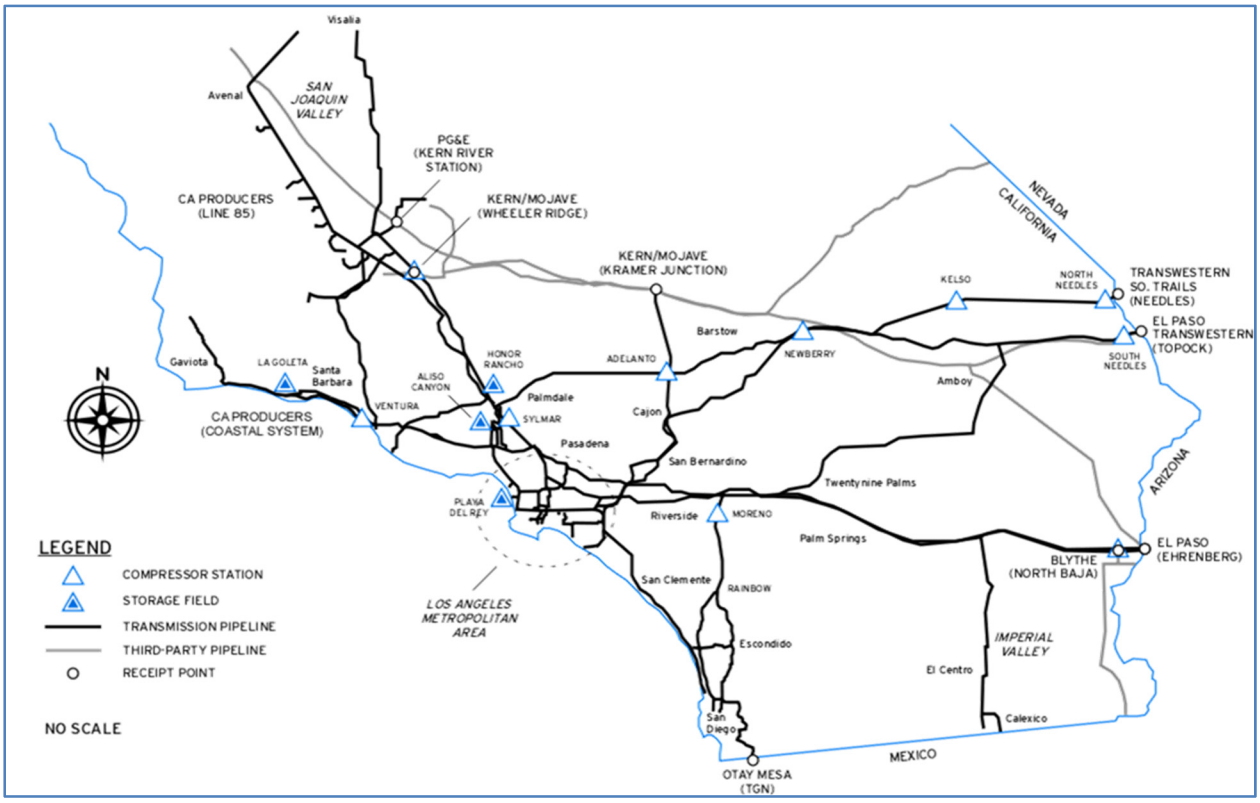
SoCalGas operates four underground storage fields that are an integral part of the SoCalGas system and mitigate reliability risks by providing natural gas when flowing supplies are temporarily insufficient to meet customer load. Collectively, the storage fields support the mission to provide southern California residents and businesses with safe, resilient, reliable, and cost-effective energy.

SDG&E Gas System Overview

SDG&E's Gas Distribution and Transmission operating units collectively operate approximately 225 miles of transmission pipeline and approximately 15,000 miles of mains and service lines. Collectively, these components allow SDG&E to deliver natural gas from receipt point to customer reliably and safely.

[1] *See* www.socalgas.com/about-us/company-profile.

Figure DRH-1
Southern California Gas Company
Southern California Gas Company and San Diego Gas & Electric
Natural Gas System



Collectively, these components enable SoCalGas and SDG&E to deliver natural gas from receipt point to burner tip reliably and safely to over 25.2 million consumers in an area of approximately 24,100 square miles stretching from Visalia in the north to Mexico in the south, and as far east as the California-Arizona border.

Gas Engineering's key activities and programs are described in my testimony under the following broad categories:

- Gas Engineering: Gas Engineering provides technical and engineering support and oversight to various groups at both Utilities. The department establishes policies to facilitate compliance with the multitude of state and federal regulations related to the engineering issues around design of pipe and their appurtenances, compressors, instrument and controls, and other gas facilities. Gas Engineering also performs all required testing on the system for gas and material quality. For example, Gas Engineering is responsible for nondestructive testing program and for verifying integrity of pressure

vessels and pipeline welds. As another example, Gas Engineering develops engineering data analytics to optimize performance of the system. Gas Engineering is responsible for cross-utility initiatives and programs such as natural gas vehicle (NGV) station maintenance, meter and regulator technical support, and engineering related issues to comply with environmental regulations such as California Air Resources Board's AB 32[2] greenhouse gas program. Gas Engineering also plays a key role in implementing Transportation Security Administration (TSA) guidelines for managing physical security of critical energy infrastructure. Further, Gas Engineering oversees the geohazard and climate adaptation programs to support resiliency of the system. The physical security, climate adaptation, geohazard programs, as well as engineering records management are further discussed in the Risk Assessment Mitigation Phase (RAMP) section of this testimony.

- Land Services and Right-of-Way: The Land and Right-of-Way group manages the necessary property rights that allow for the access, operation, and maintenance of our pipeline infrastructure on public and private properties. This group is responsible for the complex discussions related to the renewal of the expiring rights-of-way for three transmission lines and distribution facilities located on the Morongo reservation. Cost recovery for the Morongo Right-of-Way renewal activities, which are directly related to SoCalGas' service, can be best managed by implementing a two-way balancing account because while SoCalGas can reasonably forecast it will incur costs in the upcoming GRC cycle to maintain operation of these lines, there is still material uncertainty on what those activities and related costs will be. A separate memorandum account for pre-construction costs related to a complete transmission relocation around the Morongo reservation is also proposed.
- Research, Development and Demonstration (RD&D): The Gas Operations' RD&D program has the goal to develop, test, and introduce new technologies used in gas operations beneficial to ratepayers, public safety, and the environment. A major portion of SoCalGas' RD&D activities focuses on collaboration with many governmental and

[2] Assem. Bill No. 32 (2005-2006 Reg. Sess.), "Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006."

private organizations to fund research development and demonstration projects of mutual interest. These collaborative RD&D efforts provide significant financial benefits through cost sharing while also increasing the probability of technical and commercial success by tapping into the collective wisdom and experience of all participating organizations.

Key collaborative organizations are: Department of Energy (DOE), California Energy Commission (CEC), Operations Technology Development (OTD), Pipeline Research Council International (PRCI), California Air Resources Board (CARB), NYSEARCH/NGA (Northeast Gas Association), national labs (e.g., Jet Propulsion Laboratory), and universities (e.g., Stanford, University of California Irvine, Caltech). SoCalGas conducts research and partners to support state and federal policy goals broadly ranging from climate change to operational integrity and efficiency. SoCalGas supports the goals of agencies such as the California Public Utilities Commission (CPUC), the CEC, the CARB, DOE, and the Pipeline and Hazardous Materials Safety Administration (PHMSA). For example, SoCalGas and SDG&E have been instrumental in supporting the Climate Change Adaptation program that is sponsored by the CEC.

SoCalGas is also supporting CARB in establishing a better emissions profile at its meter set assemblies. SoCalGas is working indirectly with DOE on methane sensor research. Further, we are working with environmental groups, such as the Environmental Defense Fund, supporting research on methane emissions from the natural gas value chain.

SoCalGas recently presented to the National Academy of Science the results of our Advanced Meter analytics, which is helping to find and quantify leaks downstream of the gas meter. SoCalGas is investigating and researching a range of engineering data analytics tools (e.g., machine learning) that may access and derive value from the internal and external data sources. These tools may be used to create predictive and prescriptive models that may help evaluate the health of related gas assets and recommend actionable steps to optimize engineering outcomes.

- Gas Engineering-Related Capital for Transmission and Storage: This discussion details capital needed for acquiring essential tools, equipment, land rights, and the Supervision and Engineering Pool that support Transmission and Storage operations.

- Renewable Gas (RG): Gas Engineering is supporting an increasing number of RG projects and initiatives through design of interconnect facilities, gas quality evaluation, and assessment of system capability to receive RG sources. Examples of the increasing number of RG projects include biogas from landfills, waste treatment facilities and dairy farm operations (SB 1383[3]).

SoCalGas and SDG&E take a shared-service approach to many natural gas pipeline operator responsibilities, especially in Gas Engineering. The shared-service approach benefits both Utilities and their ratepayers by enabling the Utilities to pool their collective knowledge, experience, engineering expertise and intellectual property.

In preparing the Test Year 2019 (TY 2019) forecast for this testimony, a review of historical spending and an assessment of future requirements was conducted. Because of the mature nature of the activities, most of the forecasts rely upon a five-year (2012 through 2016) average. In total, SoCalGas requests the Commission adopt a TY 2019 forecast of $26,629,000 for Gas Engineering O&M expenses, which is composed of $12,226,000 for non-shared service activities and $14,403,000 for shared service activities. SoCalGas also requests the Commission adopt forecast capital expenditures for years 2017, 2018, and 2019 of $12,622,000, $13,361,000 and $14,101,000, respectively.

B. Summary of Safety and Risk-Related Costs

Certain costs supported in my testimony are driven by risk mitigation activities described in SoCalGas and SDG&E's November 30, 2016 Risk Assessment Mitigation Phase (RAMP) Report.[4] This testimony is sponsoring incremental costs associated with Records Management and Climate Change Adaptation and capital investments related to Catastrophic Damage Involving High-Pressure Pipeline Failure. How these risks are driving costs in Gas Engineering are described in the RAMP portion of this testimony and each individual workpaper group.

[3] Sen. Bill No. 1383 (2015-2016 Reg. Sess.), "Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills."

[4] 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. *Available at*: https://socalgas.com/regulatory/I16-10-016.shtml. Please refer to the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively) for more details regarding the SoCalGas RAMP Report.

O&M-related RAMP costs and capital-related RAMP costs are summarized in Tables DRH-2 and DRH-3 respectively.

Table DRH-2
Southern California Gas Company
Summary of O&M RAMP Overlay

GAS ENGINEERING (In 2016 $)			
RAMP Risk Chapter	**2016 Embedded Base Costs (000s)**	**TY 2019 Estimated Incremental (000s)**	**Total (000s)**
SCG-8 Records Management	5,442	522	5,964
SCG-9 Climate Change Adaptation	230	1,290	1,520
Total O&M	**5,672**	**1,812**	**7,484**

Table DRH-3
Southern California Gas Company
Summary of Capital RAMP Overlay

GAS ENGINEERING (In 2016 $)			
RAMP Risk Chapter	**2017 Estimated RAMP Total (000s)**	**2018 Estimated RAMP Total (000s)**	**2019 Estimated RAMP Total (000s)**
SCG-4 Catastrophic Damage Involving High-Pressure Pipeline Failure	2,245	2,245	2,245
Total Capital	**2,245**	**2,245**	**2,245**

C. Summary of Aliso Related Costs

In compliance with D.16-06-054,[5] the Aliso Incident Expenditure Requirements testimony of Andrew Steinberg (Exhibit SCG-12) describes the process undertaken so the 2019 Test Year forecasts do not include the additional costs from the Aliso Canyon Storage Facility gas leak incident (Aliso Incident), and demonstrates that the itemized recorded costs are removed from the historical information used by the impacted GRC witnesses.

As a result of removing historical costs related to the Aliso Incident from Gas Engineering adjusted recorded data, and in tandem with the forecasting method(s) employed and described herein, additional costs of the Aliso Incident response are not included as a component

[5] *See* D.16-06-054, (Conclusions of Law 75) at 324, and (Ordering Paragraph (OP) 12) at 332.

of my Test Year 2019 funding request. Historical Gas Engineering costs that are related to the Aliso Incident are removed as adjustments in my workpapers, Exhibit SCG-09-WP, and also identified in Table DRH-4 below.

Table DRH-4
Southern California Gas Company
Gas Engineering Historical Adjustments to Remove Aliso Incident Costs

GAS ENGINEERING (In 2016 $)			
Workpaper	**2015 Adjustment (000s)**	**2016 Adjustment (000s)**	**Total (000s)**
2EN000.000, GAS ENGINEERING ANALYSIS CENTER, NGV and ELECTRICAL FIELD MAINTENANCE	-5	-99	-104
2EN001.000, LAND SERVICES & RIGHT OF WAY	0	-53	-53
Total Non-Shared Services	**-5**	**-151**	**-156**
2200-0300.000, DIR ENG & TECH SERVICES	0	-7	-7
2200-0309.000, MRC MANAGEMENT & SPECIAL PROJECTS	0	-4	-4
2200-0310.000, MEASUREMENT & DESIGN	0	0	0
2200-0311.000, MEASUREMENT TECHNOLOGIES	0	-4	-4
2200-0320.000, RESEARCH & MATERIALS	0	-43	-43
2200-0320.001, 2200-2300 PIPELINE MATERIALS	0	-30	-30
2200-0323.000, RESEARCH PLANNING & DEVELOPMENT	0	-5	-5
2200-1178.000, ENGINEERING ANALYSIS CENTER - CHEMICAL LAB	-21	-59	-79
2200-2487.000, ELECTRICAL DESIGN	0	-1	-1
Total Shared Services	**-21**	**-152**	**-173**
Total O&M	**-26**	**-303**	**-329**

D. Summary of Costs Related to Fueling our Future (FOF)

As described in the Fueling Our Future Policy testimony of Hal Snyder and Randall Clark (Exhibit SCG/SDG&E-03), the Utilities kicked off the Fueling Our Future (FOF) initiative in May 2016, to identify and implement efficient operations improvements. My testimony addresses FOF initiatives that result in improvements in the Land Services and Right-of-Way department of SoCalGas (See Section III-B-1). These FOF benefits are shown as downward

adjustments to my forecasted costs, thus capturing the benefit to ratepayers. Table DRH-5 provides a summary of the FOF cost efficiencies described in my testimony:

Table DRH-5
Southern California Gas Company
Summary of FOF Costs

GAS ENGINEERING (In 2016 $)			
FOF O&M	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
FOF-Implementation	11	0	0
FOF-Ongoing/<Benefits>	-7	-45	-55
Total O&M	**4**	**-45**	**-55**

II. RISK ASSESSMENT MITIGATION PHASE AND SAFETY CULTURE

A. Risk Assessment Mitigation Phase (RAMP)

Gas Engineering supports SoCalGas and SDGE's enterprise risk management approach by identifying engineering or land services-related risk issues that become part of the risk registry. The process Gas Engineering uses is consistent with other utilities and agencies, and the Securities and Exchange Commission (SEC) guidance[6] issued in 2010 that required that publicly traded companies "consider climate change and its consequences".

To that end, my testimony includes specific risk mitigations identified in three RAMP chapters. Two of the RAMP chapters (SCG-8 Records Management and SCG-9 Climate Change Adaptation) identify incremental expenditure in my testimony and one RAMP chapter (SCG-4 Catastrophic Damage Involving High Pressure Pipeline Failure) is related to capital investments.

SCG-8 Records Management: Part of the SCG-8 Records Management RAMP chapter is included in my testimony and GRC request. It is included because Gas Engineering provides the drafting and designs of the gas infrastructure and gas facilities. For example, Gas Engineering is continuing its material traceability project. The material traceability project allows for the traceability of pipe and related components from initial receipt from a supplier through installation and then will relate the operational maintenance activities until permanent removal from service. This can help to improve compliance with recently passed[7] and/or

[6] *See* Securities and Exchange Commission, *Commission Guidance Regarding Disclosure Related to Climate Change*, 17 CFR Parts 211, 231, and 241 (February 8, 2010), *available at*: https://www.sec.gov/rules/interp/2010/33-9106.pdf.
[7] *See e.g.,* Cal. Pub. Util. Code § 958; *see also* D.11-06-017.

emerging regulations[8] mandating the maintenance of traceable, verifiable, complete, and readily available documentation.

A potential alternative to the records management, discussed above, is to maintain the current records management approach. This alternative is not sustainable because it can hinder SoCalGas' ability to meet recently passed and/or emerging regulations and will not allow SoCalGas to nimbly respond when parts or components have been recalled due to defects. For example, with these new tools we can more readily find the defected part and replace them. See Table DRH-2.

SCG-9 Climate Change Adaptation: The risk mitigations proposed in the Climate Change Adaptation RAMP chapter are included in my testimony and GRC request because Gas Engineering is responsible for the Geological Hazard Mitigation Program that performs the analysis and recommendations related to geological, civil and structural engineering design impacted by weather- and climate-driven events. One example of that responsibility is the recommendation for strain gauges on pipelines that may be vulnerable to landslides and to monitor the landslide areas for movement using sophisticated new tools such as satellite monitoring integrated into our Geographic Information System (GIS).

As an alternative, SoCalGas considered reducing satellite monitoring efforts in favor of static land movement information provided by publicly available government web sites. This data would not indicate actual land movement, but instead would provide information that the area is prone to a landslide. As a result, the data would not be useful for predicting potential failure of pipelines from land movement and thus not helpful for preventing damage to pipelines. See Table DRH-2.

SCG-4 Catastrophic Damage Involving High Pressure Pipeline Failure: Part of the SCG-4 Catastrophic Damage Involving High Pressure Pipeline Failure chapter is included in my testimony and GRC request. It is included because the Engineering Analysis Center within Gas Engineering provides the mandatory 49 Code of Federal Regulations (CFR) 192 Subpart L – Operations requirements to odorize the gas in the gas infrastructure and gas facilities. The

[8] Dept. of Transportation, PHMSA; Notice of Proposed Rulemaking, *Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines*, 81 Fed. Reg. 68, 20722 (April 8, 2016) (codified at 49 C.F.R. Pt. 191 and 192).

capital request in this testimony addresses investments in odorization equipment and techniques for pipeline systems.

An alternative could be to rely on a third party to ensure adequate odorization. However, given the mandatory odorization requirements in 49 CFR Part 192, it is not reasonably viable to rely on a third party for a primary critical safety issue. See Table DRH-3.

B. Safety Culture

As a general matter, Gas Engineering supports SoCalGas and SDG&E's safety culture by developing policies and standards; complying with applicable laws, regulations, and internal policies; designing and building a system that supports safe, resilient and reliable delivery of gas; communicating with stakeholders on engineering-related issues that impact safety; and using data and analytics to help make informed decisions related to infrastructure safety management. Gas Engineering enhances the safety culture by providing this support to gas operations for both Utilities.

More specifically, for example, Gas Engineering supports SoCalGas' and SDGE's safety culture and its objective of a safe, resilient and reliable system by supporting major projects. Major projects can include the Pipeline Safety Enhancement Plan (PSEP), mobile home master meter program, high speed rail, large transmission, distribution and storage projects, and compressor station upgrades. Gas Engineering supports these projects by providing engineering governance on infrastructure designs, hydrostatic testing, and any other related issues on major projects.

Gas Engineering utilizes data and analytics to evaluate the gas system to recommend capital expenditures associated with system improvements. These improvements are driven by the objective to create a safe, resilient and reliable gas system. This data analysis process requires asset, data, document, and analytical systems to capture, monitor, and model asset health. These systems can be used to help prevent and predict likelihood and consequence of an asset failure. The outcome of this analysis is the identification of asset risks and the design and implementation of mitigation efforts.

Finally, Gas Engineering promotes continuous improvements by facilitating Process Hazard Analysis (PHA) where appropriate to ensure designs of equipment are safe. Further, Gas Engineering promotes quality assurance and quality control policies to ensure the gas infrastructure is built to appropriate gas industry standards and best practices. Gas Engineering

performs root cause analysis of incidents and makes recommendations for process, policy or equipment changes.

III. NON-SHARED OPERATIONS AND MAINTENANCE COSTS

"Non-Shared Services" are activities that are performed by a utility solely for its own benefit. Table DRH-6 summarizes SoCalGas' total non-shared O&M forecasts for the listed cost categories.

Table DRH-6
Southern California Gas Company
Non-Shared O&M Summary of Costs

GAS ENGINEERING (In 2016 $)			
Categories of Management	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
A. GAS ENGINEERING	5,680	8,600	2,920
B. LAND SERVICES & RIGHT OF WAY	2,106	3,626	1,520
Total Non-Shared Services	**7,786**	**12,226**	**4,440**

A. Gas Engineering

Included in this section of the testimony are activities and associated O&M expenses to address the core Gas Engineering duties in the (1) Engineering Analysis Center (EAC), in the (2) Measurement, Regulation, and Control (MRC), and in the (3) Engineering Design departments that are strictly non-shared for SoCalGas. The first category includes the EAC and MRC cost centers, and the second category includes the Civil, Structural, and Hazard Mitigation group in the Engineering Design department. These activities and expenses are summarized in Table DRH-7 below and are broken down into two categories.

Table DRH-7
Southern California Gas Company
SoCalGas Non-Shared Gas Engineering Costs

GAS ENGINEERING (In 2016 $)			
A. GAS ENGINEERING	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. EAC, NGV, AND ELECTRICAL FIELD MAINTENANCE	5,538	6,083	545

2. CIVIL, STRUCTURAL, AND HAZARD MITIGATION ENGINEERING	142	2,517	2,375
Total	**5,680**	**8,600**	**2,920**

1. Engineering Analysis Center & Measurement, Regulation, and Control

a. Description

Under the broad category of non-shared Engineering Analysis Center (EAC) and Measurement, Regulation, and Control (MRC), many core engineering activities are performed to maintain safe, resilient and reliable operations and support to the various organizations at SoCalGas. Below is a list of those cost centers:

- 2200-0301 and 2200-1199 - oversight and administration
- 2200-1179 - material and equipment group
- 2200-1180 - air quality and compressor services
- 2200-1200 - applied technologies
- 2200-2265 - field support to perform and maintain safe, resilient, compliant and reliable operation and support to the NGV stations and other facilities such as gasoline fueling stations.

b. Forecast Method

The forecast method developed for this cost category[9] is a five-year average because it best reflects the costs associated with this mature organization and better accounts for the work that ebbs and flows over time. As compared to the 2016 recorded expense, the five-year average corrects for the low recorded expenses, and provides the expected increase in work that cycles over a five-year period. However, SoCalGas anticipates increasing requirements for personnel and non-labor cost in which additional staffing and resources are identified and described in the cost drivers below. These incremental costs have been added to the five-year average.

[9] The forecast in this workpaper is shown in its historically non-shared form. This forecast incorporates new programs and activities that are expected to support both SoCalGas and SDG&E. This workgroup will be reclassified as utility shared services at that time.

c. Cost Drivers

The cost drivers behind this forecast are divided into two aspects. The first aspect is related to new regulations or requirements in the EAC; specifically, Non-Destructive Examination (NDE), RG-related costs, Advanced Meter device evaluation, coating inspector and applicator qualifications, and engine analysis and condition monitoring.[10] The second aspect is related to the increased resources needed to support the increased number of NGV stations. For the breakdown of cost adjustments, refer to my workpaper, Exhibit SCG-09-WP.

2. Civil, Structural, and Hazard Mitigation Engineering

a. Description

This category of non-shared Civil, Structural, and Hazard Mitigation Engineering within the Engineering Design department encompasses the costs and forecast related to ongoing structural engineering design and new hazard mitigation programs. The hazard mitigation programs include but are not limited to mitigation related to geological hazards and climate change related risks. The cost center for this category is 2200-2271.

b. Forecast Method

The forecast method developed for this cost category[11] is a base-year because it best reflects the costs of this Engineering Design group. SoCalGas anticipates increasing mitigation programs to be implemented within this group and therefore additional staffing and resources are identified and described in the cost drivers below. These incremental costs have been added to the base-year. Other forecasting methodologies, including five-year, are not appropriate because Engineering Design is responsible for new enhanced monitoring, specifically satellite monitoring, which did not occur in previous years.

c. Cost Drivers

The cost drivers behind this forecast include resources to manage the Geological Hazard Engineering program, which includes an enhanced seismic mitigation program, strain gauge programs, and Climate Change Adaptation proposed in the RAMP filing. For the breakdown of cost adjustments, refer to my workpaper, Exhibit SCG-09-WP.

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[10] New Regulations and requirements include Sen. Bill No. 1383 and SED's closure letter for the Sempra NDE Compliance Audit GA2014-35.

[11] *Supra* note 9.

B. Land Services and Right-of-Way

Under the category of Land Services and Right-of-Way, there are two main categories discussed for SoCalGas. The first category is the general expenditures in the Land and Right-of-Way department detailed in Table DRH-8, and the second category is the request for (1) a two-way balancing account for the Morongo Right-of-Way renewal efforts and (2) a memorandum account to record pre-construction costs related to analyzing the potential for relocating SoCalGas' lines around the Morongo reservation.

Table DRH-8
Southern California Gas Company
SoCalGas Non-Shared Land Services and Right of Way Costs

GAS ENGINEERING (In 2016 $)			
B. LAND SERVICES & RIGHT OF WAY	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
1. LAND SERVICES & RIGHT OF WAY	2,106	3,626	1,520
Total	**2,106**	**3,626**	**1,520**

1. General Land and Right-of-Way

a. Description

SoCalGas has a vast pipeline network traversing public and privately held lands. The Land and Right-of-Way group for SoCalGas within Gas Engineering manages the necessary property rights that allow for the access, operation, and maintenance of our pipeline infrastructure on public and private properties. Compensation for the property interests needed is provided according to specific provisions of the contractual arrangements that allow for access, operation, and maintenance of our pipeline infrastructure placed on those lands. As part of its business need, SoCalGas provides compensation for these necessary property rights to allow its natural gas assets to traverse both public and private properties. The cost centers for this category are 2200-0315, 2200-2368, and 2200-2472.

b. Forecast Method

The forecast method developed for this cost category both for labor and non-labor is the five-year linear method. This method is most appropriate because the historical data indicate that activities and staffing levels have been steadily increasing, and this trend is expected to

continue. The forecast for non-labor costs includes the Rights of Way lease payments. Other forecast methodologies, such as the five-year average methodology, are not appropriate because they do not account for the steady historical increases such as governmental increases in fee schedules.

c. Cost Drivers

The cost drivers and forecasts contain a high level of uncertainty however historical expenditure in this cost category shows a steady increase. This uncertainty level is often driven by negotiated terms based on contractual arrangements and influenced by the perceived value of the access and possible viable alternatives as well as governmental fee schedule updates. For example, the Bureau of Land Management has a 10-year forecasted fee schedule with the ability to increase fees every five years.

In support of the FOF initiatives discussed in the introduction section of my testimony, the Land and Right-of-Way department identified FOF benefits that have been included in the forecast. These FOF benefits are shown as downward adjustments to my forecasted costs, thus capturing the benefit to ratepayers. The first FOF idea, Idea #660, includes the initiative to create a central database for land and right-of-way mapping surveys collected internally and externally. The second FOF idea, Idea #670, included the benefit of digitized and searchable databases of land right documents, eliminating hard-copy archive cost while optimizing time locating documents. For the breakdown of cost adjustments and benefits, refer to my workpapers, Exhibit SCG-09-WP.

2. Morongo Rights-Of-Way

a. Description and Background

SoCalGas operates three gas transmission pipelines (Lines 2000, 2001, and 5000) that cross federal land held in trust for the Morongo Band of Mission Indians (Reservation) near Cabazon, California, and a gas distribution system located on the Reservation, serving residential and commercial needs of the Morongo Band of Mission Indians (Morongo) pursuant to four existing rights-of-way granted by the Department of the Interior (DOI) through the Bureau of Indian Affairs (BIA).

In 1948 and 1950, the DOI/BIA granted 20-year term rights-of-way to SoCalGas to operate and maintain Lines 2000 and 2001 across the Reservation. In 1968, when SoCalGas

planned the construction of Line 5000 crossing the Reservation, it compensated Morongo by installing a gas distribution system on the Reservation to provide natural gas service to existing residents at the time, in exchange for its voluntary agreement to the DOI/BIA renewing the rights-of-way for Lines 2000 and 2001, as well as two new rights-of-way for Line 5000 and the gas distribution system. The rights-of-way for Line 5000, and the renewals for the rights-of-way for Lines 2000 and 2001, were then approved by the DOI/BIA in 1968 with no additional costs. These four rights-of-way are scheduled to expire as follows:

March 29, 2018	Line 2000
August 21, 2018	Line 5000
March 22, 2020	Line 2001
August 21, 2018	Gas Distribution System

The three gas transmission pipelines are part of the Southern System and transport gas received from interstate pipelines at the Ehrenberg and Blythe receipt points. The Southern Transmission System has a receipt point capacity of about 1.2 billion cubic feet per day (Bcfd), which represents approximately 26% of the total system receipt point capacity. In August of 2011, a temporary pressure reduction was made on Line 2000 reducing the receipt point capacity at Ehrenberg and Blythe receipt points from 1.2 to 1.0 Bcfd.[12] These three gas transmission pipelines are crucial to serving SoCalGas' customers, including Morongo as well as the SDG&E gas delivery system. The pipelines provide a high level of service reliability on the Southern System and are required to serve the needs of SoCalGas' core and noncore customers. Removing these pipelines from service would cause a significant impact on service reliability including reduction of SoCalGas' capacity to serve the SDG&E system and likely curtailment of affected Southern System customers.

In light of the important role these pipelines serve to support system reliability and access to low-cost supplies for its customers, SoCalGas is diligently pursuing the renewal of the expiring rights-of-way. SoCalGas is making every effort to reach a voluntary agreement under reasonable terms and conditions with Morongo, to be approved by the DOI/BIA, for the benefit

[12] *See* SoCalGas ENVOY Critical Notice, "Decrease in Maximum Operating Pressure on Line 2000," August 3, 2011, *available at*: https://scgenvoy.sempra.com/ebb/attachments/1312383620204_Line_2000_Drop_in_Max._Op._Pressure.pdf.

of its gas delivery system and its customers. As of the date this testimony was prepared, SoCalGas and the Morongo Tribe have reached an impasse on the renewal. The following timeline of events chronicles the key events of this renewal effort with Morongo.

In February 2015, SoCalGas and Morongo sought to conduct formal appraisals, in accordance with Department of Interior (DOI)/Bureau of Indian Affairs (BIA) regulations and requirements, to determine the appropriate valuation for the rights-of-way. SoCalGas and Morongo jointly retained a qualified, certified, and licensed independent appraiser to appraise the fair market value of the subject rights-of-way, for the express purpose of providing estimates of the current market value and market rent for the renewal of the existing underground public utility rights-of-way, along with associated access rights, for the SoCalGas transmission lines and distribution system. The appraisals were completed in February 2015, and submitted to Morongo, which then submitted the reports to the BIA/Office of Special Trustee (OST) for approval.

In March 2015, BIA/OST subsequently reviewed and approved the appraisal reports as compliant and consistent with federal regulations and guidelines.

In July 2015, SoCalGas made a formal offer of $6.43 million for a 50-year renewal of the three transmission pipelines (Lines 2000, 2001 and 5000) based on the appraisals. This proposal included a proposed expansion of the width of the rights-of-way for Lines 2000 and 2001 from 16.5 feet to 50 feet, consistent with the width of the right-of-way for Line 5000. This additional footage would provide SoCalGas additional space for operation and maintenance of the lines (including space for adding remote control features on mainline valves) and to restrict building encroachment.

Fifteen months later, in October 2016, Morongo orally rejected SoCalGas' proposed compensation amount as "too low" but provided no explanation. Morongo did not meaningfully engage SoCalGas after repeated attempts by the company to provide additional explanation and a counter-proposal.

Morongo then waited another eight months, until June 27, 2017, to send SoCalGas a letter formally stating that it had rejected SoCalGas' offer, and instead stated that the appropriate price for the renewals was a total of $1.25 billion (nominal) over 50 years ($25 million per year for 50-year renewals of the three rights-of-way), or an upfront payment of $308 million. This demand was far in excess of what is reasonable or just, as it is more than 100 times the appraised

fair market value of the renewals based on the current widths of the rights-of-way. SoCalGas determined Morongo's demand to be excessive and inconsistent with SoCalGas' obligation to provide reliable service at just and reasonable rates to ratepayers.

As of the date this testimony was prepared, and after many formal and informal discussions, SoCalGas and the Morongo Tribe are at an impasse. Therefore, while SoCalGas continues to maintain open lines of communication, the prospects of continued dialogue with Morongo and its agreement to a voluntary renewal of the expiring rights-of-way are uncertain at this time.

b. Memorandum Account for Pre-Construction Costs

Because system reliability may be negatively impacted if SoCalGas is unable to obtain renewals for these rights-of-way, and because the results of any subsequent administrative or legal proceedings are unpredictable, it is possible that SoCalGas could be placed in a position where it must vacate and abandon the segments of transmission pipeline and the gas distribution system within the Morongo Reservation. Therefore, SoCalGas is actively seeking Commission approval to establish a memorandum account to record pre-construction costs associated with the possible pipeline relocation around the Morongo Reservation. On March 10, 2017, SoCalGas filed an amended application to establish Morongo Right-of-Way Memorandum Account (MROWMA), which if granted, will facilitate SoCalGas' efforts to study, design, and make informed decisions regarding potential relocation options, in furtherance of a long-term physical solution to this system reliability need. *See* Application (A.) 16-12-011. The projected decision on that Application is scheduled for the first quarter of 2018.

The stand-alone Application is being contested by several parties who argue in essence that these types of costs should be sought in GRCs. SoCalGas continues to maintain its request for a memorandum account outside the GRC is appropriate from a ratemaking perspective and reasonable in light of the unique and unusual circumstances involving the renewal efforts with Morongo to date; the possibility that a voluntary renewal will not be achieved; and the potential benefits of a relocation solution to better serve the long-term stability, reliability, and cost effectiveness of SoCalGas' system. However, SoCalGas is not certain at this time whether the Commission will authorize the creation of the MROWMA.

In the event the Commission does not grant the requested relief in the stand-alone application, SoCalGas is seeking the same relief in this GRC. Thus, it is seeking authority to

create a MROWMA for purposes of recording pre-construction costs as described in A.16-12-011. If the Commission grants SoCalGas' relief in that proceeding, SoCalGas will withdraw its GRC proposal seeking a MROWMA. Additional testimony on the regulatory accounting for the proposed MROWMA can be found in the Regulatory Accounts testimony of Rae Marie Yu (Exhibit SCG-42).

c. Balancing Account for Costs Associated with Right-of-Way Renewal Activities and Ongoing Operation of Lines

As mentioned above, a proposal for a memorandum account for pre-construction costs, to study possible relocation options, is currently before the Commission in a separate application and in this GRC. SoCalGas is also proposing a separate and distinct regulatory account, the Morongo Right-of-Way Balancing Account (MROWBA), to record and recover costs associated with renewal of the three expiring rights-of-way for Lines 2000, 2001, and 5000, and any pre-construction costs associated with potential relocations within and/or outside of the Morongo reservation that would be incurred as of the beginning of TY 2019. SoCalGas is seeking through this proposal the ability to recover reasonable costs which will be incurred in furtherance of its obligation to serve customers, both in its service territory and those served by the Southern System. These efforts are associated with maintaining long-term stability and reliability of its transmission system.

SoCalGas proposes to include the following category of costs in the MROWBA:

1. Cost for the renewal of the rights-of-way (*i.e.*, renewal payment). If a renewal of the three expiring rights-of-way is achieved, it will involve a payment or payments for the long-term property right. This cost would be recorded in the MROWBA.
2. Potential gas infrastructure modification, additions and/or partial relocation costs (*i.e.*, infrastructure and associated pre-construction costs). To the extent SoCalGas must perform some infrastructure modifications or enhancements to segments of transmission and/or distribution lines to attain and maintain the long-term rights-of-way or relocate, either within and/or outside of the Morongo reservation, these costs, and the relevant pre-construction costs, would be recorded in the MROWBA. The pre-construction costs to be recorded in the balancing account would be distinct from those that would be recorded in the memorandum account (MROWMA) as these pre-

construction costs would be incurred in conjunction with a long-term renewal of the rights-of-way, and not in furtherance of a complete relocation.

3. Costs incurred during renewal discussions with Morongo (*i.e.*, renewal effort costs). SoCalGas may incur costs associated with its renewal effort as of the beginning of the test year. These costs may include, but are not limited to, internal labor, consulting and legal fees, professional services, and Tribal member education and communications in support of renewal. These costs would be recorded in the MROWBA.
4. Additional costs incurred for interim operational period. Should the rights-of-way expire before a renewal is granted, SoCalGas may incur additional costs to access, maintain and operate the pipelines until a longer-term resolution can be reached. These costs would be recorded in the MROWBA.

SoCalGas is proposing that the MROWBA be established as a two-way balancing account, with no associated cost estimate. Additional testimony on the regulatory accounting for the proposed MROWBA is described by Ms. Yu (Ex. SCG-42).

d. Forecast Method

Because ongoing discussions with Morongo are complex, sensitive, and uncertain as to terms, price, and extent of activities to maintain continued operation of the three transmission lines and the distribution facilities located on the Morongo reservation, SoCalGas cannot at this time estimate a cost for the MROWBA. For example, as stated earlier the price range proposals are far apart with SoCalGas offering a one-time upfront payment of $6.43 million compared to Morongo's demanded upfront payment of $308 million which is equivalent to $1.25 billion for annual payments of $25 million over the next fifty years. The beginning balance would therefore be zero, and costs as they are incurred will be recorded in this regulatory account.

e. Cost Drivers

SoCalGas would describe in general terms the cost driver for this proposal to be the need to continue to operate these transmission lines into the test year and beyond under terms and conditions that promote long-term stability of SoCalGas' ability to locate and service these lines, at a reasonable cost.

IV. SHARED OPERATIONS AND MAINTENANCE COSTS

As described in the Shared Services and Shared Assets Billing, Segmentation, and Capital Reassignments testimony of James Vanderhye (Exhibit SCG-34/SDG&E-32), Shared Services are activities performed by a utility shared services department (*i.e.*, functional area) for the benefit of: (i) SDG&E or SoCalGas, (ii) Sempra Energy Corporate Center, and/or (iii) any unregulated subsidiaries. The utility providing Shared Services allocates and bills incurred costs to the entity or entities receiving those services.

I am sponsoring the forecasts on a total incurred basis, as well as the shared services allocation percentages related to those costs. Those percentages are presented in my shared services workpapers, Exhibit SCG-09-WP, along with a description explaining the activities being allocated. The dollar amounts allocated to affiliates are presented by Mr. Vanderhye (Ex. SCG-34).

Under the broad category of Gas Engineering, many core engineering activities are performed to maintain safe, resilient and reliable operations and to support operations and other organizations at SoCalGas. In my testimony, these core engineering activities are divided into the following five groups to provide a clearer overview of the work and development of the forecast:

- Director of Gas Engineering
- Measurement, Regulation, and Control
- Engineering Design
- Engineering Analysis Center
- Gas Operations Research and Materials

Table DRH-9 summarizes the total shared O&M forecasts for the listed cost categories.

Table DRH-9
Southern California Gas Company
Shared O&M Summary of Costs

GAS ENGINEERING (In 2016 $)			
Incurred Costs (100% Level)			
Categories of Management	**2016 Adjusted-Recorded (000s)**	**TY 2019 Estimated (000s)**	**Change (000s)**
A. DIRECTOR OF GAS ENGINEERING	387	808	421

B. MEASUREMENT, REGULATION & CONTROL	4,930	6,648	1,718
C. ENGINEERING DESIGN	2,128	4,376	2,248
D. ENGINEERING ANALYSIS CENTER	1,501	2,133	632
E. GAS OPERATIONS RESEARCH & MATERIALS	491	438	-53
Total Shared Services (Incurred)	**9,437**	**14,403**	**4,966**

A. Gas Engineering Director

1. Director of Gas Engineering (Workpaper 2200-0300)

a. Description

The activities and expenses are those of cost center 2200-0300. This cost center includes expenditures incurred by the Director of Gas Engineering and the organization's administrative and financial support functions. Expenses are typically for gas transmission, underground storage, and gas distribution-related engineering and associated costs of engineering related programs that cross business units or Utilities such as the cathodic protection oversight program or engineering service provider quality management.

b. Forecast Method

The five-year average was chosen because the labor and non-labor expense requirements for these two cost centers have been consistent over recorded historical data. However, SoCalGas anticipates increasing requirements for personnel and non-labor cost in which additional staffing and resources are identified and described in the cost drivers below. These incremental costs have been added to the five-year average.

c. Cost Drivers

Cost drivers for this group include resources for overseeing the administration and strategic direction of the Gas Engineering department. This group also manages engineering programs or projects that span business units or Utilities. For example, this group oversees the identification and implementation of engineering best practices for both Utilities. Specifically, this group has a project manager overseeing best practices and performance of the cathodic protection and leakage abatement programs.

To enhance engineering design and as-built drawings of gas assets, additional resources and non-labor expenditures have been included to support the conversion of standard two-dimensional design applications to a data-centric, three-dimensional (3D) model using state-of-the-art computer-aided design software. The move to the new platform is a transformational modernization of the engineering design system that will provide more intelligent, data-rich drawings that allow queries on the design, detect conflicts, enhance compliance, support material traceability (e.g., following a manufacturer recall), support engineering analysis such as calculating stress forces, facilitate management of change, and integrate with existing work management and GIS systems. The adjustments to the new design process and platform will involve modeling and scanning of existing gas assets and will support the RAMP Records Management risk mitigation as described in the RAMP filing[13].

B. Measurement, Regulation, and Control (MRC)

The MRC shared cost centers are for engineering policy, design, material selection, testing and field support related to measurement, gas regulation, automated control systems for pipelines and compressor stations and other instrumentation for both SoCalGas and SDG&E. Expenses are typically for transmission and gas distribution-related engineering services and associated costs. In my testimony, these core gas measurement, regulation and control activities are divided into the following six workgroups to provide a clearer overview of the work and development of the forecast:

- MRC Management and Special Projects
- MRC Design
- MRC Technologies
- MRC Field Support
- MRC Instrumentation Repair and Field Maintenance
- MRC Standards, Materials and BTU Districts

[13] *Supra* note 4.

1. General Management and Special Projects (Cost Center 2200-0309)

a. Description

This cost center provides the general management and administrative support for approximately 82 employees performing work in shared cost centers 2200-0310, 2200- 0311, 2200-0312, 2200-2248, 2200-0799, 2200-2487, 2200-2488; and for similar support of non-shared cost center 2200-2265. The shared cost centers are for engineering policy, design, material selection, testing and field support related to measurement, gas regulation, automated control systems for pipelines and compressor stations and other instrumentation for both SoCalGas and SDG&E. Expenses are typically for gas transmission and distribution-related engineering services and associated costs.

b. Forecast Method

The methodology used to develop the forecast was a five-year average for both labor and non-labor expenses. This cost center is mature and well-established and the recorded historical data best portrays the ebbs and flows of the work. Thus, the five-year average best represents future expense requirements.

c. Cost drivers

As described in the underlying activities, the cost drivers supporting this cost center is the general management and administrative support to the Measurement, Regulation and Pressure Control group within the Gas Engineering department.

2. MRC Design (Cost Center 2200-0310)

a. Description

The MRC Design group is responsible for the detailed engineering design, planning, policy, equipment standards and consultation activities performed and related to large meter and regulator stations, interstate pipeline interconnections, and pressure protection for pipelines and related automated controls. The workpaper and associated forecast for cost center 2200-0310 also represent the pole maintenance, electrical and control system engineering associated with the design, operation and the related compliance and safety aspects of large gas handling facilities. These engineering services are provided for both SoCalGas and SDG&E. Design, material specifications and policy are typically managed for gas transmission, storage and gas

distribution assets, and this group supports the operational personnel associated with those entities.

b. Forecast Method

The labor expense requirements for this cost center have been consistent over recorded historical data. Thus, the 5-year average was chosen because it best represents the future expense requirements, and because it captures the fluctuations that this cost center can experience. These incremental costs have been identified and added to the 5-year average.

c. Cost Drivers

The cost drivers behind this forecast are the expense requirements and activities stated previously as well as the requirements anticipated for the roll out of Senate Bill (SB) 1383, which include additional staffing and resources. MRC Design is supporting an increasing number of RG projects and initiatives through design of interconnect facilities. Examples of the increasing number of RG projects include biogas from landfills, waste treatment facilities and dairy farm operations (SB 1383).

3. MRC Technologies (Cost Center 2200-0311)

a. Description

The Measurement Technologies group is responsible for testing, evaluation, selection, and deployment of strategic planning and policies and practices associated with gas metering equipment ranging from the smallest residential diaphragm meters to the largest ultrasonic meters and electronic measurement equipment. This work is conducted on behalf of both SDG&E and SoCalGas. This group is also responsible for managing the company's meter and regulator maintenance and inspection scheduling and reporting system, and for providing auditing of company measurement sites to validate compliance with policy and technical specifications. Furthermore, this group is also responsible for conducting engineering studies to determine replacement and performance enhancement strategies for installed measurement infrastructure.

b. Forecast Method

The labor and non-labor expense requirements for this cost center have been consistent over recorded historical data. Thus, the five-year average was chosen because it best represents

the future expense requirements, while addressing the fluctuations that this cost center can experience.

c. Cost Drivers

The cost drivers behind this forecast are the expense requirements and activities, as stated previously, which include testing, evaluation, selection, strategic planning and policies associated with gas metering equipment, ranging from the smallest residential diaphragm meters to the largest ultrasonic meters and electronic measurement equipment.

4. MRC Field Support (Cost Center 2200-0312)

a. Description

This cost center includes measurement field support activities comprised of both the labor and non-labor expenses that provide planning, field support, technical guidance, policy, procedures and training in the areas of large automated control systems for gas compressor stations, pipelines, California producers, metering and regulating stations, and ancillary equipment for both SDG&E and SoCalGas. The gas systems and operational personnel supported include Distribution, Transmission and Storage as well as Customer Services. This cost center also provides field support to maintain over 200 field computers used by Distribution, Transmission and Storage field personnel to program, calibrate and configure electronic field instruments, such as measurement systems, gas chromatographs and programmable logic controllers.

b. Forecast Method

The labor and non-labor expense requirements for this cost center have been consistent over recorded historical data. Thus, the five-year average methodology was chosen as best representing the future expense requirements because it best captures the fluctuations that this cost center can experience. However, due to added upward pressure related to the electronic devices, discussed below, additional staffing and resources were added to the five-year average.

c. Cost Drivers

The cost drivers behind this forecast are the expenses and activities described in the current group as well as the upward pressures associated with increased gas infrastructure monitoring systems such as leakage detection, cathodic protection, and pressure monitoring. In addition, there are resources migrating from capital to O&M as described and planned during the

Advanced Meter project filing. For more details, refer to the Advanced Metering Infrastructure Policy testimony of Rene Garcia (Exhibit SCG-17).

5. MRC Instrument Repair and Field Maintenance (Cost Center 2200-0799)

a. Description

Cost center 2200-0799 includes activities that provide calibration of temperature and pressure gauges and secondary standards (a recognized and acceptable alternative to using the primary calibration standard) used for: field maintenance of gas facilities; field inspection of large metering facilities using bore scoping techniques; maintenance of company gas standards used to test and calibrate gas meters; and the laboratory configuration, programming, testing and repair/assessment of electronic measurement devices used for customer billing. Special meter testing is also conducted on gas meters removed from the field, where safety or other matters are investigated. This cost center also provides for the maintenance, troubleshooting, repair and upgrade of "bell provers" (primary measurement test standards) used by both SDG&E and SoCalGas to test over 100,000 meters annually.

b. Forecast Method

The labor and non-labor expenses for this cost center have been consistent over recorded historical data and this trend is expected to continue. As such, the five-year average methodology was chosen as best representing future expenses.

c. Cost Drivers

The cost drivers behind this forecast are the expenses and activities, which include field labor required for bore scoping and inspection of large metering facilities and maintaining company calibration standards. Additional drivers include labor costs for calibration and configuration of electronic meter correctors, flow computers, and electronic pressure monitors and associated communications equipment; quality assurance of Advanced Meter modules and incoming meters along with asset management activities for adopting new measurement equipment; and identifying inventory requirements for such assets and triggering notifications for procurement.

6. MRC Standards, Materials and BTU Districts (Cost Center 2200-2248)

a. Description

This cost center includes the activities to develop material specification and technical standards for small and medium-sized meter and regulator stations employed by both SoCalGas and SDG&E. Other activities include the management of policy, standards and planning for the measurement of gas heating value (e.g., BTU [British Thermal Unit] Districts) or composition needed for any special reporting and planning in both companies.

b. Forecast Method

The methodology used to develop the forecast was a five-year average for both labor and non-labor expenses because the labor and non-labor expenses for this cost center have been consistent over recorded historical data and this trend is expected to continue.

c. Cost Drivers

The cost drivers behind this forecast are the expense requirements and activities to develop material specification and technical standards for small and medium-sized meter and regulator stations employed by both SoCalGas and SDG&E.

C. Engineering Design

The Engineering Design shared cost centers are for engineering policy and design for both SoCalGas and SDG&E. Expenses are typically for storage, transmission, and distribution-related engineering services and associated costs. The following seven categories are discussed in this section:

- Engineering Design Manager
- Design Drafting
- Process Engineering
- Pipeline Engineering
- Mechanical Design
- Electrical Design
- High Pressure and Distribution Engineering Network Design

Each of these categories are discussed separately except for the discussion of Engineering Design Manager, Design Drafting and Processing Engineering, which are combined.

1. Engineering Design Manager, Design Drafting and Process Design (Workpaper 2200-0318)

a. Description

The Engineering Design manager's cost center has the administrative, managerial and budgetary oversight over the following engineering activities; Design Drafting, Pipeline Engineering, Process Engineering, Mechanical Design, Electrical Design, and High Pressure Distribution Engineering Network Design. The cost center for the Engineering Design manager is cost center 2200-0318, which historically has been a shared cost center. Included within this workpaper are the cost centers for the Design Drafting and Process Engineering groups cost centers 2200-1335 and 2200-0316, respectively. The activities conducted in the Design Drafting group include the use of Computer Aided Drafting (CAD) designs. The Process Engineering group functions as subject matter experts in process engineering systems, and supports the operations, maintenance and design of processing systems and equipment including dehydration units, scrubbers, and vessels in storage fields and transmission systems. The Engineering Design manager's cost center also handles security-related audits by agencies such as the TSA and implementing audit recommendations around the physical security for critical infrastructure.

b. Forecast Method

The five-year average was chosen as the foundation for future labor and non-labor expense requirements. The nature of work performed under these cost centers has proven to be consistent over time, as evidenced by historical data. Further, current activity levels and support functions are expected to continue moving forward. As such, the five-year average is expected to meet future funding requirements and best represents future expense requirements.

c. Cost Drivers

Cost drivers for this group include multiple resources to support upward pressures and efforts related to new data-centric 3D design platform of complex gas facilities, Renewable Gas, and enhanced best practices for RAMP chapter "Records Management Information Management Systems" for design drawings under cost center 2200-1335. Another ongoing cost driver to this category of work is to support the expansion of our Process Hazard Analysis program. Process

Hazard Analysis is a technical and critical review of proposed new equipment or processes that is conducted through a collaborative framework involving field employees (equipment operators) and the design engineers. The review process seeks to identify potential hazards and re-design the hazard out of the proposed process or equipment.

2. Pipeline Engineering (Workpaper 2200-0322)

a. Description

The Pipeline Engineering group, under cost center 2200-0322, assesses new and existing pipelines for transmission, distribution, and storage fields. For existing pipelines, the group assesses various loadings on pipe, such as surface loadings from vehicles and construction equipment. The group also evaluates existing spans and crossings and piping vibration at compressor stations, and pipelines impacted by ground movement. Other tasks include assessment of pipeline operations, including purging, pipeline lowering and maximum allowable operating pressure (MAOP) increases, failure analysis, and the review of transmission lines pressure testing. The group develops and manages pipeline engineering gas standards and procedures and material specifications related to the design, construction, maintenance, pressure testing and operation of pipelines. Pipeline Engineering is closely involved in PRCI to improve pipeline safety in designing new pipelines as well as addressing potential concerns with existing pipe. Examples of research areas include improving assessment of vintage pipelines, seismic and landslide mitigation, fitting integrity, and loading on pipe. It performs annual reviews of Pipeline Engineering O&M standards and updates them as needed. The group sets and updates pipeline engineering policies that provide the required pipe specifications for both Utilities.

b. Forecast Method

The five-year average was chosen as the foundation for future labor expense requirements. The nature of work performed under this cost center has proven to be consistent over time, as evident by historical data. Therefore, current activity levels and program support functions are expected to continue moving forward. As such, the five-year average is expected to sufficiently meet future funding requirements and best represents future expense requirements.

c. Cost Drivers

Cost drivers for this group include the multiple PHMSA activities and decisions that can heighten pipeline design requirements, and changes as reflected in the CPUC's General Order

112-F. It is forecast that these additional, more stringent requirements will have an impact on the organization, but it is believed that any incremental costs will be absorbed within the five-year average.

3. Mechanical Design (Workpaper 2200-0321)

a. Description

The activities provided by the Mechanical Design group include the technical expertise needed to develop and implement mechanical engineering strategies and designs related to transmission and storage facilities, including compressor stations, instrument air systems, exhaust systems, pressure vessels, field piping, fire protection systems, and gas processing facilities.

b. Forecast Method

As the foundation for future labor and non-labor expense requirements, the five-year average was chosen. The nature of work performed by the Mechanical Design department has proven to be consistent over time as evidenced by historical data. It is predicted that the current activity levels and program support functions will be sustained moving forward. As such, the five-year average is expected to meet the future funding requirements.

c. Cost Drivers

Cost drivers for this group include the multiple PHMSA activities and decisions that can heighten pipeline design requirements, and changes as reflected in the CPUC's General Order 112-F. It is forecast that these additional, more stringent requirements will have an impact on the organization, but it is believed that any incremental costs will be absorbed within the five-year average.

4. Electrical Engineering Design (Workpaper 2200-2487)

a. Description

Cost center 2200-2487 captures the activities and expenses associated with the Electrical Design Team. This team designs and produces the documents associated with electric components at both Utilities, such as meters, control valves, and monitoring equipment.

b. Forecast Method

As the foundation for future labor and non-labor expense requirements, base year was chosen because the historical costs and activities of this group were included other Gas Engineering groups. The five-year average methodology was not used because this cost center shifted to Engineering Design from a different department and took on new activities that made the historical data unusable. In addition, incremental adjustments to the base year were included to represent the expense requirements anticipated in test year 2019.

c. Cost Drivers

Cost drivers for this group include new infrastructure electrical designs for the advanced meter system (e.g., Data Collection Units) and the corresponding monitoring, recordkeeping and inspection requirements under General Order 95.

5. High Pressure & Distribution Engineering Network Design (Workpaper 2200-2377)

a. Description

Activities associated with this work group are performed by the Distribution System Engineering Support group. Activities are primarily focused on providing the Distribution region engineering groups with technical, data, and policy support, as well as developing and implementing new technologies to enhance safety, effectiveness, and productivity in those groups. Specific activities include (1) the creation and validation of computer hydraulic models of medium and high pressure pipe Distribution networks, (2) managing and enhancing the company's pressure monitoring programs, (3) developing and providing system design and analysis training to Region Engineering employees, (4) meeting the requirements of SB 1383 and evaluating other renewable gas sources, (5) providing engineering data analytics and performance optimization services on gas assets, and (6) providing project management over a range of other areas, including gas blown to atmosphere, isolation area management, year-end gas inventory calculation and reporting, review and update of company standards, and participation on industry committees.

b. Forecast Method

The 5-year linear forecast method was chosen for the labor in this group because the historical data indicate that activities and staffing levels have been consistently rising and are

expected to continue. Therefore, the most appropriate method to estimate future requirements is the 5-year linear forecast. However, due to the anticipated requirements for a) roll-out of SB 1383 and related capacity studies, and b) enhancing data analytics and performance optimization, additional staffing and resources are required. These incremental costs have been identified and added to the five-year linear forecast.

c. Cost Drivers

The cost drivers behind this forecast are the expense requirements in the current group as well as new activity in two key areas:

(1) Support for an increasing number of RG projects that require an assessment of system capability to receive RG sources. Examples of the increasing number of RG projects include biogas from landfills, waste treatment facilities and dairy farm operations (SB 1383).

(2) The formation of an Engineering Data Analytics and Performance Optimization (EDAPO) program and systems. The EDAPO program and systems represents the Utilities ongoing effort to "…identify and minimize hazards and systemic risks in order to minimize accidents, explosion, fires, and dangerous conditions, and protect the public and the gas corporation workforce."[14] The EDAPO program and related systems are designed to holistically examine the various streams of data being acquired from numerous sensors and sources (e.g., pressure monitors, Advanced Meter readings, cathodic protection data, methane readings, strain gauges). Instead of being reactive, the goal of personnel using EDAPO's tools will be to create an environment in which analytics can potentially detect and proactively respond to trends and interactive effects, mitigate catastrophic failures, identify needs for gas infrastructure reinforcement or opportunities to defer projects, and evaluate the health of gas assets to ensure they are performing optimally, both at the equipment level and system level.

[14] Sen. Bill No.705 (2011-2012 Reg. Sess.), "Natural gas: service and safety." http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201120120SB705.

D. Engineering Analysis Center

1. Engineering Analysis Center – Chemical Section (Workpaper 2200-1178)

a. Description

The Engineering Analysis Center Chemical section provides environmental, gas operation, and British Thermal Unit (BTU) measurement-related testing for both Utilities. These activities include: polychlorinated biphenyl (PCB) analysis and sample management, hazardous material, gas quality policy and operating procedures, gas composition including inert gases through heavier hydrocarbons in the C_6+ range and hydrocarbon and water dew point, simulated distillation through C_{40}+, sulfur gas analysis, odorization management and test development, gas line odor seasoning management and training, gas quality testing including, mobile gas operations test vehicle, BTU measurement, fugitive and leakage gas identification and verification. These activities help verify that safe pipeline quality natural gas is delivered and detect and mitigate undesirable constituents from being transported to the customer's burner tip.

b. Forecast Method

As the foundation for future labor expense requirements, the five-year average was chosen. The nature of work performed by the Engineering Analysis Center department, primarily Operations and Engineering Support for Transmission, Storage and Distribution, has proven to be relatively stable over time. The five-year average best represents the work group's funding requirements. However, new and enhanced regulations are emerging and thus requiring additional staffing and resources to comply. These incremental costs have been identified and added to the five-year average.

c. Cost Drivers

The cost drivers behind this forecast are directly related to new RG producer requirements rooted in Tariff Rule No. 30[15]. The Engineering Analysis Center is supporting an increase in RG projects through evaluation of gas quality from several new RG sources. Examples of the growing number of RG projects include biogas from landfills, waste treatment facilities and dairy farm operations (SB1383).

[15] SoCalGas Tariff Rule No. 30, CAL. P.U.C. SHEET NO. 47193G, "Transportation of Customer-Owned Gas," *available at*: https://www.socalgas.com/regulatory/tariffs/tm2/pdf/30.pdf.

E. Gas Operations Research and Materials

1. Gas Operations Research and Materials (Workpapers 2200-0320, 2200-0320.1, 2200-0323)

a. Description

Gas Operations Research and Materials includes the following cost centers: 2200-0320, 2200-2300, 2200-0323, 2200-0324, and 2200-2067. The Research and Materials team (cost center 2200-0320) manages the activities in cost center 2200-2300 (Pipeline Materials), cost center 2200-0323 (Environmental Research), cost center 2200-0324 (Gas Operations Research), and cost center 2200-2067 (Special Projects). The Pipeline Materials section (cost center 2200-2300) manages the related business processes for the approval, documentation, and quality management of gas pipeline and appurtenance materials. Regulatory requirements (e.g., 49 CFR Part 192) mandate minimum requirements for the selection and qualification of pipe and components for use in pipelines. This includes processes for approving manufacturers that supply specified pipeline materials, which is also integrated into the material approval process. This team coordinates assessments of potential and approved suppliers of pipeline materials and products, and tracks supplier quality performance. This team also supports the minimum levels of materials-related information, such as tracking and traceability requirements that are needed to facilitate effective, long-term management of pipeline data used for system integrity, and future O&M decisions. Cost center 2200-2300 is addressed in workpaper 2200-0320.001. Cost center 2200-2300 was previously non-shared, however, new activities are being implemented to support both Utilities.

Finally, cost centers 2200-0323, 2200-0324 and 2200-2067 provide management and coordination for the Research, Development and Demonstration programs described in section I.E.1 of my testimony. These workgroups participate in research projects related to environmental research with organizations such as Pipeline Research Council International (PRCI) and in gas operations RD&D projects such as methane detection using unmanned aerial systems (a.k.a. drones).

b. Forecast Method

As the foundation for future labor and non-labor expense requirements, a base year forecast was chosen because the historical costs were included other groups, such as Gas

Engineering or Pipeline Integrity. The five-year average methodology was not used because this cost center shifted to Gas Operations Research and Materials from a different department and took on new activities that made the historical data unusable. In addition, incremental adjustments to the base year were included to represent the expense requirements anticipated in test year 2019.

c. Cost Drivers

The cost drivers behind this forecast include the expense requirements described in the activities described in greater detail above.

V. CAPITAL

This chapter of my testimony covers capital expenditures estimated for SoCalGas' Engineering operations for transmission projects related to land rights, capital tools, laboratory equipment, and the local Supervision and Engineering capital pool of overheads. The driving philosophy behind SoCalGas' capital expenditure plan is to provide safe, resilient and reliable delivery of natural gas to customers at reasonable cost. These investments also enhance the efficiency and responsiveness of our gas operations and maintain compliance with applicable regulatory and environmental regulations.

Table DRH-10 summarizes the total capital forecasts for 2017, 2018, and 2019.

Table DRH-10
Southern California Gas Company
Capital Expenditures - Summary of Costs

GAS ENGINEERING (In 2016 $)				
Categories of Management	**2016 Adjusted-Recorded**	**Estimated 2017 (000s)**	**Estimated 2018 (000s)**	**Estimated 2019 (000s)**
A. LAND & RIGHT OF WAY	5,468	5,468	5,468	5,468
B. CAPITAL TOOLS & LAB EQUIPMENT	2,926	2,245	2,245	2,245
C. TRANS & STORAGE SUPERVISION & ENGINEERING POOL	4,189	4,909	5,648	6,388
Total	**12,583**	**12,622**	**13,361**	**14,101**

A. Land and Right-of-Way

1. Land and Right-of-Way (Budget Code 617) and Gas Transmission Buildings and Improvements (Budget Code 633)

a. Description

This category includes Budget Code 617, which provides capital funding for purchases of land or land rights for new high pressure pipelines and for existing rights-of-way that have expired per contractual obligation and need to be re-negotiated. Typically, these are for pipelines installed in private lands. Federal law requires public utility lines occupying private lands to be protected by acquisition of land rights thus protecting the utility and their downstream consumers.

This category also includes Budget Code 633, Gas Transmission Buildings and Improvements. Budget Code 633 provides funding for construction, replacement or upgrades to structures used by Gas Transmission to contain, shelter and/or protect Transmission equipment such as meter stations, pressure regulating equipment, critical valves, or controls equipment. Such protection is required by Federal or local laws, but most often it is required to protect vulnerable and expensive equipment – particularly in remote locations.

Specific details regarding Land and Right-of-Way may be found in my capital workpapers, Exhibit SCG-09-CWP.

b. Forecast Method

The forecast method used is the five-year average of recorded costs in these budget codes. The five- year average was selected because historically it has best represented the capital expenditures projected in this category.

c. Cost Drivers

The underlying cost drivers for Budget Code 617 relate to real estate market conditions, typically driven by supply and demand, and by the overall economic conditions at the time of purchase or re-negotiation. The cost drivers for Budget Code 633 relate to the ongoing requirement for protective structures that shelter critical controls or SCADA-related equipment, for perimeter barriers and reinforced fencing, and for enhanced video monitoring and lock systems.

B. Capital Tools and Lab Equipment

1. Capital Tools (Budget Code 736), Lab Equipment (Budget Code 730), and Measurement Gas Samples (Budget Code 714)

a. Description

Budget Code 736 provides for acquiring and replacing high-value tools used daily by the operating personnel in the Transmission and Storage groups. Examples of such tools include volt/amp meters, Global Positioning System (GPS) receivers, leak detection equipment, gauges, wrenches, and tapping and stopping equipment. Purchases are typically to replace old, worn or damaged tools used in the field.

Budget Code 730 provides for laboratory equipment with which SoCalGas equips the Engineering Analysis Center. This equipment is modern, state-of-the-art laboratory equipment necessary to maintain the Company's ability to perform necessary analysis and evaluation of materials, emissions and technology. Typically, tools used by laboratory personnel are sensitive instruments for measuring a variety of materials, substances and gases including emissions. Other equipment may be ovens, burners, microscopes, scales and handling equipment.

Budget Code 714 provides for laboratory equipment related to the analysis of gas samples.

Specific details regarding Capital Tools and Lab Equipment may be found in my capital workpapers, Exhibit SCG-09-CWP.

b. Forecast Method

The forecast method used is the five-year average of recorded costs in these budget codes. The five-year average is both fair and conservative, and it best represents the capital expenditures projected in this category.

c. Cost Drivers

The underlying cost drivers for this capital cost relate to the specialized nature of tools used in the operation and maintenance of gas infrastructure, and the relatively few suppliers of quality, cost-effective tools and measuring systems. Regulations are already in process requiring equipment upgrades for both pipeline and engine monitoring. Equipment replacement schedules are based on equipment life and past practices. Laboratory-grade equipment will continue to evolve and become increasingly costly. In addition, one cost driver within Budget Code 730 is

linked to RAMP Chapter SCG-4 and addresses investments in odorization equipment and techniques for pipeline systems.

C. Supervision and Engineering Overheads

1. Supervision and Engineering Overheads (Budget Code 908)

a. Description

This budget code provides a pool for Supervision and Engineering charges to be made on a direct basis to this capital category that will then be reassigned to the various budget categories on an indirect basis. Charges reside in this budget category temporarily and are reassigned monthly. Specific details regarding Supervision and Engineering overheads pool may be found in my capital workpapers, Exhibit SCG-09-CWP.

b. Forecast Method

The forecast method used for Supervision and Engineering overheads is the five-year linear because costs in this budget code have been steadily rising with the increase in project complexity and volume.

c. Cost Drivers

The underlying cost drivers for this capital budget code relate to the cost of labor assigned to planning and engineering of capital gas infrastructure projects and the increasing complexity and volume of these projects requiring more oversight and preliminary engineering. Gas Engineering will be supporting projects such as compressor station replacements, fiber optics, and methane detection systems.

VI. SUPPORT FOR OTHER WITNESSES

A. Gas Operations Research, Development and Demonstration (RD&D)

The Gas Operations' RD&D program is managed in the Gas Engineering department and has the goal to develop, test, and introduce new technologies used in gas operations beneficial to ratepayers, public safety, and reduction of emissions. The following testimony provides business justification for the Gas Operations portion of the SoCalGas RD&D program. The Gas Operations' RD&D TY 2019 cost forecast is contained within the overall SoCalGas RD&D program funding request in the Customer Services – Technologies, Policies, and Solutions (referred to as "Customer Solutions") testimony of Lisa Alexander (Exhibit SCG-21).

Gas Operations' RD&D program does not duplicate programs led by State agencies and universities, although SoCalGas may support research projects sponsored by these organizations. For this GRC, we have separated Gas Operations' sponsored testimony from Customer Solutions' RD&D testimony in order to integrate Gas Operations' RD&D goals and objectives with Gas Engineering activities and responsibilities. However, the Gas Operations' RD&D TY 2019 funding request is consolidated in Customer Solutions' total RD&D dollar request to show historic and proposed expenses in a single RD&D Balancing Account.

In 2016, Gas Operations recorded $2.8 million in RD&D expenses, including labor and non-labor charges. The five-year historical average is $2.7 million, and Gas Operations' 2017 RD&D budget is $2.9 million. Actual RD&D spending has fluctuated from one year to the next, due to the developmental nature of research efforts that impacts project milestone and completion schedules.

The strategic goals of Gas Operations RD&D are to develop, demonstrate and deploy innovative technologies that measurably benefit SoCalGas in the areas of: Environmental & safety, operations technologies, system design & materials, and system inspection & monitoring, and compliance with regulatory mandates. Specific technology objectives and proposed project areas include, but are not limited to, continuing research to meet the regulatory requirements of 49 CFR 192, CPUC General Order 112-F, AB 32[16], SB 887[17], and CARB Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities. Examples include ground and aerial leak detection and quantification systems, pipeline material tracking and traceability, renewable gas quality assessment, pipeline and ground movement detection sensors, and internal pipeline robotic technologies. The TY 2019 funding request of $3.45 million reflects an increase of $580,000 relative to the prior funding cycle to support increased activity in the areas of Environmental & Safety, which includes damage prevention, pipeline safety, methane emissions detection and quantification technologies, and System Inspection & Monitoring, which includes pipeline inspection technologies.

Gas Operations' RD&D will continue to derive benefits from its research programs. Recent successes include expanding the capabilities of the Explorer Robotics Inspection System

[16] *Supra* note 2.
[17] Sen. Bill No. 887 (2015-2016 Reg. Sess.), "Natural gas storage wells."

for Unpiggable Pipelines, development of Biomethane Gas Quality Specifications, study on Hydrogen-Natural Gas Blend impact to infrastructure and end-use, refined Methane Emission Factors for pipelines and regulation stations, assessment of Methane Emissions Quantification systems, and Alternative Methods to Hydro-test for Integrity Verification Process.

The Explorer and Tigre robotics inspection systems for unpiggable pipelines demonstrate the value of a long-term RD&D program. Through the NGA/NYSEARCH research collaborative, with significant co-funding from PHMSA, the number of commercially available inspection systems has grown since 2010 and currently the pipe sizes range from 6 to 36 inches. New enhancements, such as circumferential magnetic flux leakage (MFL) and crack sensors for long seam weld inspection, are being developed with field demonstrations planned in the near future. Other ancillary technologies, such as in-situ hardness testing and sensor to inspect pipeline bends are being developed. The NYSEARCH robotic inspection program has a royalty element, based on the licensing of underlying robotic inspection system patents to Invodane Engineering. The Company's ownership shares of net royalties received by NYSEARCH resulted in an initial royalty payment of $4k for pre-2014 activities, which was credited 100% to ratepayers through the RD&D Balancing Account. Royalties have increased to over $27,000 in 2016, due to high demand for the robotics inspection systems.

SoCalGas is requesting $1.1 million in TY 2019 for labor and non-labor expenses related to the project management and milestone reviews performed by individuals in the Gas Engineering Department. See Ex. 21 SCG/Alexander. Subject matter experts and other personnel charge only the portion of time directed to RD&D activities to the program. The complexity and the breadth of technological progress related to RD&D, often found at industry-sponsored technical meetings, require additional company expert resources to match the level of spending requested. By expanding the technical base, subject matter experts become mentors, using RD&D projects and industry meetings as a teaching opportunity. Continuous knowledge transfer is a critical departmental objective, consistent with long-term company goals.

The Gas Operations RD&D Program is categorized into four sub-program areas. A program description and funding summary, and examples of projects under development or recently completed are described below:

Operations Technologies

SoCalGas requests $0.21 million in TY 2019 to develop new technologies that can reduce the cost of operations, maintenance, and construction, and to ensure continued safe, resilient and reliable service. New technologies include innovative field tools, equipment, and processes that will enhance field operations productivity. For example, a major effort to harvest the results of extensive research in polyethylene (PE) piping systems is being pursued under a Gas Technology Institute (GTI) Joint Industry Project (JIP) research project "Polyethylene Systems Research – A Total Quality Approach". Recent industry events have increased the level of scrutiny of PE piping systems and fusion practices. The approach to this JIP is to develop a total quality approach to plastic fusion in which critical fusion process parameters, inclusive of pipe, fittings, surface preparation, fusion equipment, controls and tolerances, would be clearly understood, defined and validated for adoption throughout the industry.

SoCalGas co-funded several items: a) the development of cost-effective repair technologies for non-leaking damaged PE pipes that do not require shutdown, removal and replacement, b) alternative methods of locating PE pipelines with the use of a newly developed Directional Entry Tool that allows a line tracer rod to be inserted internally and directed to travel in either direction, and c) evaluation of advanced cathodic protection systems such as a Fuel Cell powered rectifier.

Environment and Safety

For the Environment and Safety sub-program, SoCalGas requests $0.90 million in TY 2019 to improve customer, employee, and public safety, and to detect/quantify fugitive methane emissions. Specific objectives include the development of advanced systems to identify and mitigate threats to the pipeline system and detect/quantify gas leaks. Also, being developed are safety shutoff devices for aboveground facilities, ergonomic tools, and personal protection equipment for worker comfort and safety.

Through the Operations Technology Development (OTD) and NYSEARCH collaborative research programs, SoCalGas has co-funded several methane emissions research projects from early stage state-of-the-art methane sensor development through Unmanned Aerial System – based leak detection. More specifically, a unique colorimetry approach by BioInspira employs special materials that react to a particular chemical species by changing color. The color changes can be monitored to determine species and concentration with a precise imaging system. Other

methane emissions-related technologies being investigated include Optical Gas Imaging systems, Residential Methane Detectors, vehicle-based Methane Mapping Systems, alternative methods such as flaring and re-capture of the blowdown gas, how a leak evolves overtime due to slow crack growth in PE material, and drone-based leak detection.

Figure DRH-2
Southern California Gas Company
Demonstration of Unmanned Aerial Systems ("Drones")
for Pipeline and Facility Methane Leak and Safety Inspections

Under OTD development are advanced gas shut-off safety systems such as a Breakaway Disconnect Fitting for meter set assemblies and an Intelligent Shut-Off System for commercial/industrial service lines that will immediately shut-off gas flow upon initial damage to the pipeline.

System Design & Materials

For the System Design & Materials sub-program, SoCalGas requests $0.34 million in TY 2019 to advance the reliability, asset life, and efficiency of equipment and systems used in gas utility operations, including medium and high pressure facilities. Projects include advancing and implementing new engineering design standards, improving and assessing the operational efficiencies of gas storage and compressor station assets, and assessing the effects of gas quality from non-traditional sources (biogas and hydrogen-blend) on the gas delivery systems.

Research at PRCI includes: development of a user-friendly, spreadsheet-based computer program to determine safe and effective parameters for lifting and lowering 24-inch through 48-inch diameter pipe in a trench; investigation of High Voltage Direct Current interference risks on gas pipelines and the development of mitigation guidelines; and a multi-year program to address technical concerns and challenges of toxic air quality regulations involving after-treatment pollution controls including oxidation and three-way catalysts.

System Inspection & Monitoring

For the System Inspection & Monitoring sub-program, SoCalGas requests $0.90 million in TY 2019 to include developing technologies and methods for internal inspection of pipelines, and direct and indirect performance monitoring of facilities. Internal robotics inspection system is an example of innovative technologies being pursued in this area. Research at PRCI, NYSEARCH and OTD involves projects to overcome inspection-related challenges, including the development of sensors to accurately detect pipeline anomalies that are currently difficult to characterize (e.g., fine cracks) and a new module that performs hardness testing to estimate pipe yield strength properties from inside a live pipeline.

Other examples include the development of a Cathodic Disbondment Detector, which is a non-intrusive method to locate potential corrosion sites on underground, coated steel pipe before serious metal loss or leaks occur. This development effort has received PHMSA co-funding and will be an essential pre-assessment tool for pipeline integrity assessment activities. Another example is performance validation of an in-line inspection MFL tool for full examination of recently pulled storage field well casing pipe.

VII. CONCLUSION

The SoCalGas forecast of the O&M expenses and planned capital expenditures presented in my testimony balances compliance obligations, risk, as well as the cost to deliver natural gas safely and reliably. The forecast relies principally on five-year averages. In those few cases where a five-year average was not employed, another appropriate methodology was used, such as a base-year projection, because the historical average was not a sufficient basis to reflect the requirements demanding more work and resources.

As a result, SoCalGas requests the Commission adopt SoCalGas' TY 2019 forecast of $26,629,000 for Gas Engineering O&M expenses, which is composed of $12,226,000 for non-shared service activities and $14,403,000 for shared service activities. SoCalGas also requests

the Commission adopt capital expenditure forecasts of $12,622,000, $13,361,000 and $14,101,000 for years 2017, 2018, and 2019 respectively.

In summary, these forecasts reflect sound judgment and represent the impact from higher regulatory expectations to continuously enhance the safety of the SoCalGas natural gas system and provide safe, resilient and reliable natural gas service at reasonable cost. The Commission should adopt the forecasted expenditures discussed in this testimony because they are prudent and reasonable.

This concludes my prepared direct testimony.

VIII. WITNESS QUALIFICATIONS

My name is Deanna R. Haines. My business address is 555 W. Fifth St., Los Angeles, California 90013. My current position is Director of Gas Engineering under the Gas Engineering and Major Projects organization at the Southern California Gas Company (SoCalGas). The Gas Engineering organization provides gas engineering oversight and support to both SoCalGas and SDG&E. I joined SoCalGas in 1988 and have been in my current position since December 2013. Before that date, I was the Director of Environmental Services. I have a Bachelor of Science Degree in Chemical Engineering from University of Southern California and a Master's Degree in Business Administration from University of Redlands. I have previously testified before the Commission.

LIST OF ACRONYMS

ACRONYM	DEFINITION
AB	Assembly Bill
BCFD	Billion Cubic Feet Per Day
BIA	Bureau of Indian Affairs
BTU	British Thermal Unit
CAD	Computer Aided Drafting
CARB	California Air Resources Board
CEC	California Energy Commission
CFR	Code of Federal Regulations
CPUC	California Public Utilities Commission
(D.)	Decision
DOE	Department of Energy
DOI	Department of the Interior
EAC	Engineering Analysis Center
EDAPO	Engineering Data Analytics and Performance Optimization
FOF	Fueling Our Future
GIS	Geographic Information System
GPS	Global Positioning System
GTI	Gas Technology Institute
GRC	General Rate Case
JIP	Joint Industry Project
MAOP	maximum allowable operating pressure
MFL	Magnetic flux leakage
MRC	Measurement, Regulation, and Control
MROWBA	Morongo Right-of-Way Balancing Account
MROWMA	Morongo Right-of-Way Memorandum Account
NGA	Northeast Gas Association
NGV	Natural Gas Vehicle
NDE	Non-Destructive Examination
O&M	Operations and Maintenance

OP	Ordering Paragraph
OST	Office of Special Trustee
OTD	Operations Technology Development
PCB	Polychlorinated biphenyl
PE	Polyethylene
PHA	Process Hazard Analysis
PHMSA	Pipeline and Hazardous Materials Safety Administration
PRCI	Pipeline Research Council International
PSEP	Pipeline Safety Enhancement Plan
RAMP	Risk Assessment Mitigation Phase
RD&D	Research, Development and Demonstration
RG	Renewable Gas
SB	Senate Bill
SDG&E	San Diego Gas & Electric Company
SEC	Securities and Exchange Commission
SoCalGas	Southern California Gas Company
TSA	Transportation Security Administration
TY	Test Year

SCG 2019 GRC Testimony Revision Log – December 2017

Exhibit	Witness	Page	Line	Revision Detail
SCG-09	*Deanna R. Haines*	*DRH-iii*	*n/a*	*Changed "14,511" to "14,403"*
SCG-09	*Deanna R. Haines*	*DRH-iii*	*n/a*	*Changed "5,074" to "4,966"*
SCG-09	*Deanna R. Haines*	*DRH-iii*	*n/a*	*Changed "26,737" to "26,629"*
SCG-09	*Deanna R. Haines*	*DRH-iii*	*n/a*	*Changed "9,514" to "9,406"*
SCG-09	*Deanna R. Haines*	*DRH-1*	14	*Changed "14,511" to "14,403"*
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SCG-09	*Deanna R. Haines*	*DRH-1*	14	*Changed "9,514" to "9,406"*
SCG-09	*Deanna R. Haines*	*DRH-6*	13	*Changed "26,792" to "26,629"*
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SCG-09	*Deanna R. Haines*	*DRH-22*	26	*Changed "2,356" to "2,248"*
SCG-09	*Deanna R. Haines*	*DRH-22*	26	*Changed "14,511" to "14,403"*
SCG-09	*Deanna R. Haines*	*DRH-22*	26	*Changed "5,074" to "4,966"*
SCG-09	*Deanna R. Haines*	*DRH-28*	n/a	*Remove footnote 14 which stated: "This forecast is undergoing further evaluation and may be revised at the next opportunity." The forecast has been revised as reflected herein.*
SCG-09	*Deanna R. Haines*	*DRH-45*	30	*Changed "26,737" to "26,629"*
SCG-09	*Deanna R. Haines*	*DRH-45*	31	*Changed "14,511" to "14,403"*