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SOCALGAS

DIRECT TESTIMONY OF JEFFREY G. REED

**(CUSTOMER SERVICE TECHNOLOGIES,
POLICIES AND SOLUTIONS)**

November 2014

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**



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SUMMARY

CUSTOMER SERVICE TECHNOLOGIES, POLICIES & SOLUTIONS			
O&M	2013 (\$000)	2016 (\$000)	Change
Non-Shared	8,080	12,715	4,635
Shared	4,986	8,142	3,156
Total	13,066	20,857	7,791

Summary of Requests

SoCalGas is requesting \$20.857 million for Test Year (TY) 2016 operations and maintenance costs associated with the Customer Service Technologies, Policies and Solutions cost categories; an increase of \$7.791 million over base year (BY) 2013 levels. These activity areas cover a variety of functions and activities to promote the development and implementation of policies and regulations and technologies that optimize the use of natural gas as an environmentally beneficial and cost effective energy solution, enhance safety and reliability of the natural gas delivery system, support customer adoption and use of low-emission technologies, and support a variety of company-wide initiatives in related areas. My testimony is divided into five sections: Research Development and Demonstration, Policy and Environmental Solutions, Natural Gas Vehicle Program, Biofuels and Low-Carbon Energy Resources Market Development, and Business Strategy and Development. Key drivers of activity in these areas include:

- Federal Clean Air Act (CAA) standards for ozone, implemented through local air district regulations, requiring a reduction in emissions of oxides of nitrogen (NO_x) of more than 80% from current levels by 2023;¹
- State policy calling for an 80% reduction in greenhouse gas (GHG) emissions relative to 1990 levels by 2050;² and
- New regulations related to the safe and reliable production and use of natural gas.

Cost effectively meeting state mandates requires active engagement with regulatory and other stakeholder bodies. Through this engagement, SoCalGas works to meet state environmental, safety and reliability goals, while also protecting the interests of ratepayers.

¹ California Air Resources Board, SCAQMD, SJVAPCD, Vision for Clean Air: A Framework for Air Quality and Climate Planning (2012) p.4 Available at:

http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf

² Governor's Executive Order S-3-05 is available at: <http://gov.ca.gov/news.php?id=1861>

These goals and requirements also require SoCalGas' active support for technology research, development, and demonstration and active outreach and support to customers seeking to adopt clean natural gas technologies to meet their increasingly stringent environmental compliance obligations.

**SOCALGAS DIRECT TESTIMONY OF JEFFREY G. REED
(CUSTOMER SERVICE TECHNOLOGIES, POLICIES AND SOLUTIONS)**

I. INTRODUCTION

A. Summary of Costs

I sponsor SoCalGas' TY 2016 forecasts for operations and maintenance (O&M) costs for both non-shared and shared services for the Customer Service Technologies, Policies and Solutions areas. There are no capital costs forecast for Customer Service Technologies, Policies and Solutions. Table JGR-1 summarizes my sponsored costs.

TABLE JGR-1

Test Year 2016 Summary of Total Costs

CS - TECHNOLOGIES, POLICIES & SOLUTIONS			
Shown in Thousands of 2013 Dollars	2013 Adjusted-Recorded	TY2016 Estimated	Change
Non-Shared (RD&D)	8,080	12,715	4,635
Shared			
Policy and Environmental Solutions	2,344	4,005	1,661
Natural Gas Vehicle Program	1,432	2,271	839
Biofuels and Low-Carbon Resources	226	665	439
Business Strategy and Development	984	1,201	217
Total Shared Services (Incurred)	4,986	8,142	3,156
Total O&M	13,066	20,857	7,791

Note: Totals may include rounding differences

B. Summary of Activities

Customer Service Technologies, Policies and Solutions comprises a group of functions and activities to promote the development and implementation of policies and technologies that optimize the use of natural gas as an environmentally beneficial and cost effective energy solution, enhance safety and reliability of the natural gas delivery system, support customer adoption and use of low-emission technologies, and support a variety of company-wide initiatives in related areas.

A major focus of Customer Service Technologies, Policies and Solutions is to advance and support California's environmental quality and public health and safety goals including those set forth in witness Bret Lane's Policy testimony (Ex. SCG-01). These goals include reducing GHG emissions in California to levels 80% below 1990 levels by 2050 as required by Executive Order S-3-05, attaining the CAA standards for particulate matter and smog-causing pollutants,

1 and closing the gap between technical and economical energy efficiency feasibility articulated in
2 the 2013 Energy Efficiency Potential and Goals Study.³ SoCalGas is uniquely suited to support
3 customer interests in these matters because SoCalGas' service territory includes the only two
4 designated extreme non-attainment areas under the CAA,⁴ SoCalGas has deep expertise in
5 natural gas policy matters as well as natural gas technologies and their potential advancement,
6 and SoCalGas has a unique role in representing the interests of its customers on matters that
7 relate to the production, distribution and use of natural gas.

8 My testimony is divided into five sections: Research Development and Demonstration,
9 Policy and Environmental Solutions, Natural Gas Vehicle Program, Biofuels and Low-Carbon
10 Energy Resources Market Development, and Business Strategy and Development. Each of the
11 five activity areas and the associated funding request is briefly described below.

- 12 • The Research, Development and Demonstration (RD&D) group conducts or sponsors
13 technology assessments, technology development and field demonstration projects
14 focusing on reducing emissions, improving performance or reducing costs across the
15 full range of natural gas applications and on improving the safety and reliability of
16 utility operations. The TY2016 funding request is \$12.715 million, an increase of
17 \$4.635 million relative to BY2013 (or \$3.204 million relative to average annual
18 expenditures forecast over the TY2012 program cycle). The increase is driven by
19 increased activity to support development and demonstration of technologies to
20 address increasingly stringent regulations on air emissions and to enhance system
21 reliability and safety.
- 22 • Policy and Environmental Solutions (P&ES) engages in policy analysis, stakeholder
23 and agency engagement, and customer support related to energy and environmental
24 policies, laws and regulations. This group is newly formed. The TY2016 funding
25 request of \$4.005 million represents an increase of \$1.661 million relative to the
26 BY2013 costs incurred by functions transferred into the group. The incremental costs

³ Navigant. February 14, 2014. California Energy Efficiency Potential and Goals Study. Prepared for California Public Utilities Commission (CPUC). Available at: <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M088/K661/88661468.PDF>.

⁴ 42 U.S.C. 7407 SEC. 181. Classification and Attainment Dates. Extreme nonattainment areas are an area that has a design ozone value of 0.280 ppm and above. Available at: <http://www.epa.gov/airquality/greenbook/caa-t1p.html#Sec.181>. The two extreme nonattainment zones are Los Angeles-South Coast Air Basin, CA and San Joaquin Valley, CA. (See: <http://www.epa.gov/ozonedesignations/2008standards/final/finaldes.htm>).

1 will be incurred to promote ratepayer interests related to the dramatically increased
2 volume of environmental and energy policy, regulatory, and legislative matters
3 impacting SoCalGas and its customers.

- 4 • The Natural Gas Vehicle (NGV) Program undertakes a variety of activities to
5 promote customer adoption of cleaner burning natural gas as a transportation fuel
6 capable of advancing environmental policy goals. The TY2016 request of \$2.271
7 million represents an increase of \$0.839 million relative to BY2013. The low cost of
8 natural gas, the increasing availability of vehicle and engine options, and new
9 application areas in rail, marine and heavy equipment are driving increased activity in
10 this program area.
- 11 • The Biofuels and Low-Carbon Energy Resources Market Development group is
12 responsible for facilitating the development of biogas production and conversion
13 projects with a focus on projects seeking to inject conditioned biogas into the natural
14 gas system. The TY2016 request of \$0.665 million represents an increase of \$0.439
15 million relative to BY2013. The TY2016 increase is driven by increased
16 development activity resulting from resolution of two matters that caused a
17 significant slowdown in biofuels development activity. First, the California Energy
18 Commission (CEC) lifted the suspension on the eligibility of directed biogas as a
19 Renewables Portfolio Standards (RPS) eligible resource. Second, the California
20 Public Utilities Commission (CPUC or Commission) established biomethane quality
21 specifications for the injection of biomethane into the utility natural gas transmission
22 and distribution system and lifted a ban on the injection of landfill biomethane –
23 adding a significant biogas source to the set of resources eligible for pipeline
24 injection.
- 25 • The Business Strategy and Development group provides company-wide assistance
26 and facilitation on long-term planning of programs and project optimization. The
27 TY2016 funding request of \$1.201 million represents an increase of \$0.217 million
28 relative to BY2013. This increase supports new processes and tools supporting four
29 strategic objectives: Operational Excellence, Employee Development, Clean Energy
30 Solutions, and Sound Environmental Policy.

1 My TY2016 forecasts represent the activity levels necessary to: (1) address the increase
2 in new regulatory, legislative, and policy proposals and mandates; (2) support the advancement
3 of technologies to achieve Commission environmental and safety goals; (3) support the
4 development of natural gas transportation and biogas markets; and (4) provide company-wide
5 coordination and support for strategic programs.

6 **C. Activities in My Cost Forecast Support State Environmental Goals**

7 The majority of costs in my forecast support the achievement of state environmental
8 goals at least cost through optimized use of natural gas and renewable natural gas (RNG)
9 resources. The P&ES group is specifically focused on analyzing and supporting the
10 development and implementation of policies and regulations that optimize the use of natural gas
11 in alignment with the long-term environmental goals of the state, including 80% or greater
12 reductions in GHG and nitrogen oxides (NOx) emissions. Similarly, the RD&D program and
13 the NGV and Biofuels and Low-Carbon Energy Resources Market Development groups advance
14 the development and adoption of technologies that support the reduction of emissions.

15 **D. Support To/From Other Witnesses**

16 The objectives and proposed activities for natural gas operations RD&D projects are
17 provided in the testimony of witness Raymond Stanford, Ex. SCG-07. The proposed treatment
18 of the RD&D balancing account is contained in the testimony of witness Reginald Austria, Ex.
19 SCG-33. The amount and allocation of costs to affiliates for shared service costs within my
20 testimony are presented in witness Mark Diancin's testimony, Ex. SCG-25.

21 **II. NON-SHARED COSTS**

22 **TABLE JGR-2**

23 **Summary of CS Technologies, Policies & Solutions Non-Shared O&M Costs**

Shown in Thousands of 2013 Dollars			
Categories of Management	2013 Adjusted-Recorded	TY2016 Estimated	Change
Research, Development & Demonstration	8,080	12,715	4,635
Total	8,080	12,715	4,635

24 **A. Research, Development and Demonstration - Introduction and Overview**

25 SoCalGas' refundable RD&D program is the only activity area presented in the non-
26 shared O&M area of my testimony. California Public Utilities Code Section 740.1 provides for
27 the Commission to authorize utility RD&D activities that benefit ratepayers through improved

1 reliability and safety, environmental benefits and operational efficiencies provided that achieving
 2 those benefits is reasonably probable and the focus is not unnecessarily duplicative of efforts by
 3 other research organizations. The SoCalGas RD&D program authorized by the 2012 General
 4 Rate Case (GRC) Decision (D.) 13-05-010 adopted an average annual funding level of \$9.511
 5 million (in 2013 dollars) with all costs tracked via a one-way balancing account. Table JGR-2
 6 summarizes the non-shared historical and forecast costs for the SoCalGas refundable RD&D
 7 program and Table JGR-3 provides additional detail on cost elements and staffing levels. The
 8 average annual RD&D program cost forecast over the TY2016 program cycle of \$12.715 million
 9 is driven by the need to develop and deploy technologies that: (1) enhance system safety and
 10 reliability and; (2) cost effectively meet increasingly stringent environmental requirements
 11 (including dramatic reductions in greenhouse gas and criteria pollutant emissions). Brief
 12 summaries of recent RD&D project results can be found in Appendix A.

13 The RD&D program forecasts an increase of 4.4 full-time equivalents (FTEs) in TY2016
 14 relative to BY2013 at an incremental cost of \$0.44 million. The increase reflects the addition of
 15 1.5 FTEs in the operations area to focus on gas quality analysis and testing for various new
 16 renewable natural gas and hydrogen resources and increased participation in industry and
 17 research collaborative committee meetings and events. The remaining 2.9 FTEs increment is
 18 composed of one staff member added in early 2014 to focus on renewable natural gas and low-
 19 carbon resources, one staff member addition to focus on low-emission transportation solutions
 20 and 0.9 FTEs related to full-year staffing of a vacancy resulting from a 2013 retirement and
 21 additional part-time hours charged to the program for commercial support (budgets, contracts
 22 and transactions).

23 **TABLE JGR-3**
 24 **Research, Development & Demonstration**
 25 **In Thousands of 2013 Dollars**

	Adjusted-Recorded					Forecast			Change
Year	2009	2010	2011	2012	2013	2014	2015	2016	2013 – 2016
Labor	1,182	1,400	1,357	1,446	1,135	1,575	1,575	1,575	440
Non-labor	8,990	11,264	11,288	6,919	6,946	9,225	9,225	11,140	4,194
Total	10,171	12,664	12,645	8,365	8,080	10,800	10,800	12,715	4,635
FTEs	10.8	13.2	13.0	13.7	10.7	15.1	15.1	15.1	4.4

26 Note: Totals may include rounding differences

1 The RD&D funding request was developed using a zero-based methodology to develop
2 an RD&D program plan that addresses specific technology needs. As shown in Table JGR-4, the
3 RD&D cost forecast is 0.60 percent of requested annual authorized GRC base margin revenues
4 which is well within the historical range over the current and last program cycles (eight years).
5 As a point of reference, the SoCalGas RD&D forecast is less than 8% of the \$162 million budget
6 allocated to the Electric Program Investment Charge (EPIC) established by the Commission D.
7 12-05-037 for research and development, technology demonstration and deployment of clean
8 energy technologies.

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TABLE JGR-4
RD&D Authorized as a Percentage
of Authorized Base Margin Revenues

Year	Annual Authorized RD&D Expenditures	SoCalGas Annual Authorized Base Margin Revenues	RD&D Expenditures as a Percentage of Revenues
	\$000 Nominal		
2008	10,000	1,610,510	0.62%
2009	10,000	1,663,407	0.60 %
2010	10,000	1,715,288	0.58%
2011	10,000	1,770,782	0.56%
2012	9,264	1,855,615	0.50%
2013	9,509	1,879,348	0.51%
2014	9,770	1,943,304	0.50%
2015	10,039	1,996,480	0.50%
Average	9,823	1,804,342	0.54%
2016 Forecast	13,519	2,251,303	0.60%

B. Forecast Methodology, Balancing Account and Revenues

1. Forecasting Methodology

The forecast approach I chose for RD&D is the zero-based method. The zero-based cost forecast method is most appropriate because specific RD&D needs and activities evolve through time as technologies progress and new public policies and goals are established. Technology needs or gaps were assessed in each program area based on the current state of technology compared to the performance required to meet safety and reliability enhancements, energy efficiency goals, criteria pollutant, GHG emissions and other cost and performance goals (more detail on the technology needs assessment is provided in Appendix B – “Technology Needs Assessment Summary”). The identified technology needs were combined with prior experience on project cost and co-funding requirements to develop target projects and funding requirements in each program area. The TY2016 forecast reflects increased activity in system safety and reliability, criteria pollutants reduction, carbon reduction, natural gas transportation and renewable energy integration with conventional resources and the gas transmission and distribution system.

1 Alternative forecasting approaches, such as forecasting based on averages or trends,
2 would not be appropriate as they would fail to reflect increased needs for technology
3 development to enhance safety and reliability and to meet emission reduction requirements.

4 **2. Balancing Account**

5 As in prior GRC cycles, the RD&D program costs will be tracked in a one-way balancing
6 account and all RD&D program funding is refundable. Costs incurred and tracked in the RD&D
7 balancing account include direct project expenditures and all project related management and
8 administration costs. This includes non-labor costs used for the direct execution of RD&D
9 projects by third parties under contract to SoCalGas, as well as labor and non-labor costs used in
10 planning, directing, managing and administering these projects. SoCalGas is not forecasting any
11 non-refundable RD&D program costs.

12 **3. Technology Royalties and Revenues**

13 In some instances, SoCalGas receives product royalty rights or equity in companies
14 developing targeted technologies in exchange for funds provided to support technology
15 development and demonstration. These arrangements provide an opportunity for SoCalGas
16 ratepayers to receive a direct financial return should the technology development efforts prove
17 successful.

18 **TABLE JGR-5**
19 **RD&D Recorded Revenues**
20 **In Nominal Dollars**

Year	Program Revenues	Ratepayer Portion	Shareholder Portion
2009	4,878,225	3,476,550	1,401,675
2010	209,874	135,496	74,378
2011	62,312	61,692	621
2012	1,560,486	1,330,082	230,404
2013	104,394	88,173	16,221
Total	6,815,292	5,091,993	1,723,299

21 Note: ratepayer revenue includes recovery of initial program costs
22 and excludes recovery of legal costs and proceeds due to
23 co-investors.

1 As authorized in D.13-05-010, royalty revenue and net proceeds from sale of equity
2 holdings are shared 75% to ratepayers and 25% to shareholders. As shown in Table JGR-5
3 above, ratepayers have received over \$5 million in RD&D program revenue over the past five
4 years through royalty and equity provisions in program funding agreements. SoCalGas proposes
5 to continue the sharing mechanism approved in D.13-05-010. The portion of royalties allocated
6 to ratepayers is refunded as part of periodic rate adjustments.

7 **C. The Proposed RD&D Program Meets the Standards Established in State**
8 **Law and Policy**

9 The California Legislature enacted Public Utility Code section 740.1 to establish the
10 basis upon which RD&D programs for gas and electric corporations are authorized by the
11 Commission:

12 The commission (CPUC) shall consider the following guidelines in
13 evaluating the research, development, and demonstration programs
14 proposed by electrical and gas corporations:

- 15 a) Projects should offer a reasonable probability of providing benefits
16 to ratepayers.
- 17 b) Expenditures on projects which have a low probability for success
18 should be minimized.
- 19 c) Projects should be consistent with the corporation's resource plan.
- 20 d) Projects should not unnecessarily duplicate research currently,
21 previously, or imminently undertaken by other electrical or gas
22 corporations or research organizations.
- 23 e) Each project should also support one or more of the following
24 objectives:
 - 25 1) Environmental improvement.
 - 26 2) Public and employee safety.
 - 27 3) Conservation by efficient resource use or by reducing or
28 shifting system load.
 - 29 4) Development of new resources and processes, particularly
30 renewable resources and processes which further supply
31 technologies.
 - 32 5) Improve operating efficiency and reliability or otherwise
33 reduce operating costs.

1 Using similar reasoning, the CEC succinctly described the importance of energy RD&D
2 in its recent publication, “Energy Innovation, Moving California Towards a Clean Energy
3 Future”:

4 Economic vitality and social well-being depend upon affordable, safe, and reliable energy.
5 Today, the energy we use and the ways we use it are rapidly changing. Innovation is the
6 bridge that enables California to move from the unsustainable status quo to a clean energy
7 future. Though the public sector cannot provide the entire innovation investment necessary
8 for California’s clean energy future, its role is critical.”⁵

9 Both the entirety of the RD&D program and its individual elements are planned and
10 executed to carefully comply with the requirements set forth in California Public Utilities Code
11 Section 740.1. Each RD&D project selected supports one or more of the objectives of section
12 740.1(a) through (e) above. The track record of the SoCalGas program in targeting technologies
13 that will provide benefit to ratepayers is demonstrated by the internal utility operation and
14 customer-adoption benefit-cost analysis provided in Appendix C, which forecasts a benefit-cost
15 ratio of 1.5 for internal operations and customers adopting the technologies under development
16 with support of the RD&D program. The direct net benefits for SoCalGas internal operations
17 and customers adopting these technologies is forecast to have a net present value of \$2.5 billion
18 with no financial value applied for NOx reduction and \$30/tonne used as a metric to value GHG
19 benefit.

20 **1. Proposed RD&D Program Supports Environmental, Health, Safety**
21 **and Reliability Policy Goals**

22 SoCalGas’ RD&D efforts support the goal of continually enhancing pipeline safety and
23 reliability by making necessary investments in gas operations RD&D. As shown in the Gas
24 Engineering testimony of witness Raymond Stanford (Ex. SCG-07), a significant portion of the
25 RD&D funding will be used to support utility operations through enhanced safety, reliability and
26 operational efficiency. In addition, a major portion of the requested funding is aimed at
27 addressing California’s public health and environmental policy and goals and federal CAA
28 mandates, goals, and standards which apply uniquely to SoCalGas because its service territory
29 includes the only two Environmental Protection Agency (EPA) designated extreme non-
30 attainment areas for 8-hour ozone concentrations: the South Coast Air Quality Management

⁵ CEC-500-2014-008, February 2014, p.3. Available at
<http://www.energy.ca.gov/2014publications/CEC-500-2014-008/CEC-500-2014-008.pdf>.

1 District (SCAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPC). Some
2 of the drivers of RD&D program activity include:

- 3 • Pipeline Safety and Reliability: The Department of Transportation’s Code of Federal
4 Regulations (49 CFR), the Commission’s General Order 112-E, and the Commissions
5 recently developed biomethane quality standards established new or enhanced natural gas
6 pipeline safety and reliability standards or requirements. SoCalGas’ planned RD&D
7 supports advancement of technologies that enhance the safety and reliability of the
8 natural gas system in the areas of inspection, monitoring, control and construction.
9 Examples include satellite and aerial leak detection, pipeline and ground movement
10 detection sensors and robotic weld inspection technologies.
- 11 • Energy Efficiency: California continues to pursue ambitious energy efficiency goals.
12 Specifically, the Commission’s Energy Efficiency Program goals (D.12-11-015) require a
13 reduction of natural gas consumption by 23.2 million therms per year for 2014 and
14 similar target for subsequent years.⁶ Activities in the RD&D program supplement and
15 support activities funded through the energy efficiency program in areas such as gas-fired
16 distributed generation, appliances and industrial processes.
- 17 • NOx and Particulate Matter (PM) Emissions Reductions: The National Ambient Air
18 Quality Standard (NAAQS) under the CAA require substantially lower fine particulate
19 (PM2.5) and 8-hour surface-level ozone standards. These new standards require southern
20 California to significantly accelerate its criteria pollution reduction efforts over the next
21 decade. Meeting the standards will require reduction of NOx emissions of 80% or more
22 in the SCAQMD and SJVAPCD by 2023 and 90% by 2032.⁷ Technology advancement
23 in combustion science and after treatment is critical to meeting these goals.
- 24 • Greenhouse Gas Emissions Mitigation: AB32 directs the California Air Resources Board
25 (CARB) to develop plans to reduce GHG emissions to 1990 levels by 2020 and
26 Executive Order S-03-05 set the target for California to reduce GHG emissions by 80%
27 relative to 1990 levels by 2050. Meeting these targets requires dramatic advances in
28 efficiency and development of renewable natural gas and low-carbon resources.

⁶ Decision Approving 2013-2014 Energy Efficiency Programs (D.12-11-015), p. 58.

⁷ California Air Resources Board, SCAQMD, SJVAPCD, Vision for Clean Air: A Framework for Air Quality and Climate Planning (2012) p.4 Available at: http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf.

- 1 • Indoor Air Quality: The planned RD&D addressing indoor air quality is intending to
2 support the development of new technologies that reduce formaldehyde, NOx, CO and
3 Volatile Organic Compounds inside homes and businesses. Uses of unvented appliances
4 in the kitchen (range & oven) are of primary concern.
- 5 • Distributed Generation and Combined Heat and Power (CHP): California Public
6 Utilities Code Section 372(a) and Section 379.6(c)⁸ and Energy Action Plan II⁹ call for
7 expended development of efficient, environmentally beneficial CHP. The CARB
8 scoping plan for the implementation of AB32 established a target for 4,000 megawatt
9 (MW) of additional CHP capacity by 2020 to combat GHG emissions.¹⁰ In addition,
10 Governor Brown has called for adding 6,500 MW of new combined heat and power by
11 2030.¹¹ Progress in cost reduction, efficiency, and emissions control is needed to ensure
12 that these goals can be met cost effectively and provide the intended environmental
13 benefits.
- 14 • Alternative and Renewable Fuel and Vehicle Technology: California law requires
15 increased use of alternative transportation fuels and Executive Order S-01-07 establishes
16 a state-wide goal to reduce (1) the carbon intensity of California's transportation fuels by
17 at least 10 percent by 2020 and (2) reduce petroleum fuel use to 15% below 2003 levels
18 by 2020.¹² California Public Utilities Code Section 740.3 codifies the role of utility
19 programs in facilitating the use of natural gas-fueled low-emission vehicles and
20 supporting these goals.¹³
- 21 • Zero Net Energy (ZNE): The 2011 Integrated Energy Policy Report (IEPR)
22 recommended triennial building standards updates that increase the energy
23 efficiency of newly constructed buildings by 20 - 30 percent in every triennial

⁸ Cal Pub Util Code §§ 372 and Section 379.6.

⁹ CPUC, CEC, California Energy Action Plan 2008 Update p.15. Available at:
<http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF>.

¹⁰ CARB Climate Change Scoping Plan (October 2008). P.43. Available at
<http://www.arb.ca.gov/cc/scopingplan/document/psp.pdf>.

¹¹ California Energy Commission. New Generation of Combined Heat and Power: Policy Planning for
2030 (September 2012) p. 10. <http://www.energy.ca.gov/2012publications/CEC-200-2012-005/CEC-200-2012-005.pdf>.

¹² Available at: <http://www.arb.ca.gov/fuels/lcfs/eos0107.pdf>.

¹³ Cal Pub Util Code § 740.3 (The commission, in cooperation with...regulated electrical and gas corporations... shall evaluate and implement policies to promote the development of equipment and infrastructure needed to facilitate the use of electric power and natural gas to fuel low-emission vehicles.”).

1 update to achieve ZNE standards for newly constructed homes by 2020. The
2 Report states that the adoption of a ZNE definition will enable the CEC to update
3 the California Building Energy Efficiency Standards for 2016 and 2019 with clear
4 orientation toward the upcoming ZNE targets for low-rise residential buildings in
5 2020 and nonresidential buildings in 2030.¹⁴ Development of efficient natural gas
6 technologies to support local energy production can serve a critical role in
7 meeting this goal, particularly considering the intermittent nature of photovoltaic
8 generation, the predominant on-site generation technology.

- 9 • Renewable Portfolio Standard: The state has in place the aggressive goal of increasing
10 energy procured from eligible renewable energy resources to 33% of total procurement
11 by 2020.¹⁵ Integration and firming of renewables is a growing concern for California and
12 technologies at the intersection of the natural gas and electricity sectors can help address
13 this need while increasing the utilization of existing natural gas infrastructure.
- 14 • Bioenergy Action Plan: The CEC’s 2012 Bioenergy Action Plan outlines strategies,
15 goals, objectives, and actions that California state agencies will take to increase
16 bioenergy development in California. The 2012 Bioenergy Action Plan states that the
17 bioenergy market is underdeveloped and that “despite its many benefits, bioenergy
18 production uses only 15 percent of California’s available biomass waste, and production
19 is decreasing.”¹⁶ Executive Order S-06-06 also established a goal to produce 20% of
20 renewable electricity from biofuels by 2020 and establishes goals for increasing
21 production of total biofuels from in-state resources with that fraction increasing to 75
22 percent by 2050.¹⁷ Accomplishing these goals requires advancement in the technologies
23 to produce, process, and upgrade biogas.
- 24 • The CA Solar Thermal Initiative: Commission D.13-02-018 and D.13-08-004 affirm the
25 Commission’s commitment to expansion of solar thermal technologies and establish
26 incentives for solar thermal applications for process heat, solar cooling, space heating

¹⁴ California Energy Commission Integrated Energy Policy Report 2013. p.38.

¹⁵ RPS was established in 2002 under Senate Bill 1078, accelerated in 2006 under Senate Bill 107 and expanded in 2011 under Senate Bill 2. See: <http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm>.

¹⁶ 2012 Bioenergy Action Plan, August 2012, prepared as part of the Bioenergy Action Plan proceeding docket # 10-BAP-01, p.2. http://www.resources.ca.gov/docs/2012_Bioenergy_Action_Plan.pdf.

¹⁷ Available at: <http://www.dot.ca.gov/hq/energy/Exec%20Order%20S-06-06.pdf>.

1 systems, and solar pool systems. Significant technology advancement is needed to
2 improve the cost and performance of these technologies.

3 **2. Internal Processes and External Collaboration Ensure Synergistic,**
4 **Non-duplicative and Effective RD&D**

5 In order to increase RD&D program effectiveness, enhance the probability of program
6 success, avoid duplication and amplify benefits to ratepayers, SoCalGas RD&D expenditures are
7 highly leveraged through collaboration with other funding sources such as CEC, Department of
8 Energy (DoE), and air quality districts. The recent co-funding ratios for each RD&D program
9 area based on active projects during 2013 are shown in the Table JGR-6. This co-funding ratio
10 indicates that, on average, for every dollar of SoCalGas RD&D program funding expended,
11 seven dollars are brought to bear for the benefits of ratepayers.

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TABLE JGR-6
RD&D Co-Funding for 2013 Active Projects
In Thousands of Nominal Dollars

RD&D Program	SoCalGas Funding	Co-Funding	Ratio
Clean Generation	\$6,554	\$77,570	11.84
Clean Transportation - NGV	\$2,585	\$3,550	1.37
Customer Applications - Energy Efficiency	\$1,786	\$1,237	0.69
Customer Applications - Energy Efficiency - Collaboratives (SMP & UTD) ¹⁸	\$2,850	\$18,789	6.59
Gas Operations	\$1,543	\$7,331	4.75
Gas Operations - Collaboratives (OTD, NGA, PRCI) ¹⁹	\$5,323	\$48,823	9.17
Renewable	\$2,550	\$6,081	2.38
Total	\$23,191	\$163,381	7.05

The collaboration partners have robust stakeholder engagement and technology gap assessment processes to ensure that their research programs address specific technology needs not being met through other means and have a high potential for commercial success. These processes augment SoCalGas’ own industry, agency, university and industry engagement processes to identify unmet or partially unmet technology development needs that the SoCalGas RD&D program can appropriately help address. As a collaborator with other funding entities, SoCalGas plays a unique role in serving its mandates to create SoCalGas customer benefits and advance state and Commission policy goals. No other RD&D entity has these same mandates.

D. Cost Drivers and Funding Detail

This section summarizes the technology needs, the proposed activities to address those needs and the associated cost forecasts for the RD&D program. As shown in Table JGR-7, SoCalGas requests annual funding of \$12.715 million for the RD&D program for the next GRC cycle. The table also breaks out SoCalGas’ planned distribution of TY 2016 RD&D funding by project area. Summary descriptions of each program area and its objectives are provided below

¹⁸ Sustaining Membership Program (SMP); Utilization Technology Development (UTD).
¹⁹ Operations Technology Development (OTD); Natural Gas Association (NGA); Pipeline Research Council International (PRCI).

1 with additional detail on specific technology needs and planned activities provided in Appendix
 2 B “Technology Needs Assessment.”

3 **TABLE JGR-7**
 4 **TY2016 RD&D Program Funding Forecast**
 5 **& 2012-2015 Forecast Average**
 6 **In Thousands of 2013 dollars**

Program	Sub-Program		TY 2016 Forecast
Gas Operations	2012 - 15 Forecast Avg. \$2,600	Subtotal	\$ 3,500
Customer Applications	Residential		\$ 850
	Commercial		\$ 500
	Industrial		\$ 400
	2012 - 15 Forecast Avg. \$1,000	Subtotal	\$ 1,750
Clean Generation	Prime Movers & Integrated Systems		\$ 1,000
	Advanced Generation		\$ 800
	2012 - 15 Forecast Avg. \$1,900	Subtotal	\$ 1,800
Clean Transportation	Fueling Infrastructure & Storage		\$ 730
	Systems & Components		\$ 1,525
	2012 - 15 Forecast Avg. \$1,300	Subtotal	\$ 2,255
New, Renewable Energy Resources and Supply Technologies	Solar Thermal		\$ 1,200
	Bioenergy		\$ 1,300
	Gaseous Energy Storage		\$ 910
	2012 - 15 Forecast Avg. \$2,700	Subtotal	\$ 3,410
Total	2012 - 15 Forecast Avg. \$9,500		\$ 12,715

7 **1. Gas Operations RD&D**

8 The objectives of Gas Operations RD&D are to develop and deploy technologies that
 9 enhance public and employee safety, operating efficiency, reliability and reduce the operating
 10 costs of gas operations. Specific technology objectives and proposed project areas are described
 11 in the testimony of witness Raymond Stanford, Ex. SCG-07. The TY2016 funding request of
 12 \$3.5 million reflects an increase of \$900,000 relative to the prior funding cycle in order to
 13 support increased activity in the areas of safety and pipeline integrity.

1 **2. Customer Applications RD&D**

2 The objectives of Customer Applications RD&D are to develop and commercialize
3 technologies that cost-effectively improve the efficiency and reduce the environmental impacts
4 of natural gas end-use applications such as space heating and cooling, cooking, and industrial
5 process heating. The SoCalGas Customer Applications RD&D activities seek to support the
6 development and deployment of end-use technologies that cost effectively meet air emissions
7 and efficiency goals. The TY2016 funding request of \$1.750 million reflects an increase of
8 \$750,000 relative to the prior funding cycle in order to support increased activity in the areas of
9 energy efficiency, NOx and GHG emissions, and indoor air quality.

10 **i. Residential Air Quality, Energy Efficiency and Integration**

11 A key objective in this area is to support the development of lower-cost condensing
12 (latent heat recovery) appliances and solar thermal systems as well as new burner technologies to
13 reduce NOx and improve combustion efficiency. Beyond advances in individual technologies,
14 achieving these targets will require development and demonstration projects that use state-of-the-
15 art control systems to integrate the operations of water heating, heating, ventilation and air
16 conditioning (HVAC), solar thermal concentrators, photovoltaic panels and fuel cells.

17 SoCalGas intends to pursue projects in areas focusing on lifecycle testing and
18 demonstration of next-generation condensing water and space-heating appliances, solar thermal
19 systems for water heating, space conditioning and clothes drying, and full-building integration,
20 control and automation of multiple technologies to optimize performance. Underlying
21 technology elements of focus will include improved burner and combustion systems for NOx
22 control, insulation and thermal management, improved materials and control systems.

23 **ii. Commercial and Industrial Air Quality, Energy Efficiency and**
24 **Integration**

25 A key objective in this area is to support the development of new appliances such as
26 commercial cooking and food service equipment, space heating and cooling, and process heat.
27 Meeting the expected standards will require significant improvements in combustion technology
28 and emission controls tailored to specific equipment types. To address these technology
29 development needs, SoCalGas will develop projects in collaboration with others focused on
30 developing and demonstrating improved condensing appliances, gas heat pump technology, new
31 burner designs (e.g., surface combustion and radiant heaters), waste heat recovery systems, solar
32 thermal systems, and control and automation technologies to optimize efficiency and emissions

1 performance. Underlying technology elements of focus will include improved burner and
2 combustion systems for NOx control, insulation and thermal management, and improved
3 materials and control systems.

4 **3. Clean Generation RD&D**

5 SoCalGas' Clean Generation RD&D program focuses on supporting the development and
6 demonstration of high-efficiency, low-emissions CHP systems for the commercial, industrial and
7 residential market segments within the SoCalGas service territory. The SoCalGas RD&D
8 program has supported and will continue to support development and market introduction of
9 low-emission, distributed generation technologies working with equipment providers developing
10 emissions control technologies, improving total system efficiency and lowering the cost of CHP
11 and other natural gas distributed generation solutions that meet the unique environmental
12 requirements of southern California. Clean Generation RD&D activities will include (1) small-
13 scale CHP systems featuring advanced emission control systems capable of meeting current and
14 future AQMD NOx limits; (2) fuel cell systems demonstrating improved efficiency, performance
15 and reliability; and (3) smaller residential scale systems. Systems for recovering waste heat and
16 those using alternative thermal cycles, such as Stirling cycle, free-piston engine, and rotary
17 engines, with the potential for improved efficiency and low cost will also be pursued as will
18 carbon capture technologies. The TY2016 funding request of \$1.800 million reflects a decrease
19 of \$100,000 relative to the prior funding cycle reflecting the reduced spending on oxy-
20 combustion carbon capture technology as that technology has reached commercial readiness.

21 **4. Clean Transportation RD&D**

22 SoCalGas' Clean Transportation RD&D activities focus on minimizing the
23 environmental impacts related to the use of natural gas as a transportation fuel and on reducing
24 the cost of natural gas transportation. Specific areas of SoCalGas development and
25 demonstration support include engine control and after-treatment systems to reduce emissions,
26 engine and drive-line efficiency improvements (such as air-fuel systems and hybrid drive), cost
27 reduction for fueling infrastructure and on-board natural gas storage tanks, and synergies
28 between natural gas and hydrogen transportation and infrastructure technologies. The TY2016
29 funding request of \$2.255 million reflects an increase of \$955,000 relative to the prior funding
30 cycle to increase efforts in the area of NOx reduction, to address high-horsepower application
31 and to reduce the cost of fueling infrastructure (compression and storage).

1 **5. Renewable Energy Resources and Supply Technologies**

2 SoCalGas’ Renewable Energy Resources and Supply Technologies RD&D activities
3 focus on technologies to improve and support biomethane and renewable natural gas production
4 and use. While biogas production is well known, renewable natural gas and hydrogen can also
5 be produced from solar energy and renewable electric energy through a number of pathways.
6 Once in the form of methane or hydrogen, renewable energy can be readily transported, stored
7 and distributed to its highest economic value through our nearly ubiquitous natural gas system.
8 This is a growing area of activity in Europe and the DoE has initiated related analysis and
9 development activities in which SoCalGas is collaborating. Specific areas of focus include
10 biogas clean-up and monitoring technologies, biomass gasification systems, improved anaerobic
11 digester systems, solar-based reforming and direct methane production technologies, and the
12 storage of renewable electricity via methane electrolysis and methanation. The TY2016 funding
13 request of \$3.410 million reflects an increase of \$710,000 relative to the prior funding cycle in
14 order to support increased activity in the areas of bioenergy, solar-thermal methane production
15 and use of gaseous fuel (methane and hydrogen) for renewable electricity storage.

16 **E. Summary**

17 SoCalGas’ RD&D efforts have consistently been successful in creating ratepayer
18 benefits. The program focuses on creation of ratepayer benefits through technologies enhancing
19 safe and reliable operations and by supporting cost-effective attainment of state environmental
20 goals. An independent analysis by Gas Technology Institute (GTI) projects a 1.5 to 1 benefit to
21 cost ratio for internal operations and customers deploying the technologies being developed with
22 the support of the SoCalGas RD&D program (see Appendix C). The program’s success is
23 further demonstrated by the roughly 7 to 1 co-funding ratio that the program has achieved and
24 the ongoing collaboration with key funding partners and stakeholders. The proposed funding
25 level of \$12.715 million is consistent with the technology development opportunities and
26 challenges facing the natural gas sector and SoCalGas customers.

27 **III. SHARED COSTS**

28 **A. Introduction**

29 Table JGR-8 summarizes the total shared O&M forecasts for the listed shared-service
30 elements of my testimony. I am sponsoring the forecasts on a total incurred basis, as well as the
31 shared services allocation percentages related to those costs. Those percentages are presented in

1 my shared services workpapers. See Ex. SCG-13-WP. The dollar amounts allocated to affiliates
 2 are presented in our Shared Services and Shared Assets Billing Policies testimony. See Ex.
 3 SCG-25 (Diancin).

4 **TABLE JGR-8**

5 **Summary of CS Technologies, Policies & Solutions Shared O&M Costs**

Shown in Thousands of 2013 Dollars Incurred Costs (100% Level)			
Categories of Management	2013 Adjusted- Recorded	TY2016 Estimated	Change
Policy and Environmental Solutions	2,344	4,005	1,661
Natural Gas Vehicle Program	1,432	2,271	839
Biofuels and Low-Carbon Resources	226	665	439
Business Strategy and Development	984	1,201	217
Total Shared Services (Incurred)	4,986	8,142	3,156

6 **B. Policy & Environmental Solutions**

7 **TABLE JGR-9**

8 **Policy & Environmental Solutions**

9 **In Thousands of 2013 Dollars – Incurred Costs**

Year	Adjusted-Recorded					Forecast			Change
	2009	2010	2011	2012	2013	2014	2015	2016	2013- 2016
Labor	381	431	678	894	937	1,517	1,861	1,940	1,003
Non-labor	46	589	1,628	1,221	1,408	1,486	1,836	2,066	658
Total	427	1,020	2,307	2,115	2,345	3,002	3,696	4,005	1,661
FTEs	3.3	3.8	5.7	7.6	7.8	13.2	16.5	17.3	9.5

10 Note: Totals may include rounding differences

11 **1. Description of Costs and Underlying Activities**

12 Table JGR-9 summarizes the costs incurred and forecast for the P&ES organization. This
 13 group was formed in 2013 and incurs labor and non-labor costs for the purpose of state and
 14 federal agency policy analysis, engagement, outreach, and customer support related to existing
 15 and proposed state and federal policies, laws and regulations concerning natural gas utilization.
 16 Specific matters addressed include efforts to educate policymakers and assist in the development
 17 of reasoned legislation, environmental policy and regulation (such as criteria air pollution and
 18 greenhouse gas regulation), and energy policy and regulation (such as the CEC's IEPR). The

1 group also serves as a customer and company compliance matter liaison with local air districts,
2 the CARB, and United States Environmental Protection Agency (US EPA) Region 9. Non-labor
3 costs incurred by this group include employee-related costs and costs for external expert support
4 in the areas of economy wide impacts (economic and air emissions) of proposed policies, laws
5 and regulations, and company and customer compliance impacts.

6 The activities of the P&ES group are distinct from and complementary to the activities of
7 the Regulatory Affairs group, which is responsible for management of proceedings before the
8 Commission and of the State Government Affairs group which coordinates activities with the
9 legislature. State Government Affairs relies upon P&ES to provide policy guidance and analysis
10 on proposed legislation and regulations related to energy and environmental matters, especially
11 air quality, at the CEC, CARB, Resources Agencies, Office of Planning and Research and the
12 legislature.

13 SoCalGas forecasts a required funding level of \$4.005 million for TY 2016. This request
14 represents an increase of \$1.661 million compared to base year 2013 incurred costs. Staffing is
15 increased by 9.2 FTEs, from 7.8 FTEs in 2013 to 17.0 FTEs in 2016 at an incremental cost of
16 \$1.003 million. Three staff members came into the group during 2013 and their costs are
17 reflected in the base year on a part-year basis. The breakdown of incremental FTE additions
18 forecast for 2014 through 2016 is: (1) 5.2 FTEs to support environmental and energy policy and
19 regulation; (2) 3 FTEs to support legislative and public policy activities; and (3) 1 FTE to
20 provide administrative support to the combined P&ES group. The staffing increases reflected in
21 the forecast are necessary to respond to a substantial increase in energy and environmental
22 legislative, policy and regulatory activities, as well as an increase in customer need for
23 compliance assistance. Table JGR-10 summarizes the cumulative staff additions in TY 2016.
24 Non-labor spend will increase \$0.658 million between BY2013 and TY2016 to support increased
25 staff costs and increased use of external expert resources to support policy analysis and customer
26 compliance matters.

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TABLE JGR-10
TY 2016 Funding Summary
In Thousands of 2013 Dollars – Incurred Costs

Item	Labor	Non-labor	Total	FTE	Explanation
P&ES Labor					
Energy & Environmental Policy ("E&EP")					
BY Forecast	407		407	3.7	
Incremental to BY	556		556	5.3	1.3 FTEs full year effect of manager & advisor hired in 2013; 3 advisors (1 hired in 2014; 2 planned in 2015); 1 administrative assistant (hired in 2014)
Subtotal E&EP Labor	963		963	9.0	
Legislative Analysis & Public Policy ("LA&PC")					
BY Forecast	0		0	0.0	
Incremental to BY	340		340	3.0	1 manager (hired in 2014); 2 advisors (1 hired in 2014; 1 planned in 2015)
Subtotal LA&PC Labor	340		340	3.0	
Air Agency Liaison & Customer Support ("AAL")					
BY Forecast	530		530	4.1	
Incremental to BY	107		107	0.9	0.9 FTE full year effect of CARB project manager hired in 2013
Subtotal AAL Labor	637		637	5.0	
P&ES Non-labor					
BY Forecast		1,408	1,408		
Incremental to BY		658	658		
Subtotal P&ES Non-labor	0	2,066	2,066		
Total P&ES	1,940	2,066	4,006	17.0	

Note: Totals may include rounding differences

2. Supports State Policy Goals and Protects Ratepayers

The P&ES group supports Commission and state policy goals related to the use of energy and the cost-effective reduction of greenhouse gas and other air emissions. Although various state agencies are tasked with protecting the interests of SoCalGas customers as members of the general public, SoCalGas has a unique role in representing the interests of its customers on matters that relate to the production, distribution and use of natural gas. Customers rely on SoCalGas to participate in proceedings at the various air and energy agencies to ensure that state and federal policies do not cause undue burden to our customers. Policies supporting the use of natural gas and renewable natural gas in ways that advance state and Commission energy and environmental policy goals benefit ratepayers through cleaner air, lower rates, and reduced direct

1 compliance costs for customers. The work of the P&ES team on the natural-gas-sector
2 allowance allocation provisions under the AB32 Cap and Trade program alone will help save
3 ratepayers an estimated \$1.4 billion from 2015 through 2020.²⁰

4 **3. Forecast Method**

5 A base year forecast method is used for this cost category with incremental funding in
6 addition to the base year added using a zero-based methodology. Multi-year trend or averaging
7 would not be appropriate for this area because the group is newly formed and these methods
8 would not reflect the new and increased activity necessary to address policy, regulatory and
9 legislative matters visible in the forecast period that were not active during the historical period.

10 **4. Cost Drivers**

11 The primary cost drivers for the P&ES group are the number and complexity of policy,
12 regulatory and legislative matters relevant to natural gas utilization and the volume and
13 complexity of compliance matters to address on behalf of customers and the company in local air
14 district rule makings and compliance matters. All of these activities have seen dramatic increase
15 over the past few years and this will continue through the forecast period. SoCalGas activities
16 serve to protect the interests of ratepayers by providing specific input, developed through internal
17 and external analysis, on policy, regulatory and legislative approaches. SoCalGas' input is
18 designed to educate policymakers on SoCalGas operations and how state environmental goals
19 can be accomplished in the most cost effective manner.

20 Work drivers and resourcing levels are discussed below for the three activity areas of the
21 group: (1) Energy and environmental policy and regulation; (2) legislative and public policy
22 matters; and (3) local air district liaison and customer support. Work drivers related to external
23 expert support for these areas is discussed separately at the end of this section of testimony.

24 **i. Energy and Environmental Policy and Regulation**

25 The energy and environmental policy staff support the development and implementation
26 of policies affecting the distribution and use of natural gas. Primary activities include
27 development of SoCalGas' responses to policy proposals and regulatory proceedings at the CEC,
28 CARB, local air agencies, and federal matters of importance to SoCalGas customers. To support

²⁰ Avoided allowance expense calculated using SoCalGas' estimated allowance allocation from 2015-2020 multiplied by an allowance price forecast starting at \$12.18 per ton of carbon dioxide (CO2) in 2015 increasing to \$15 in 2020.

1 these activities, external expert resources are engaged to assist with economy-wide studies on
2 economic and environmental impacts of policy and regulatory proposals and alternatives.

3 In the 2013 base year, 3.7 FTEs were devoted to work on energy and environmental
4 policy matters facing the natural gas sector, including the mid-term and long-term role of natural
5 gas in the energy and transportation sectors, impacts on gas distribution customers of proposed
6 policies and regulations pertaining to air quality, carbon emissions, methane emissions, and
7 hydraulic fracturing among others. SoCalGas' efforts in this area have been to support
8 technology neutral regulations capable of achieving the state's environmental and economic
9 goals. SoCalGas' efforts to support technology neutral solutions benefits all consumers by
10 ensuring that the most economic and feasible pathways to achieving state goals will be
11 considered by policy makers, and benefits ratepayers by supporting policy and regulations that
12 consider the potential uses of the natural gas system to achieve environmental and economic
13 policy goals – helping keep rates down. Without SoCalGas' involvement, it is likely that
14 policies and regulations developed to meet long term environmental objectives would focus
15 almost exclusively on electrifying most end uses and decarbonizing the electricity supply. This
16 approach would risk foregoing cost-effective emission reduction strategies involving the use of
17 natural gas and renewable natural gas.

18 In order to support increased workload in this area, 9.0 FTEs are forecast for TY 2016.
19 Specific matters that will need to be addressed in the TY 2016 time frame and beyond include:

20 **Air Quality Management Plan (AQMP) Development and Implementation** — Local
21 air districts must develop periodic AQMP identifying rules and strategies to meet the
22 NAAQS established by the Federal Environmental Protection Agency (EPA). Two of the
23 local air districts, SCAQMD and SJVAPCD, are currently not in attainment for PM and
24 ozone. By 2016, both districts must submit plans to meet current ozone standards. The
25 districts have already begun the public process to evaluate potential rules and strategies to
26 meet the standard. P&ES staff is needed to work with the district to develop cost
27 effective means to meet NAAQS. Activity levels will continue to increase as the districts
28 get closer to their 2016 deadlines and through the implementation period.

29 **Natural Gas Act (AB1257) Implementation**—Beginning in November 2015, and every
30 four years thereafter, the CEC will identify strategies to maximize the benefits obtained
31 from natural gas as an energy source, helping the state realize the environmental and cost

1 benefits afforded by natural gas. The CEC’s ongoing and continuous effort requires
2 SoCalGas to support and participate in the CEC’s working group and submit testimony to
3 form the basis of periodic policy reports.

4 **Greenhouse Gas Reductions**—AB32 requires California to reduce its GHG emissions to
5 1990 levels by 2020 and executive order S-3-05 requires a reduction to 80 percent below
6 1990 levels by 2050. In the First Update to the AB32 Scoping Plan approved in May
7 2014, CARB lays out an ambitious agenda to put regulations in place to meet the 2050
8 goal. Implementing this plan and future updates will require significant effort by
9 SoCalGas and other stakeholders in TY2016 and beyond.

10 **Zero Net Energy Building Policies**—The CEC’s 2013 IEPR established a definition for
11 ZNE buildings in anticipation of ZNE requirements for new construction starting in 2020.
12 The treatment of natural gas technologies in these regulations will have significant impact
13 on natural gas ratepayers.

14 **Methane Emissions Reduction Policies** — New policies and regulations on methane
15 emissions from natural gas production, transmission and distribution are emerging at the
16 federal, state and local levels in order to meet federal and state climate change policies, as
17 well as address safety concerns related to natural gas operations. These regulations may
18 impact natural gas supplies and will impact SoCalGas operating practices and costs.

19 **ii. Legislative Analysis and Public Policy**

20 In TY2013, legislative analysis and public policy activities were shared across gas and
21 electric areas at San Diego Gas & Electric (SDG&E) and SoCalGas with a staff of 3 FTEs. In
22 2013, SoCalGas determined that the legislative and public policy issues and impacts were
23 significantly different between the natural gas and electricity sectors and between the service
24 territories of SDG&E and SoCalGas (e.g., unique air emissions issues within the South Coast
25 and San Joaquin Valley air districts, storage field maintenance issues and increasing legislative
26 focus on fossil fuels). In addition, the volume of natural-gas-related legislative matters had
27 increased significantly over the past several years.²¹ Based on these factors, in 2013, SoCalGas
28 established its own group to address legislative and public policy issues and staffed the function
29 with 2 FTEs in early 2014. In TY2016 and beyond, due to the increasing focus on
30 environmental sustainability, climate change and safety, we expect the number of bills

²¹ In 2012 the shared SoCalGas/SDG&E group analyzed, developed position recommendations and conferred with stakeholders on 72 bills. This number increased to 87 bills in 2013.

1 introduced that pertain to natural gas and energy to follow the upward trend that we have
2 observed over the past few of years. To address this trend, an additional staff member is
3 forecast to be added in 2015, resulting in a TY 2016 forecast of 3 FTEs in this group.

4 Examples of the types of legislative issues addressed by SoCalGas include distributed
5 generation and CHP, bioenergy, methane controls, hydraulic fracturing, long term energy and
6 environmental planning, pipeline safety, dig alert, development and management of the AB32
7 Investment Fund and use of natural gas as a transportation fuel. Without SoCalGas' involvement,
8 laws that negatively impact natural gas customers would be more likely to be signed into law
9 without adequate information on the impact of the laws and potential alternatives. For example,
10 in the past year, there has been greater scrutiny and concern about the production of oil and
11 natural gas using hydraulic fracturing. There have been several bills introduced in the state
12 Legislature and initiatives by local city governments to put a moratorium on hydraulic fracturing.
13 The bills are worded very broadly, but are intended to limit oil and natural gas production. Some
14 of the practices listed in these bills and initiatives are also used to maintain the wells at
15 SoCalGas' storage fields. The Public Policy group has worked with state and local government
16 officials to make sure the bills do not unintentionally impact our storage operations. Through
17 these efforts, Senate Bill 4 (Pavley, 2013) and the Los Angeles City ban on hydraulic fracturing
18 (2014) were both modified to exclude the well stimulation practices for natural gas storage.
19 Absent these exemptions, SoCalGas' ability to maintain and operate our storage fields would
20 have been limited, impacting our ability to provide reliable service during high demand periods.

21 **iii. Air Agency Liaison and Customer Support**

22 New and more complex air quality regulations continue to be developed and introduced.
23 SoCalGas staff works with local air regulatory entities to contribute expertise, address
24 operational impacts on SoCalGas, and find the most cost effective way to achieve air quality
25 requirements. Additionally, SoCalGas provides education and support to large non-residential
26 customers who must comply with increasingly complex air quality rules and regulations.

27 In the 2013 base year, 4.1 FTEs supported this area and participated in 51 air agency
28 regulatory proceedings and responded to 204 requests for customer's assistance. We expect this
29 volume of regulatory activity to increase along with additional demands for customer support.
30 The 4.1 FTEs in BY2013 include a staff member added late in the year to address increased
31 work. This leads to a forecast of 5 FTEs through the 2016 TY including the 2013 hire on a full-
32 year basis.

1 **iv. External Expert Support and Non-labor expense**

2 Due to the complexity, ambitious scope and sheer number of plans, policies, and
3 proceedings that affect natural gas customers, we require external support in order to contribute
4 information that will advance the thinking and broaden the perspective of local, state and federal
5 policymakers as they consider how to meet California’s ambitious environmental goals and craft
6 new proposed federal climate change-related regulations and policies. SoCalGas’ objective is to
7 provide information relevant state and federal proceedings about natural gas technologies and
8 best practices with respect to controlling methane emissions from natural gas facilities that will
9 help meet environmental goals in the most efficient and cost effective manner.

10 In BY2013, the P&ES group incurred \$1.408 million in non-labor expense.
11 Approximately \$1.34 million was for external services to: (1) provide expert analysis on
12 economic and environmental impacts of policy and regulatory initiatives; (2) assess the potential
13 long-term role of natural gas in meeting California’s GHG and air quality goals;²² and
14 (3) sponsorship of energy and environmental policy forums. The remaining \$68,000 was
15 expended for employee related costs and other activities.

16 In TY2016, non-labor costs are forecast to be \$2.07 million. The cost components are:
17 (1) employee related costs of \$135,000; (2) conference and event sponsorship costs of \$230,000;
18 (3) communications and outreach costs of \$200,000; (4) information resource costs of \$85,000;
19 (5) periodic update of major studies conducted in the 2011 to 2015 time frame of \$325,000; (6)
20 expert support for analysis and studies of policies and regulations of \$925,000; and (7)
21 engineering support for AQMP compliance and rule development of \$170,000. The driver for
22 the increase in external expert support is the growing number of proceedings at the state and
23 federal level related to energy policy, GHG, and air quality;²³ and agency requests for utility

²² “Using Low Carbon Gas to Help Meet California’s 2050 Greenhouse Gas Reduction Goal” prepared by E3; “Pathways to Near-Zero Emissions,” a report prepared by Gladstein, Neandross & Associates; E3 Study to Assess the “Costs and Benefits of Replacing Diesel School Buses with Compressed Natural Gas School Buses.”

²³ For example, the First Update to the AB32 Scoping Plan identifies the following greenhouse gas related plans and proceedings relevant to energy: CA Climate Adaptation Strategy; Safeguarding California Plan; California’s Clean Energy Future; CARB’s Vision for Clean Air; CA Agricultural Vision; DWR Climate Action Plan; CEC Integrated Energy Policy Report; CA Transportation Plan; Water Action Plan; Environmental Goals and Policies Report; Zero Emission Vehicle Action plan; Caltrans Interregional Blueprint; Climate Research Plan; Vision California; State Implementation Plan; CDFW Vision for Confronting Climate Change in CA; AB341 75% Plan.

1 participation as energy experts at workshops organized as part of a rule or policy development
2 process.²⁴

3 For example, the discussion draft of the Scoping Plan Update issued in October 2013
4 relied primarily upon electrifying most end uses, decarbonizing the electricity supply, and
5 phasing out natural gas after 2030. SoCalGas provided CARB with preliminary findings from
6 the Energy and Environmental Economics (E3) low carbon gas study that analyzed options for
7 utilizing natural gas technology to meet California's 2050 GHG goals.²⁵ The final Scoping Plan
8 Update approved by the CARB in May of 2014 presented a more technology neutral approach
9 than earlier drafts.

10 As an example of upcoming efforts, SCAQMD has begun its development of the 2016
11 AQMP to address meeting ozone standards. Meeting these standards will require an
12 approximately 80% reduction in NOx emissions. To accomplish these reductions, SCAQMD
13 will need rules and programs to reduce NOx emissions by around 230 tons per day by 2023.²⁶
14 SoCalGas will support studies to identify multiple technology deployment pathways that
15 examine options at the economy-wide level for customers to reach these stringent standards.
16 Additionally, it is likely that many customers will be directly impacted by the new rules.
17 Therefore, SoCalGas will need to contract with engineering firms that have expertise in air
18 quality regulation and emissions control technologies to meet the demand for customer support
19 activities.

20 **5. Cost Allocation (Shared Service)**

21 Some activities in the P&ES group benefit gas operations at both SoCalGas and SDG&E.
22 Costs are allocated based on activity analysis or natural gas revenues as a proxy for the benefit to
23 each utility depending on the work group.

²⁴ For example, in June of 2014 the CEC requested extensive testimony on the role of natural gas over the short, mid and long term both in transportation and stationary source use, and the potential pathways to reduce the carbon content of gas supply.

²⁵ Publication of the study is planned before the end of 2014.

²⁶ By comparison, the 2012 AQMP established rules to reduce NOx emissions by 8-10 tons per day by 2019.

C. Natural Gas Vehicle Program

TABLE JGR-11

Natural Gas Vehicle Program Costs

In Thousands of 2013 Dollars – Incurred Costs

	Adjusted-Recorded					Forecast			Change
Year	2009	2010	2011	2012	2013	2014	2015	2016	2013-2016
Labor	675	711	628	620	618	816	1,002	1,111	493
Non-labor	755	768	838	1,276	815	878	943	1,161	346
Total	1,431	1,479	1,467	1,896	1,432	1,693	1,944	2,271	839
FTEs	7.6	8.2	7.1	6.9	6.9	9.1	10.9	11.9	5.0

Note: Totals may include rounding differences

1. Description of Costs and Underlying Activities

Table JGR-11 summarizes the costs incurred and forecast for the NGV program. The NGV program incurs both labor and non-labor costs for the purpose of promoting customer adoption of natural gas as a transportation fuel and providing information and assistance to customers that have or are in the process of installing natural gas vehicle fueling facilities. These activities support the adoption of natural gas as a transportation fuel consistent with Public Utilities Code 740.3(a), which instructs the Commission to evaluate and implement policies to “...promote the development of equipment and infrastructure needed to facilitate the use of...natural gas to fuel low-emission vehicles...” SoCalGas’ NGV activities are consistent with statute, provide environmental benefits by promoting the adoption of cleaner burning natural gas, and reduce rates through increased throughput.

Specific activities include: (1) account management and customer outreach for both on-road and off-road NGVs; (2) low-carbon fuel standard (LCFS) customer outreach and administration; (3) commuter and home refueling appliance account management and customer outreach; and (4) customer safety training courses. Customer outreach includes the development and delivery of customer information, education, training and facilitation of customer new service requests for transportation applications.

SoCalGas requests a funding level for the NGV program of \$2.271 million per year during the proposed GRC cycle. This request represents an increase of \$0.839 million compared

1 to 2013 funding levels to support 5.0 additional FTEs and expanded non-labor expenditures for
2 customer outreach and training.

3 **2. Supports Transportation Policy Goals and Safe Use of Natural Gas as** 4 **a Transportation Fuel**

5 The state has ambitious goals for GHG and NOx reduction. The increased adoption of
6 cleaner burning natural gas as a transportation fuel will better enable the state to reach these
7 ambitious goals. However, adoption of natural gas as a transportation fuel is not reaching its
8 potential.²⁷ The NGV program funding requested is necessary to support California’s clean
9 transportation policy goals by increasing the adoption of natural gas as a transportation fuel.
10 Increased adoption of natural gas as a transportation fuel simultaneously addresses several state-
11 wide policy objectives, including:

- 12 • Public Utilities Code 740.3(a), which instructs the Commission to implement policies to
13 “...promote the development of equipment and infrastructure needed to facilitate the use
14 of...natural gas to fuel low-emission vehicles...”
- 15 • Petroleum dependency reduction goals established in AB1007.
- 16 • Greenhouse gas reduction goals established in AB32 and the LCSF.
- 17 • Regional air pollution improvement goals established by the CAA, CARB, and regional
18 Air Pollution Control agencies.
- 19 • Safety – in this case, the safe use of natural gas for transportation applications.

20 **3. Forecast Method**

21 The forecast method I selected for the NGV program is a base year forecast plus zero-
22 based increment. The incremental forecast is based on increases in the number of natural gas
23 vehicle tariff (G-NGV) customers per year, the population of existing G-NGV customers and the
24 number of potential new G-NGV customers to whom NGV adoption will be promoted. This is
25 described further in the discussion of cost drivers below. The base year represents the activity
26 level to which the incremental requirements are added. Using a multi-year average or trend is

²⁷ California Energy Commission, "Natural Gas Scenario AB 1007 State Plan to Increase the Use of Alternative Fuels 5/31/07 Draft", p.18, states “...the aggressive scenario forecast predicts that CNG and LNG will displace approximately 1.9%, 6.2%, and 19% of California’s petroleum-based fuel consumption in 2012, 2022, and 2050, respectively...” These potential levels are much higher than actual adoption rates of less than 1% reported by the U.S. Energy Information Administration “State Energy Consumption Estimates, 1960 Through 2009” DoE/EIA- 0214(2009), June 2011, p.11, Table C8: Transportation Sector Energy Consumption Estimates, 2009 http://www.eia.gov/state/seds/sep_use/notes/use_print2009.pdf.

1 not appropriate as it would not capture incremental activities related to the expanded population
2 of potential customers, nor the expected acceleration of new station additions both of which are
3 based on recent developments in the NGV market.

4 **4. Cost Drivers**

5 The NGV program cost drivers are the number of new G-NGV customers added during
6 each year, the number of customer inquiries (including those related to new programs and
7 regulations such as LCFS and low emission vehicles), the population of existing G-NGV
8 customers, the number of outbound customer contacts and meetings to promote adoption, and the
9 number of customer events.

10 An internal assessment of time requirements for key program activities provides the
11 following FTE equivalents: 1 FTE per 40 new service installations, 1 FTE per approximately 90
12 existing G-NGV accounts and 1 FTE per approximately 80 customer presentations. The number
13 of annual new service requests averaged 15 installations between 2009 and 2013. SoCalGas has
14 established an internal goal of increasing G-NGV throughput by at least 10 million therms per
15 year beginning in 2014 which will increase annual compressed natural gas (CNG) facility
16 additions to 30.

17 In order to address these increased work drivers, 1 FTE addition is needed to support the
18 increased demand for new compressed natural gas CNG service requests and existing G-NGV
19 accounts. An additional 2.0 FTEs will be needed to meet the load growth goal through increased
20 outreach and interaction with customers with fleets that are prospective adopters of CNG.

21 Additionally, two application areas related to natural gas for transportation are seeing
22 significantly increased activity at both the national and local level: off-road applications and
23 commuter / home refueling applications. The DoE has funded a major research initiative to
24 develop low-cost home refueling devices and low-cost on-board CNG tanks to reduce the cost
25 and infrastructure barriers to adoption of passenger CNG vehicles.²⁸ In addition, new vehicle
26 choices are becoming available.²⁹ SoCalGas is requesting 1 FTE to support this growing area.

²⁸ DoE ARPA-e MOVE research initiative is "...creating practical and affordable natural gas storage tanks for passenger cars and quick-filling at-home refueling stations...", <http://arpa-e.energy.gov/?q=arpa-e-programs/move> .

²⁹ Recent new models of light-duty NGVs include the Chrysler Ram 2500, the Chevrolet Silverado and Express, the GMC Sierra and Savana, and the General Motors Impala,

1 Similarly, off-road applications such as heavy equipment, rail and marine are expected to
2 see rapid growth.^{30,31} SoCalGas is requesting 1 FTE to support this area. The foregoing totals to
3 5.0 incremental FTEs in the TY 2016 forecast relative to TY 2013. The staffing plan calls for 3
4 staff additions in 2014, 1 staff addition in 2015, and 1 staff addition in 2016. The TY2016
5 forecast reflects the full increment of 5.0 FTEs at an incremental labor cost of \$0.493 million.

6 Incremental non-labor costs include \$346,000 account management and customer
7 outreach program costs for the off-road applications, commuter / home refueling applications,
8 LCFS program, customer safety training courses, and employee expenses related to incremental
9 FTEs.

10 **5. Cost Allocation (Shared Service)**

11 For 2013, the allocation percentage is estimated proportionally using meter counts for
12 each utility. Natural-gas vehicle tariff meter count is a good proxy for the relative amount of
13 resources required to provide customer information, education, and training programs. For
14 TY2016, the allocation percentage will be 91.96% to SoCalGas and 8.04% to SDG&E based
15 proportionally on meter counts for each utility.
16

³⁰ “Potential of liquefied natural gas use as a railroad fuel”, 2014 Annual Energy Outlook, United States Energy Information Administration, April 14, 2014, states “...Continued growth in domestic natural gas production, along with substantially lower natural gas spot prices compared to crude oil, is reshaping the U.S. energy economy and attracting considerable interest in the potential for fueling freight locomotives with liquefied natural gas (LNG)...” Use of natural gas as percentage of total domestic rail energy consumption is forecast to range from a “low” case of 16% (64 trillion BTUs) to a “high” case of 95% (392 trillion BTUs) by 2040.

³¹ “LNG-fuelled deep sea shipping”, Lloyd’s Register, August 2012, states “...LNG-fuelled engines are a viable option for deep sea trades in the long term (10+ years), particularly for ships on liner trades...” Use of natural gas is forecast to be as high as 4.2% of global LNG production by 2025 and 8.0% of global bunker consumption associated with maritime transportation.

1 **D. Biofuels and Low-Carbon Energy Resources Market Development**

2 **TABLE JGR-12**

3 **Biofuels and Low-Carbon Energy Resources Market Development**

4 **In Thousands of 2013 Dollars – Incurred Costs**

	Adjusted-Recorded					Forecast			Change
Year	2009	2010	2011	2012	2013	2014	2015	2016	2013-2016
Labor	224	399	358	222	133	415	415	415	282
Non-labor	58	422	279	112	94	105	250	250	156
Total	283	821	637	334	226	520	665	665	439
FTEs	2.0	3.1	2.7	1.5	1.0	3.5	3.5	3.5	2.5

5 Note: Totals may include rounding differences

6 **1. Description of Costs and Underlying Activities**

7 Table JGR-12 summarizes the costs incurred and forecast for the Biofuels and Low-
8 Carbon Energy Resources Market Development group. The Biofuels and Low-Carbon Energy
9 Resources Market Development group incurs both labor and non-labor costs for the purpose of
10 promoting increased development and utilization of biogas resources in support of state policy
11 goals for the development of this under-developed renewable natural gas resource. Specific
12 activities include tracking of technology and market development; outreach to biogas feedstock
13 owners and developers to discuss the benefits of pipeline injection; and the provision of
14 information on gas quality requirements, the interconnection process, technology options, high-
15 level economics, and other information resources. The group also provides facilitation support
16 for biofuels project developers wishing to interconnect with the SoCalGas system and
17 participates in policy and regulatory activities addressing biofuels policies and regulations.
18 Finally, the group develops presentations and informational materials for use by others in the
19 company, including public affairs, communications and general account managers, and
20 participates in industry events and conferences. Non-labor expense is for employee costs and for
21 outside engineering support for feasibility assessments and technology evaluation.

22 SoCalGas requests a funding level for Biofuels and Low-Carbon Energy Resources
23 Market Development of \$0.665 million for TY2016. This request represents an increase of
24 \$0.439 million relative to BY2013 in order to accelerate development of biogas resources in the
25 SoCalGas service territory for vehicle fuel and renewable fuel applications.

1 **2. Supports Policy Goals of the State to Reduce GHG from the Use of**
2 **Natural Gas**

3 Biomethane, (a form of RNG), can potentially play an important role in meeting the
4 state’s goals for GHG reduction because biomethane resources have among the lowest carbon
5 intensity scores of any substitutes for gasoline and diesel.³² California first identified biogas and
6 biofuels as a priority resource for accelerated development in 2006 through Executive Order
7 S.06-06. However, progress toward the state’s goals has been slow. The 2012 Bioenergy
8 Action Plan states the market is underdeveloped and that “despite its many benefits, bioenergy
9 production uses only 15 percent of California’s available biomass waste, and production is
10 decreasing.”³³ The Action Plan established the goal to “increase environmentally and
11 economically sustainable energy production from organic waste” by carrying out specific
12 recommended actions.³⁴ These actions include:

- 13 • Increase research and development of diverse bioenergy technologies and
14 applications, as well as their costs, benefits, and impacts;
- 15 • Continue to develop and make accessible information about the availability of
16 organic wastes and opportunities for bioenergy development;
- 17 • Assess and monetize the economic, energy, safety, environmental, and other benefits
18 of biomass; and
- 19 • Facilitate access to transmission pipelines, and other distribution networks.³⁵

20 In addition, state law provides for active utility support for biomethane and biogas market
21 development activities. Section 399.24 of the Public Utilities Code states: “To meet the energy
22 and transportation needs of the state, the commission shall adopt policies and programs that
23 promote the in-state production and distribution of biomethane. The policies and programs shall
24 facilitate the development of a variety of sources of in-state biomethane.” Section 399.20 of the
25 Public Utilities Code states: “The commission shall encourage gas and electrical corporations to
26 develop and offer programs and services to facilitate development of in-state biogas for a broad

³² California Air Resources Board Final Regulation Order, Subchapter 10. Climate Change, Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions, Subarticle 7. Low Carbon Fuel Standard, pp. 47, 50. Available at: <http://www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf>.

³³ 2012 Bioenergy Action Plan, August 2012, prepared as part of the Bioenergy Action Plan proceeding docket # 10-BAP-01, page 2.

³⁴ Ibid, page 1.

³⁵ Ibid, page 2.

1 range of purposes.” The Biofuels and Low-Carbon Energy Resources Market Development
2 group is specifically focused on pursuing these goals.

3 **3. Forecast Method**

4 A zero-based forecast method is used for this cost center. A base year or multi-year trend
5 or averaging would not be appropriate for this area. The 2013 base year represents a reduced
6 level of activity relative to 2010 and 2011 when the biofuels program was staffed at activity
7 levels close to those planned for this forecast period. The dip in activity in 2012 and 2013 relates
8 to staff turnover in concert with diminished levels of project development activity caused by
9 uncertainty regarding gas quality standards due to be developed pursuant to AB1900 and to the
10 suspension of directed biogas as a qualified renewable energy resource in 2012.³⁶ With these
11 regulatory issues resolved, activity levels in the forecast period will return to prior levels or
12 increase with the addition of significant new activity to develop landfill resources; made eligible
13 for pipeline injection in D.14-01-034. Additional outreach and support will also be undertaken
14 in support of development of biomethane as a vehicle fuel.

15 **4. Cost Drivers**

16 Activity levels in support of biogas market development are driven by a number of
17 factors, specifically:

- 18 • Level of biogas project development activity;
- 19 • Customer outreach activity;
- 20 • Number of trade and industry events supported;
- 21 • Regulatory / agency activities;
- 22 • New program implementation (such as LCFS); and
- 23 • Tracking / assessment of markets and products.

24 To support the planned level of activity, 3.5 FTEs will be needed, an increment of 2.5
25 FTEs relative to BY2013 at an incremental cost of \$0.282 million. This forecast is based on a
26 return to activity levels of 2010 and 2011 (~2.75 FTEs) as a result of the CEC lifting its
27 suspension of biomethane as an RPS eligible resource and Commission’s development of
28 biomethane quality specifications in Rulemaking 13-02-008. An additional 0.75 FTE is

³⁶ Notice to Consider Suspension of the RPS Eligibility Guidelines Related to Biomethane Under the RPS Proceeding, Docket 11-RPS-01 and Docket 02-REN-031, Available at: http://www.energy.ca.gov/portfolio/notices/2012-03-28_biomethane_notice/2012-03-28_Biomethane_Suspension_Notice.pdf.

1 requested to support increased activity levels related to landfill gas development and renewable
 2 CNG vehicle fuel activities. As shown in Table JGR-13, adding landfills to the set of eligible
 3 resources increases the resource level by about 80%. The non-labor forecast covers employee
 4 expenses as well as external engineering support for market assessment and evaluation of
 5 commercial technologies.

6 **TABLE JGR-13**
 7 **Biomethane Resource Potential Estimates³⁷**

Feedstock Source	Estimated MMscfd Biomethane	Annual MM Gasoline Gallons Equivalent	Estimated Number of Potential Projects
Wastewater Treatment	11.4	34.1	14
Dairies	42.6	127	54
Food/Green Waste	43.2	129	55
Landfills	65	194	83
Total	162	485	206

8 **5. Cost Allocation (Shared Service)**

9 For the base year, allocation for this cost center was 95% SoCalGas and 5% SDG&E.
 10 For TY 2016, the allocation will remain unchanged 95% SoCalGas and 5% SDG&E. During
 11 this GRC period, SoCalGas will be the primary beneficiary of the market development effort
 12 based on near term potential opportunities identified.

13
 37 Resource potential estimated from various public source documents: Waste Water facility data from US EPA Region 9 database; Dairy statistics from United States Department of Agriculture National Agricultural Statistics Service; Food and Green Waste statistics from <http://www.calrecycle.ca.gov/SWFacilities/Landfills/Tonnages/>; Landfill data from <http://www.epa.gov/lmop/projects-candidates/index.html#map-area>. Number of potential projects based on minimum project size of 1.5 MMscfd of raw biogas.

1 **E. Business Strategy and Development**

2 **TABLE JGR-14**

3 **Business Strategy and Development**

4 **In Thousands of 2013 Dollars – Incurred Costs**

	Adjusted-Recorded					Forecast			Change
Year	2009	2010	2011	2012	2013	2014	2015	2016	2013-2016
Labor	526	411	424	371	510	714	727	727	217
Non-labor	31	241	349	596	474	474	474	474	0
Total	557	652	772	967	984	1,188	1,201	1,201	217
FTEs	4.6	3.5	3.7	3.2	5.0	6.8	7.0	7.0	2.0

5 Note: Totals may include rounding differences

6 **1. Description of Costs and Underlying Activities**

7 Table JGR-14 summarizes the costs incurred and forecast for the Business Strategy and
8 Development organization. The Business Strategy and Development organization incurs labor
9 and non-labor costs associated with long-term planning, tracking of natural gas industry trends,
10 support for company-wide initiatives and project analysis. The group provides analytical and
11 execution support for initiatives in four strategic priority areas: operational excellence;
12 development and deployment of clean energy solutions for customers; support for sensible
13 policies and regulations that promote ratepayer interests and advance Commission policy; and
14 workforce development. In addition, the organization collects and analyzes information on
15 external trends, assists with financial and technical analysis related to major capital projects,
16 supports the long-term capital planning process and develops and maintains analytical and
17 collaboration tools. The cost elements include labor and associated employee costs as well as
18 expenses related to third party information and consulting services.

19 SoCalGas requests a funding level for Business Strategy and Development of \$1.2
20 million per year during the proposed GRC cycle. This request represents an increase of \$0.217
21 million compared to base year recorded spend in order to provide increased support for
22 development and implementation of company-wide optimization and improvement initiatives
23 and tools to support collaboration and progress tracking of those initiatives.

24 **2. Supports Safety, Reliability and Policy Goals**

25 SoCalGas' four strategic priority areas support safe and reliable operation of the natural
26 gas system, customer service, environmental goals, and workforce development. The activities

1 of the Business Strategy and Development group assist teams in various divisions in pursuing
2 these priorities and create ratepayer benefit by improving the effectiveness of these efforts.

3 **3. Forecast Method**

4 A base year forecast method is used for this cost category with incremental funding in
5 addition to the base year added using a zero-based methodology. Multi-year trend or averaging
6 would not be appropriate for this area because the group has taken on new activities to support
7 company-wide improvement initiatives.

8 **4. Cost Drivers**

9 Costs in the Business Strategy and Development group are driven by a number of factors
10 including:

- 11 • Tasks and analysis required for the annual, long-range planning process;
- 12 • The number of active projects and analysis tasks supported and their complexity;
- 13 • Number of tools and processes managed by the group; and
- 14 • Outside information service requirements.

15 Activity levels in support of the annual planning process increased in 2012 with the
16 implementation of the Balanced Scorecard TM methodology. This methodology is intended to
17 ensure balance across a range of strategic objectives and to align activities with those objectives
18 through defined strategic initiatives. Project analysis and support requirements have
19 correspondingly increased. In 2014, a manager and analyst were added to the group to support
20 new company-wide collaboration tools related to development and implementation of
21 improvement initiatives, and to assist in implementation of these initiatives. This created an
22 FTE increment of 1.8 in 2014 due to part year effect which becomes a 2.0 FTEs full year impact
23 in 2015 at a cost of \$0.217 million. Non-labor stays flat throughout the forecast period and
24 supports employee costs, funding for company-wide information services, and consulting
25 support for strategic programs.

26 **5. Cost Allocation (Shared Service)**

27 Activities in the Business Strategy and Development organization provide benefit to both
28 SoCalGas and SDG&E. Costs are allocated based on natural gas revenues as a proxy for the
29 benefit to each utility.

1 **IV. CONCLUSION**

2 The activity areas in my testimony cover a variety of functions and activities that support
3 policies and technologies that optimize the use of natural gas as an environmentally beneficial
4 and cost effective energy solution, enhance safety and reliability of the natural gas delivery
5 system, support customer adoption and use of low-emission technologies, and support a variety
6 of company-wide initiatives in related areas.

7 The incremental funding requirements supported in my testimony are driven by state and
8 federal policies and regulations requiring dramatic reduction in criteria pollutants (primarily
9 NOx) and greenhouse gases. These overall policy goals are driving a proliferation of new
10 legislation, proposals, and regulations to achieve these goals. SoCalGas' activities are carried
11 out to protect the interests of ratepayers and ensure that policy goals are achieved in the most
12 cost-effective manner, with costs fairly allocated across sectors and with natural gas and the
13 natural gas system utilized to maximum benefit. This drives activity in legislative, regulatory
14 and policy analysis, modeling of economic and environmental impact of proposals, agency
15 interaction, stakeholder outreach and direct support for customers. It also creates the need for
16 increased activity to assess and advance technologies that improve the emissions profile of
17 natural gas and that make available future supplies of renewable natural gas. Similarly, pipeline
18 safety enhancement requires active engagement in development of appropriate policies and
19 regulations and investment in the development of technologies that enhance system safety and
20 reliability.

21 This concludes my prepared direct testimony.
22

1 **V. WITNESS QUALIFICATIONS**

2 My name is Jeffrey G. Reed. My business address is 8330 Century Park Court, San
3 Diego, California. I am a shared service employee of the Southern California Gas Company and
4 San Diego Gas & Electric Company and serve as Director of Business Strategy and Advanced
5 Technology. At the Southern California Gas Company, I'm responsible for coordination of
6 strategic planning and advanced technology activities. In a prior assignment, I was responsible
7 for strategic planning for the Southern California Gas Company and San Diego Gas & Electric.
8 Prior to joining SoCalGas and SDG&E, I worked as a consultant to the energy industry leading
9 business strategy and operational improvement initiatives. I also served as a director and officer
10 in the gas turbine and steam turbine divisions of Asea Brown Boveri (ABB) Power Generation in
11 Switzerland with responsibilities in technology development, product design, marketing,
12 business development and strategic planning. Prior to that, I held various positions in a defense
13 research and development company. I hold a bachelor's degree in Mechanical and
14 Environmental Engineering from the University of California, Santa Barbara, a master's degree
15 and doctorate in Mechanical Engineering from the University of California, Berkeley and a
16 master's degree in management from Stanford University. I have previously testified before the
17 Commission.

APPENDIX A

RD&D Summary of Significant Recent Projects

The following research, development and demonstration (RD&D) program projects focus on six key objectives:

- Develop and implement technologies that enhance the safety and efficiency of SoCalGas' operations.
- Develop and demonstrate low-emission, high-efficiency equipment for residential, commercial, and industrial applications.
- Develop and demonstrate technologies that substantially reduce NOx & GHG emissions and comply with or exceed all air quality regulations.
- Advance the use of natural gas vehicles to help customers to decrease their dependence on other higher cost fuels and meet California's emissions standards.
- Increase the viability of clean, highly efficient, cost-effective distributed generation and combined heat and power systems.
- Develop new renewable natural gas resources to meet California's aggressive renewable portfolio standards.

Gas Operations RD&D

Supporting Technologies for Robotic Inspection System

This NYSEARCH-led project with Invodane Engineering involves the development of ancillary and supporting technologies for the Explorer robotic inspection platform. New features include mechanical damage and crack sensors, an in-line charging system, and a rescue robot. These technologies will enhance the Explorer's pipe inspection capabilities and increase operational efficiency.

Study of Odor Masking Phenomena

This research is investigating conditions that could lead to odor masking phenomena when odorants of differing compositions are added to natural gas supplies. A scientific research project was initiated to study how and which chemical interactions (or conjugate pairs) result in odor

masking. Tests using human subjects and research evaluations by scientists at Cardiff University are being conducted.

Satellite Monitoring of Remote Pipeline Routes

This project aims to evaluate the use of radar satellite imagery and data analysis to enable terrain-related risk assessment and alerts of geohazards along transmission pipelines. MDA Geospatial Services will utilize its proprietary images and models to analyze company pipelines in the mountains of Ventura, CA. A risk index product called InSIGHT (Information Status In GeoHazardous Terrain) will be developed to serve as a risk management tool.

Advanced Leak Detection

Picarro's Surveyor™ incorporates a highly sensitive methane gas analyzer, a global positioning system, and atmospheric sensors. The system captures all pertinent data in real time and converts the information, using Picarro's patented software, into a user-friendly graphic display viewable via a computer. The graphic display shows "leak indications" as they are detected along the path of the driven route.

GHG Emission Factors

In this project, fugitive methane emissions are measured from leaking polyethylene (PE) pipelines. Aboveground and belowground measurements are taken to develop more accurate GHG emission factors for PE pipe systems.

Impact of Siloxane in Landfill Biogas on Internal-Combustion Engines

Biomethane derived from landfill biogas contains many trace elements that could be harmful to end-use combustion equipment. Siloxane is a trace element that converts to silica dioxide, which deposits onto combustion surfaces including downstream equipment. The performance of a post-combustion catalyst can be negatively impacted by this deposit. This project tested Siloxane impacts on engines for the purpose of natural gas quality standards development.

Landfill Gas Cleanup Assessment

Biogas samples from three local landfills in SoCalGas' service territory were included in this study. From the results obtained in this project, it can be concluded that high-Btu landfill-derived renewable gas of high quality can be produced within required tolerance specifications for introduction into natural gas supplies.

Methane Emission Factors

The objective of this phase is to quantify methane emissions from underground pipelines by conducting field validation testing of the methodology. Eight field sites were selected in SoCalGas' service territory covering three distribution districts (Azusa, Canoga, and Pasadena). Two of these sites were excavated, the leak source (pipe segment) was isolated, and actual flow measurements were performed. GTI is compiling leak measurement data from other gas distribution company host sites and will write a final report based on the combined results.

Outdoor Storage Standards for PE Pipe

This project's goal is to update federal and state regulations (CFR Part 192) and ASTM test method D2513. Research findings include comprehensive ultraviolet and weatherability testing of PE pipe stored outdoors for more than 2 years. Our research found that medium-density PE pipe can be exposed to ultraviolet light for 3 years and high-density PE for 10 years with no degradation of PE pipe performance. These recommendations were incorporated in ASTM D2513-2009a. Changes to federal and state regulations are now under consideration.

Leak Rupture Boundary

GTI completed this study using incident and laboratory testing data with advanced modeling techniques to calculate the boundary between failure by leak and failure by rupture as a function of the pipe's specified minimum yield strength. The results of the study found that the yield strength, toughness, wall thickness, and diameter of a pipe segment can be used to predict the leak-rupture boundary. The research indicated that this boundary could range from slightly below 20% of specified minimum yield strength for rare pipe materials to well over 30% for many others.

Customer Applications RD&D

Low-NO_x Water Heaters

Working with industry leaders, SoCalGas successfully developed and demonstrated 10 ng/joule NO_x water heaters. SoCalGas and GTI are now collaborating to develop and demonstrate low NO_x (5 ng/joule) residential water heaters utilizing metal fiber and metal foam burner technologies to meet anticipated lower NO_x emission regulations. We are currently in discussions with GTI to develop first prototype units in a next phase project, starting in late 2014 or early 2015. There are approximately 5.5 million residential gas-fired water heaters in use in Southern California Gas Company territory.

Low-NO_x Furnaces

SoCalGas supported the development of low-NO_x central furnaces under four separate projects with strategic industry partners including GTI, Nordyne, Ingersol Rand, and Beckett Gas. Burner designs for metal mesh, metal foam, cyclonic, and forced internal recirculation burners were developed and the designs refined. Each project has successfully achieved the goal of meeting mandated NO_x emission targets with a reduction in emissions from 40 ng/joule down to 14 ng/joule in prototype testing. The manufacturing partners are finalizing designs in preparation for product releases in late 2014 and 2015. There are several million central furnaces used in homes today in Southern California Gas Company territory.

Interactive Natural Gas Appliances and Programs

In collaboration with GTI, SoCalGas completed an assessment of the market potential and direction for natural gas energy usage feedback technologies. The assessment showed that there are no smart (integrated feedback and control) gas-fired appliances currently in the market. However, several key manufacturers are looking at pursuing development of advanced products. SoCalGas has initiated dialog with these key manufacturers to explore future product development activities.

High Efficiency Cooking

Working with GTI, SoCalGas supported the development of more efficient commercial cooking ranges and woks. Wok prototype testing has indicated a 100% efficiency improvement over a

baseline wok. Commercialization efforts have shifted to Royal Range to build and market the new wok design. The advanced range incorporated a pilotless burner which conserves approximately 20 therms per year. This technology is now being marketed by Montague in the United States and Europe.

High-Efficiency Ovens

Working with GTI, SoCalGas and UTD supported the development and demonstration of a more efficient conveyor oven with Lincoln Oven Company. Thermal efficiency of the conveyor oven increased from 20% to 40%. Two models are currently being sold throughout the United States.

Portable Gas Analyzers

SoCalGas Engineering Analysis Center completed an evaluation of the number of certification gases needed to validate the accuracy of portable analyzers under SCAQMD engine Rule 1110.2. The results show that fewer gases can be used than are required in the existing rule potentially reducing cost and complexity. Modifications to the testing protocol used by SCAQMD are still pending their review.

Low-NO_x Burners

Working with GTI, SoCalGas is developing new ultra-low NO_x burner technologies for both boiler and process heater applications. Current NO_x emission targets for the boiler projects are approximately 5 ppm at 3% O₂ (existing boiler regulations are at 9 ppm NO_x). A first demonstration of a boiler is planned for late 2014 / early 2015 with Power Flame. GTI submitted a proposal to the CEC and to SoCalGas to fund this next phase.

Low-NO_x Process Heaters

SoCalGas is developing process heaters to meet NO_x emission targets range from 20 to 60 ppm depending on process temperature. Burner material and performance evaluations are still ongoing with equipment field demonstrations being planned for 2015.

Heat Recovery

SoCalGas supported the development and commercialization of a low temperature heat recovery technology called Transport Membrane Condenser (TMC) in a project at GTI. The technology was successfully demonstrated on several test sites including the Super Boiler project at Clement Pappas, steam boiler at Baxter Pharmaceuticals and in a steam tunnel application at L&M Cleaners. The TMC technology removes heat from process temperatures below 300°F. GTI has licensed this technology to Canon Boiler Works who is currently marketing the product throughout the United States.

Clean Generation RD&D

Engine Emissions Control Systems

SoCalGas, working with Tecogen and Continental Controls, completed development and testing of engine emission control systems to meet regional air quality management district emissions requirements. The multiyear projects utilized post-combustion catalytic treatments to reduce criteria pollutants from natural gas engines. These technologies have successfully reduced untreated NOx levels from over 2000 ppm to less than 5 ppm. Similarly, CO emissions were reduced to less than 5 ppm. The developers of these technologies, Tecogen and Continental Controls, are now selling the technologies in the Southern California market. There are approximately 660 industrial engines located in SoCalGas territory.

Combined Heat and Power

SoCalGas, along with project partners DE Solutions, GE Jenbacher, and Houweling's Tomatoes, successfully won an award from the CEC to demonstrate in a greenhouse setting. The project has completed installation and begun testing of several lean-burn natural gas engines installed in a CHP setting at an advanced greenhouse. Normal byproducts of combustion/generation are used beneficially to bolster crop production and maintain stable greenhouse temperatures. Preliminary measurement of the system indicates a CHP efficiency of approximately 86% for the system. Additionally, the NOx and CO emissions have successfully met SJVAPCD emissions limits of 5 ppmv and 80 ppmv respectively. GE Jenbacher currently offers this natural gas

fueled engine commercially. The project will continue to be monitored and evaluated per reporting criteria of the CEC and a final report will be presented in March of 2015.

Flex-CHP High-Efficiency Ultra-Clean Power & Steam Package

This project developed and demonstrated a flex-CHP microturbine system (65 kW Capstone microturbine with a waste heat boiler) for the generation of power and steam for commercial and industrial customer applications. The system was commissioned in the fourth quarter of 2013 and has successfully met SCAQMD emissions limits without the need for flue-gas or SCR exhaust treatment. The tested configuration has the potential to reduce CHP system costs by more than 25% due to the elimination of post-combustion treatment. The project was the result of a CEC grant awarded to SoCalGas, GTI and other project partners. SoCalGas leveraged its R&D funding by approximately 11 to 1. The project will be evaluated on a technical basis for the remainder of 2014, and a final report presented to the CEC in the second quarter of 2015.

Tri-Generation: Renewable Power, Heat and Hydrogen

Working with DoE, Air Products, Inc., Fuel Cell Energy, Inc. and others, SoCalGas supported a demonstration of a 300 kW fuel cell at the Orange County Sanitation District. The system is the first “tri-generation” project, where recoverable heat, electrical power, and hydrogen are used for plant utility needs and vehicle refueling respectively. The project successfully provided a proof of concept while demonstrating the longevity of molten-carbonate fuel cell chemistry in an industrial application. Furthermore, the hydrogen refueling component of the project has demonstrated increased reliability to the FCEV market in southern Orange County. The project demonstration will end in the 4th quarter of 2014. Equipment operators will decide at the termination of the demonstration period to pursue use of the equipment commercially.

Oxy-Fuel Combustion Based CO₂ Capture

In 2012, Rancho Cordova based Clean Energy Systems (CES) designed, manufactured, and installed an SGT-900 combustion turbine modified to operate on steam and carbon dioxide (CO₂) at temperatures up to 2,200°F. The resulting oxy-fuel turbine is called the OFT-900. This completed a 4-year, \$43 million DoE program 1 year ahead of schedule. CES also designed and tested the first zero-emission steam system for heavy oil recovery. In 2014, CES sold the first

commercial licenses to a Danish company, Maersk Oil & Gas. Following SoCalGas' initial, RD&D investment in 2006 and 2007, CES has received more than \$100 million in DoE grants, investments by third parties and license fees.

Clean Transportation

Galileo Microbox Modular Refueling Station

The Microbox, developed by Galileo and used extensively internationally, is being showcased for the first time in the United States at SoCalGas' Riverside customer service base. The compact, self-contained fueling station, with a capacity of 500 standard cubic feet per minute (scfm), provides compressed natural gas at about \$2 per gasoline gallon-equivalent. It serves vehicles operated by Riverside (city and county), AT&T, and SoCalGas, as well as regional school bus and taxi companies and consumer vehicles.

Galileo Nanobox Modular Refueling Station

The Galileo "fuel-in-a-box," plug-and-play packaged natural gas refueling station called the Nanobox targets smaller fleets and is available rated between 80 and 200 scfm. Two Nanoboxes have been installed at SoCalGas sites in Bakersfield and Chatsworth. They will serve the SoCalGas fleet through a time-fill system. Both systems are operational.

Westport Natural Gas Vehicle (NGV) Fuel System

High-pressure, direct-injection technology enables engines designed for diesel combustion to operate with natural gas while retaining the same critical performance features of a traditional diesel engine – high torque, power, and fuel economy. A demonstration of the Westport high-pressure, direct-injection engine in southern California allowed fleets to obtain first-hand experience with the new technology.

Cummins Westport High-Horsepower NGV Engine

With SoCalGas support through the GTI UTD program, Cummins Westport is developing a new 11.9-liter, 400-horsepower NGV engine (ISX12G) for the large truck and bus market segments, such as regional haulers and refuse transfer trucks. The engine will satisfy California's stringent

emissions requirements. Over a dozen field demonstration units were put into service in 2012 and are performing well.

Multi-Fuel Vehicular Engine

This project focuses on designing and testing a dual liquid/natural gas combustor for a 350-kW turbine engine. The Class 8 truck engine was co-developed by Peterbilt Motors and Kenworth Trucks for diesel fuel. Under a new CEC project, it could be adapted to use liquefied natural gas. In 2012, the project team characterized and measured the turbine and compressor efficiencies, refined the shaft seals and air-buffering system, and identified a performance deficiency in the compressor for the high-pressure spool that is now being addressed by the vendors.

NGV Home & Small Fleet Fueling Investigation

The objective of this project was to evaluate and compare small-capacity compression technologies suitable for NGV fueling devices for residential and small fleet use. Roughly 30 vendor products were assessed. Three vendors were identified with promising products that could reach market entry within the next few years. Product cost presents the biggest challenge and it is uncertain whether any of the products currently under development can reach the 70% cost reduction required for wide adoption. SoCalGas has been an advisor to the DoE ARPA-e program seeking breakthrough technology advances to address this gap.

Low Pressure Storage

SoCalGas Supported the development of a low-pressure adsorption CNG storage tank for use in natural gas powered vehicles. The technology allows for gas adsorption in order to reduce pressure vessel cost and compression expense. University of Missouri developed a high performance adsorbent that consists of high surface area carbon. The storage capacity is estimated equivalent to CNG at 250 bar (3,600 psig) on same size tank. It is estimated that prototype conformable tank assembly for simulating on-road operation cost including vehicle conversion and NG compression to be \$2.62/GGE for ANG and \$4.26/GGE for CNG. This cost advantage over CNG, makes Adsorb Natural Gas (ANG) an attractive technology for allowing vehicles to run on natural gas. The project is cofunded with the CEC. Field demonstration is expected in late 2014.

Doosan Low Emission Engine

In collaboration with DoE/NREL, SCAQMD, Southwest Research Institute and Doosan, SoCalGas helped to develop an 11.0 liter heavy duty engine for initial use in an articulated bus that produces near zero emissions without sacrificing performance or efficiency compared to 2010 diesel engine. The project has successfully met and exceeded CARB 2013 emissions requirements and will continue with durability/longevity and certification testing as well as field demonstration with Los Angeles Municipal Transit Authority.

Renewable Energy RD&D

Solar Thermal Combined Cooling, Heat, and Power (CCHP)

An array of Cogenra cogeneration collectors was commissioned in 2012 at SoCalGas' Energy Resource Center in Downey, CA. The Cogenra array simultaneously produces electricity and hot water. The system was integrated into the building's existing solar heating and cooling system and is being tested for performance and reliability. The system has also improved the building's status under the Leadership in Energy & Environmental Design (LEED) program. Cogenra collectors are now commercially available.

Equinox Solar-Assisted Heating System

The Equinox system is a combination thermal storage tank and instantaneous water heater capable of providing 100% of domestic hot-water and space-heating needs. This unit was tested in multiple residential and commercial sites and is available from Solar Usage Now as the S.U.N. Equinox Heating System®. A field test is being conducted at a residential customer site in southern California.

Solar-Assisted Natural Gas Energy Systems

Progress continues with the installation of solar thermal collectors using B2U Solar's higher temperature technology, called the external compound parabolic concentrator. This system pairs an evacuated-tube solar collector with an external non-imaging reflector in a non-tracking system to cost-effectively achieve temperatures above 392°F at 50% efficiency. Additional field testing is planned.

Biomethane Purification Demonstration

The purpose of this project was to demonstrate and advance the state-of-the-art of biogas upgrading to pipeline-quality standards. SoCalGas designed and installed a heavily instrumented biogas processing system comprised of pressure swing adsorption vessels, activated carbon media and an H₂S reactor at a waste water treatment plant in Escondido, CA. Over the 18 month demonstration period, the upgrading system reliably converted highly contaminated, CO₂ rich biogas from the facility's anaerobic digesters into produced pipeline-quality renewable natural gas. In 2014, this demonstration was used to field-test a low-cost biogas quality system developed by GTI. SoCalGas is now evaluating the possibility of converting this system to commercial use.

Low-Cost Concentrated Solar Thermal System

In collaboration with the CEC, SoCalGas help develop and demonstrate Hyperlight™, a unique, low-cost reflector system for a compact linear Fresnel reflector with a linear receiver and single-axis tracking. The most important cost driver is the solar reflector field (up to 45% of total cost). Hyperlight's key innovation is the use of water as a structural material, providing a perfectly level foundation that enables the use of lightweight, inexpensive materials such as extruded plastic. This system is now commercially available.

Renewable Hydrogen and Methane from Solar Thermocatalytic Water Splitting

In collaboration with DoE, UCSD and SAIC, SoCalGas supported the development of a high-temperature sulfur-ammonia solar thermochemical cycle water-splitting cycle to produce renewable hydrogen and methane. This all-fluid process is unique in that it is designed to

operate at steady state around the clock when coupled to a sodium chloride phase change thermal energy storage system. Since the chemical plant operates continuously, it is one-third the size of a plant that operates only when the sun shines. In 2012, electrocatalysts were improved, and a 500-hour durability test was initiated to demonstrate the long-term stability of the electrolytic cell materials. The development team is now preparing for on-sun testing at a concentrating solar dish recently installed at San Diego State Brawley.

Commercial Hybrid Gas/Solar Demonstration

In 2012, a hybrid gas/solar water-heating system was installed at Courtside Cellars Winery in San Miguel, California. A second system had been installed at a healthcare facility in North Carolina in 2011. Data-acquisition equipment at both facilities was gathering operating data for analysis of system performance. Both systems have performed as expected, and energy savings have been realized without any major operational issues since the installations.

Algae-based Carbon Dioxide Capture and Recycling

In 2013 and 2014, SoCalGas collaborated with Scripps Institution of Oceanography to develop the design, engineering specifications and environmental impacts for a cost-effective algae-based system for carbon dioxide capture and recycling from large-scale natural gas combustion processes. The design was based on the Merino Valley compressor station operated by SoCalGas. Based on the results, SoCalGas is working to secure funding support to construct the system at commercial sites such as natural gas water pumping facilities and utility compressor stations.

Appendix B

Technology Needs Assessment Summary

Residential End-use Applications RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Efficiency and Renewable Energy Systems Integration	<ul style="list-style-type: none"> Residential utility customers consume 74 MMBtu/yr of natural gas¹ and 10,837 kWh/yr of electricity² Present Title 24 residential home efficiency standards 	<ul style="list-style-type: none"> 2020 target for Zero Net Energy new homes and 40% energy reduction for existing homes to 37 MMBtu/yr of natural gas and 3,900 kWh/yr of electricity.³ Energy Efficiency Program goals set by the CPUC in D.12-11-015 	<ul style="list-style-type: none"> Develop and integrate new high efficiency appliances combined with distributed renewable thermal and electric energy generation like solar thermal, PV and fuel cells. Develop improved “Smart Home” technologies Cost reductions to make systems affordable for the home owner Integration of electric and natural gas grids through residential fuel cells, and CHP 	<ul style="list-style-type: none"> Single family home and multifamily home demonstrations that incorporate solar thermal, fuel cell (or other microCHP) with condensing appliances. Smart Home demonstration projects that integrate smart appliances, home energy management, on-site vehicles refueling, smart meters with two-way communication with energy utilities, and remote controls of appliances. Continued support and demonstration of residential solar thermal products and higher efficiency gas-fired condensing products.
Appliance NOx Emissions and Indoor Air Quality and	<ul style="list-style-type: none"> NOx emissions limit: 40 ng/joule⁴ 	<ul style="list-style-type: none"> NOx emissions: 10 ng/joule NOx for water heaters; 14 ng/joule by October 2014 for residential condensing central space heating furnaces; 14 ng/joule by October 2015 for residential non-condensing furnaces⁵ 2016 Title 24 residential home efficiency standards 	<ul style="list-style-type: none"> Develop space heaters < 14 ng/Joule NOx. Develop water heaters < 10 NG/joule NOx. Reduce cost of condensing tank-less water heaters. Reduce cost of condensing tank type water heaters. Reduce cost and improve efficiency of gas heat pump water heaters. 	<ul style="list-style-type: none"> Support industry developing new low NOx emission products on water heaters and space heaters. Foster development of new combustion technologies using metallic, ceramic, and fiber materials Foster development of lower cost condensing water heating and space heating technologies. Life cycle and field testing of new units with manufacturers

¹ EIA’s 2009 Residential Energy Consumption Survey, Trends in U.S. Residential Natural Gas Consumption

p.1 Available at: http://www.eia.gov/pub/oil_gas/natural_gas/feature_articles/2010/ngtrendsresidcon/ngtrendsresidcon.pdf

² EIA Frequently Asked Questions. Available at <http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3>

³ CEC- 2007 Integrated Energy Policy Report (IEPR) Zero Net Energy (ZNE) goals

⁴ SCAQMD Rule 1111 furnace NOx emissions limits. Available at http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1111/par1111_prelimdraftsr.pdf?sfvrsn=2

⁵ Ibid.

Commercial End-use Applications RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Efficiency and Renewable Energy Systems Integration, Heating & Cooling	<ul style="list-style-type: none"> • NOx emissions limit is 40 ng/joule⁶ • Title 24 commercial building efficiency standards 	<ul style="list-style-type: none"> • 2030 target for commercial buildings⁷ • Energy Efficiency Program goals set by the CPUC under Decision 12-11-015 • Future Title 24 Energy Code 	<ul style="list-style-type: none"> • Develop cost competitive (high efficiency) condensing products and gas heat pump technologies • Thermodynamic cycles such as adsorption cooling and heat pumps • Insulation materials and geometries • Develop advanced controls to maximize the performance characteristics of the solar system, chillers, heaters, and water heaters 	<ul style="list-style-type: none"> • Evaluate and identify high efficiency water and space heating systems for commercial buildings including condensing water heating and condensing space heating products. • Support companies with advanced gas-fired heat pump technology based on absorption chiller technology and engine driven chiller advanced catalyst emission control. • Support development of cost effective adsorption cooling systems integrated with solar thermal. • Support development of advanced radiant burner technology for commercial warehouse and manufacturing applications.
Commercial Cooking & Food Service Equipment	<ul style="list-style-type: none"> • Commercial food service equipment does not have to meet NOx or efficiency standards. 	<ul style="list-style-type: none"> • NOx control projected for SCAQMD in 2016 AQMP • Energy Efficiency Program goals set by the CPUC under Decision 12-11-015 	<ul style="list-style-type: none"> • Improved combustion systems and geometries • Insulation and thermal control • Exhaust management and exhaust treatment systems 	<ul style="list-style-type: none"> • Support integration of advanced burner technologies that provide high efficiency and lower NOx emissions with major cooking appliances (fryers, griddles, ovens, ranges). • Demonstration of a “commercial kitchen of the future” which will integrate high efficiency appliances with advanced ventilation concepts and control systems. • Evaluate, identify, and encourage use of improved, higher efficiency gas-fired cooking appliances that can qualify for the California Energy Star program.

⁶ Ibid.

⁷ EPA 2030 Challenge Available at http://www.architecture2030.org/files/2030_Challenge_Targets_National.pdf.

Industrial End-use Applications RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Ovens, Furnaces, Boilers, Process Heating	<ul style="list-style-type: none"> • Uncontrolled NOx levels from industrial ovens, dryers, furnaces, afterburners and other process equipment • Boiler NOx limits: 9 to 30 ppm⁸ 	<ul style="list-style-type: none"> • 30 to 60 ppm NOx emission levels depending on process temperature for industrial ovens, dryers, furnaces, afterburners and other process equipment⁹ • Boiler NOx limits: 5 to 9 ppm • Increasingly stringent NOx emissions limits are anticipated in SCAQMD’s 2016 AQMP 	<ul style="list-style-type: none"> • Advanced boiler products to reduce NOx emissions. • Advanced burner and heat recovery technologies to reduce increase efficiency and reduce emissions from industrial ovens, dryers, furnaces, afterburners and other process equipment 	<ul style="list-style-type: none"> • Demonstration of a high efficiency gas-fired rotary dryer with advanced heat pump in a food processing application. • Demonstrations of advanced waste heat recovery technologies in caustic effluent applications that are commonly found in various metal melting applications (e.g. testing of Gas Guard Heat Recovery technology that utilizes “trona” [soda ash] as a sorbent material that removes 96% of hydrogen chloride from the exhaust stream) • Demonstration of advanced economizers for industrial boiler applications to refine system performance and installation costs. • Demonstration of improved regenerative and recuperative thermal oxidation technologies to destroy smog-causing VOCs.

⁸ SCAQMD Rule 1146.

⁹ SCAQMD Rules 1147 and 1153.

Clean Generation RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Waste Heat Recovery	<ul style="list-style-type: none"> Organic Rankin cycle systems are less than 8% efficient 	<ul style="list-style-type: none"> 20% recovery is necessary to cost-effectively help meet AB32 CO2 emissions goals 	<ul style="list-style-type: none"> Develop improved cycles, heat exchange systems (e.g. micro-channel heat exchangers and advanced sorbents), thermally drive chillers 	<ul style="list-style-type: none"> Demonstrate heat recuperation and power generation systems. Demonstrate advanced adsorption chillers operating on waste heat
Internal Combustion Engines, Turbines, and Sterling Systems	<ul style="list-style-type: none"> NOx emission limit for stationary sources of 0.07lbs/MW-hour for 2013 AQMP for DG/CHP applications (AQMD-Rule 1110.2) 	<ul style="list-style-type: none"> NOx emission limit for stationary sources of 0.07lbs/MW-hour for DG/CHP. 30% efficiency gains are necessary to help meet AB32 GHG emissions goals. 	<ul style="list-style-type: none"> Advanced combustion technologies, after-treatment catalytic processes and control systems. Lighter, low-friction materials 	<ul style="list-style-type: none"> Demonstrate advanced combustion technologies, low-NOx post-combustion treatment systems, sensors and controls systems, free piston engines and dual fuel biogas/biomethane systems.
Fuel Cells	<ul style="list-style-type: none"> 60 percent efficiency (CHP) Capx: \$5,000/kW+ Poor dynamic and start-stop operation 	<ul style="list-style-type: none"> 80 percent efficiency (CHP) Capx: <\$2000/kW Excellent load following and start-stop operation 	<ul style="list-style-type: none"> Lower-cost catalyst materials with improved reaction kinetics Increased stack life by reducing operating temperatures and improving seals and adhesives Faster response electrolytes Materials advances 	<ul style="list-style-type: none"> Demonstration of small 1-100 kW low temperature proton exchange membrane fuel cells capable of load following to meet Zero-Net Energy goals for 2020. Demonstrate direct methane fuel cells using low-cost catalytic non-thermal plasma technology. Demonstrate ability of fuel cell systems to run on biogas/biomethane in order to validate a near-zero GHG emissions.
Carbon Capture, Utilization & Storage	<ul style="list-style-type: none"> Low system efficiency & costs 50% above market 	<ul style="list-style-type: none"> 30% reduction from 2005 levels by 2030 California's Interim Goal of 556 avg. lb. CO2 per net MWh and final goal of 537 avg. lb. CO2 per net MWh¹⁰ 	<ul style="list-style-type: none"> Variety of low-cost CO2 capture technologies from ARPA-e using pre-combustion separation, scrubbers, phase change, air separators and biological systems 	<ul style="list-style-type: none"> Demonstrate enzymatic and high velocity expansion CO2 precipitation technologies. Demonstrate profitable algae-based CO2 recycling

¹⁰ EPA's proposed Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units.

Clean Transportation RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Engine Development, After-treatment, Vehicle Integration, and Hybrid electric vehicles	<ul style="list-style-type: none"> Cummins Westport, Honda and GM produce optimized natural gas engines. 	<ul style="list-style-type: none"> Multiple engines from several suppliers are required. NOx performance 80%+ below current levels 	<ul style="list-style-type: none"> New engine cycles, combustion systems, exhaust treatment and heat recovery to improve fuel efficiency and performance while decreasing emissions. NGV versions of hybrid gasoline-electric vehicles with part-time zero-emission miles and extended range 	<ul style="list-style-type: none"> Demonstrate advanced selective and non-selective catalytic reduction and lean NOx trap systems. Demonstrate Miller and Atkinson and Camless cycles, improved combustion, high pressure direct injection Demonstrate waste heat recovery using exhaust recirculation and thermo-chemical and thermoelectric recuperation. Demonstrate hybrid NG-electric vehicles.
Fueling Infrastructure	<ul style="list-style-type: none"> Natural Gas refueling cost is 50% higher compared to liquid fuel systems 	<ul style="list-style-type: none"> Cost competitive with liquid fuel systems Reduction in “carbon intensity” of California’s transportation fuels by at least 10 percent by 2020¹¹ 	<ul style="list-style-type: none"> Advanced compressor technologies Lighter, low-friction materials and low-cost additive manufacturing Modular package designs 	<ul style="list-style-type: none"> Develop standardized station designs, increased dispensing efficiencies, better controls, including for time-fill, smaller footprint, and lower cost. Support research in reducing methane emission from NGV fueling stations or in tailpipe emissions (e.g., new vehicle catalyst formation)
Fuel Storage	<ul style="list-style-type: none"> CNG fuel storage is 200% less dense and heavier than liquid fuel storage. 	<ul style="list-style-type: none"> NGV fuel storage equal to the energy density and weight of liquid fuel storage. 	<ul style="list-style-type: none"> Stronger and lighter materials for CNG storage Novel internal geometries Develop low pressure sorbent storage technologies 	<ul style="list-style-type: none"> Demonstrate next generation fuel storage systems.
Refueling	<ul style="list-style-type: none"> Only one product available and cost is over \$5,000 	<ul style="list-style-type: none"> Safe, reliable, durable home refueling systems that cost less than \$2,000 per unit. 	<ul style="list-style-type: none"> Micro-scale versions of advanced compressors being pursued through ARPA-e 	<ul style="list-style-type: none"> Advisory participation in ARPA-e program Field demonstration of prototype units

¹¹ California Executive Order S-1-07.

Renewable Natural Gas RD&D

Project Area	Current Performance	Required Performance	Development Areas	SoCalGas RD&D Activities
Solar Thermal Hydrogen and RNG	<ul style="list-style-type: none"> • Lab-scale systems • Cost >\$30/MMBtu 	<ul style="list-style-type: none"> • 100 kg/hour hydrogen • 250 MMBtu/day natural gas at a cost of < \$6/MMBtu 	<ul style="list-style-type: none"> • Develop Solar SMR with high-efficiency thermal energy recuperation • Develop Concentrated solar water-splitting and methanation 	<ul style="list-style-type: none"> • Demonstrate solar SMR and solar water-splitting technologies in collaboration with DoE and other partners
RNG from Biomass	<ul style="list-style-type: none"> • No commercial projects in CA • Pilot demonstration systems producing 1000 MMBtu/day • Cost > \$10/MMBtu 	<ul style="list-style-type: none"> • 1000 MMBtu/day at a cost of < \$10/MMBtu 	<ul style="list-style-type: none"> • Anaerobic digester yield improvement • Cost reduction and down-sizing of gasifier systems • Improve system heat recovery down-stream gas treatment • Inorganic and organic methanation technologies 	<ul style="list-style-type: none"> • Component test and validation • Gasification demonstration project with methanation and pipeline injection in collaboration with DoE and other partners
Renewable Energy Storage	<ul style="list-style-type: none"> • Power-to-gas round-trip efficiency ~35% • LCOE ~ \$0.30/kWh 	<ul style="list-style-type: none"> • Round-trip efficiency > 40% • LCOE <\$0.20/kWh 	<ul style="list-style-type: none"> • Improve the efficiencies of electrolysis and methanation systems • System design improvements through materials, manufacturing and volume 	<ul style="list-style-type: none"> • Techno-economic modelling including co-benefits with fueling applications • Demonstrate a complete grid-integrated power-to-gas system co-located with sources of CO2 such as breweries, waste water treatment plants, landfills or biomass gasifier in collaboration with DoE and other partners

Appendix C

RD&D Benefit/Cost Analysis Summary

SoCalGas commissioned GTI to perform a benefit/cost analysis of operations and customer technologies being developed with the support of the SoCalGas RD&D program. The assessment covered the period 2009-2013 and employed the Total Resource Cost (TRC) Test methodology. It was conducted for 208 (out of 297 total projects) active research, development and demonstration (RD&D) projects during the period 2009-2013. The TRC test analysis focused on three program areas:

1. Advanced, high-efficiency end-use technologies for core residential, commercial, and industrial customers that will reduce gas use, lower energy bills, and reduce CO₂, NO_x, and other emissions.
2. Operational technologies that will result in reduced operational and maintenance (O&M) costs, increased system integrity, enhanced safety, and increased productivity of utility operations.
3. Renewable energy projects.

The key findings:

- The NPV of ratepayer benefits is \$7.4 billion compared to NPV of costs of \$4.9 billion, resulting in a benefit/cost ratio of 1.5/1.
- CO₂ savings of 14 million tonnes over the fifteen year evaluation period.¹

The methodology is based on a gas ratepayer perspective using an approach similar to the TRC in the CPUC's Standard Practice Manual.² This approach is consistent with the methodology used to analyze the benefits of RD&D expenditures for the 2005-2010 timeframe submitted with the previous GRC filing. The costs and benefits associated with each project are totaled, and a ratio of benefits to costs is developed. For a project to be accepted, the benefit/cost ratio must exceed 1/1.

¹ NO_x reduction benefits were calculated but the economic benefits for NO_x reduction were not quantified.

² CPUC Energy Efficiency Policy Manual V.5. Applicable to post-2012 Energy Efficiency Programs (2013) Available at: <https://sapportal.sempra.com:50001/irj/portal>

Benefits and costs were carried out to 2030, with a societal discount rate of 8.03% was used to calculate NPV. If a technology was put in place in 2029, full first costs of the technology were included, but only one year of benefits, as the analysis was truncated in 2030. These assumptions assure a conservative analysis.

Economic benefits for end-use efficiency projects include reduced energy costs resulting from the use of more efficient technology, reduced CO₂ emissions valued at \$30/tonne, avoided costs of not purchasing the conventional equipment, and lower O&M costs. Costs for the advanced end-use technologies included the generally higher first cost, fuel costs for the more advanced equipment, CO₂ emissions (even though they are lower) from the advanced equipment.

The economic benefits for operations technologies included utility labor and non-labor O&M savings, reduced leakage, reduced repair events, avoided costs of not purchasing the conventional equipment, and methane emissions reduction. Benefits also included reduced costs for pipeline integrity inspection, leak location and detection, and other required utility operations. Costs included generally higher first costs for the advanced equipment, equipment O&M costs, and costs of installation and such for using the equipment. Reduced incidents, enhanced safety, and increased integrity are real benefits, but were not quantified. This approach helps to assure conservative operations technologies benefit estimates.

The economic benefits used for renewables technologies included fossil fuel and electricity cost savings, avoided costs of not purchasing the conventional equipment, and monetized CO₂ savings. Costs included the generally higher capital and O&M costs associated with renewable technology systems.

Appendix D

Glossary of Terms

AB: Assembly Bill
AQMP: Air Quality Management Plan
BY: Base Year
CAA: Federal Clean Air Act
CAISO: California Independent System Operator
CALTRANS: California Department of Transportation
CARB: California Air Resources Board
CEC: California Energy Commission
CES: Clean Energy Systems
CHP: Combined Heat and Power
CNG: Compressed Natural Gas
CO₂: Carbon Dioxide
CPUC: California Public Utilities Commission
D: Decision
DOT: United States Department of Transportation
E3: Energy and Environmental Economics
EMF: Electric Magnetic Fields
EPA: United States Environmental Protection Agency
EPIC: Electric Program Investment Charge
FTE: Full Time Equivalent
GHG: Greenhouse Gas
GRC: General Rate Case
GTD: Gas Technology Institute
HVAC: Heating, Ventilation and Air Conditioning
IEPR: Integrated Energy Policy Report
LCFS: Low-Carbon Fuel Standard
LEV: Low Emission Vehicle
LNG: Liquefied Natural Gas
LOCE: Lifecycle Cost of Energy
MW: Megawatt
NAAQS: National Ambient Air Quality Standard
NGA: Natural Gas Association
NGV: Natural Gas Vehicle
NO_x: Oxides of Nitrogen
O&M: Operations and Maintenance
OTD: Operations Technology Development
P&ES: Policy & Environmental Solutions
PM: Particulate Matter
PRCI: Pipeline Research Council International
RD&D: Research, Development and Demonstration
RICE: Reciprocating Internal Combustion Engines
RNG: Renewable Natural Gas

RPS: Renewable Portfolio Standard
SCAQMD: South Coast Air Quality Management District
SCE: Southern California Edison Company
SCGC: Southern California Generation Coalition
SDG&E: San Diego Gas & Electric Company
Sempra: Sempra Energy
SJVAPC: San Joaquin Valley Air Pollution Control District
SMP: Sustaining Membership Program
SoCalGas: Southern California Gas Company
TY: Test Year
UTD: Utilization Technology Development
ZNE: Zero Net Energy

Appendix E

RESPONSE TO INFORMAL DATA REQUEST

**ORA INFORMAL-SDG&E/SOCALSGAS-DR-05, Question 4
Copies of Relevant Testimony Sections from Other Sempra Utility Witness
Exhibits that Customer Services Witnesses Reference**

SOCALGAS

Supporting the Request of Jeffrey G. Reed

(Customer Service Technologies, Policies and Solutions)

ORA INFORMAL DATA REQUEST
ORA INFORMAL-SDG&E/SOCALGAS-DR-05
SDG&E/SOCALGAS 2016 GRC – A.14-11-XXX
SDG&E/SOCALGAS RESPONSE
DATE RECEIVED: AUGUST 15, 2014
DATE RESPONDED: AUGUST 20, 2014

SDG&E and SoCalGas

Question 4

Copies of Relevant Testimony Sections from Other Sempra Utility Witness
Exhibits that Customer Services Witnesses Reference

Provided to ORA witness Tamera Godfrey

**ORA INFORMAL DATA REQUEST
ORA INFORMAL-SDG&E/SOCALGAS-DR-05
SDG&E/SOCALGAS 2016 GRC – A.14-11-XXX
SDG&E/SOCALGAS RESPONSE
DATE RECEIVED: AUGUST 15, 2014
DATE RESPONDED: AUGUST 20, 2014**

4. Please provide copies of relevant testimony sections from other Sempra Utility Witness exhibits that Customer Services references in their own Exhibits (eg. Sara Franke's reference to Gina Orozco-Mejia's OpQual training frequency change)

SDG&E-SoCalGas Response:

SoCalGas and SDG&E Customer Service witnesses provided copies of the following testimony sections from other Sempra Utility Witness exhibits that Customer Services references in their own Exhibits to ORA witness Tamara Godfrey during their meeting in San Francisco on Wednesday, August 20, 2014.

Referenced in SoCalGas Ex. SCG-10 (Customer Services Field and Meter Reading) -

- SoCalGas Ex. SCG-04 (Gas Distribution) sponsored by witness Gina Orozco-Mejia
 - a. Section II.D.2.a. Operator Qualification Program; pages GOM-57 to GOM-59
 - b. Section IV.M.2. Regulators; pages GOM-127 to GOM-129

Referenced in SoCalGas Ex. SCG-10 (Customer Services Field and Meter Reading) and Ex. SCG-11 (Customer Service Office Operations) –

- SoCalGas Ex. SCG-30 (Customers) sponsored by witness Rose-Marie Payan
 - a. Section II.A. 2016 Forecast of SoCalGas Customers and New Meters; pages RMP-1 to RMP-2

Referenced in SoCalGas Ex. SCG-13 (Customer Service Technologies, Policies and Solutions) –

- SoCalGas Ex. SCG-07 (Gas Engineering) sponsored by witness Raymond K. Stanford
 - a. Section II.E. Research, Development, and Demonstration; pages RKS-24 to RKS-28

Referenced in SDG&E Ex. SDG&E-13 (Customer Services Field) –

- SDG&E Ex. SDG&E-04 (Gas Distribution) sponsored by witness Gina Orozco-Mejia
 - a. Section II.D.1.b.i. Expansion of the Operator Qualification Program; pages GOM-53 to GOM-54

Referenced in SDG&E Ex. SDG&E-13 (Customer Services Field) and Ex. SDG&E-14 (Customer Service Office Operations, Information, and Technologies) –

- SDG&E Ex. SDG&E-31 (Electric Customers and Sales) sponsored by witness Kenneth E. Schiermeyer
 - a. Section I. Forecast of 2016 Electric Customers; page KES-1
- SDG&E Ex. SDG&E-32 (Customers) sponsored by witness Rose-Marie Payan
 - a. Section II.A. 2016 Forecast of SDG&E Customers and New Meters; pages RMP-1 to RMP-2

Company: Southern California Gas Company (U 904 G)
Proceeding: 2016 General Rate Case
Application: A.14-11-XXX (NOI)
NOI Exhibit: SCG-07

SOCALGAS
DIRECT TESTIMONY OF RAYMOND K. STANFORD
(GAS ENGINEERING)

July, 2014

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**



NOI Doc #

1 of information can become overwhelming to recipients. Therefore, caution must be exercised
2 and carefully-crafted messages must be developed to avoid having information overlooked or
3 discarded as “junk mail.”

4 Lastly, another cost driver is anticipated revisions by PHMSA to the guidance document,
5 Recommended Practice 1162 issued by American Petroleum Institute (API). PHMSA
6 announced this effort last year (June 2013) at its Public Awareness workshop in Dallas. The
7 anticipated changes will more than likely result in additional communication requirements,
8 which may require additional resources beyond what is forecast here.

9 **E. Research, Development, and Demonstration**

10 Gas Operations’ RD&D activities within the SoCalGas RD&D program are managed in
11 the Gas Engineering and System Integrity Department. In my testimony, I offer business
12 justification for the Gas Operations portion of the SoCalGas RD&D program. The Gas
13 Operations’ RD&D TY2016 cost forecast is contained within the overall SoCalGas RD&D
14 program funding request witness Jeffrey G. Reed’s Customer Service Technologies, Policies and
15 Solutions testimony, Exhibit SCG-13.

16 The purpose of these activities is to develop, test, and introduce new technologies or
17 advance existing technologies used in gas operations to benefit public and employee safety, the
18 environment, and ratepayers. Thus, Gas Operations RD&D activities will continue to deliver
19 benefits from research on pipeline inspection technologies, monitoring of remote rights-of-ways,
20 prevention of damage from third-party excavation, leak detection, and continuous monitoring of
21 gas quality. We are advancing technologies to enhance pipeline safety and reliability mandated
22 by 49 CFR 192, Subpart O and Subpart P, General Order 112-E, and AB 1900 (renewables)
23 regulations.

24 Recent RD&D successes include the Explorer Robotics Inspection System for
25 Unpiggable Pipelines, Bio-methane Gas Quality Specifications, and Gas Interchangeability
26 Ranges for Elastomer Performance and Satellite Monitoring for Pipeline Route Geohazard
27 Threats. Having the ability to inspect unpiggable pipelines allows SoCalGas to collect
28 information the health/condition of the pipeline. This information is used to evaluate the
29 potential pipeline integrity risk and determine a control to mitigate that risk. The Explorer
30 Robotics thus provides a public safety risk mitigation control, through its ability to help identify
31 pipeline anomalies.

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1 The Explorer Robotics Inspection System for Unpiggable Pipelines demonstrates the
2 value of a long-term RD&D program to promote safety-enhancing technology. Traditional in-
3 line-inspection tools are not always capable of inspecting pipes where flow dynamics do not
4 facilitate such. In such circumstances, pipelines are “unpiggable,” which means they cannot be
5 inspected using in-line inspection technology. As discussed in the testimony of Pipeline
6 Integrity witness Maria Martinez, where in-line inspection is one of the methods capable of
7 assessing an identified threat to pipeline integrity, it is SoCalGas’ preferred assessment method
8 because it provides a more complete picture of the overall condition of a transmission pipeline.
9 Accordingly, SoCalGas continues to focus on the advancement of in-line inspection
10 technologies. Through the NYSEARCH research collaborative, with significant co-funding from
11 DOT, through PHMSA, the number of commercially-available inspection systems has grown
12 from two in the year 2010 to five commercially-available systems today, supporting inspection
13 of a range of pipeline diameters, varying from 6-36 inches. Further, in situ recharging and
14 mechanical damage/ovality sensor capabilities were added to the Explorer robotic inspection
15 system capabilities in 2013. New enhancements, such as circumferential magnetic flux leakage
16 sensors for long-seam weld inspection, are under development, with field demonstrations
17 targeted for the 2015-2016 time period. Because pipeline material grade may be unknown, some
18 techniques are needed to help define grade. Thus, SoCalGas is also pursuing ancillary
19 technologies, such as in-situ hardness testing, of steel material properties.

20 When possible, SoCalGas seeks and secures terms that allow for remuneration of its Gas
21 Operations RD&D investments to defray program cost. For example, the Explorer RD&D
22 project has a royalty element, based on the licensing of underlying robotic inspection system
23 patents to Invodane Engineering.

24 Another challenge being addressed is the transfer of knowledge from our maturing
25 workforce to less-experienced technical employees. SoCalGas proactively expands its technical
26 base by using RD&D projects and industry meetings as a teaching opportunity to encourage
27 subject matter experts to serve as mentors. Continuous knowledge transfer is a critical
28 departmental objective, consistent with long term Company goals.

29 In addition, the Gas Operations’ RD&D program plans to augment project research and
30 testing in gas quality and pipeline materials, which are new areas that have emerged as vital to
31 achieving public and employee safety and system reliability. By engaging Engineering Analysis

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1 Center¹² technicians and engineers early in the technology development process, we can
2 accelerate the testing and evaluation process, thereby expediting the introduction of emerging
3 technologies into our operations.

4 The Gas Operations RD&D program is administered into three sub-program areas. A
5 program description and funding summary and examples of projects under development or
6 recently completed are described below:

7 **1. Gas Distribution Technologies**

8 The Gas Distribution Technologies sub-program was developed to continue our focus on
9 technologies that will reduce system installation, operation and maintenance costs, maintain
10 system integrity, reliability, and extend its service life. New technologies include innovative
11 field tools, equipment, and processes that will enhance field operations productivity and reduce
12 overall costs. For example, the SpreadBoss Asset Tracking System will address the feasibility of
13 using a third-party vendor's traceability system to track pipeline materials during procurement,
14 fabrication, coating, transportation, and delivery to the jobsite with a proprietary coded tag
15 applied directly onto each section of pipe or material. SpreadBoss uses a web-based software
16 platform developed to track pipeline materials, together with its corresponding material test data,
17 for logistics and inventory management and for pipeline integrity record-keeping purposes. In
18 addition, the long-term durability of the asset tag and adhesion/application method will be tested
19 at our Engineering Analysis Center.

20 The Gas Operations RD&D program also co-sponsors an Operations Technology
21 Development project to partner with manufacturers' of Poly-Ethylene pipe-splitting systems to
22 develop standardized system designs. Poly-Ethylene pipe splitting is a trenchless technology
23 used to replace pipe by mechanically splitting the existing damaged segment and pulling new
24 Poly-Ethylene pipe into the opened bore slot.¹³ This unique approach is for niche applications
25 where open trench is the only, and expensive, alternative. Based on extensive field testing at
26 SoCalGas and other gas utilities, Operations Technology Development and pipe splitting
27 manufacturers are developing packaged systems based on customer needs. This process could
28 greatly benefit SoCalGas, by matching the equipment and parts to each pipe replacement job.

¹² A description of the activities of the Engineering Analysis Center is provided in Section III.A.

¹³ See Ex. SCG-08, Direct Testimony of Maria T. Martinez, for a high-level description of the process of using trenchless technology to install a pipeline.

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2. Environment and Safety

The Environment and Safety sub-program was developed to improve customer, employee, and public safety. Objectives include the development of advanced pipeline-locating and gas leak detection systems and real-time monitoring of gas quality of biomethane supplies. A system to eliminate a persistent residual gas situation was developed to extract residual gas trapped underground in soils or substructures to mitigate a potentially hazardous condition. With input from SoCalGas' Environmental Services group, with experience from Manufactured Gas Plant clean-up projects, a prototype system was designed using strategically-placed extraction (vent) wells and an internal combustion engine to safely and effectively withdraw and consume the residual gas. Field testing and training on actual residual gas leak sites proved the effectiveness of the new system over traditional methods. Further system enhancements tailored for use by the Gas Distribution organization are planned.

SoCalGas also co-funded an Acoustic Pipe Locator research project under the Operations Technology Development program to locate buried pipelines, specifically non-metallic pipelines (such as plastic gas lines without locating wires) and/or non-metallic sewer lines. The technological approach involved a concept used in underwater sonar to transmit and receive acoustic signals, but applied the technology from above-ground into the soil. The Acoustic Pipe Locator is a portable handheld instrument designed to send an acoustic pulse into the ground/soil and to analyze the reflected signal to map the location of substructures. The Acoustic Pipe Locator is being field-tested for use in the Sewer Lateral Inspection Program, also known as SLIP. Information about the safety and reliability benefits of this inspection program may be found in the testimony of Maria Martinez, Exhibit SCG-08.

Although Gas Operations RD&D programs do not duplicate programs lead by State agencies and universities, SoCalGas may help support such programs. For example, SoCalGas funded a study conducted by the University of Southern California to understand the impact of Siloxane on the performance of residential appliances. Siloxane is a man-made organic compound that is often present in renewal biomethane gas (biogas) produced by landfill and wastewater facilities. The benefit of this was that the study found that a Siloxane upper limit was necessary in gas delivered to customers, as residential appliance performance could be negatively impacted by high levels of Siloxane. The study's findings were then used to shape our Rule 30 update and subsequently, in the implementation of AB 1900 (Renewables Energy

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1 Resources, Biomethane), involving acceptable trace constituent levels from renewable gas
2 supplies. A separate project is currently underway to develop a real-time sensor/chromatograph
3 to analyze and monitor critical trace constituents in biomethane received from suppliers.

4 **3. Transmission and Storage**

5 The Transmission and Storage sub-program was developed to improve the reliability,
6 asset life, and efficiency of equipment and systems used in high pressure gas utility operations.
7 Projects include: developing tools consistent with DOT pipeline integrity and inspection
8 regulations; advancing pipeline design standards; monitoring pipeline route hazards; and
9 improving efficiencies of gas storage and compressor station assets.

10 The Explorer Robotics Inspection System described above is an example of innovative
11 technologies being pursued in this area and how SoCalGas maximizes the benefits of technology
12 through vertical integration in its operations.

13 Research at Pipeline Research Council International and NYSEARCH involve projects to
14 overcome inspection-related challenges, including the accurate detection of anomalies that are
15 currently difficult to characterize, such as longseam welds and fine cracks.

16 SoCalGas worked with a remote sensing Synthetic Aperture Radar satellite vendor and
17 service provider to advance Synthetic Aperture Radar satellite imaging and interferometric
18 analysis for monitoring pipeline rights-of-way. The objective of this work was to enhance
19 existing capabilities of Synthetic Aperture Radar satellites (or sensors) for monitoring along
20 transmission pipelines by detecting and measuring ground movement, performing terrain-related
21 risk assessments, and providing alert notifications. A project was successfully conducted for
22 landslide and soil erosion threats on transmission pipelines in the mountainous terrain of Ventura
23 County. A more in-depth, multi-year Pipeline Research Council International study is underway
24 that will further enhance Synthetic Aperture Radar satellite capabilities for ground movement
25 monitoring and right-of-way encroachment detection. This project was then co-funded by the
26 DOT's Research and Innovative Technology Administration. The goal of the project is to
27 further satellite technology research and develop a best practice guidance document and Decision
28 Support System framework for ground movement and encroachment, including leading
29 indicators, for monitoring along pipeline rights-of-way.

30

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