

Application No: A.16-09-XXX  
Exhibit No.: \_\_\_\_\_  
Witness: M. Bermel

Application of Southern California Gas Company (U 904 G) and San Diego Gas & Electric Company (U 902 G) to Recover Costs Recorded in the Pipeline Safety and Reliability Memorandum Accounts, the Safety Enhancement Expense Balancing Accounts, and the Safety Enhancement Capital Cost Balancing Accounts

Application 16-09-XXX

**CHAPTER VI**  
**DIRECT TESTIMONY OF**  
**MICHAEL BERMEL**  
**ON BEHALF OF**  
**SOUTHERN CALIFORNIA GAS COMPANY**  
**AND**  
**SAN DIEGO GAS & ELECTRIC COMPANY**

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA

September 2, 2016

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1       **I.    PURPOSE AND OVERVIEW OF TESTIMONY**

2           The purpose of my Direct Testimony on behalf of Southern California Gas Company  
3 (SoCalGas) and San Diego Gas & Electric Company (SDG&E) (collectively, the “Utilities”) is  
4 to explain our efforts to enhance pipeline system safety through the installation of new  
5 technology-based assets and equipment consistent with the Pipeline Safety Enhancement Plan  
6 (PSEP) Technology Plan. SoCalGas and SDG&E included the Technology Plan as one element  
7 of the larger PSEP submission.<sup>1</sup> The Technology Plan proposed various systems and equipment  
8 deployments that enhance system safety through the remote, near-real-time monitoring of larger  
9 natural gas pipelines to enable the notifying of operating personnel in the event of unplanned  
10 intrusion, disturbance, ground movement or gas release at, or near, large pipeline routes. My  
11 testimony explains the implementation of the Technology Plan and notes certain enhancements  
12 that will be presented in future PSEP reasonableness review applications. In this application,  
13 SoCalGas and SDG&E only seek review and cost recovery for a methane sensing equipment  
14 pilot effort that includes the design, specification, development, procurement, installation, and  
15 commissioning of certain methane sensing equipment and associated data collection and  
16 management assets.

17       **II.   TECHNOLOGY PLAN**

18           The purpose of SoCalGas and SDG&E’s Technology Plan is threefold. First, the  
19 Technology Plan will provide more timely information about the pipeline and pipeline route and  
20 right-of-way status. Second, the Technology Plan will enable more timely responses to  
21 incidents. Third, the Technology Plan will equip operators with additional data to help manage

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<sup>1</sup> Originally filed in R.11-02-019 and subsequently transferred to A.11-11-002.

1 situations following a major pipeline emergency. In furtherance of these goals, SoCalGas and  
2 SDG&E proposed to install a variety of technology assets and systems, including:

- 3 • Above-ground, near-real-time methane sensors, to provide for continuous gas leak  
4 detection at locations where large, high-pressure pipelines are routed near facilities that  
5 pose special evacuation consideration or other special commerce implications. These  
6 sensors allow for leak detection identification improvements and reduces the risks  
7 associated with managing these events, where they may infrequently occur;
- 8 • Fiber-optic cabling along pipeline segments, to allow for monitoring when the pipeline is  
9 experiencing non-native movement, vibration, or temperature gradients, and/or acoustic  
10 signatures indicative of a leak; and
- 11 • Back-office computer monitoring and communication system assets to collect and  
12 manage routine fiber and methane sensor data, acquire and manage alarms, and provide  
13 information and processing for the timely dispatch of field personnel to either prevent  
14 pipeline damage or to help manage an unplanned gas release.

15 In its technical review of SoCalGas and SDG&E's PSEP, the Commission's Consumer  
16 and Protection Safety Division (CPSD) (now Safety and Enforcement Division) acknowledged  
17 that methane sensing and fiber optic monitoring systems were emerging technologies with value  
18 in the pipeline safety arena. Regarding methane detection equipment, the report found:

19 The Companies should continue evaluating next generation methane detection  
20 technologies. Any technology that shows promise in regard to accuracy,  
21 reliability, maintenance needs, and cost should be tested through a pilot program  
22 through which the units are evaluated in actual, varying, field conditions, to  
23 support wide scale deployment throughout the system.<sup>2</sup>

24 Regarding fiber optic sensing technology, the report noted:

25 CPSD believes that work and materials related to the installation of fiber-optic  
26 sensors and the DCMS may have value. The greatest cost of placement of fiber-  
27 optic cable, which must be buried slightly above the pipeline, is the cost of the

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<sup>2</sup> R.11-02-019, January 17, 2012 Technical Report of CPSD Regarding the SoCalGas and SDG&E PSEP at p. 22.

1 excavation itself. The costs for material and installation justify placing the cable  
2 in the ground even if it is not connected to monitors right away.<sup>3</sup>

3  
4 The Commission, in Decision (D.)14-06-007, acknowledged the proposed technology  
5 enhancements:

6 In addition to the testing or replacing pipeline, Safety Enhancement includes ... 1)  
7 improvements to communications and data gathering to ascertain pipeline  
8 conditions; ... 3) expand the coverage of SDG&E and SoCalGas' private radio  
9 networks to serve as back-up to other available means of communications with  
10 the newly installed valves to improve system reliability; 4) installing remote leak  
11 detection equipment....<sup>4</sup>

12 Similar to other aspects of PSEP, however, D.14-06-007 ordered that the costs for these  
13 enhancements be addressed in future after-the-fact reasonableness reviews.<sup>5</sup> Thus far, and as  
14 described below, SoCalGas and SDG&E have initiated a measured Technology Plan roll-out  
15 using pilot efforts to further validate the safety enhancement benefits of SoCalGas and SDG&E's  
16 Technology Plan. Also of note is that the methane sensors and fiber optic programs within this  
17 Technology Plan support the objectives under SB1371 "Natural Gas Leakage Abatement"  
18 rulemaking currently being promulgated to help prevent leaks altogether or detect them early for  
19 timely mitigation.

### 20 **III. FIBER OPTIC INSTALLATION**

21 SoCalGas and SDG&E have prescribed in Company procedures that new and  
22 replacement pipelines 12" or greater in diameter and over 1-mile in contiguous length are to be  
23 co-equipped with fiber-optic sensing cable during construction. Future pipelines meeting the  
24 criteria, which are executed under PSEP in 2017 and beyond will include the companion fiber  
25 optic installation. As of this reasonableness review application submission, SoCalGas has

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<sup>3</sup> R.11-02-019, January 17, 2012 Technical Report of CPSD Regarding the SoCalGas and SDG&E PSEP at p. 22.

<sup>4</sup> D.14-06-007, mimeo., at 8.

<sup>5</sup> D.14-06-007, mimeo., at 59 (Ordering Paragraph 2).

1 completed a test facility at its Pico Rivera base to evaluate fiber optic monitoring systems and to  
2 refine its methods and procedures for field installations. However, there has not yet been PSEP-  
3 related pipeline work completed in this arena. Therefore, although the installation of fiber optic  
4 cable has been incorporated into company procedures, no cost recovery is sought in this  
5 application.

#### 6 **IV. REMOTE METHANE SENSING EQUIPMENT PILOT INSTALLATIONS**

7 Since 2011, SoCalGas and SDG&E have pursued remote methane sensing system  
8 development and advancements with their respective Advanced Meter business partners. This  
9 effort has led to the production of proprietary early-generation remote field site methane sensing  
10 systems capable of employing advance metering network communications. In this application,  
11 SoCalGas and SDG&E seek review and approval of the costs associated with the work  
12 completed to-date in support of pilot installations. The scope of the two pilot system  
13 installations are as follows:

##### 14 **A. SoCalGas –Developed and Deployed Methane Sensing Infrastructure:**

15 At SoCalGas, a total of ten (10) solar-powered, remote, continuous methane monitoring  
16 systems were deployed along transmission pipelines at or near facilities with special evacuation  
17 considerations in the event of a pipeline gas release. To develop and deploy this advanced  
18 infrastructure, SoCalGas in conjunction with its Advanced Meter supplier and system provider  
19 engaged in the following work:

- 20 • Design, fabrication, and installation of the base remote methane monitoring stations;
- 21 • Integration of the remote monitoring stations with SoCalGas' Advance Metering System,  
22 to be able to read and process data from each of the field devices;
- 23 • Implementation of an early-generation data management and alarm processing host  
24 system to read methane sensor data, register and process alarms, and to provide for daily

1 system integrity checks of deployed units. This system is provided as a “managed  
2 service” by SoCalGas’ Advance Meter system provider for test purposes.

3 Additionally, SoCalGas worked with its Advance Meter supplier to develop an advance meter  
4 system radio module, which can be interfaced with commercially-available methane sensors to  
5 provide for near-real-time measurement of methane concentrations in air. The installation of ten  
6 field units and related monitoring infrastructure was completed in January 2016. The system is  
7 now under testing and evaluation.<sup>6</sup> Contract work related to this development was sole-sourced  
8 to SoCalGas’ Advance Meter system provider because the installed Advanced Meter collection  
9 radio infrastructure in SoCalGas’ service territory is proprietary to the provider.

10 **B. SDG&E – Developed and Deployed Methane Sensing Infrastructure:**

11 At SDG&E, a total of fifteen (15) self-contained, battery-powered remote continuous  
12 methane monitoring systems were deployed along SDG&E’s transmission Line 3010 at or near  
13 facilities with special evacuation considerations in the event of a pipeline gas release. To  
14 develop and deploy this advanced infrastructure, SoCalGas Engineering, working in support of  
15 SDG&E, engaged in the following work:

- 16 • Specification, development, purchase and installation of base remote methane monitoring  
17 sensors and integrated Advance Meter radios system compatible modules;
- 18 • Integration of the remote monitoring stations with SDG&E Advance Metering System-  
19 compatible collector radios, to enable reading and processing data from each of the field  
20 devices.

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<sup>6</sup> Attachment A includes photos of installed equipment and related system information.

- Implementation of an early generation data management and alarm processing host system. This system is provided as a “managed service” by the Advance Meter supplier for test purposes.

Additionally, SDG&E and SoCalGas worked with SDG&E’s Advance Meter system supplier to develop an advance meter system-compatible radio module containing an integral methane sensor (OEM) in a single small package, which can be easily pole-mounted on a fence or right-of-way pipeline marker posts. The installation and commissioning of the 15 field monitoring sites was completed in January 2016. The system is now under testing and evaluation.<sup>7</sup> Contract work related to this development was sole sourced to SDG&E’s Advanced Meter system provider because the installed Advanced Meter collection radio infrastructure in SDG&E’s service territory is proprietary to the provider.

## **V. TECHNOLOGY PLAN EXPENDITURES SUBMITTED FOR COST RECOVERY**

The installation of remote methane sensing equipment, consistent with our Technology Plan, was prudent and the costs for design, specification, development, manufacturing, installing and commissioning of the remote methane systems are reasonable and should be approved for rate recovery.

The methane sensing pilot programs fulfill SoCalGas and SDG&E’s objectives to test and advance the use of their respective Advanced Metering Radio systems to support monitoring, collecting, and managing information from remote methane sensors placed along their pipeline systems. This work has required significant developmental work to be completed by both SoCalGas, SDG&E, and their respective Advanced Meter radios system suppliers to:

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<sup>7</sup> Attachment B provides a sample of photos and information on the deployed sensors and related system.



- 1 • Develop remote Advanced Meter modules either containing integrally coupled methane  
2 sensors or directly able to couple with methane sensors;
- 3 • Develop data interfaces and software systems to provide for reading of the methane  
4 sensors through the module/AM radios; and
- 5 • Develop software to present and manage the information after it is transferred from the  
6 field methane sensors via the Utilities' Advanced meter radio systems.

7 This developmental work and related costs are included for cost recovery. The early  
8 developmental work has set the groundwork for execution of additional safety enhancement  
9 technology installations. The expenditures have and will continue to further establish proof-of-  
10 concept in employing these Advanced Metering systems to remotely monitor and assess in near-  
11 real time, leakage on the pipeline systems, and to move from concept-proof to full enterprise  
12 production. The general pilot work will also enable SoCalGas and SDG&E to leverage future  
13 advances in commercialized methane sensors, as this technology continues to see major progress  
14 in sensing accuracy, reliability, and cost.

15 **A. SoCalGas Remote Methane Monitoring sensors and related system costs.**

16 Major cost elements associated with SoCalGas' methane monitoring and cost presented for  
17 recovery in this application include:

- 18 • Development and production of 200 Advanced Meter-compatible gas modules, which  
19 can interface with commercially-available methane sensor(s);<sup>8</sup>
- 20 • Purchase of 20 methane sensors (separate from the Advanced Meter-based radio  
21 module);<sup>9</sup>

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<sup>8</sup> SoCalGas arranged for a production run and purchase of 200 units to provide for further testing and deployment beyond the 10 units placed in production as of January 2016. This approach leveraged manufacturing production cost of these specialized modules on a per unit basis and allowed for similar one-time development cost to be spread over a large module production base.

- Fabrication and field installation of the 10 remote methane sensing stations;
- Configuring the existing utility AM radio system to collect information from the remote sensing units and route information into a data management and alarming system; and
- Development and deployment of a computerized base hosted data management, alarm processing, and reporting system.

The following are the incurred costs requested for recovery to deploy SoCalGas methane sensing pilot.

**Table 1**  
**SoCalGas 2015/6 Methane Pilot Cost**

<b>Cost Element</b>	<b>Total Cost</b>
Labor	\$50,161
Non-labor/materials contracted service	\$262,427
Indirects	\$45,492
<b>Total</b>	<b>\$358,080</b>

**B. SDG&E Remote Methane Monitoring Sensors and Related System Costs**

Major cost elements associated with SDG&E’s methane monitoring and presented for cost recovery, include:

- Development, production and purchase of 15 Advanced Meter-compatible gas modules, which contain an integral methane sensor;
- Installing the sensors;
- Installing AM-compatible, next-generation collection radio units;
- Configuring the AM radio system to collect information from the remote sensing units and route information into a data management and alarming system; and

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<sup>9</sup> The purchase covered 10 units to be placed into formal testing by January 2016, and to provide for inventory for the next 10 installations later in 2016.

- Development and implementation of a hosted data management, alarm processing, and reporting system.

The costs incurred for the deployed SDG&E methane sensing pilot program are as follows:

**Table 2**  
**SDG&E 2015/6 Methane Pilot Cost**

<b>Cost Element</b>	<b>Cost</b>
Labor	\$7,059
Non-Labor/contracted services/materials	\$97,200
Indirects	\$12,800
<b>Total</b>	<b>\$117,059</b>

## **VI. CONCLUSION**

SoCalGas and SDG&E have prudently moved forward with a reasonable and measured roll-out of technology enhancements to validate the safety enhancement benefits of this new technology, and in doing so, completed key technical objectives to help build a cost-effective implementation of SoCalGas and SDG&E's Technology Plan. SoCalGas and SDG&E request the Commission find prudent the measured roll-out costs of the Technology Plan, including methane sensing equipment and future installation of fiber optic cables on replacement pipelines 12" or greater in diameter, and over 1-mile in contiguous length. Additionally, SoCalGas and SDG&E request the Commission find reasonable and approve cost recovery for the SoCalGas and SDG&E methane sensing equipment pilot program presented in this application.

This concludes my prepared Direct Testimony.

1       **VII. WITNESS QUALIFICATIONS**

2           My name is Michael A. Bermel. My business address is 555 West 5<sup>th</sup> Street, Mail Stop  
3 11A3, Los Angeles, CA 90013.

4           My current Job Title is Measurement, Regulation and Control Manager. I have been  
5 employed by SoCalGas since 1981. I possess a Bachelor-of-Science degree, in Mechanical  
6 Engineering, from Cal State University, Long Beach. I am a Registered Professional Mechanical  
7 Engineer in the State of California. I have over 20 years' experience managing the engineering,  
8 design and commissioning of valve, pressure control, gas quality management, receipt points and  
9 related automated control and monitoring sites for SEu and affiliates.

10          I am the principal architect and manager of SoCalGas and SDG&E system PSEP valve  
11 and Technology Plans. I have not previously testified before the Commission. This concludes  
12 my Testimony.

# **Attachment A**

Installation Report for SoCalGas 2015/6 Remote

Methane Monitoring Pilot

## **SoCalGas Methane Sensing Pilot - Overview of Installed Technology:**

SoCalGas has worked with the manufacturer of its automated meter reading system to develop, and supply to SoCalGas for pilot testing, Advanced Meter-compatible radio modules, which can be matched with commercially-available methane sensors to measure and remotely report methane-in air-concentrations. The units read methane in parts per million at varying time intervals down to a few minutes, and also transmit information over an advanced meter radio system for review and processing. The units currently report/transmit data four times per day and on a scheduled basis and by an exception alarm protocol with minimal time delay, when pre-programmed allowable methane concentration levels are exceeded. This information is sent to a computerized data collection system developed specifically for this pilot test. The system is supported by SoCalGas existing Advance Meter radio network and data engine used to collect the company's 6+ million meter reads 4 times per day.

SoCalGas designed a solar assembly to power and integrate the methane sensor to the Advance Meter module for field deployment. Ten stations were fabricated and installed in late 2015 and early 2016 for a 6-12-month test period.

The scope of completed work for the pilot includes the 10 remote monitoring site installations and related infrastructure to capture methane reads in the host system/back office environment for processing. Major sub-components for this system are shown in Figure 1.

The 10 units were installed at points along SoCalGas transmission pipelines in the LA Basin. Field installation photos of the methane measurement stations are shown in in Figures 2-4. A photo of the methane panel internal components is shown in Figure 5.

Figure 6 provides an overview of the installed methane sensor locations -noted with the yellow push-pin designations. Their general coordinates are referenced in Table A-1.

**Figure 1**  
**Methane Sensor System employing Advanced Meter Technology-SoCalGas Pilot:**

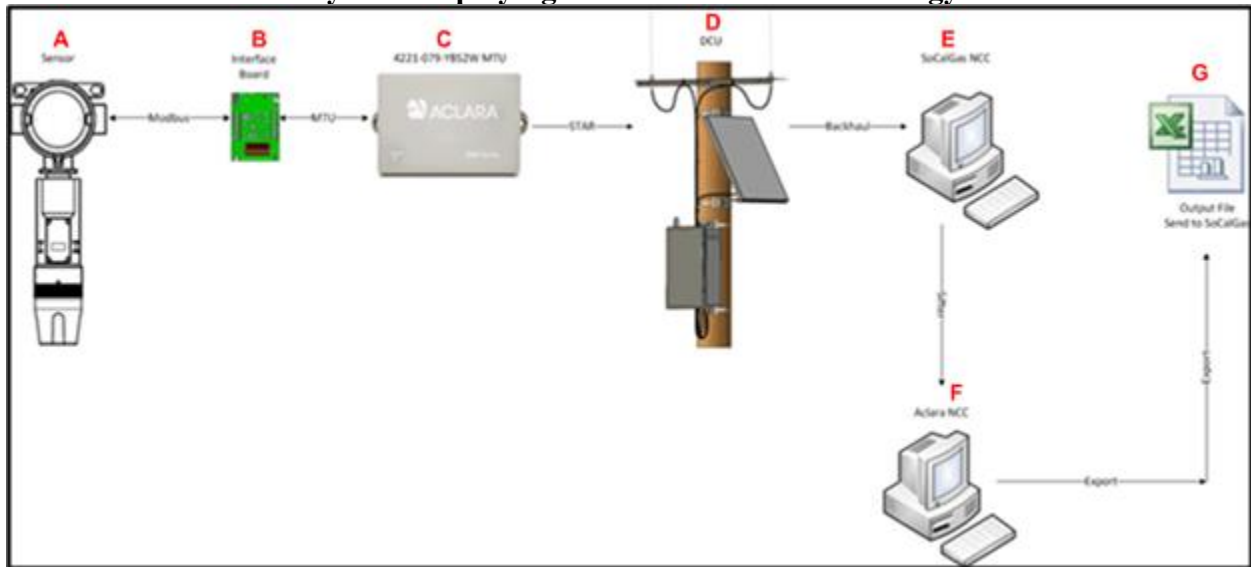


Figure 1 Pilot System Elements:

- A. CX-IR-100 methane sensor - powered by plug-in lithium ion battery and solar charge.
- B. Interface Board - sensor/MTU connection using Modbus protocol.
- C. MTU - reads the sensor data via interface board then transmits data over the existing DCU network to NCC.
- D. DCU - Data Collection Unit communicates with MTU to pass data to network
- E. SCG NCC - Network Control Computer is referred to as the head-end that collects all data from the field.
- F. Aclara NCC - methane data routed to existing shared service (data sifter) into hosted head-end.
- G. Output file - SCG accesses head end for all methane data and alarms.

**Figure 2**

**Pole-mounted methane sensing station with solar panel — sidewalk**



**Figure 3**

**Front view**



**Figure 4**  
**Wall-mounted sensor box**



**Figure 5**  
**Sensor, battery and wiring in box**

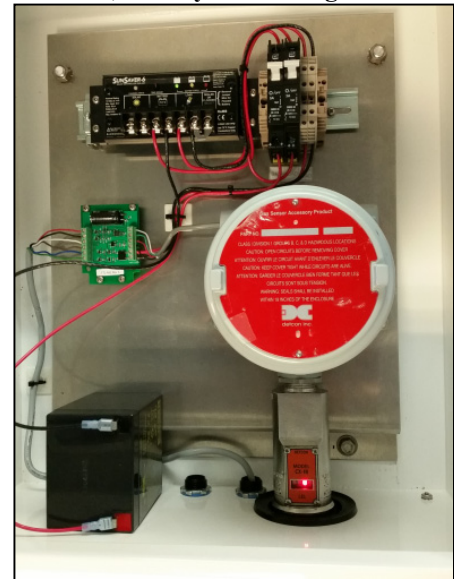
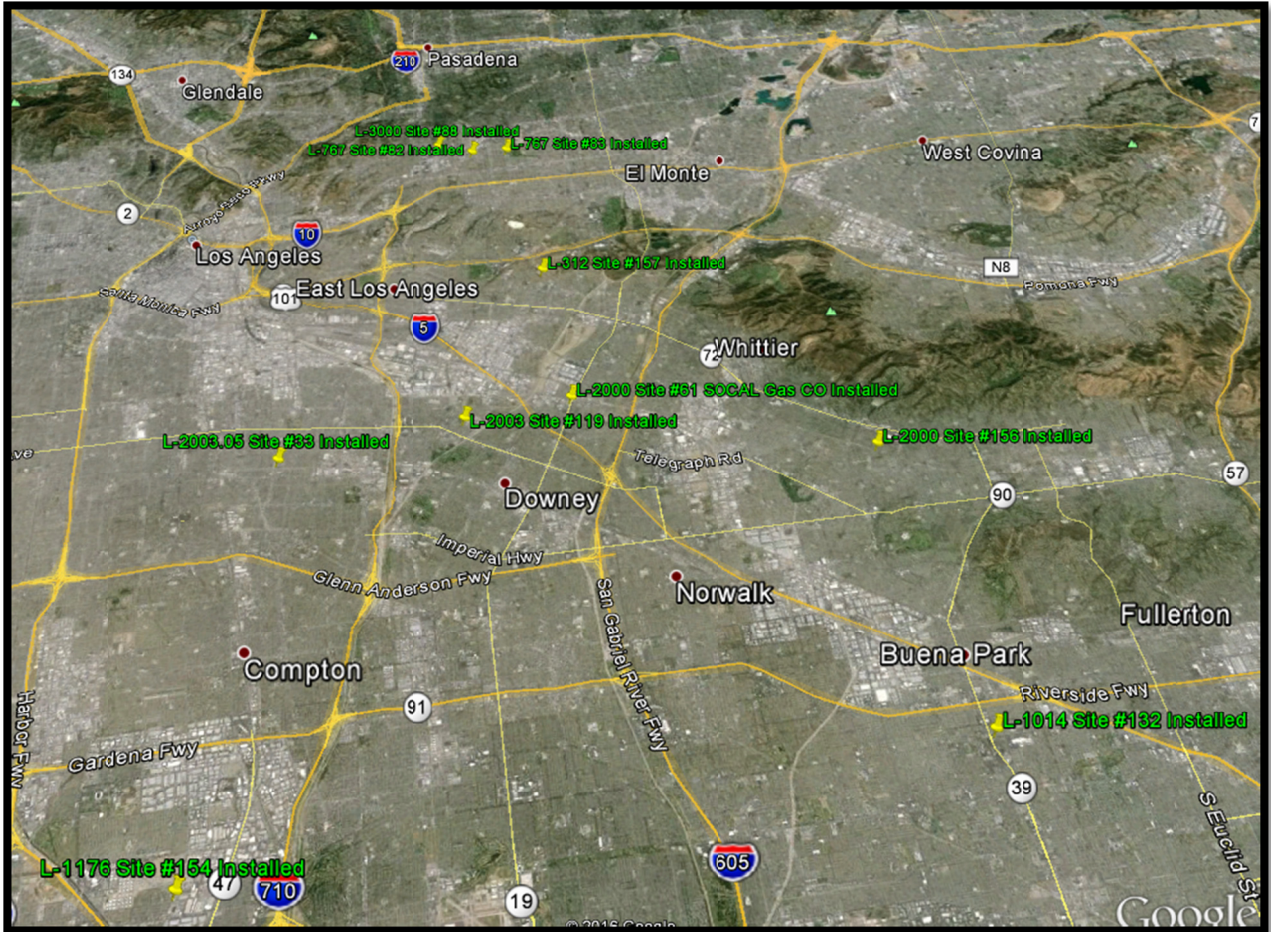




Figure 6

Location overview map of SoCalGas pilot methane sensors installations  
Sites shown with yellow push pin icons



**Table A-1**

**SoCalGas Methane Sensor Pilot Sites**

PIPELINE			SITE #	SENSOR ID #	CITY	H.C.A. TYPE	LAT	LONG
LINE #								
2003			33	80007719	South Gate	School	33.958°	-118.211°
2000			61	80007703	Pico Rivera	Railroad	33.969°	-118.106°
767			82	80007717	Alhambra	School	34.085°	-118.131°
767			83	80007702	Alhambra	School	34.085°	-118.116°
3000			88	80007701	Alhambra	Hospital	34.090°	-118.145°
1014			132	80007707	Buena Park	Theme park	33.846°	-117.996°
2000			156	80007718	Whittier	School	33.938°	-118.003°
312			157	80007700	Montebello	Storage Field	34.024°	-118.109°
1176			154	80007708	Carson	School/Industrial	33.835°	-118.237°
2003			119	80007709	Bell Gardens	City Park/School	33.965°	-118.145°

# **Attachment B**

Installation Report for SDG&E 2015/6 Remote

Methane Monitoring Pilot

## **SDG&E Methane Sensing Pilot - Overview of Installed Technology:**

SDG&E (managed through SoCalGas Engineering) has worked with the manufacturer of its automated meter reading system to develop, and supply to SDG&E for pilot testing, Advanced Meter-compatible radio modules which contain an integral sensor to measure methane-in air-concentrations. The units are capable of reading methane in parts per million at varying time intervals (daily - down to a few minutes), subject to battery life/size considerations, and also transmit information over an advanced meter radio system for review and processing. The units report/transmit data hourly. Data is sent to a computerized data collection system developed for this test.

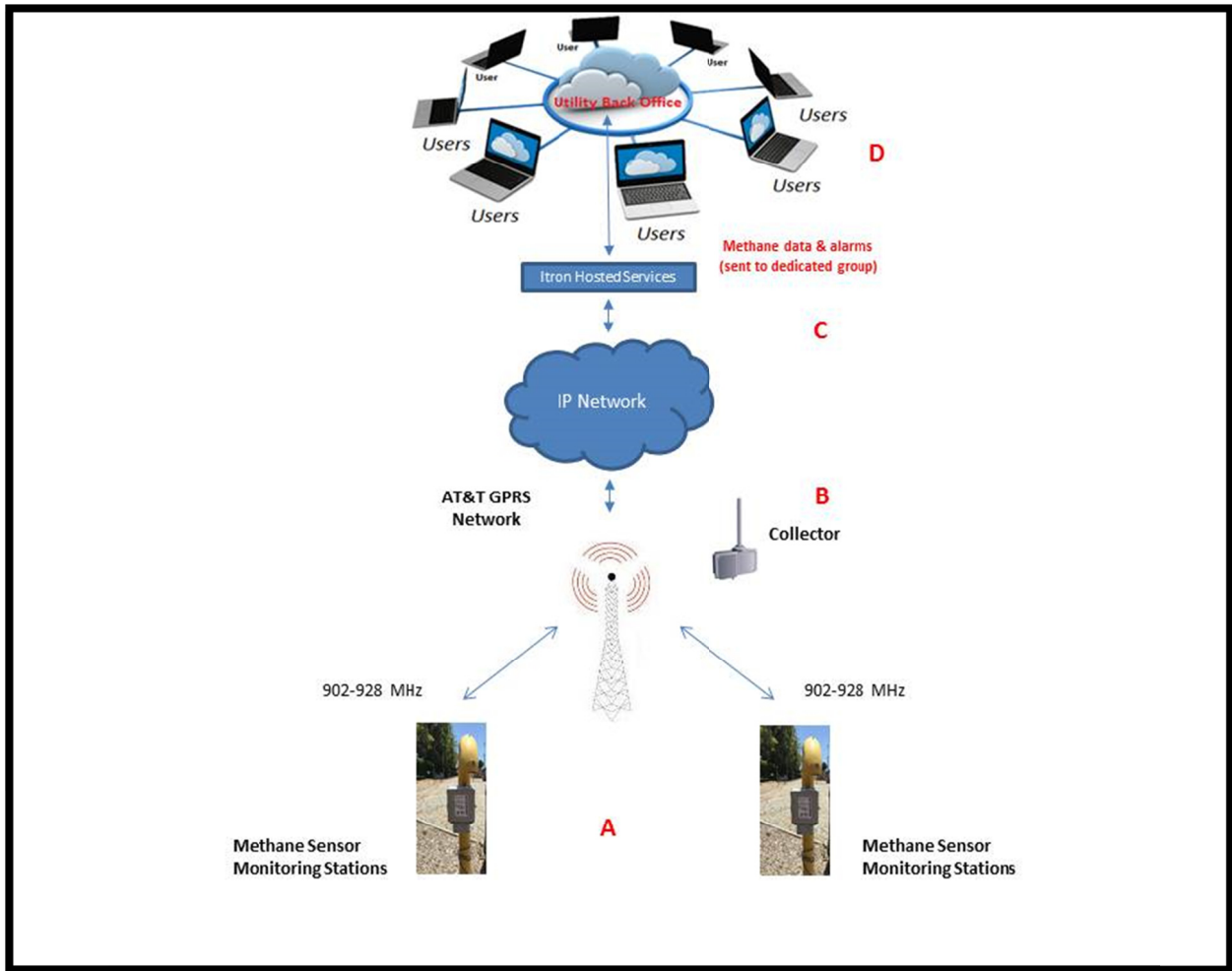
The system is accompanied by collector radios which are compatible with SDG&E's Advanced Meter network in operation, but which have been partitioned from the billing collection system as part of the pilot to ensure billing operations integrity during the test period.

The methane sensors and collection system were placed in operation in late 2015 and early 2016 for a 6-12-month test period. The scope of completed work includes 15 remote monitoring sites and the related infrastructure to capture methane reads into the host system/back office environment for processing. Major sub-components for this system are shown in Figure 1.

The 15 units were installed at points along SDG&E's transmission pipeline number 3010. Field installation photos of the methane-radio modules are shown in in Figures 2-4. A photo of the radio collector units used to poll the methane sensors is shown in Figure 5.

Figure 6 provides an earth view with the methane sensor general locations - noted with the red push-pin designations. Their general coordinates are referenced in Table B-1.

**Figure 1**  
**Methane sensor system employing Advanced Meter technology - SDG&E Pilot:**



Description of Figure 1 Assets:

- A. Itron Methane sensor modules - powered by internal battery (Figures 2-4: -small gray boxes). Includes small radio to transmit information to the radio collector units.
- B. CCU – Radio collector unit communicates with methane modules to pass data to Advance Meter network. (Figure 5)
- C. Itron Hosted Services - receives methane data via radio collection to be stored, organized, and presented. Alarms are managed and reported.
- D. User Interface – access to hosted services for all methane data and alarms



**Figure 2**  
Methane module-pole mount



**Figure 3**  
Methane module-pole mount



**Figure 4**  
Methane sensor on ROW marker



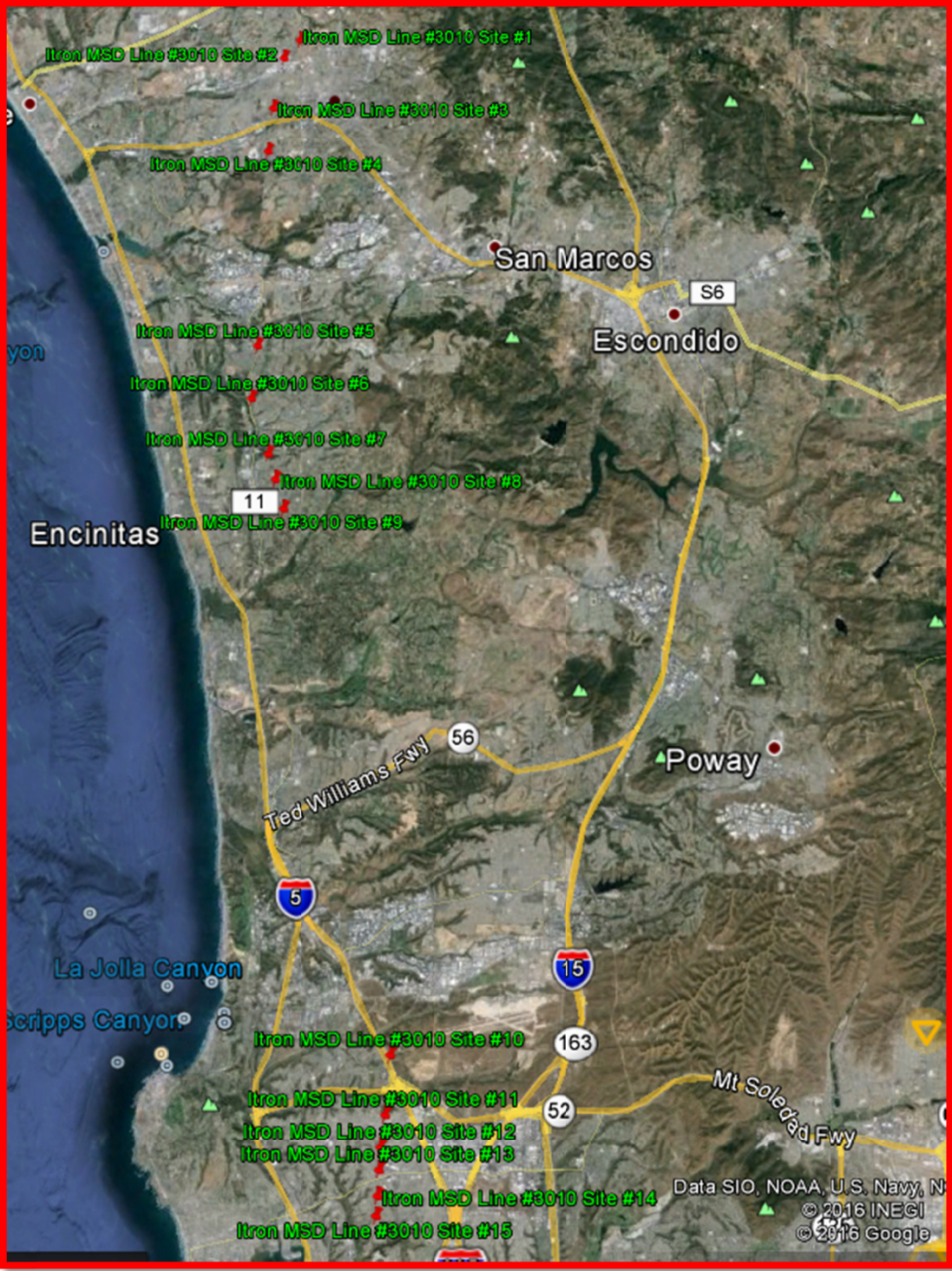
**Figure 5**  
CCU Radio collector unit



**Figure 6**



**Location overview map of pilot methane sensors installed along SDG&E Line 3010**  
Sensor sites shown with red push pin icons



**SDG&E Pilot Methane Sensor sites:**

<b>Transmission Line #</b>	3010
----------------------------	------

**Table B-1**

<b>SITE #</b>	<b>SENSOR ID #</b>	<b>CITY</b>	<b>LAT (approx)</b>	<b>LONG (approx)</b>	<b>HCA DESCRIPTION</b>
1	39399919	Oceanside	33.222°	-117.262°	Residential
2	39399528	Oceanside	33.215°	-117.268°	Business
3	39399789	Vista	33.194°	-117.270°	Residential
4	39399671	Oceanside	33.177°	-117.271°	Residential
5	39399473	Carlsbad	33.101°	-117.266°	Industrial/Residential
6	39399463	Carlsbad	33.081°	-117.266°	Business
7	39399838	Encinitas	33.060°	-117.257°	Residential
8	39400060	Encinitas	33.051°	-117.252°	Residential
9	39399388	Encinitas	33.041°	-117.248°	Residntl/Golf Course
10	39399496	San Diego	32.855°	-117.183°	School
11	39399479	San Diego	32.836°	-117.183°	School
12	39399459	San Diego	32.825°	-117.18°	Residential
13	39399523	San Diego	32.818°	-117.184°	Industrial/Residential
14	39399364	San Diego	32.810°	-117.184°	Residential
15	39400432	San Diego	32.804°	-117.184°	School/Park/Residntl