Application No: A.15-09-013
Exhibit No.:
Witness: J. Kikuts

| In The Matter of the Application of San Diego Gas & Electric Company (U 902 G) and Southern California Gas Company (U 904 G) for a Certificate of Public Convenience and Necessity for the Pipeline Safety & Reliability Project | Application 15-09-013<br>(Filed September 30, 2015) |
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**PREPARED DIRECT TESTIMONY OF**

**JANI KIKUTS**

**ON BEHALF OF**

**SAN DIEGO GAS & ELECTRIC COMPANY**

**AND**

**SOUTHERN CALIFORNIA GAS COMPANY**

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

March 21, 2016

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## I. PURPOSE AND OVERVIEW

The purpose of my prepared direct testimony on behalf of San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) (collectively, the Utilities) is to describe how a supply disruption on an existing SDG&E gas transmission line would impact the Utilities' system and their ability to provide gas service to customers. My testimony also addresses the high-level steps that the Utilities would undertake to manage a potential outage event.

## II. SDG&E GAS SYSTEM OVERVIEW

As explained in the Prepared Direct Testimony of David Bisi, the SDG&E gas transmission system primarily consists of two large diameter high-pressure pipelines. Lines 3010 and 1600 extend north to south from the Rainbow Station, located at the Riverside/San Diego County border and terminate at the San Diego metropolitan area. Two cross-ties join Line 3010 and Line 1600, the northern cross-tie runs from Escondido to Carlsbad and the southern cross-tie runs across Miramar. From Miramar another large diameter pipeline extends eastbound to Santee. From Santee the large diameter pipeline system extends to the Otay Mesa metering station at the U.S./Mexico border. At Otay Mesa, the SDG&E system interconnects with the Transportadora de Gas Natural, S.R.L. pipeline, providing another receipt point for supplies into the SoCalGas/SDG&E system, if supplies are available, as explained in the Prepared Direct Testimony of Gwen Marelli.

The transmission system supplies gas to approximately 14,600 miles of distribution operated mains and services. The 8,000 miles of gas mains are operated at either high-pressure (over 60 pounds per square inch, gage (psig)) or medium-pressure (60 psig and below). This network of mains is supplied by 505 regulator stations located throughout the system to maintain gas pressure and provide adequate capacity to meet customer needs. This network contains approximately 2,250 maintained valves providing the SDG&E capability to isolate the total system into smaller areas for operation, construction, and emergency purposes.

The final component of this network is composed of gas service lines that connect the high- and medium-pressure mains to each customer meter set assembly (MSA) and "house pipeline." SDG&E maintains approximately 6,600 miles of service lines serving approximately 873,000 meters.

## III. OUTAGE SCENARIOS

The Utilities' gas transmission and distribution systems are complex networks of pipelines. There are an infinite number of scenarios that could cause an outage; each different and unique due to outage or damage location, duration, weather, customer demand, availability of alternate gas supplies, and other unrelated system constraints such as compressor station capacity or additional outages on the transmission or distribution pipeline systems.[1]

To illustrate the potential impact to the SDG&E gas system and customers in the event of a Line 3010 outage, my testimony assumes that Line 1600 has been pressure tested and placed back into service operating at 640 psig.[2] In summary, an unplanned disruption of service on Line 3010 is a significant threat to overall system integrity and SDG&E's ability to serve core customers. The Utilities' proposed 47-mile, 36 inch diameter natural gas transmission pipeline

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[1] As described in the Amended Application, the Utilities retained PricewaterhouseCoopers (PwC) to perform a cost-effectiveness analysis, which included a scenario analysis that evaluates SDG&E's system performance in the case of an outage or reduction in pressure of Line 3010. *See* Amended Application, Volume III – Cost-Effectiveness Analysis. I provided data input to the analysis, which PwC used to model a range of scenarios across a variety of parameters and variables, with the aim to assess any resulting gas and electric curtailment impacts to customers.

[2] Due to the specific characteristics of Line 1600, the maximum allowable operating pressure (MAOP) of Line 1600 is now 640 psig, even though it historically operated at 800 psig. *See* Prepared Direct Testimony of Travis Sera.

(Proposed Project or Line 3602) would provide resiliency and redundancy for Line 3010, as long as compression is available.[3]

## IV. LINE 3010 OUTAGE SCENARIO

As explained in the Prepared Direct Testimony of David Bisi, the SDG&E gas transmission system is highly dependent on Line 3010 and the Moreno Compressor Station, and an outage on Line 3010, either planned or unplanned, severely reduces the capacity of the SDG&E system. The resulting system and customer impact of an outage is highly dependent on a variety of factors including outage location, outage duration, weather conditions, system demand, and alternate gas supply availability. The following outage scenario is just one plausible example of the kinds of potential impacts that could occur to core, noncore, and electric generation customers in the event of an outage on the northern section of Line 3010. Depending on the circumstances, the impacts of other outage scenarios could be more or less severe than those described below.

The assumptions for this outage scenario are as follows:

- Outage occurs at 10 a.m. on the northern end of Line 3010. After an initial release of gas for a period of 3 to 15 minutes, approximately 6.5 miles of Line 3010 are isolated by main line valve closures. See Figure 1 below for overall system map.
- The isolated segment of Line 3010 will be out of service for an extended period of time, but a minimum of 24 hours.
- The event occurs during a 1-in-10 year gas demand day, which on average has a 10% probability of occurring each year during the winter season.
- Alternate gas supplies through Otay Mesa are not available in the short term at the time of the Line 3010 outage.
- Moreno Compressor Station is functioning at full capacity feeding the SDG&E transmission system through Line 1600.

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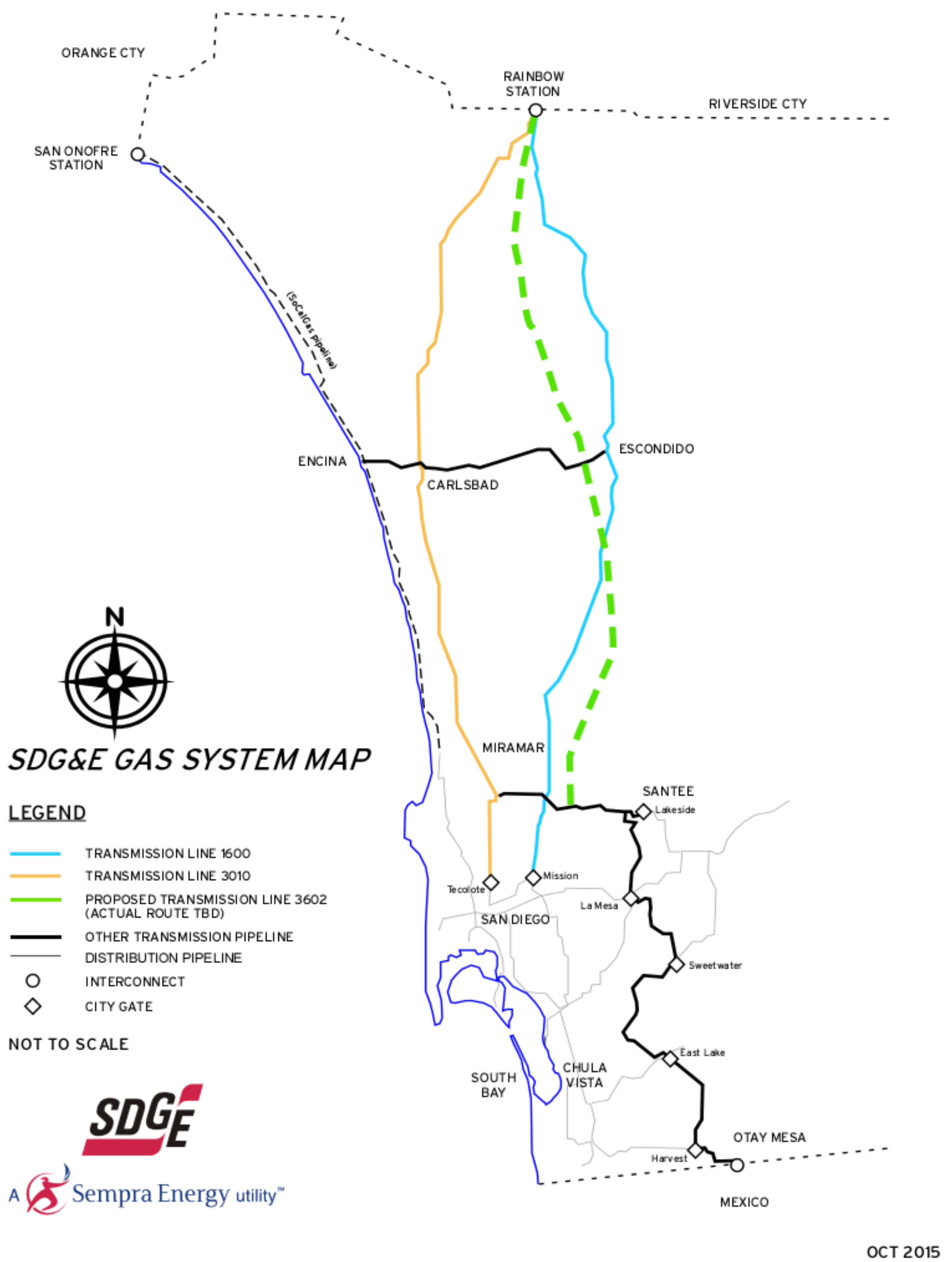
[3] *See* Prepared Direct Testimony of David Bisi.

- Without Line 3010 or additional gas supplies at the Otay Mesa interconnect, Line 1600 is operating at its maximum current transmission capacity of 150 million cubic feet per day (MMcfd)[4] supplying the SDG&E system.

**FIGURE 1**




[4] If there is an outage on Line 3010, Line 1600 operating by itself can contribute up to 150 MMcfd. *See* Prepared Direct Testimony of David Bisi.

## V. OUTAGE SCENARIO IMPACT TO SDG&E GAS DISTRIBUTION SYSTEM AND CUSTOMERS[5]

The SDG&E gas transmission system supplies gas to downstream distribution high pressure supply lines and distribution mains. Distribution systems are designed assuming a Minimum Operating Pressure (MinOP) in the transmission system, the MinOp gradient on Line 3010 and Line 1600 ranges from a high of 350 psig to a low of 250 psig from North to South under normal operating conditions. Pipeline capacity, or ability to serve downstream demand, is exponentially related to the length of the pipeline and system inlet pressure, as transmission system pressures diminish below MinOp the distribution system's ability to adequately serve customer demand drops exponentially potentially leading to an outage.

In the scenario outlined above in Section IV, the SDG&E transmission system has experienced an outage on a northern segment of Line 3010 with no alternate gas supplies available at Otay Mesa. As a result, the transmission system is solely supplied by Line 1600 with a capacity of 150 MMcfd. The remaining system capacity, core demand, electric generation demand, and noncore demands are summarized in Figure 2 below.

**FIGURE 2**

| System Capacity and Demand With Line 3010 Outage and No Otay Mesa Source | | |
|---|---|---|
| Line 1600 Capacity | 150 | MMcfd |
| Core Demand | 350 | MMcfd |
| Electric Generation (EG) Demand | 165 | MMcfd |
| Noncore, Non-EG Demand | 44 | MMcfd |
| Noncore, Non-Compliant Demand | 18 | MMcfd |

Initially at the time of isolation of the Line 3010 segment, the transmission system will have 111 MMcf of line pack. With Line 1600 solely feeding the SDG&E transmission system and without any curtailment, the line pack will quickly diminish as customer demand is

[5] *See* Section V of the Prepared Direct Testimony of Mr. S. Ali Yari for a discussion of electric reliability impacts from a gas service interruption.

significantly higher than available supply that can be brought in through Line 1600. In a relatively short amount of time, pressures will drop and customer gas outages will begin to occur until a natural system balance is reached between remaining demand and capacity of Line 1600.

Upon recognition of a transmission system capacity constraint, curtailment procedures will be implemented according to SDG&E Rule 14 as noted in the Prepared Direct Testimony of Gwen Marelli. In this outage scenario it is assumed that the following curtailments occur in an effort to preserve core customers:

- EG demand of 165 MMcfd is fully curtailed within 1 hour of capacity constraint identification.
- Noncore, non-EG customer demand of 44 MMcfd is fully curtailed within 4 hours of capacity constraint identification.

In this scenario, it is assumed that not all noncore customers will comply with the curtailment order in a timely manner. These customers may have committed to production or delivery of services with economical or contractual consequences for failure to deliver. Examples of customer types include small manufacturing, asphalt plants, food processing, industrial bakeries, and large scale laundry facilities.

The remaining system demand consists of a core demand of 350 MMcfd and non-compliant noncore demand of 18 MMcfd. As illustrated in Figure 3, the shortfall between available supply through Line 1600 and system demand requires additional curtailment of 218 MMcfd of core and noncore non-compliant customers.

**FIGURE 3**

| System Capacity and Demand<br>With Line 3010 Outage and No Otay Mesa Source | | |
|---|---|---|
| Line 1600 Capacity (Supply) | 150 | MMcfd |
| Core Demand | 350 | MMcfd |
| Noncore, Non-Compliant Demand | 18 | MMcfd |
| Required Curtailment (Shortfall) | 218 | MMcfd |

Without additional load curtailment beyond EG and large noncore system, pressures will continue to drop until the system can no longer flow gas to all customers. It is estimated that the first naturally occurring system outages begin to occur at system extremities approximately 6 hours after isolation of Line 3010. Areas likely to experience initial outages include Alpine, Rancho San Diego, Camp Pendleton Marine Corps Base, and portions of Rancho Bernardo. As initial outages occur, the rest of the system will continue to lose pressure resulting in the loss of additional customers. It is estimated that at the 8-hour mark, the gas system will have lost 218 MMcfd of core and noncore non-compliant demand corresponding to an estimated 60% to 65% of core customers. This represents roughly 550,000 meters.

Allowing the gas system to "self-curtail" through naturally occurring gas outages from diminishing supply is likely to result in multiple outages with undefined boundaries scattered through the service territory. When adequate transmission supply returns, and in order to restore these customers, these outage areas would need to be identified, isolated, purged of any air that may have entered the system. This would require a methodical effort of great complexity and resource needs, and could take weeks to complete, as described in Section VI.

In this scenario alternate gas supplies from the Otay Mesa receipt point are not available and additional curtailment of 218 MMcfd is required to meet the system capacity. As discussed in the Prepared Direct Testimony of Gwen Marelli, the immediate supply of gas from Otay Mesa receipt point is not guaranteed. The preferred approach would be to deliberately, proactively, and in a controlled manner, isolate large portions of the system. By doing so, the exact curtailment boundaries and affected customer counts will be defined and the remaining customers will receive adequate service from Line 1600 at a capacity of 150 MMcfd.

Initial curtailment of EG and large noncore customers gains some time to evaluate impacts to remaining customers and form a strategy. However, deliberate curtailment action must take place prior to the 6- to 8-hour mark in this scenario. Considering the time necessary to develop and execute a curtailment plan specific to a particular outage scenario, 6 to 8 hours is not a lot of time. A curtailment effort would be executed through the closure of valves in strategic areas of the service territory. Distribution valves are not automated and require a field response with windshield time, potential traffic control requirements, and potential resource constraints depending on the number of valves to be isolated.

The most effective approach to required large scale curtailment of core and small noncore customers is by closing the least number of valves isolating a large quantity of customers. In this scenario, the closure of 6 to 8 strategic valves would meet the required load curtailment and effectively isolate an estimated 550,000 customers in the system south of Sorrento Valley, Poway, and Ted Williams Highway 56 to the U.S. – Mexico border, as depicted in Figure 4.[6] It should be noted that the curtailment of a large geographic area is likely to result in gas outages for multiple customer types including residential, commercial, industrial, schools, hospitals, military bases, as well as local county and city government facilities, all of which would be affected by this scenario. Following the initial isolation of the southern portion of the SDG&E system, further sub-isolations of the outage area will occur in order to facilitate organized restoration of service efforts.

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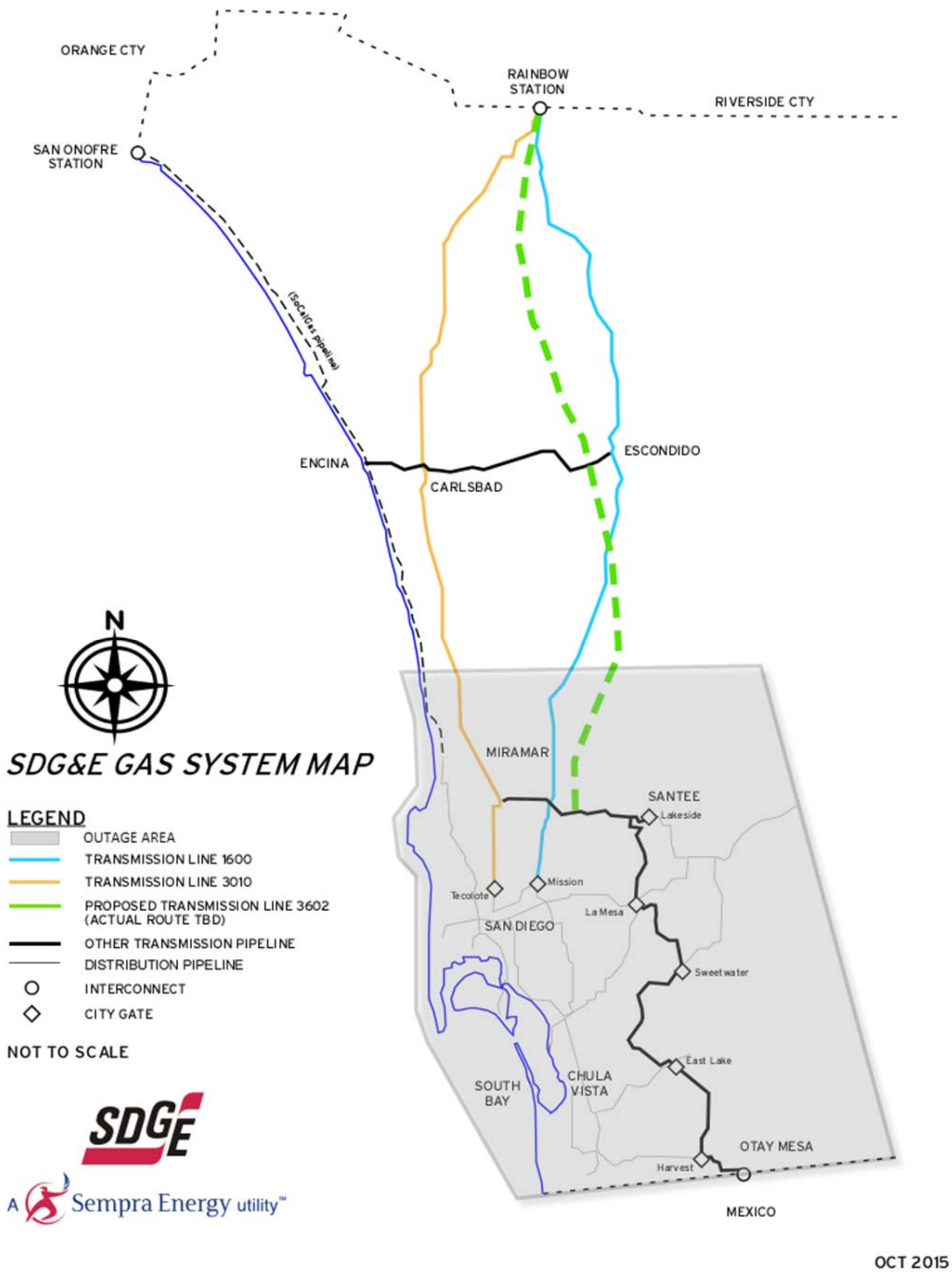
[6] This map is not to scale and is for illustrative purposes only.

**FIGURE 4**


ORANGE CTY
RAINBOW STATION
RIVERSIDE CTY
SAN ONOFRE STATION
(SoCalGas pipeline)
ENCINA
CARLSBAD
ESCONDIDO
MIRAMAR
SANTEE
Lakeside
Tecolote
Mission
La Mesa
SAN DIEGO
Sweetwater
East Lake
SOUTH BAY
CHULA VISTA
OTAY MESA
Harvest
MEXICO
SDG&E GAS SYSTEM MAP
LEGEND
OUTAGE AREA
TRANSMISSION LINE 1600
TRANSMISSION LINE 3010
PROPOSED TRANSMISSION LINE 3602 (ACTUAL ROUTE TBD)
OTHER TRANSMISSION PIPELINE
DISTRIBUTION PIPELINE
INTERCONNECT
CITY GATE
NOT TO SCALE
SDGE
A Sempra Energy utility
OCT 2015

## VI. GAS SERVICE RESTORATION

Recovering from a large scale gas outage and restoring service to customers is a time-consuming activity requiring customer outreach, system engineering evaluations, and support activities for field personnel. Examples of support activities include resource planning, meals, establishment of centralized command locations, and restoration progress tracking. The size of the field work force needed is directly dependent on the desired restoration timeframe and number of outages. On average, one service technician can isolate or shut down 20 customers per hour and relight 6 customers per hour once the distribution system is ready for relights. The shut-offs and relights per hour are an average; the actual rate can vary depending on the area terrain, time of day, majority multi-family or single family units, and age of appliances. Newer appliances have electronic ignition and are faster to place in service than older appliances.

In this scenario, it is safe to assume that an outage of 550,000 customers would require mutual aid from other utilities for a period of weeks. As an example, SDG&E can allocate approximately 100 service technicians to the restoration effort, and with another 100 mutual aid technicians working 12 hour shifts, it would take approximately 12 days to isolate all the risers in the affected area and another 42 days to perform restores for a total field effort of 53 days. Even if over 1,000 field employees were available through mutual aid, it would still take nearly 2 weeks to restore customers. The following activity list outlines the basic steps required in system isolation / restoration.

<u>Shut Off</u>

- Set up area based command post.
- Perform meter shut-offs through area sweeps and gas riser valve closures. Mark or tag each meter as shut off, and document the shut off. Inform customer if present.
- Report back to area command post.

Restoration of Service

- Purge gas system in restoration area to 100% gas.
- If customer is present and premises are accessible perform and document restoration of service.
- If customer is not present, service cannot be restored. Valve on riser is left in closed position and a door tag is left for a follow up appointment.
- Keep notes of any unusual circumstances encountered at a customer's premises.

In sum, if the Proposed Project was constructed and in service, there would be no disruption to customers if the scenario described above occurred.

## VII. QUALIFICATIONS

My name is Jani Kikuts. I am employed by SDG&E as the Gas Engineering Supervisor. My business address is 6875 Consolidated Way, San Diego, California, 92121.

I received a Bachelor of Science degree in Mechanical Engineering from San Diego State University in 2005 and I am a registered professional engineer. I have been employed by SDG&E since 2006, and have held engineering and supervisory positions within the Gas Engineering Department in Gas Technical Services.

I have held my current position since October 2011. My current responsibilities include supervising the Gas Engineering group responsible for engineering and planning SDG&E's gas distribution system. As such, I am responsible for: ensuring the distribution system meets the CPUC-mandated design standards; recommending system improvements and additions as necessary; monitoring the changing dynamics of the gas distribution system as customer demand changes; performing capacity analysis for proposed customer projects on the distribution system; and supporting routine capital and franchise driven work.

I have not previously testified before the California Public Utilities Commission.

This concludes my prepared direct testimony.