Company: Southern California Gas Company (U 904 G)
Proceeding: 2016 General Rate Case
Application: A.14-11-XXX
Exhibit: SCG-06

SOCALGAS

DIRECT TESTIMONY OF PHILLIP E. BAKER

UNDERGROUND STORAGE

November, 2014

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

Southern California Gas Company

A Sempra Energy utility®

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SUMMARY

UNDERGROUND STORAGE O&M	Thousands of 2013 Dollars		
	2013 Adjusted Recorded	**TY2016 Estimated**	**Change**
Total Non-Shared	$30,995	$40,181	$9,186
Total Shared Services (Incurred)	$0	$0	$0
Total O&M	**$30,995**	**$40,181**	**$9,186**

UNDERGROUND STORAGE CAPITAL	Thousands of 2013 Dollars		
	2014	**2015**	**2016**
Total Capital	**$71,429**	**$74,270**	**$90,523**

The funding summarized above and described in my testimony is reasonable and represents the required Operations and Maintenance (O&M) expenses and capital investments for Southern California Gas Company's (SoCalGas or the Company) underground storage facilities to:

- Maintain the safety, integrity, and effective operations of the natural gas storage system;
- Provide a reliable and economic supply of gas for customers throughout the service territory, especially during periods of high demand;
- Achieve compliance with operating and environmental regulations; and
- Allow gas deliveries to be efficiently balanced throughout the overall transmission and distribution system.

Incremental O&M and capital funding associated with a new safety, system integrity, and risk management initiative, the Storage Integrity Management Program (SIMP), is proposed for underground storage wells. This program is modeled after SoCalGas' Transmission Integrity Management Program (TIMP), and a similar two-way balancing account process is requested.

The driving force behind the expenditure plan for Underground Storage is the objective of SoCalGas and its employees to provide safe, reliable deliveries of natural gas to customers at reasonable rates. O&M and capital investments also enhance and maintain the efficiency and responsiveness of operations, extend the life of assets, and facilitate compliance with governmental regulations.

The O&M forecast was established using a five-year trend, with the addition of costs for the new safety and integrity management program for underground storage wells.

The capital forecast was established using a five-year average. Added to the average are remediation costs for the new safety and well integrity management program, plus costs to drill new wells.

To understand this Test Year (TY) 2016 forecast in the proper context, the following factors should be considered:

- Storage facilities consist of large complex interconnected industrial equipment that continues to age. The increasing volume, frequency and complexity of above-ground and below-ground maintenance work, and the declining availability of replacement components for older assets exposed to demanding field conditions, all continue to push operating costs higher.

- Costs for storage activities have been increasing at a relatively consistent rate in recent years in support of safety, system integrity, maintenance, reliability, deliverability, and regulatory compliance objectives. Most increases have been driven by the intensity of traditional operating functions and routine work efforts across the board that are required to safely operate and maintain the aging infrastructure of the fields. As a result, there are very few "big ticket items" one can single out as primary contributors for the increasing O&M trend.

- Problems associated with operating equipment, aging wells, compressors, and gas and liquid process/piping systems are difficult to predict. When unpredictable failures or preemptive repair situations occur, the associated mitigation costs for such occurrences can vary from year to year. This potential for peaks and valleys in spending trends supports a longer-term (five-year) trending methodology to forecast O&M costs.

- In the future, pipeline integrity inspection requirements, the frequency and depth of regulatory audits and resulting compliance activities, additional focus on employee training, operator and supervisory qualification, employee turnover, expanded permitting and reporting requirements of regulatory agencies from new and existing environmental regulations such as storm water requirements, security enhancements, and chemical costs are all expected to increase operating expenses. These upward pressures further support the five-year trending methodology used to forecast O&M costs.

- Capital costs for routine storage functions have been relatively consistent over the past five years. This supports the five-year methodology used to forecast costs for traditional baseline capital expenditures.

- Underground storage reservoirs are dynamic geological assets where gas injection and withdrawal capabilities can change over time. These changes, which include natural well degradation and storage volume variability due to fluid extraction or intrusion, require ongoing studies and significant capital investments in new or replacement wells to maintain historical storage deliverability rates. The small number of new or replacement wells planned, the high cost of constructing these assets, along with an inconsistent historical trend for this particular sub-activity supports a zero-based approach to forecasting the capital costs for new wells.

SOCALGAS DIRECT TESTIMONY OF PHILLIP E. BAKER
UNDERGROUND STORAGE

I. INTRODUCTION

A. Summary of Costs

I sponsor the TY2016 forecasts of O&M costs for non-shared services, and forecasts of capital costs for years 2014, 2015, and 2016, associated with Underground Storage for SoCalGas.[1] My cost forecasts support the Company's goals of maintaining and enhancing public and employee safety, as well as providing reliable supplies of gas for service delivery. Underground Storage's support of SoCalGas' safety, integrity and reliability goals is discussed in greater detail within this testimony. Tables PEB-1 and PEB-2 below summarize my sponsored costs.

Table PEB-1
Southern California Gas Company
Test Year 2016 Summary of Total O&M Costs

UNDERGROUND STORAGE O&M	Thousands of 2013 Dollars		
	2013 Adjusted Recorded	TY2016 Estimated	Change
Total Non-Shared	$30,995	$40,181	$9,186
Total Shared Services (Incurred)	$0	$0	$0
Total O&M	**$30,995**	**$40,181**	**$9,186**

Table PEB-2
Southern California Gas Company
Test Year 2016 Summary of Total Capital Costs

UNDERGROUND STORAGE CAPITAL	Thousands of 2013 Dollars		
	2014 Estimated	2015 Estimated	2016 Estimated
Total Capital	**$71,429**	**$74,270**	**$90,523**

In addition to this testimony, please also refer to my workpapers, Exhibits SCG-06-WP (O&M) and SCG-06-CWP (capital), for additional information on the activities described herein.

[1] Pursuant to CPUC Decision (D) 01-06-081, issued June 28, 2001, the costs forecast in TY2016 do not include costs associated with the operation and maintenance of the Montebello underground storage field or any costs associated with salvage operations. This decision directs that all costs associated with the Montebello underground storage field operation be removed from rates as of August 29, 2001, which has been done. Also, as of April 2009, the East Whittier storage field was removed from rate base. Therefore, costs associated with maintaining this field are also excluded from this case.

B. Summary of Activities

SoCalGas operates four underground storage fields with a combined working capacity of approximately 136 Bcf.[2] These fields are: Aliso Canyon (86.2 Bcf), La Goleta (21.5 Bcf), Honor Rancho (26.0 Bcf), and Playa del Rey (2.4 Bcf). Underground Storage is responsible for the safety, system integrity, design, operations, maintenance, and gas injection/withdrawal activities, along with environmental and regulatory compliance functions, within the four storage fields. It plans and constructs the capital investments necessary to provide value-added storage services for SoCalGas customers. The critical goals for storage are safety, system integrity, gas availability, reliability, and value, which are achieved in full compliance with governmental regulations.[3]

Gas storage fields can only be constructed in areas with unique underground geological characteristics. Their proximity to local gas consumers and transmission and distribution pipelines make them even more valuable assets. The unique underground geology of SoCalGas' storage fields, all former hydrocarbon-producing fields, and their location with respect to gas loads make them ideally suited for storage operations within the SoCalGas system. More information about what determines a good storage field is provided in Appendix B: Underground Storage of Natural Gas, and incorporated here by reference.

By their nature, gas storage fields occupy large open areas of land and require the continual installation, maintenance, refurbishment, and replacement of heavy industrial equipment such as engines, compressors, electrical systems, wells and piping, gas processing components, and instrumentation.

Natural gas is compressed onsite to very high pressures (up to 3,600 psig) and injected underground into the field reservoirs through piping networks and storage wells, typically during seasonal periods when gas consumption is low and supplies are ample.

Storage gas is usually withdrawn and delivered to customers through the transmission and distribution system when gas consumption is seasonally high during winter months. At the beginning of the withdrawal season in November, the combined storage capacity of the four storage fields is enough to supply all of SoCalGas' customers for approximately six weeks, if one assumes an average daily consumption rate.

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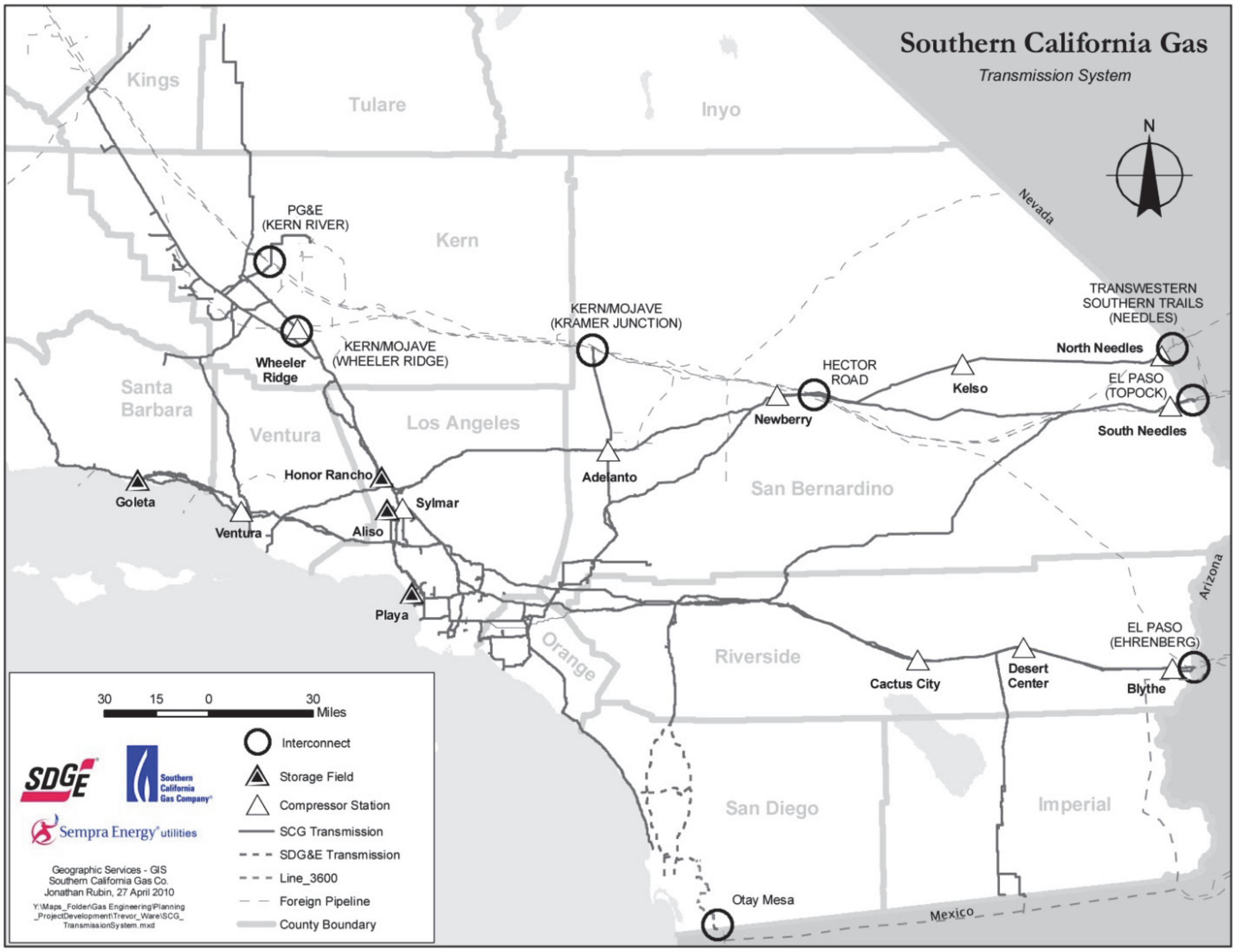
[2] The volumetric capacity of a natural gas storage field reservoir is measured in units of billion cubic feet (Bcf).

[3] Additional information on storage operations can be found in Appendix B.

A diagram/map of the SoCalGas/SDG&E gas transmission system, including the location of the four storage fields is shown in Figure PEB-1 below.

Figure PEB-1
Southern California Gas Company
Transmission and Storage System



The four storage facilities are an integrated part of the energy infrastructure required to provide southern California businesses and residents with safe and reliable energy and gas storage services at a reasonable cost.

<u>Aliso Canyon</u>

Aliso Canyon is located in Northern Los Angeles County and is the largest of the four gas storage fields, with a working capacity of approximately 86 Bcf and deliveries to the Los Angeles pipeline loop. Aliso Canyon began storage operations in 1973, although many of its wells date back to the 1940s. Aliso Canyon has 115 injection/withdrawal/observation wells and is designed for a maximum withdrawal rate of approximately 1.8 Bcf per day at full-field inventory. Within the field, it is estimated there are approximately 38 miles of gas injection, withdrawal, and liquid-handling pipelines that connect the storage wells to processing and compression facilities.

Honor Rancho

Honor Rancho is also located in Northern Los Angeles County, approximately ten miles north of Aliso Canyon, with a working capacity of approximately 26 Bcf and deliveries to the Los Angeles pipeline loop. Honor Rancho began storage operations in 1975, although many of its wells date back to the 1940s. Honor Rancho has 40 gas injection/withdrawal wells and is designed for a maximum withdrawal capability of 1.0 Bcf per day. It is estimated that approximately 12 miles of pipelines connect the storage wells to processing and compression facilities.

La Goleta

La Goleta is located in Santa Barbara County near the Santa Barbara Airport and the University of California–Santa Barbara campus and provides service to the northern coastal area of the SoCalGas territory. La Goleta, the oldest of the four fields, began storage operations in 1941 and has a working capacity of approximately 21 Bcf. Most of its wells date back to the 1940s. La Goleta has 20 gas injection/withdrawal/observation wells and is designed for a maximum withdrawal capability of 0.4 Bcf per day. It is estimated that approximately eight miles of pipelines connect the storage wells to processing and compression facilities.

Playa Del Rey

Playa Del Rey, located in central Los Angeles County, near the Los Angeles International Airport, was placed into storage service in 1942. It is the smallest of the storage fields, yet, due its location, is a very critical asset with a design working capacity of approximately 2.4 Bcf. Playa Del Rey has 54 gas injection/withdrawal/observation wells. It is estimated that approximately 11 miles of pipeline connect the storage wells to processing and compression facilities.

Playa Del Rey is designed for a maximum withdrawal rate of 0.4 Bcf per day to meet residential, commercial and industrial loads throughout the western part of Los Angeles, including oil refineries and power generators.

Table PEB-3 below further summarizes the descriptive characteristics of all four storage fields.

Table PEB-3
Southern California Gas Company
Descriptive Statistics of Storage Fields

Descriptive Statistic	Aliso Canyon	La Goleta	Honor Rancho	Playa del Rey	Total All Fields
Year Field Placed in Service	1973	1941	1975	1942	-
Injection/Withdrawal/Observation Wells (number)	115	20	40	54	229
Gas Compressor Units (number)	8	8	5	3	24
Compression Horsepower (bhp)	42,000	5,700	27,500	6,000	81,000
Maximum Reservoir Pressure (psig)	3,600	2,050	4,400	1,700	-
Working Gas (Bcf)	86.2	21.5	26.0	2.4	136.1
Maximum Withdrawal Rate (MMcfd)	1,860	420	1,000	400	3,760
Maximum Injection Rate (MMcfd)	600	140	300	75	1,115
Maximum Well Depth (feet)	10,691	6,912	13,300	6,575	-
Minimum Well Depth (feet)	6,997	4,247	9,165	6,049	-
Average Well Depth (feet)	8,146	4,886	9,959	6,339	-

C. Risk Management Practices in Storage

The risk policy witnesses, Diana Day (Exhibit SCG-02) and Doug Schneider (Exhibit SCG-03), describe how risks are assessed and factored into cost decisions on an enterprise-wide basis. Several of my costs address safety risks associated with the storage system. Most specifically, I propose to establish a new SIMP, described and discussed below in the O&M and Capital cost sections, to mitigate safety-related risks.

While we have historically managed risk at our storage facilities by relying on more traditional monitoring activities and identification of potential component failures, we believe that it is critical that we adopt a more proactive and in-depth approach. Historically, safety and risk considerations for wells and their associated valves and piping components have not been addressed in past rate cases to the same extent that distribution and transmission facilities have been under the Distribution and Transmission integrity management programs. As a prudent storage operator, SoCalGas proposes to manage and approach the integrity of its storage well assets, which all fall under the jurisdiction of the California Department of Oil, Gas and Geothermal Resources (DOGGR), in a manner consistent with the approach adopted for distribution and transmission systems. Risk management activities, processes, and procedures for well integrity should have a focus similar to those employed under the Company's pipeline risk mitigation programs.

Accordingly, in this rate case, we propose to establish a highly proactive approach to evaluating and managing risks associated with wells in our storage system through a new SIMP, modeled after the successes of our pipeline integrity management programs (TIMP and DIMP). Through the implementation of the SIMP, better storage well system data will be collected, maintained and modeled to identify the top risks throughout Storage. Comprehensive plans to mitigate those risks will be developed and implemented.

1. Risk Assessment

Currently, risk assessment of our storage system is of a qualitative nature and is based on our long experience in operating and managing SoCalGas' storage facilities. During routine system assessments, we monitor the condition of our assets and consider the risks they may pose on safety, reliability, and the environment.

The future of risk assessment for our storage system is moving towards a more robust and quantitative approach that will help us capture more information on the condition of our storage wells and develop models that will assist in prioritizing risk mitigation activities. The details of this new risk assessment are captured in further sections of my testimony describing the SIMP.

2. Risk Mitigation Alternatives Evaluation

Well risk mitigation is evaluated on a case-by-case basis. Whenever a well may pose a safety risk, we act immediately to address the problem. Alternatives, such as plugging and abandoning the well, versus a major repair or well replacement, are evaluated based on conditions, including the age of the well, prior repair or maintenance history, performance during withdrawal or injection periods, and surface considerations, such as susceptibility to landslides. These various conditions, and their associated costs, are evaluated to determine the safest, most cost-effective mitigation option. Another consideration that may influence repair decisions is the age and condition of certain well components that may have become obsolete and are no longer supported by the original equipment manufacturer and cannot be readily replaced or maintained.

At a very high level, alternatives to mitigate risks posed by deteriorating, aging, obsolete or failed storage equipment include:

- Replacement of equipment / storage wells
- Overhaul of equipment / storage wells

- Repair of equipment / storage wells
- Abandonment of a storage well / equipment
- Installation of additional equipment

3. Risk Reduction Benefits

The proposed mitigation activities are expected to address safety, reliability and environmental risks by either maintaining a certain acceptable level of control over those risks, or by further reducing the potential impacts of the risks. While there are no current means to provide a quantitative risk reduction forecast, it is my belief that the proposed mitigation activities will greatly assist in controlling and reducing the risks in our storage system.

In addition to establishing a more quantitative risk analysis of our storage wells as discussed below, the SIMP will result in a more effective prioritization of required capital expenditures that address risks that impact safety, reliability and the environment.

4. Integration of Risk Mitigation Actions and Investment Prioritization

The implementation of the proposed SIMP will establish an integrated risk management and investment prioritization process for storage management at SoCalGas. Storage wells are an integral gas delivery component, and an unanticipated safety concern could interrupt access to the working gas asset and potentially lead to a complete shutdown of a storage field.

Models to be developed from captured well data will evaluate threats and risks that exist in our storage system. This will allow for a prioritization of those storage well threats, based on their location, age, condition and other factors, thereby establishing a robust methodology for prioritizing storage management investments.

5. Investment Included in Request to Support Risk Mitigation

Investments related to the SIMP are necessary to establish a risk management program. Future mitigation activities that will result from the implementation of the SIMP will be risk-driven and will address identified and prioritized risks. SoCalGas forecasts $5.676 million annually in O&M and $24.272 million annually in capital costs for the implementation of the SIMP. It is anticipated that the SIMP will last for six years, the estimated length of time required to inspect all of the wells and mitigate any identified conditions. After this six-year period, when the program is complete, future inspection and mitigation costs will be addressed through routine operations.

D. Support To/From Other Witnesses

In addition to sponsoring my own organization's costs, I also provide sponsorship of the New Environmental Regulatory Balancing Account (NERBA) cost forecast for the reporting requirements under Subpart W for Gas Engineering, Gas Transmission and Underground Storage for witnesses Raymond Stanford (Exhibit SCG-07), John Dagg (Exhibit SCG-05), and myself. The costs associated with Subpart W reporting requirements are illustrated in the cost detail in section II.C of my testimony. Policy testimony in support of NERBA and storm water regulations is provided by Environmental Services witness Jill Tracy (Exhibit SCG-17).

II. NON-SHARED COSTS

A. Introduction

Table PEB-4 below summarizes the total non-shared O&M forecasts for the listed cost categories.

Table PEB-4
Southern California Gas Company
Non-Shared O&M Summary of Costs

UNDERGROUND STORAGE	**Thousands of 2013 Dollars**		
Categories of Management	**2013 Adjusted Recorded**	**TY2016 Estimated**	**Change**
Underground Storage – Routine	$30,681	$34,101	$3,420
New Environmental Regulatory Balancing Account (NERBA) (Existing Balancing Account)	$314	$404	$90
Storage Integrity Management Program (Proposed New Balancing Account)	$0	$5,676	$5,676
Total	**$30,995**	**$40,181**	**$9,186**

B. Underground Storage – Routine O&M

Table PEB-05 below summarizes the non-shared O&M forecasts for routine storage operations.

Table PEB-05
Southern California Gas Company
Non-Shared Routine O&M Costs

UNDERGROUND STORAGE	Thousands of 2013 Dollars		
Categories of Management	**2013 Adjusted Recorded**	**TY2016 Estimated**	**Change**
Underground Storage - Routine	$30,681	$34,101	$3,420

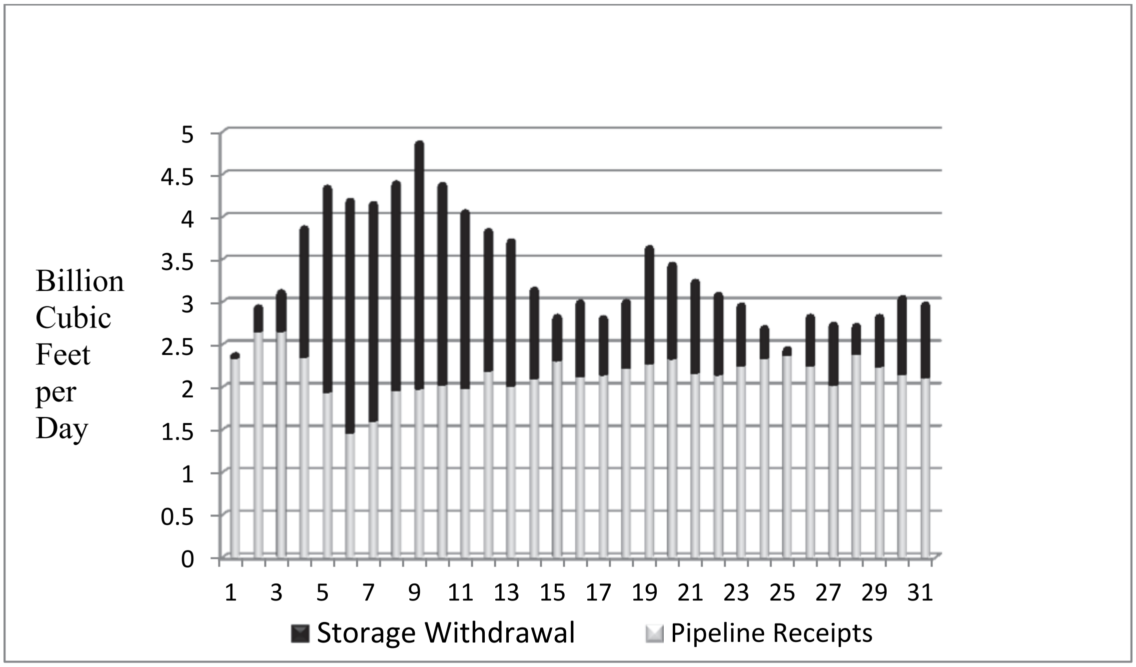
1. Criticality of Storage and Underlying Activities

The use of the four underground storage fields is an essential component of the energy delivery system within California that works in conjunction with the SoCalGas transmission pipeline and distribution delivery network. This interconnected system consists of high-pressure pipelines, compressor stations, and underground storage fields, designed to receive natural gas from interstate pipelines and local production sources. The integrated system enables deliveries of natural gas to customers or into storage field reservoirs, depending on market demands. SoCalGas uses its storage assets to efficiently meet seasonal, as well as daily, gas balancing requirements.[4] To satisfy these needs, the individual storage facilities act as "gas suppliers" or "consumers," depending upon the withdrawal or injection requirements as managed by Gas Control. Fluctuating demands may require Storage Operations to perform gas injection or withdrawal functions at any hour of the day, 365 days per year. Storage fields are continually staffed with operating crews and on-call personnel to support these critical 24/7 operations.

Figure PEB-2 below illustrates the crucial role of storage in the delivery of reliable gas service for energy consumers within southern California during the fall and winter heating season.

[4] In order to maintain operational stability of the gas system, smaller changes in supply and demand are typically met by "increasing" and/or "pulling" on the inventory of pressurized gas contained within the transmission pipelines. This process known as "packing and drafting," is an efficient way to deal with minor changes in load. As the system load increases, and can no longer be satisfied using pack and draft, the system is balanced by either injecting natural gas into the storage fields when pipeline delivery supply exceeds customer demand, or withdrawing natural gas from storage when service requirements exceeds out-of-State pipeline supplies.

Figure PEB-2
Southern California Gas Company
System Send-out December 2013



From the bar chart in Figure PEB-2, it can be observed that SoCalGas underground storage provided approximately 58% of the system send-out, or 17.7 Bcf, for a seven-day period beginning on December 5, 2013. On December 6, 2013, storage actually delivered 2.8 Bcf or 66% of the gas consumed by residential, commercial and industrial customers on this cold day. Had underground storage not been available and reliable for this extended period of high demand, widespread curtailments may have been necessary, and potentially significantly impacted millions of Southern California customers.

The reliance/dependency on underground storage to supply the SoCalGas system with such enormous volumes of gas over short period of times due to extreme weather conditions occurring locally or out of state, or from the temporary reduction of interstate supplies for other reasons, places significant strains on the wells, pipelines, and other aging storage facilities that must support the heavy withdrawal demands. The expected instant availability of storage gas requires continuous maintenance activities and ongoing investments to satisfy these immediate and longer-term customer demands.

Storage is responsible for the operation, maintenance, integrity, and engineering functions associated with the use of facilities within the perimeter of the fields. This responsibility also extends beyond the plant perimeter in some areas, where gas injection and withdrawal pipelines and storage wells exist outside of the storage field property. As an example, Figure PEB-3 below is an aerial view of the Playa del Rey storage field that plots the location of its wells inside and outside of the plant perimeter.[5]

Figure PEB-3
Southern California Gas Company
Aerial View of Playa Del Rey Underground Storage Field

The Storage department presently consists of approximately 175 employees. It is organized with both operational and technical support groups that provide cost-effective delivery of services essential to operating and maintaining the safety, integrity, security, and reliability of its crucial gas delivery assets. While each storage field has its own unique operating issues and characteristics, there are common support activities performed on a regular basis that make up the bulk of historical expenses presented in this testimony.

In general, the activities performed in compliance with increasing regulatory requirements that drive the historical and future O&M costs for storage can be summarized as follows:

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[5] Some wells are plotted on the graphic as a single dot, due to their close proximity of each other.

Management, Supervision, Training, and Engineering

These activities cover the administrative salaries and engineering costs associated with the operation of the underground storage fields. This includes funding for studies in connection with reservoir operations and wells necessary to maintain the integrity of the storage system. Leadership, safety, technical training, operator qualification and quality assurance functions are other critical components of this grouping.

Wells and Pipelines

These costs include salaries and expenses associated with routinely operating storage reservoirs such as: turning wells on and off, well testing and pressure surveys, and wellhead[6] and down-hole activities for contractors that perform subsurface leakage surveys on injection/withdrawal facilities. Other expenses include the costs associated with patrolling field lines, lubricating valves, cleaning lines, disposing of pipeline drips, injecting corrosion inhibitors, pressure monitors, and maintaining alarms and gauges.

Equipment Operation and Maintenance

These costs include salaries and expenses for maintenance work performed on gas compressors and other mechanical equipment. The work ranges from the basic repair of an oil leak to a major time consuming overhaul of a compressor engine. Other maintenance functions include: work on measurement and regulating equipment, starting and monitoring engines, lubricating machinery, environmental compliance, checking pressures, work on equipment used for conditioning extracted gas, and wastewater disposal systems. Lastly, this area includes costs for chemicals, consumables, fuel, and electrical power used to operate storage reservoirs and compressors. [7]

Structural Improvements, Rents, Royalties

These costs include salaries and expenses for maintenance work performed on compressor station structures at underground storage facilities along with property rental costs. Royalty payments associated with gas wells and land acreage located at underground storage properties is also included.

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[6] An illustrative diagram of a wellhead is provided as Appendix C, Wellhead Diagram and Down-hole Schematic.

[7] The cost of natural gas used as fuel for the compressors and other equipment necessary to operate the storage fields has been adjusted out and excluded from this testimony because these costs are included in the Triennial Cost Allocation Proceeding (TCAP). In the same manner, all unaccounted for quantities of gas associated with field operation activities are similarly excluded from this general rate case due to cost recovery in the TCAP.

Records Management

These activities are associated with maintaining records related to storage assets and operations. Typical types of work performed include: work orders, surveys and documentation of wells, pipelines, topography, roads, rights-of-way, various infrastructure and easements boundary verification, and creation and maintenance of maps related to underground zones/rights. Audit related activities are also included.

2. Cost Forecast Methodology

A five-year trending methodology using 2009 to 2013 adjusted-recorded expenses for labor and non-labor was used to forecast the TY2016 O&M for routine Storage operations, since historical O&M costs have been increasing at a relatively consistent rate. Storage facilities consist of large heavy duty equipment located above and below ground that continues to wear and age, due to operating demands and the environment. The volume of maintenance work, along with its complexity and the limited availability of replacement components, continues to push costs consistently higher on an annual basis. Increasingly stringent governmental regulations, operator qualification requirements, enhanced employee training, chemical consumables, records management functions and enhanced audit activities also contribute to the upward trend.

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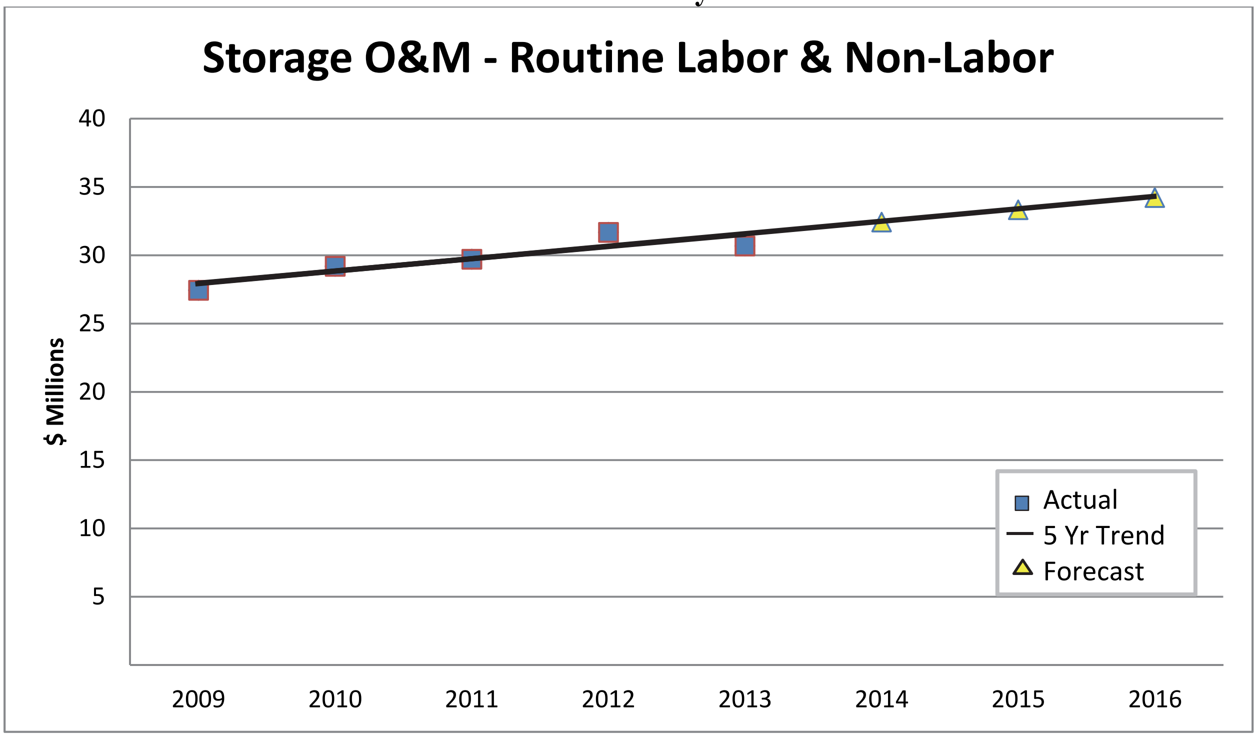
Figure PEB-4 below illustrates the historical and future projected costs (excluding NERBA and SIMP in 2016) for the routine labor and non-labor expenses based on a five-year trending methodology.

Figure PEB-4
Southern California Gas Company
Non-Shared O&M Summary of Routine Costs



The five-year trend establishes a TY2016 forecast of $34.101 million for routine O&M expenses.

3. Cost Drivers

Most increases in costs for storage over the five-year trend period are driven by the intensity of traditional operating functions and routine work efforts across the board that are required to safely operate and maintain the aging infrastructure of the fields, and costs associated with a larger volumetric storage capacity and throughput.[8]

Aging wells, compressors, and gas and liquid piping systems are susceptible to unpredictable failures or preemptive repair situations. The associated mitigation costs for such

[8] Over the five-year period of 2009 through 2013, SoCalGas increased the capacity of its storage fields by 5 Bcf, from approximately 131 Bcf to 136 Bcf. In CPUC Decision (D) 10-04-034, SoCalGas was authorized to increase the capacity of Honor Rancho from 23 to 28 Bcf. This expansion is expected to result in a total storage capacity of 138 Bcf by 2016, an inventory increase of 5.3% over 2009 volumes.

occurrences can vary from year to year. Thus, single events among relatively few facilities can have a significant impact on expense history. This "peak and valley" potential is another reason that a long-term horizon, such as the five-year historical trending methodology utilized, is appropriate for forecasting O&M costs.

In the future, pipeline integrity inspection requirements, the frequency and depth of regulatory audits and resulting compliance activities, additional focus on employee training and supervisory qualification, chemical consumables, increased permitting and reporting to regulatory agencies, along with new and existing environmental regulations are expected to add to operating expenses. Thus, O&M costs are expected to continue to increase, if not exceed, the annual historical rate of approximately 3.1%.

Another cost driver that varies from year to year is the amount of gas throughput (injection volume plus withdrawal volume) for the storage fields. This cycled volume is dependent on external factors such as the weather, the economy, and the gas markets. Over the five-year period of 2009 through 2013, the annual volume of gas cycled through the storage fields varied from a high of 228 Bcf to a low of 162 Bcf. The storage throughput in 2013 was 197 Bcf, 4% higher than the five year average of 189 Bcf. Higher gas throughput causes more wear on the compressors and equipment, and requires additional use of consumables such as engine oil, glycol, chemicals, odorant, etc.

There are few "big ticket items" one can point to as a primary cause for the increasing trend. Those few identifiable items that tend to stand out beyond the routine trend include the increasing costs of environmental compliance and hazardous waste disposal along with chemical consumables such as lubricating oil or glycol.

C. New Environmental Regulatory Balancing Account O&M Costs

The NERBA is a two-way balancing account established to record costs associated with specified new and proposed environmental regulations. Table PEB-6 below summarizes the costs for Storage, Transmission and Gas Engineering that are balanced in the NERBA.

Table PEB-6
Southern California Gas Company
NERBA Costs for Storage, Transmission and Gas Engineering

UNDERGROUND STORAGE	Thousands of 2013 Dollars		
Categories of Management	**2013 Adjusted Recorded**	**TY2016 Estimated**	**Change**
New Environmental Regulatory Balancing Account (NERBA)	$314	$404	$90

1. Description of Costs and Underlying Activities

The NERBA costs in my testimony are limited to the Environmental Protection Agency Subpart W reporting requirement costs for Gas Engineering, Gas Transmission, and Underground Storage. This forecast is to comply with the Subpart W requirements for fugitive emission monitoring, as supported by Environmental Services witness Jill Tracy (Exhibit SCG-17), that address facilities downstream of major equipment, such as compressors, regulator stations, and valves.

2. Cost Forecast Method

The forecast method for this cost category is the base year plus anticipated incremental costs. This method is appropriate because it identifies specific environmental regulatory changes and their related costs impacting the company in 2013, and during the next forecast period that cannot be represented using an average or trending forecast. Due to the uncertainty of the scope and anticipated costs related to future reporting, incremental funding was added to the base year recorded costs.

3. Cost Drivers

The cost drivers behind this forecast are the anticipated upper pressures from air quality agencies requiring more emission reporting during the next forecast period.

D. Storage Integrity Management Program

SoCalGas proposes to implement a new SIMP to proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees. Table PEB-7 below summarizes the projected O&M costs for implementation of the SIMP.

Table PEB-7
Southern California Gas Company
Storage Integrity Management Program O&M Costs

UNDERGROUND STORAGE	Thousands of 2013 Dollars		
Categories of Management	**2013 Adjusted Recorded**	**TY2016 Estimated**	**Change**
Storage Integrity Management Program (SIMP)	$0	$5,676	$5,676

1. Introduction

SoCalGas proposes to implement a new six-year SIMP to proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees. A proactive, methodical, and structured approach, using state-of-the-art inspection technologies and risk management disciplines to address well integrity issues before they result in unsafe conditions, or become major situational or media incidents, is a prudent operating practice. Without a robust program to inspect underground storage wells to identify potential safety and/or integrity issues, problems may remain undetected within the high pressure above-ground wellheads, pipe laterals (up to 3,600 psig) and below-ground facilities (up to 4,400 psig) among the 229 storage field wells. This situation is evidenced by an increase in recent years in the type of work related to safety conditions observed as part of routine operations. This concern is further amplified by the age, length, and location of wells. Some SoCalGas wells are more than 80 years old with an average age of 52 years. Well depths can exceed 13,000 feet. In addition, some wells are located within close proximity to residential dwellings or high consequence areas, as shown in Figure PEB-3.

The SIMP is intended to:

- Identify threats and perform risk assessment for all wells
- Develop an assessment plan for all wells
- Remediate conditions
- Develop preventative and mitigation measures
- Maintain associated records

The primary threats to the SoCalGas well facilities that SIMP will address are internal and external corrosion, and erosion.[9] Once an issue is identified, the initiation of critical repair work identified will immediately minimize safety risks. Lesser-risk integrity work will be prioritized to plan and efficiently execute mitigation or preventative actions.

SoCalGas proposes to establish detailed baseline assessments on its underground assets that are complete, verifiable, and traceable to a much greater degree than it has done in the past.[10] This risk management approach will enhance the proactive assessment, management, planning, repair, and replacement of below-ground facilities to eliminate situations that could potentially expose the public or employees to uncontrolled well-related situations.

The SIMP would launch an accelerated and robust assessment of the inspected storage well facilities (approximately 50% of the SoCalGas wells) over the rate case period. The initial SIMP work, which will likely target wells older than fifty years of age, would enhance ongoing safety, system integrity, support reliability of service, and provide additional confidence that wells, down-hole equipment, and associated pipe laterals maintain their compliance with DOGGR regulations. While SoCalGas currently meets existing requirements under DOGGR regulations, the possibility of a well related incident still exists, given the age of the wells and their heavy utilization. A SIMP will further decrease risks always present in these types of operations, provide a higher level of safety for its customers and employees, and further protect the environment.

Presently, most major O&M and capital funded activities conducted on storage wells are typically reactive-type work, in response to corrosion or other problems identified through routine pressure surveillance and temperature surveys. For example in 2008 at Aliso Canyon, it was discovered during routine weekly pressure surveillance that the surface annulus of well Porter 50A had a pressure of over 400 psig.[11] In most cases, situations like this can be indicative of production casing leaks from either internal or external corrosion where high pressure gas can

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9 The gas withdrawn from storage formations typically contains water, sand, and reactive gas constituents such as carbon dioxide that can corrode or erode storage well components especially during periods of high demand.

10 The goals and objectives of SIMP are similar to those of the TIMP for transmission pipelines. SIMP would be focused on vertical casing pipe and components (wells) and associated above-ground facilities.

11 The well was immediately taken out of service and work began to isolate and blow-down the surface casing. Eventually a workover rig moved onto the well and an ultrasonic inspection revealed external production casing corrosion from 450 ft. to 1050 ft.

migrate to the surface in a matter of hours. External corrosion has also been observed in other wells at the field.

Routine surveillance and temperature survey work identifies problems that have already occurred, and well integrity may have already been severely compromised requiring immediate attention to maintain safety, integrity and reliability. For example in 2013, again at Aliso Canyon, two wells were found to have leaks in the production casing at depths adjacent to the shallower oil production sands. In these situations, there was no evidence of the leaks at the surface or surface casing.

Reactive-type work in response to identified safety-related conditions observed as part of routine operations has increased in recent years. In fact, a negative well integrity trend seems to have developed since 2008. The increasing number of safety and integrity conditions summarized in Table PEB-8 below is attributed primarily to the frequency of use, exposure to the environment, and length of time the wells have been in service.

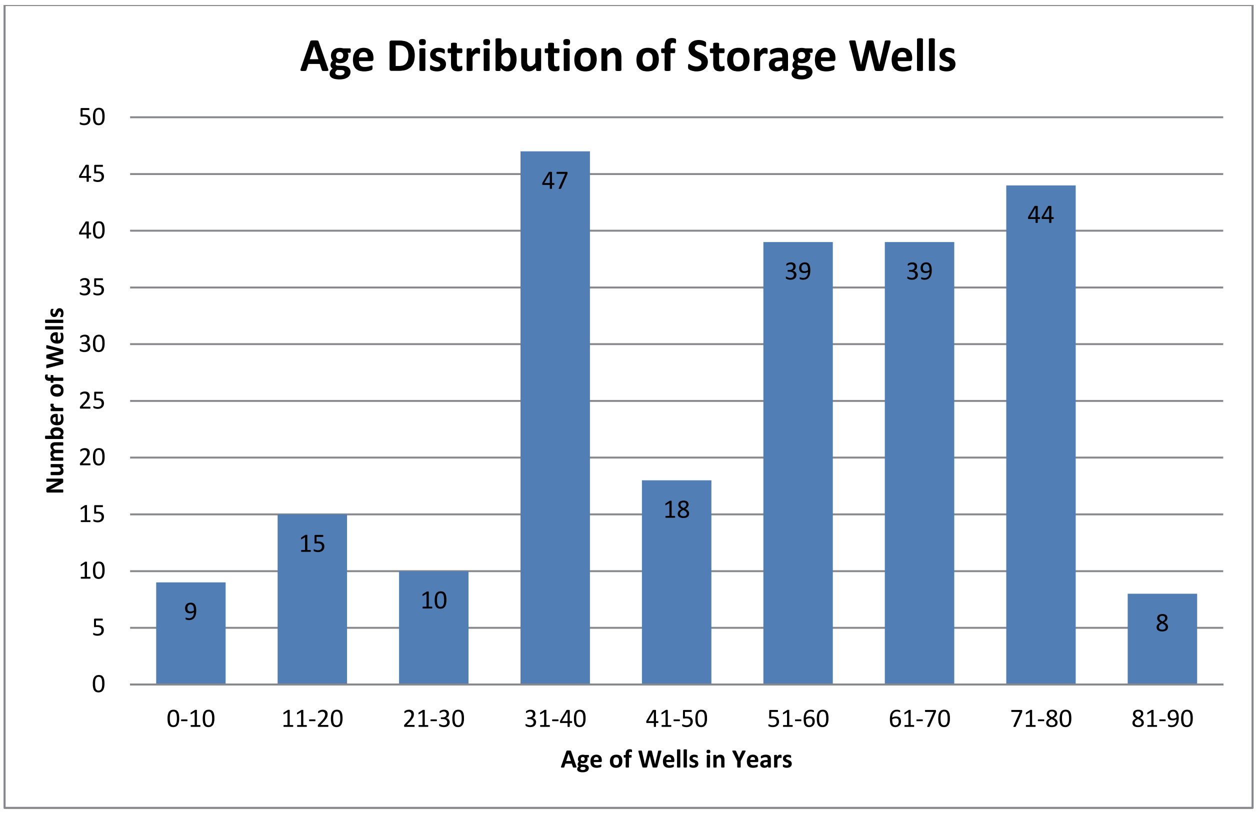
Table PEB-8
Southern California Gas Company
Number of Major Well Integrity Workovers by Year

Well Integrity Category	Year					
	2008	2009	2010	2011	2012	2013
Casing Leak	-	-	-	2	3	2
Tubing Leak	1	1	5	3	3	4
Wellhead Leak	-	-	1	2	-	2
Casing Shoe Leak	-	1	-	1	-	-
Sub-surface Safety Valve	2	-	-	-	2	1
Total	3	2	6	8	8	9

Ultrasonic surveys conducted in storage wells as part of well repair work from 2008 to 2013 identified internal/external casing corrosion, or mechanical damage in 15 wells. External casing corrosion has been observed at relatively shallow depths in the production casing, and at deeper intervals near the Aliso Canyon shallow oil production zone at which is being water-flooded. Internal mechanical wear has been observed in production casings, likely as a result of drilling operations that took place when the well was originally drilled. In addition, external tubing corrosion has been observed on tubing in the joint above the packer most likely as a result of stagnant fluid.

In addition to the 36 well-related conditions presented in Table 8, and the corrosion or mechanically damaged wells that were previously identified, SoCalGas has 52 storage wells in service that are more than 70 years old. Half of the 229 storage wells are more than 57 years old as of July 2014. Figure PEB-5 below displays the age distribution visually.

Figure PEB-5
Southern California Gas Company
Age Distribution of Storage Wells



Given the increasing trend in well integrity repairs, the corrosion threats that have been detected on some wells, the increasing age of the wells, and the success of the California Public Utilities Commission (CPUC)-approved TIMP, which has been established to maintain the safety of horizontal high pressure pipelines that are subject to less harsh conditions than storage wells, the SIMP is certainly justified. Without the SIMP, SoCalGas will continue to operate in a reactive mode (with the potential for even higher costs to ratepayers) to address sudden failures of old equipment. In addition, SoCalGas and customers could experience major failures and service interruptions from potential hazards that currently remain undetected.

Some of the inspection techniques, components, and practices planned for the SIMP are currently conducted on a limited basis as part of on-going operations performed to address maintenance issues. The intensity of routine inspections is expected to continue at historical levels. The more advanced SIMP inspections will be performed in addition to routine reactive inspections, as there is currently no indication that the rate of reactive maintenance work will decrease over the period of the next rate case. By establishing the additional and more robust SIMP inspections, and creating baseline assessments of well conditions, the severity and extent of reactive maintenance may be reduced in the future, and the time necessary to respond to indications of breaches in reservoir integrity and safety should be greatly improved.

To take advantage of economy of scale, accelerate problem solving and knowledge continuity, and best utilize the limited resources of qualified personnel and specialized equipment in the oil and gas industry required for this type of program, SoCalGas plans to conduct this program over a six-year period. Economic rig availability and quality supervision is highly dependent on overall demands of the industry. A continuous program implemented over a reasonable period of time will help secure efficient and effective specialty resources. After the six-year baseline assessment period of the SIMP, it is expected that well assessments performed on a regular frequency would become part of routine operations.

SoCalGas proposes that these O&M costs receive two-way balancing treatment due to the highly unpredictable nature of inspection costs. Factors contributing to the uncertainty include the unknown number of at-risk wells and their integrity status, the highly variable nature of well inspection strategies, the uncertainty surrounding the volume and degree of repair work to be performed, the variable cost of consulting experts when required, specialty equipment and skillful operators to be procured, and erratic field conditions typically encountered once inspection work is initiated. Since there are many uncertainties with regards to the number and integrity condition of the wells, and down hole inspection activities can become enormously costly and unpredictable when problems occur which is increasingly frequent, and follow-up mitigation actions whether they be O&M or capital is so variable due to the unique situation of each well, a two-way interest bearing balancing account treatment is requested for this work as sponsored by Regulatory Accounts witness Reginald Austria (Exhibit SCG-35).

2. General Description of Work

The safety and integrity-related work will be conducted in parallel at all four Storage Fields (Aliso Canyon, Honor Rancho, Playa del Rey, and La Goleta). A project manager, with other support personnel, will be used to conduct detailed internal well inspections and to develop the threat identification, risk assessment, well assessment plan, plan to remediate the conditions found, preventive and mitigative measures, and record keeping requirements for the SIMP. The assessment portion of the process will include contract workover rigs that will be used to evaluate downhole casing and tubing. Surface equipment such as valves, wellheads, and well laterals will be evaluated using different methods.

A threat assessment and risk assessment matrix will be developed and populated, and a priority inspection guide established, from existing well data that includes but is not limited to: age of the well, proximity to sensitive areas or populations, workover history, inspection data, historical withdrawal rates (energy release potential), known reservoir and geologic conditions, and surrounding geological characteristics (fault lines, landslide potential, etc.). In summary, it is expected that the oldest wells in closest proximity to the public, located in environmentally or safety-sensitive areas that have not had recent downhole inspections or work would likely be prioritized for inspection. Other wells may be added to this list, where deemed appropriate, based on subject matter expertise.

The first order of work would include the detailed inspection of all surface valves and above ground lines on the wellheads and laterals (both kill and injection/withdrawal lines), since surface failures, should they occur, could potentially have the most immediate impact on operating personnel and the public.

The majority of O&M costs to perform the noise and temperature surveys, pressure tests, visual camera tests, and casing/tubing inspections to assess well integrity risks associated with internal/external corrosion and erosion are associated with workover rig usage and well control activities. A typical week-long inspection process is summarized at a high level with the following ten steps:

1. Move in the workover rig and fill the well with brine.
2. Install well Blow-out Prevention Equipment.
3. Remove the tubing and down-hole completion equipment.
4. Scrape and prepare the casing, set the bridge plug and sand.

5. Run casing inspection equipment (Ultrasonic, magnetic flux, calipers, cameras etc.).
6. Run the test packer and pressure test production casing.
7. Remove the sand and retrievable bridge plug.
8. Re-install the production tubing and completion equipment, then pressure test.
9. Rig down the Blow-out Prevention Equipment, reinstall the production tree, and move the workover rig off the well.
10. Replace laterals, instrumentation, unload the workover brine from the wellbore and return the well to service.

This type of inspection operation typically requires six to eight days to complete, assuming no difficulties are encountered. If difficulties are encountered, which are not unusual with well work, the duration of the inspection and associated costs could easily double.

Follow-up preventative mitigation and remediation work will most likely be capitalized. The remediation plan will depend on the evaluation of the inspection data, and further pressure testing of the casing may be conducted. If no damage is observed or questionable conditions identified, the tubing will be re-run, the wellheads and laterals reinstalled, and the well will be returned to normal operations. If any significant deficiencies or unacceptable operating situations are found during the evaluation, the well will not be returned to service. Rather, it will be idled for an indefinite period of time while a detailed work prognosis is prepared and further work scheduled. Preventative and mitigative measures could include actions such as running inner liners, new tubing, cement squeezing of holes, or possible abandonment of the well. A complete abandonment would likely require the drilling of a replacement well in order to maintain storage field deliverability requirements. The details of the SIMP capital plan are included in section III-C.C13 of this testimony.

The record keeping requirements will include a written Storage Integrity Management Plan, traceable, verifiable and complete documentation of the results of the assessments that are completed, and the results of the remediation completed.

The company labor required for the inspection process is one individual at each of the four fields to oversee the workover/inspection contractors, plus 1.5 FTEs to manage the inspection program, interpret the complex data, and develop follow-up mitigation plans.

3. Cost Forecast Methodology

The forecast method used for SIMP O&M activities is zero-based. This approach is most appropriate because this is a new program and the assumed units of work, estimated cost per unit, and support labor needs are identifiable. Unit costs for the ten step inspection process previously described and the lateral inspections are based on historical prices of similar type work. Labor FTEs to support the program based on experience and practicality consist of one Contract Administrator for each of the fields (4), a Well Inspection Project Manager (1), and 0.5 clerical support. These costs are presented in Table PEB-9 below.

Table PEB-9
Southern California Gas Company
SIMP O&M Cost Detail

Description	Annual Number	Cost Per Inspection	Estimated Total
		(Thousands of $2003)	
Well Inspections and Mitigation	40	$390	$15,600
Lateral Piping Inspections	40	$5	$200
Company Labor FTEs	5.5	N/A	$812
Well Inspection Costs Reassigned to Capital	N/A	N/A	($10,936)
Total O&M	-	-	$5,676

4. Cost Drivers

The most significant cost drivers for this uniquely specialized work performed on high pressure wells is the availability of workover rigs, the skilled field and technical workforce required to produce and analyze data, and the specialized equipment to be employed.

III. CAPITAL COSTS

A. Introduction

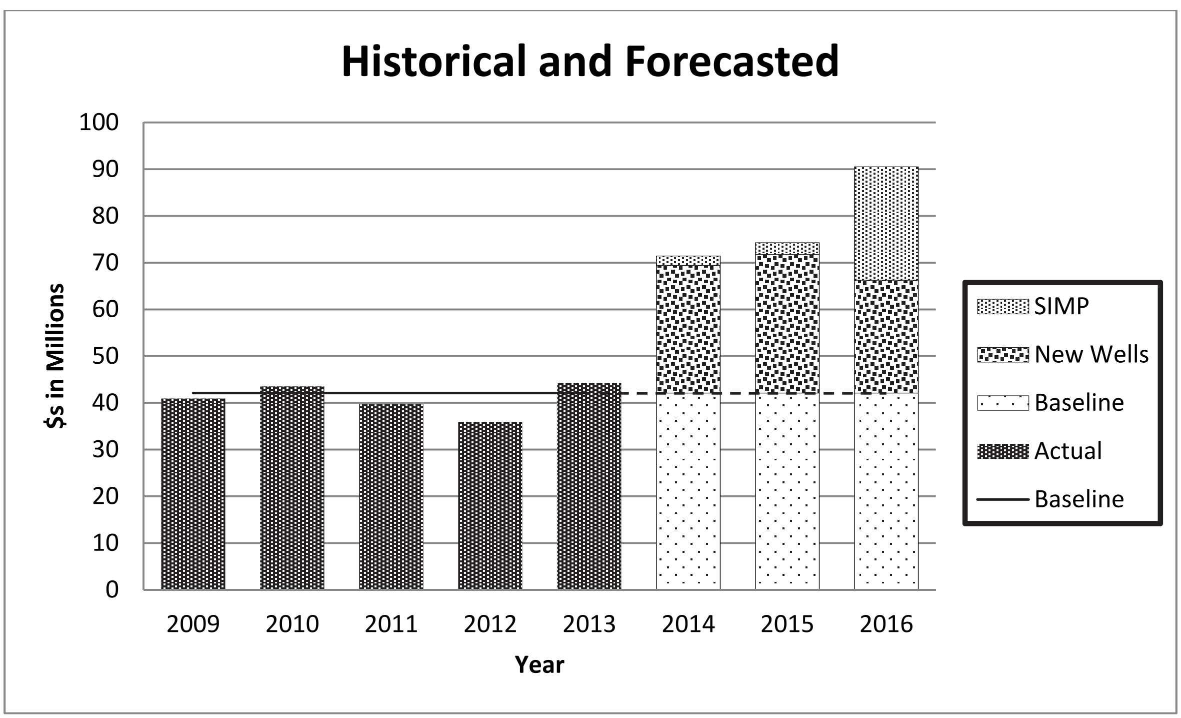
The costs described in this section cover the capital expenditures estimated for Storage operations. The intent behind the capital expenditure plan is to provide safe, reliable delivery of natural gas to customers at the lowest reasonable cost. These investments also enhance the integrity, efficiency, and responsiveness of operations while maintaining compliance with applicable regulatory and environmental regulations. Table PEB-10 below summarizes the total capital forecasts for Gas Storage for 2014, 2015, and 2016.

Table PEB-10
Southern California Gas Company
Capital Expenditures Summary of Costs
(Thousands of $2013)

Category Description	2013 Recorded	2014 Estimated	2015 Estimated	2016 Estimated
Storage Compressors	$8,991	$7,790	$7,790	$7,790
Storage Wells	$10,976	$31,890	$34,360	$36,977
Storage Integrity Management Program	$0	$2,008	$2,510	$24,272
Storage Pipelines	$4,005	$6,546	$10,083	$4,931
Storage Purification Systems	$9,284	$8,796	$7,605	$7,605
Storage Auxiliary Systems	$11,058	$14,398	$11,922	$8,948
Total Capital:	**$44,313**	**$71,429**	**$74,270**	**$90,523**

Figure PEB-6 below presents the Total Capital summary of Table PEB-10 in a graphical format.

Figure PEB-6
Southern California Gas Company
Historical and Forecasted Total Capital by Year



The 2016 capital request of $90.523 million was derived using the following methodology:

- Summation of five-year averages to create a baseline estimate for routine functions.
- Plus, incremental costs to drill new wells at a level that began in 2014 to address natural deliverability declines.
- Plus SIMP.

As noted previously, SoCalGas seeks two-way balancing treatment of the SIMP capital cost estimates. Additional detail on the categories and costs that comprise the total capital forecast is presented in the sections below.

B. Storage Compressors

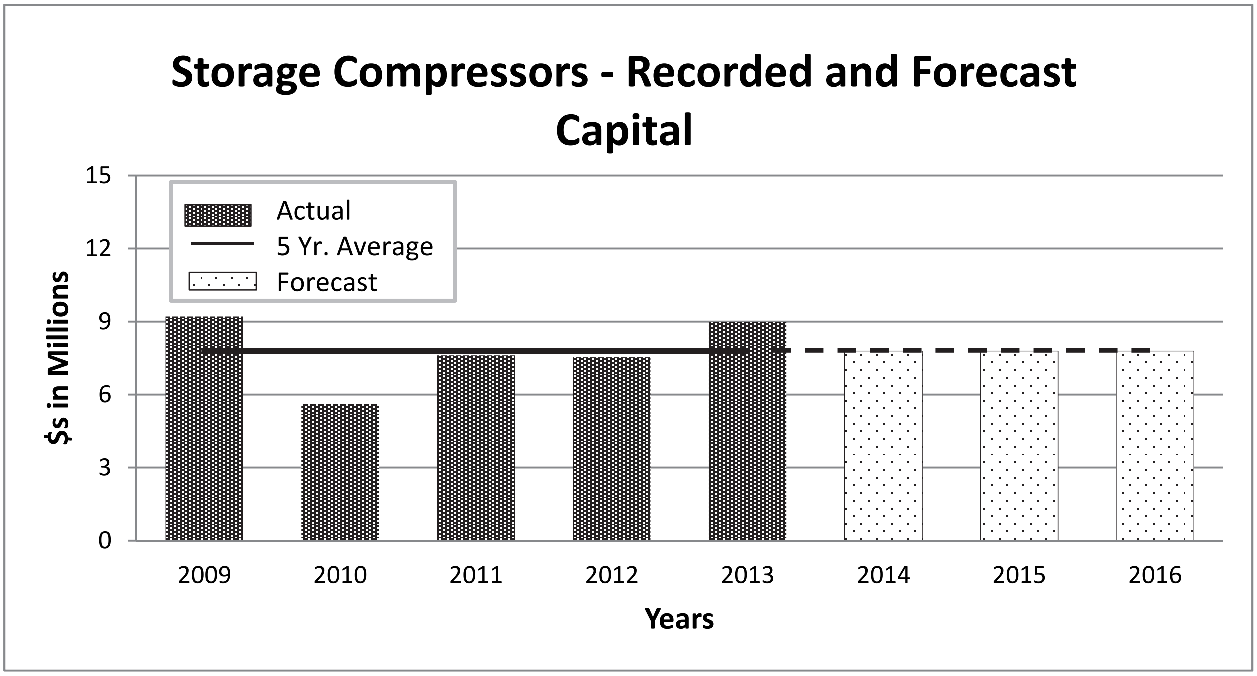
This Budget Category includes costs associated with natural gas compressors. These storage compressor units increase the pressure of natural gas so it can be injected into the underground reservoirs. Examples of equipment within this area include turbines, engines, high-pressure gas compressors, compressed air system equipment, fire suppression systems, gas scrubbers, and related control instruments. This budget category includes the necessary capital for maintenance, replacements, and upgrades of the various storage field compressors to uphold safety, maintain or improve reliability, extend equipment life, achieve environmental compliance, and to meet the required injection capacities. Table PEB-11 below summarizes the cost forecast for storage compressors.

Table PEB-11
Southern California Gas Company
Capital Expenditures for Storage Compressors

STORAGE COMPRESSORS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
B1- Goleta Units #2 and #3 Overhauls	$253	$2,272	$0
B2- Blanket Projects	$7,538	$5,518	$7.790
Total	**$7,791**	**$7,790**	**$7,790**

Due to the annual variability of this category, a five year average was used to develop the 2016 estimate, as presented in Figure PEB-7 below. Projects expected to cost over $1 million are supported by individual capital workpapers that accompany this testimony, Exhibit SCG-CWP.

Figure PEB-7
Southern California Gas Company
Historical and Forecasted Storage Compressor Capital



1. B1-Goleta Units #2 and #3 Overhauls

a. Description

When compressors reach the end of their service lives, they must be overhauled in order to avoid replacing them in-kind. Overhauls are necessary for safety, to restore and/or maintain their efficiency, deliver capacity, maintain compliance with environmental regulations and provide reliable service. While parts and compressor service contractors are still available, an overhaul is typically the most cost-effective solution. Goleta Units #2 and #3 have reached their maximum in-service time and require overhauls in order to maintain safety, efficiency, reliability, and environmental compliance. The overhaul of units #2 and #3 at Goleta is expected to cost $253K, $2.272 million, and $0 in 2014, 2015, and 2016, respectively. Specific details regarding the overhauls may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are based on the knowledge of experienced personnel who have handled similar overhauls in the recent past. Such experience is based on recent costs of component parts and quotes by qualified contractors.

c. Cost Drivers

The cost drivers for these capital projects relate to the very specific skill sets, tooling, parts, and specialized knowledge for gas engines, equipment, and the high pressure natural gas compressors they power.

2. B2-Blanket Projects

a. Description

Compressor Station equipment must have continuing capital maintenance as items continue to age and to wear out. SoCalGas plans to replace and upgrade aging and obsolete compressor equipment via smaller projects with individual costs estimates that do not justify the preparation of individual workpapers. These projects are addressed as "Blanket" projects and cost estimates vary from tens of thousands to several hundred thousands of dollars. Projected work includes, but is not limited to overhauls, rebuilds, major equipment replacements and upgrades to critical assets such as power turbines, gear boxes, compressors, and engines. Deferral of these smaller compressor maintenance projects could jeopardize safety or cause equipment to shut down, which can threaten supply continuity. Forecast capital costs for Blanket projects in $ millions for 2014, 2015, and 2016 are $7.538, $5.518, and $7.790, respectively.

b. Forecast Method

This estimate is based on the local knowledge and judgment of the managers at the storage fields, and the historical conditions at each field that routinely need correcting through blanket capital projects.

c. Cost Drivers

The underlying cost drivers for Blanket projects relate to equipment type and complexity, operating location, availability of qualified contractors, and workload. There are a limited number of qualified contractors available for compressor work in Southern California, and they perform work for customers other than SoCalGas. Thus, prices for these specialized services vary based on contractor workload and associated equipment lead times. Parts and equipment costs are driven by the limited number of competing suppliers and the very specialized nature of the hardware.

C. Storage Wells

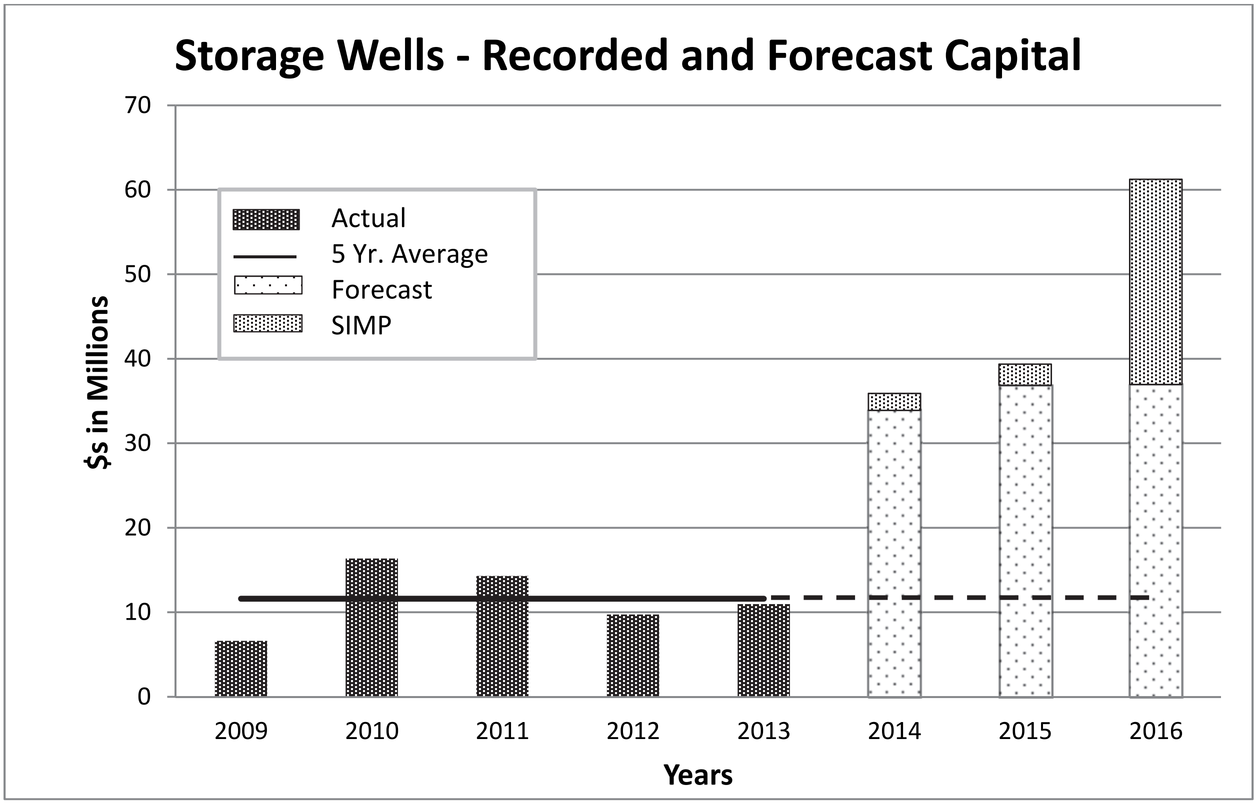
This Budget Category includes costs associated with replacing failed components on existing wells, and the design, drilling and completion of replacement wells for the injection and withdrawal of natural gas and reservoir observation purposes. This includes well workover contractors (major well work), drilling contractors, and component materials such as tubing, casing, valves, pumps, and other down-hole equipment. Table PEB-12 below summarizes the capital cost forecast for this Budget Category.

Table PEB-12
Southern California Gas Company
Capital Expenditures for Storage Wells

STORAGE WELLS	**Thousands of 2013 Dollars**		
	Estimated 2014	**Estimated 2015**	**Estimated 2016**
C1- Wellhead Valve Replacements	$1,194	$1,194	$1,194
C2- Well Tubing Replacements	$4,041	$4,041	$4,041
C3- Wellhead Leak Repairs	$1,807	$1,807	$1,807
C4- Well Inner-string Installations	$1,707	$1,707	$1,707
C5- Submersible Pump Installations	$552	$552	$552
C6- Well Stimulations	$176	$176	$176
C7- Well Gravel Packs	$3,715	$3,715	$3,715
C8- Well Re-drills	$2,209	$2,008	$0
C9- Replacement Wells	$10,241	$10,442	$18,273
C10- Plug and Abandon Wells	$3,876	$6,195	$4,688
C11- Blanket Projects	$974	$1,125	$824
C12- Cushion Gas Purchase	$1,398	$1,398	$0
C13- SIMP	$2,008	$2,510	$24,272
Total	**$33,898**	**$36,870**	**$61,249**

Figure PEB-8 below illustrates the combined Wells and SIMP capital forecasts from Table PEB-12 in a graphical format.

Figure PEB-8
Southern California Gas Company
Historical and Forecasted Wells Capital



The Storage Wells category in this testimony is further described using the following sub-sections:

- C1-Wellhead Valve Replacements
- C2-Well Tubing Replacements
- C3-Wellhead Leak Repairs
- C4-Well Inner-string Installations
- C5-Submersible Pump Replacements
- C6-Well stimulations
- C7-Well Gravel Packs
- C8-Well Re-drills
- C9-Well Replacements

- C10-Well Plug and Abandonments
- C11-Storage Blanket Projects
- C12-Cushion Gas Purchase
- C13-Storage Integrity Management Program (SIMP)

1. C1-Wellhead Valve Replacements

a. Description

SoCalGas plans to replace and upgrade gas-passing, aging, and obsolete wellhead valves located throughout the four storage fields. This work is necessary due to obsolete and gas-passing wellhead valves, some of which have been in service more than fifty years. Gas-passing wellhead valves can create a safety, operating or environmental hazard if not replaced in a timely manner. Costs in $ millions for 2014, 2015, and 2016 are forecast to be $1.194, $1.194, and $1.194, respectively. The specific details regarding wellhead valve replacements identified as part of routine operations are found in my capital workpapers, Exhibit PEB-06-CWP. An illustrative diagram of a wellhead is provided as Appendix C, Wellhead Diagram and Downhole Schematic.

b. Forecast Method

Historically, there have been twelve to fifteen wellhead valve replacement projects per year at an approximate cost of $85k each. Fourteen projects are planned in 2016. Costs include the material and services required to secure the well, replace the wellhead valves, and return the well to service.

c. Cost Drivers

The cost drivers for wellhead valves are the purchase price of the valves and the installation contracting services. Wellheads must be isolated from reservoir pressure and depressurized in order to replace the principal valve. This is a complex operation that requires controlling well pressures that can reach 3,600 psig.

2. C2-Well Tubing Replacements

a. Description

Continuous tubing replacements are required among the existing 229 aging wells throughout the storage fields. Tubing replacements are necessary to maintain aging well equipment when they have reached the end of their useful life. Leaking tubing strings can become a safety or environmental hazards if not replaced in a timely manner. Costs in $ millions for such work are estimated to be $4.041, $4.041, and $4.041, for 2014, 2015, and 2016 respectively. The estimated costs of the replacement projects include the tubing commodity purchase, all of the activities involved to secure the wells, the equipment and well services required for tubing removal, and the reinstallation operations. Specific details regarding tubing replacements identified as part of routine operations are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

There are seven workover rig tubing replacement projects estimated per year at an approximate cost of $575k each. Costs include the material and services required to secure the well, replace the tubing, valve work, and returning the well to service.

c. Cost Drivers

Cost of these replacements is driven by the very specific nature and characteristics of high pressure injection wells. This is a complex operation that requires controlling well pressures which can reach 3,600 psig.

3. C3-Wellhead Leak Repairs

a. Description

Wellhead leak repairs are required among the existing 229 wells throughout the storage fields. Wellhead leaks pose safety and environmental risks and must be removed from service while leak repairs are in progress. The costs for these wellhead leak repairs in $ millions are forecast to be $1.807, $1.807, and $1.807, for 2014, 2015, and 2016, respectively. Specific details regarding cost estimates for wellhead leak repairs identified as part of routine operations may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Four wellhead leak repairs requiring workover rig support are planned at an approximate cost of $450k each. Individual project costs typically vary due to the specific equipment required and configuration of the well being repaired.

c. Cost Drivers

The cost driver for this activity relates to the highly specialized nature of work performed on leaking high pressure wells and the skilled workforce and equipment employed. These repairs can be complex operations that require controlling underground well pressures, which can reach 3,600 psig.

4. C4-Well Inner-String Installations

a. Description

When the production casing in a well reaches the end of its useful life, an inner-string may be installed to extend the life of the well, depending on its mechanical condition. This methodology requires the installation of smaller-sized casing due to a loss of production casing integrity observed within the storage wells. Inner-string installations are used as a temporary or interim mitigation strategy in response to aging or damaged storage wells. The well must be removed from service and secured pending the installation process. The well will be unavailable for withdrawal or injection until the work is completed. The costs for inner-string installations in $ millions are projected to be $1.707, $1.707, and $1.707, for 2014, 2015, and 2016, respectively. Specific details regarding inner-string installations identified as part of routine operations are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

SoCalGas plans to complete two inner-string installations per year, at an approximate cost of $850k each.

c. Cost Drivers

The underlying cost drivers for this activity relate to the highly specialized nature of work performed on high pressure wells and the skilled workforce and equipment employed. These can be complex operations.

5. C5-Submersible Pump Replacements

a. Description

SoCalGas plans to replace existing electric submersible pumps in various storage wells. These pumped wells, required to control liquids and storage reservoir management, typically require replacement on a one to four year cycle. If pumps are not installed in a timely manner, there is the likely risk of reduced reservoir storage capacity. The forecast for 2014, 2015, and 2016 are $552K, $552K, and $552K, respectively. Specific details regarding these capital projects are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

SoCalGas typically replaces two electric submersible pumps per year, at an approximate cost of $275k each.

c. Cost Drivers

The cost drivers for these projects relate to equipment type and complexity, location, and availability of qualified contractors. Individual project costs can also vary due to the depth of the electric submersible pump being replaced. There are a limited number of qualified contractors who specialize in downhole pumps and controls. Thus, the prices for this very specialized work varies according to contractor workload and associated lead times. Parts and equipment costs are driven by the limited number of competing suppliers and the very specialized nature of these pumps.

6. C6-Well Stimulations/Re-Perforations

a. Description

SoCalGas plans to perform required "stimulation" or "re-perforation" of existing storage wells to improve poor deliverability rates. Storage wells that experience minor productivity damage can be restored via this method. These capital expenditures therefore support the company's goals of maintaining the integrity, efficiency, reliability and continuity of supply. The forecast for well stimulations and re-perforations work in 2014, 2015, and 2016 is $176K, $176K, and $176K, respectively. Specific details regarding these capital projects are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

The forecast is based on local knowledge of expected upgrades and capital project estimates prepared on experience.

c. Cost Drivers

The underlying cost drivers for these projects relate to the complexity of the operations and availability of qualified contractors. Parts and equipment costs are driven by the limited number of competing suppliers and the very specialized nature of the hardware they produce.

7. C7-Well Gravel Packs

a. Description

Gas flows will be restricted if a well has a failed gravel pack. Typically, a well will remain out of service until the well is repaired and re-gravel packed. SoCalGas plans to replace failed gravel packs from existing wells at historical rates. The costs in $ millions for well gravel pack replacements are forecasted to be $3.715, $3.715, and $3.715, for 2014, 2015, and 2016, respectively. Costs include the materials and services required to remove existing equipment, sidetrack the well, install a new gravel pack, complete the well, and return the well to service. Specific details regarding gravel pack replacements are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Typically there are two gravel pack replacements performed per year at an approximate cost of $1.85 million each. Individual project costs may vary from well to well and field to field, depending on the actual depth and mechanical condition of the subject well.

c. Cost Drivers

The underlying cost drivers for this activity relate to the highly specialized nature of work performed on high pressure wells and the skilled workforce and equipment employed.

8. C8-Well Re-Drills

a. Description

It is not uncommon for a well to experience declining or poor deliverability with age. If a storage well has poor deliverability and the well is not re-drilled, the well will likely become a high operating cost, low productivity asset, with negative impacts to service reliability. SoCalGas expects to relocate bottom-hole locations for some wells due to poor or low deliverability. The costs in $ millions for well re-drills are projected to be $2.209, $2.008, and $0, for 2014, 2015, and 2016, respectively. Specific details regarding re-drill projects are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Re-drill costs are based upon historical projects of similar complexity. However, no storage well re-drills are planned for 2016.

c. Cost Drivers

The cost drivers for this activity relate to the highly specialized nature of work performed on high pressure wells and the skilled workforce and equipment employed.

9. C9-Well Replacements

a. Description

SoCalGas plans to replace mechanically constrained wells with curtailed deliverability, along with high operating cost aging injection/withdrawal wells and their associated production, with new wells that provide higher deliverability rates. These new wells are necessary replacements due to lost deliverability from failed gravel packs or poor deliverability rates from other causes. It also includes the replacement of lost withdrawal capacity from the required abandonments of aging storage wells. The costs for replacement storage wells in $ millions are forecast to be $10.241, $10.442, and $18.273 for 2014, 2015, and 2016, respectively.

At the end of the 2013/2014 winter withdrawal season, during a period of high demand and low field inventory not seen in recent years, Aliso Canyon was not able to meet the deliverability levels expected from existing wells. Declining performance of older wellbores, along with the necessary plugging of problem wells, resulted in the field falling short of delivery expectations by more than 350 MMCFD. Having operated at higher inventories in recent years, this 20% downgrading of well performance was not readily apparent until early 2014.

With modern well design and completion techniques, opportunities exist to reduce the number of storage wells by drilling new replacement wells in a manner that may allow for better than a one-for-one replacement. Depending on the storage field and its geology, a newly drilled and completed replacement well is likely to provide the replacement deliverability of two or more existing older wells. This scenario would be repeated as each new replacement storage well is drilled, thus potentially reducing the overall storage well count and operating expenses.

These projects will locate and prepare drill sites, drill and complete new replacement storage injection/withdrawal wells to be strategically located throughout the Storage Fields. Included are all services and materials to complete each well. The anticipated numbers and locations of the replacement wells are as follows:

- 2014 - Two Aliso Canyon Storage Wells. This work is required to replace naturally declining deliverability from existing wells, and wells that were abandoned due to integrity concerns;

- 2015 - Two Goleta Storage Wells. This work is necessary to improve lost deliverability as well as decrease the footprint of the facility by bringing remotely located wells in a high consequence area closer to the main station and removing injection/withdrawal lines from environmentally-sensitive areas; and

- 2016 - Three Aliso Canyon Storage Wells. This work is needed to continue the replacement of lost deliverability due to the natural productivity declines from aging wells described above.

Specific details regarding storage well replacements are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Planned replacement wells located among the storage fields will vary in cost, but average approximately $5-6 million each. Costs are based on historical well drilling costs combined with recent vendor cost estimates.

c. Cost Drivers

The underlying cost drivers for these capital projects relate to the highly specialized nature of work performed on high pressure wells and the necessarily skilled workforce and equipment employed. These older storage wells typically require high cost casing repairs ($700K or more) per occurrence and/or repeated re-gravel packing of the wells due to highly erosive sand production. Costs of replacing the gravel packs of these aging wells are typically in the range of $2 million each. Phasing in these new higher-deliverability replacement wells and eliminating the high cost aging wells over time, may reduce the Company's long term operating costs by reducing the need for frequent, high cost, casing repairs and gravel pack capital projects.

10. C10-Well Plug and Abandonments

a. Description

SoCalGas plans to abandon aging, mechanically unsound wells that are beyond their useful lives. Required abandonments are becoming more frequent as various storage wells reach or exceed their useful lives. These subject wells become high risk, high operating cost assets due to poor or declining mechanical integrity, or complete lack of productivity due to age. A number of the abandonments are required for the removal of wells and their operations from environmentally sensitive areas or higher public risk areas and relocating the new replacement storage wells within storage field boundaries.

Currently there are 26 existing mechanically-unsound, unproductive, or aging storage wells located in environmentally-sensitive areas. SoCalGas will focus on the abandonment of aging storage wells located in environmentally-sensitive or high consequence areas. Projected costs include the material and services required to plug and abandon the wells in a manner that meets or exceeds California DOGGR requirements. The cost in $ millions for well plug and abandonments are forecasted to be $3.876, $6.195, and $4.688, for 2014, 2015, and 2016, respectively. Specific details regarding well abandonment projects are found in the capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Eight wells per year are planned for abandonment among the existing storage fields, at an approximate cost of $600K each. The individual well abandonment costs will vary depending on the condition of the well at the time of the abandonment, surface location of the well, in addition to the depth of the well to be abandoned.

c. Cost Drivers

The underlying cost drivers for these capital projects relate to the highly specialized nature of work performed on high pressure gas wells and the necessarily skilled workforce and equipment employed.

11. C11-Storage Blanket Projects

a. Description

SoCalGas plans to build and place in service multiple smaller projects with individual costs that do not warrant the preparation of individual workpapers. These forecasted capital expenditures support the goals of maintaining the safety of the public and employees, as well as operating efficiency, reliability and continuity of supply. The costs of individual projects in this category will vary from as low as ten thousand to as high as several hundreds of thousands of dollars. They include shallow zone work in the Aliso Canyon field, projects related to geology and storage engineering, and smaller technology upgrades. The forecast in $ million for 2014, 2015, and 2016 is $0.974, $1.125, and $0.824, respectively. Specific details regarding these projects are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

The forecasts of these smaller projects are based on local knowledge of required upgrades and capital maintenance projects prepared by experienced professionals who have worked in the Storage fields for years. This method is appropriate because these professionals are responsible for preparing a list of upgrades and projects, which is updated and prioritized regularly, based on equipment age, wear and tear, failure history, and technical obsolescence.

c. Cost Drivers

The underlying cost drivers for these kinds of projects relate to equipment type and complexity, operating location, availability of qualified contractors, and workload. There are a limited number of qualified contractors available for Storage field work. Thus, the prices for this very specialized work varies according to the contractor’s workload and associated lead times.

Parts and equipment costs are driven by the limited number of competing suppliers and the very specialized nature of the hardware.

12. C12-Cushion Gas Purchases (Honor Rancho Expansion)

a. Description

SoCalGas plans to purchase cushion gas to support the final phase of the Honor Rancho expansion project. Cushion gas is the volume of gas intended to serve as the permanent inventory within a storage reservoir that is required to maintain adequate pressure for deliverability rates throughout the withdrawal season. The need for storage capacity expansion and its relationship to Gas System supply reliability was established by the CPUC in decision (D) 10-04-034. That discussion is incorporated herein by reference. The cost for cushion gas purchases in $ million is forecast to be $1.398, $1.398, and $0, for 2014, 2015, and 2016, respectively. Specific details regarding this estimate of cushion gas costs may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are estimated for the purchase of 300 MMCF, at a price of $4.55 per decatherm.

c. Cost Drivers

The unit cost of the gas is driven by conditions in the natural gas market.

13. C13-Storage Integrity Management Program

a. Description

Reactive-type well repair work performed by Storage related to safety situations observed as part of routine operations has increased in recent years. In fact, a negative well integrity trend seems to have developed since 2008. The increasing number of well integrity conditions summarized in Table PEB-8 above are attributed primarily to the frequency of use, operating environment, age, and length of time the wells have been in service. In contrast to the reactive capital work discussed above, the SIMP is intended to proactively identify, diagnose, and mitigate potential safety and/or integrity problems associated with gas storage wells. It is important to distinguish that SIMP is incremental work above and beyond the levels traditionally performed. As such, it consists of accelerated mitigation work performed over a condensed period of time in response to the thorough well integrity inspections described above in section II D-2 of my testimony. Early identification and mitigation of well integrity issues will improve safety and increase reliable gas deliveries. The capital costs in $ million for the SIMP are forecasted to be $2.008, $2.510, and $24.272 for 2014, 2015, and 2016, respectively.

Safety and/or integrity conditions that are presently unknown may exist within the high pressure (up to 3,600 psig) above ground pipe laterals and below ground facilities that comprise of 229 aging gas storage field wells that can exceed 13,000 feet in depth. Some SoCalGas wells are more than 80 years old while the average age of all Storage wells is 52 years. A proactive, methodical, and structured approach, using advanced inspection technologies, such as ultra-sonic and neutron type casing logs, along with risk management disciplines to address well integrity issues before they result in unsafe conditions for employees or the public, or become major incidents, is a prudent operating practice. In addition, some SoCalGas wells are located within close proximity to residential dwellings, as depicted in Figure PEB-2.

The primary threats to the SoCalGas well facilities that SIMP will address are internal and external corrosion, and erosion.[12] Immediate repairs may be necessary to minimize safety risks. Lesser risk integrity work will be prioritized to plan and efficiently execute mitigation actions.

SoCalGas proposes that these capital costs receive two-way balancing account treatment due to the highly unpredictable nature of estimating well mitigation costs. Factors contributing to the uncertainty include the unknown number of at-risk wells and their integrity status, the highly variable nature of well mitigation strategies, the uncertainty surrounding the volume and degree of repair work to be performed, the variable cost of consulting experts, when required, specialty equipment and skillful operators to be procured, and erratic field conditions typically encountered once repair work is initiated. All well work to be performed will be dependent on the site-specific conditions found at the time work is initiated. While average costs were utilized to prepare initial forecasts for SIMP, actual conditions and the scale of work to be performed can only be determined after the well is actually entered with inspection devices and/or repair tools. Given the fact that many of the wells have not been worked on in recent years, and the mature age of some wells, major problems and fixes of unknown costs are anticipated.

Past work on well Frew 3 at Aliso Canyon in 2013 is a good example of the wide variability in mitigation costs. Frew 3 was originally targeted for a tubing leak repair scheme,

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[12] The gas withdrawn from storage formations typically contains water, sand, and reactive gas constituents such as carbon dioxide that can corrode or erode storage well components especially during periods of high demand.

estimated to cost approximately $600,000. Once the well was entered and repairs began, the wellbore was found to be compromised due to shifting geological formations requiring extensive work. The net result was a decision to abandon the well at a cost of $1.39 million, more than double the original repair estimate.

In addition, costs for the well rigs required for SIMP are dependent on activity throughout the oil and gas industry. The ability to secure equipment and associated prices are dependent on energy demand and rig availability worldwide. Financial outlays to secure rigs and oil/gas field services can vary greatly over time due to domestic and foreign developments related to energy.

b. Forecast Method

The forecast method used for the SIMP capital work is zero-based. This approach is most appropriate because it is an incremental program. The costs per units of work are based on historical averages, and internal labor support was established based on practical considerations and experience. Actual well repair methods will be based upon assessment findings, however, and optimized among the options described in the Capital Costs Section III C-Wells of my testimony. Unit costs based on historical prices of similar type work for the mitigation work would most likely consist of:

- Wellhead Valve Replacements ($85k)
- Well Tubing Replacements ($575k)
- Wellhead Leak Repairs ($450k)
- Well Inner-string Replacements ($850k)

Mitigation work could also consist of well abandonments, well redrills or well replacements typically cost approximately $0.6 million, $2.0 million, and $6 million, respectively.

The decision whether to re-drill an existing well or drill a replacement well as a risk mitigation strategy depends upon localized conditions encountered during the downhole inspections. If data indicate poor conditions of casing in the upper part of the wellbore, a re-drill solution is generally not an option. Other site-specific conditions that could justify a replacement well over a re-drill are wells with a small casing, existing condition of the well/casing cement bond, proximity of integrity issues relative to the surface, and the geographic location of the well within the reservoir. Re-drill versus replacement decisions will be made by experienced storage reservoir engineering personnel using knowledge, professional judgment and site specific information.

Labor totaling 6.5 FTEs to support the capital program consists of two Contract Administrators for Aliso Canyon, and one each for the remaining three fields, one Well Mitigation Project Manager, and 0.5 FTE clerical support. Company labor estimates are presented in Table PEB-13 below.

Table PEB-13
Southern California Gas Company
SIMP Capital Cost Detail

Description	Annual Number	Unit Cost	Estimated Total
		(Thousands of $2013)	
Wells Requiring Capital Mitigation Work	28	$429	$12,014
Lateral Piping Replacements	5	$75	$375
Company Labor FTEs	6.5	N/A	$945
Well Inspection Costs Reassigned to Capital	28	N/A	$10,936
Total Capital	-	-	$24,272

c. Cost Drivers

The most significant cost driver for this uniquely specialized work performed on high pressure wells is the availability of workover rigs, material costs, the skilled field and technical workforce required to produce and analyze data, and the equipment to be employed. Other cost drivers include the unique solutions required to address the conditions discovered during exploratory examinations of the wells, equipment, well design, and permitting requirements.

D. Storage Pipelines

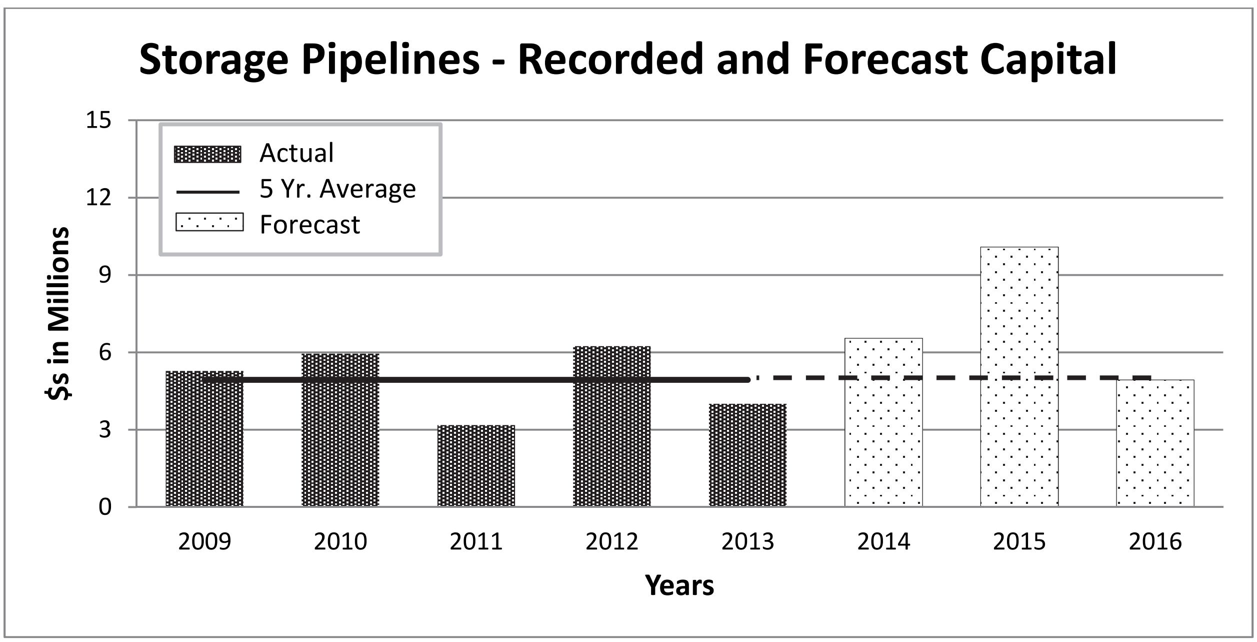
This Budget Category includes costs associated with upgrading or replacing failed field piping and related components. The cost forecast for this work is summarized in Table PEB-14 below.

Table PEB-14
Southern California Gas Company
Capital Expenditures for Storage Pipelines

STORAGE PIPELINES	Thousands of 2013 Dollars		
	Estimated 2014	**Estimated 2015**	**Estimated 2016**
D1- Valve Replacements	$889	$889	$688
D2- Aliso Pipe Bridge Replacement	$505	$3,526	$0
D3- Aliso Injection System Debottlenecking	$0	$505	$505
D4- Aliso Canyon Piping Improvements	$1,313	$152	$505
D5- Playa del Rey Withdrawal Debottlenecking	$505	$2,526	$0
D6- Pipeline Blanket Projects	$3,334	$2,485	$3,233
Total	**$6,546**	**$10,083**	**$4,931**

Figure PEB-9 below depicts the Storage Pipeline costs from Table PEB-14.

Figure PEB-9
Southern California Gas Company
Historical and Forecasted Storage Pipelines Capital



The Storage Pipelines category in this testimony is further described using the following sub-sections:

- D1-Valve Replacements
- D2-Aliso Pipe Bridge Replacement
- D3-Aliso Injection System Debottlenecking

- D4-Aliso Canyon Withdrawal System Debottlenecking
- D5-Playa del Rey Withdrawal Debottlenecking
- D6-Blanket Projects

1. D1-Valve Replacements

a. Description

Valves within the storage fields can leak or allow gas to pass as they wear and age. SoCalGas plans to replace various valves of differing sizes and pressure ratings throughout the year, depending on line shut-in capability and valve conditions. The costs for valve replacements are estimated to be $889k, $889k, and $688k for 2014, 2015, and 2016, respectively. Specific details regarding this valve work may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Historical average costs are approximately $20K per valve. The estimated number of replacements, approximately 5% of the larger field valves every year, is based on recent operational experience.

c. Cost Drivers

The underlying cost drivers for this capital category relate to the purchase price of the valves and their installation costs. This includes specialized work performed on high pressure gas lines and the skilled workforce and equipment employed for replacements.

2. D2-Aliso Pipe Bridge Replacement

a. Description

SoCalGas plans to relocate an existing pipe rack in Aliso Canyon out of a ravine area with an active landslide and soil erosion condition that is threatening several existing pipe supports. Failure of pipe and supports in this ravine could result in the potential loss of gas injection/withdrawal capabilities of 21 wells in Aliso Canyon's east field. The combined withdrawal capacity of these wells is approximately 600 MMCFD. A Rupture of these pipes could result in the release of crude oil and brine water into the stream at the bottom of the ravine. The costs in $ million for the Aliso Pipe Bridge Replacement are projected to be $0.505, $3.526, and $0 for 2014, 2015, and 2016, respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

The project costs were derived by estimates from structural steel fabricators and installation contractors.

c. Cost Drivers

The underlying cost driver for this capital project relates to the soil types, customized design, permits, steel fabrication, and the highly specialized nature of work performed on high pressure gas piping, and the skilled workforce and equipment employed.

3. D3-Aliso Injection System Debottlenecking

a. Description

Through the evolution of the Aliso Canyon storage field, piping restrictions have developed. SoCalGas plans to improve the injection capacities at Aliso Canyon through the installation of larger diameter pipe and associated pipe supports. With new projects such as Aliso Canyon Turbine Replacement, and planned well replacements, the system piping will be studied to eliminate sections that restrict the flow of gas to the storage wells. Pipe will be sized to meet the specific injection criteria. This project will allow for a more efficient gas injection process. If bottlenecks are not removed, adequate pipe capacity at the intended rate of injection at maximum capacity will not be achieved. The costs for the injection system debottlenecking are forecast to be $0, $505k, and $505k for 2014, 2015, and 2016, respectively. Specific details regarding this project are found in my capital workpapers. See 06-CWP.

b. Forecast Method

Estimated costs are based on recent projects of similar pipe size, scope and complexity.

c. Cost Drivers

The underlying cost drivers for this capital project relate to material costs and the highly specialized nature of work performed on high pressure gas injection piping and the skilled workforce and equipment employed.

4. D4-Aliso Canyon Piping Improvements

a. Description

SoCalGas plans to perform necessary work to minimize piping restrictions in the Aliso Canyon withdrawal system. In addition, work is also planned for a remote well-kill safety system, installation of field utility gas system (Master Lease Gas), and replacement of high pressure liquid handling pipelines. The improvement of these systems will allow for remote killing of the wells, a cleaner source of motive gas in the field for equipment, and the continued reliability of liquid-carrying piping. The liquid handling pipelines are critical to liquid removal operations from the high pressure gas system that transports, cleans, dehydrates, and meters gas from the facility. If the liquid handling pipelines were to fail, gas deliveries may be significantly impacted or sent through metering without complying with standards for water content in pipeline-quality natural gas. Safety equipment in the field also requires clean motive gas for proper operations. Each of these projects will require new piping, pipe supports and possibly pipe trenches. The costs for these piping improvements are forecast to be $1,313k, $152k, and $505k for 2014, 2015, and 2016, respectively. Specific details regarding these projects may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Estimated costs are based on recent projects of similar equipment size, scope and complexity.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed on high pressure pipelines and the skilled workforce and equipment employed.

5. D5-Playa del Rey Withdrawal Debottlenecking

a. Description

SoCalGas plans to perform necessary work to alleviate system bottlenecking in the Playa del Rey withdrawal system. Upgrade of the lower field equipment and piping would help maintain deliverability capacity while achieving the desired standards for water content in pipeline-quality natural gas. The work will include replacement of withdrawal equipment and installation of newly resized piping. The costs in $ million are estimated to be $0.505, $2.526, and $0, for 2014, 2015, and 2016, respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

This cost estimate is based on previously-completed work, vendor quotes for similar equipment, and current contractor rates.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed and the skilled workforce and equipment employed.

6. D6-Pipeline Blanket Projects

a. Description

SoCalGas plans to perform necessary work to alleviate various pipeline issues. This can include various projects including pipe replacements, expansions, upsizing, supports, corrosion protection, and other elements related to piping systems. The upgrade of station piping will help maintain injection and deliverability capacity. The costs in $ million are estimated to be $3.334, $2.485, and $3.233, for 2014, 2015, and 2016, respectively. Specific details regarding these projects may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

This cost estimate is based on the assumption that future costs and projects will be similar in scope and pricing to historical levels.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed and the skilled workforce and equipment employed.

E. Storage Purification Systems

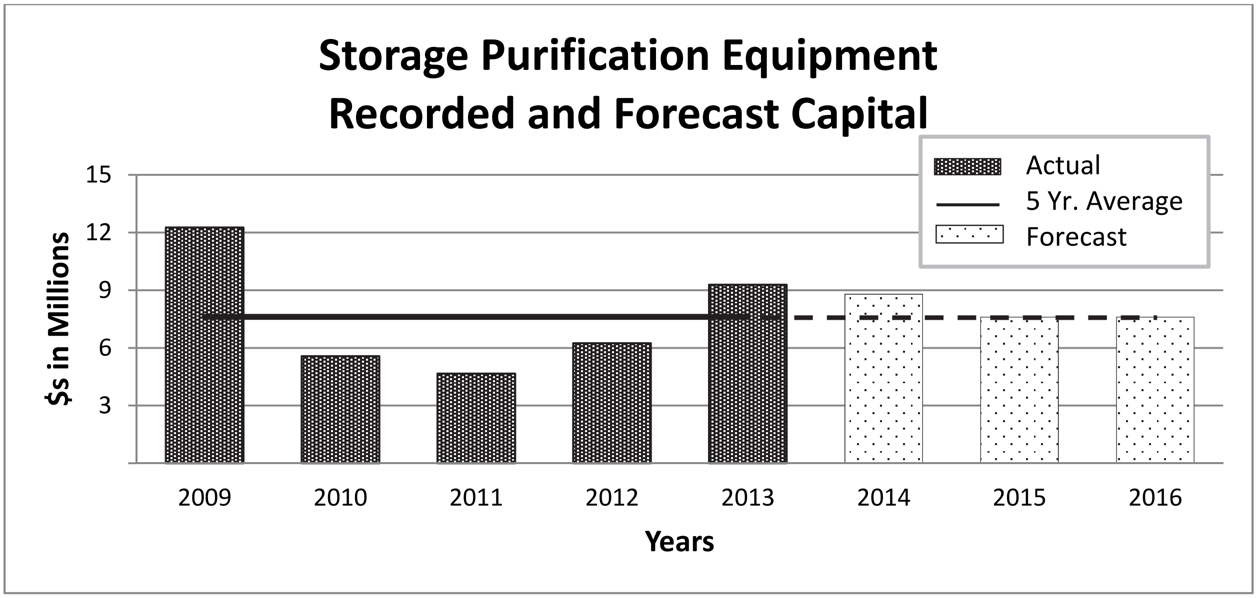
This budget category forecasts costs associated with equipment used primarily for the removal of impurities from, or the conditioning of, natural gas withdrawn from storage. Examples of equipment included in this area are dehydrators, coolers, scrubbers, boilers, pumps, valves, piping, power supply, controls, and instrumentation. Table PEB-15 below summarizes the forecast of capital expenditures for Storage Purification Systems.

Table PEB-15
Southern California Gas Company
Capital Expenditures Purification Systems

STORAGE PURIFICATION SYSTEMS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
E1- Aliso Canyon Dehydration Upgrades	$1,018	$1,018	$1,018
E2- Honor Rancho Dehydration Upgrades	$3,094	$992	$0
E3- Goleta Dehydration Upgrades	$3,055	$1,018	$0
E4- Purification Blanket Projects	$1,629	$4,577	$6,587
Total	**$8,796**	**$7,605**	**$7,605**

Figure PEB-10 below illustrates the Purification Systems forecast from Table PEB-15.

Figure PEB-10
Southern California Gas Company
Historical and Forecasted Purification Systems Capital



The Storage Purification Systems category in this testimony is further described using the following sub-sections:

- E1-Aliso Canyon Dehydration Upgrades
- E2-Honor Rancho Dehydration Upgrades
- E3-Goleta Dehydration Upgrades
- E4-Purification Blanket Projects

1. E1-Aliso Canyon Dehydration Upgrades

a. Description

This project will include the installation of new gas and glycol filters for improved gas conditioning. Instrumentation upgrades will also improve the ability to remotely monitor the plant during operation. In addition, the site Motor Control Center will be replaced to better support existing and new equipment. The Dehydration 2 plant at Aliso Canyon has withdrawal capacity of approximately 750 MMCFD. SoCalGas has plans to upgrade the Dehydration 2 plant to increase its withdrawal capacity. Without this project, the station may not be able to adequately comply with standards for water content in pipeline-quality natural gas and achieve future planned increases in withdrawal capacity. The estimated forecasts in $ million for this project are $1.018, $1.018, and $1.018, for 2014, 2015, and 2016 respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are based on quotes provided by vessel fabricators, equipment manufacturers, contractor estimates, and similar work completed on previous projects.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed, the necessarily skilled workforce, equipment employed, and the cost of materials.

2. E2-Honor Rancho Dehydration Upgrades

a. Description

SoCalGas plans to separate dehydration trains and install filters to allow for more flexibility of operations, less downtime during routine maintenance, improved gas conditioning, and a reduction in glycol degradation. The Programmable Logic Controller system will be upgraded to meet the new operating requirements and instrumentation needs. Without this project, the station may require extended and more frequent shutdowns as part of routine maintenance activities. In addition, this project will also allow the station to better achieve water content standards in pipeline-quality natural gas. The costs for improvements in $ million are $3.094, $0.992, and $0, for 2014, 2015, and 2016, respectively. Specific details regarding this capital project are found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are based on quotes provided by vessel fabricators, equipment manufacturers, contractor estimates, and similar work completed on previous projects.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed, the necessarily skilled workforce and equipment employed and the cost of materials.

3. E3-Goleta Dehydration Upgrades

a. Description

SoCalGas plans to install new gas and glycol filters, heat exchangers, glycol regeneration equipment upgrades and instrumentation for remote monitoring in order to improve dehydration efficiency. This project will also allow the station to better achieve water content standards in pipeline-quality natural gas. Costs for the Goleta dehydration project in $ million are projected to be $3.055, $1.018, and $0 for 2014, 2015, and 2016, respectively. Specific details regarding this capital project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are based on quotes provided by vessel fabricators, equipment manufacturers, contractor estimates, and similar work completed on previous projects.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed, the necessarily skilled workforce and equipment employed, and the cost of materials.

4. E4-Purification Blanket Projects

a. Description

SoCalGas plans to perform necessary work to alleviate gas processing and purification issues. This can include work on various equipment including dehydrators, coolers, scrubbers, boilers, pumps, valves, piping, power supply, controls, and instrumentation. Upgrade of purification equipment will help maintain deliverability capacity and allow the station to better achieve water content standards in pipeline-quality natural gas. The costs in $ million are estimated to be $1.629, $4.577, and $6.587, for 2014, 2015, and 2016, respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

This cost estimate is based on historical and expected levels of work.

c. Cost Driver(s)

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed and the skilled workforce and equipment employed.

F. Storage Auxiliary Systems

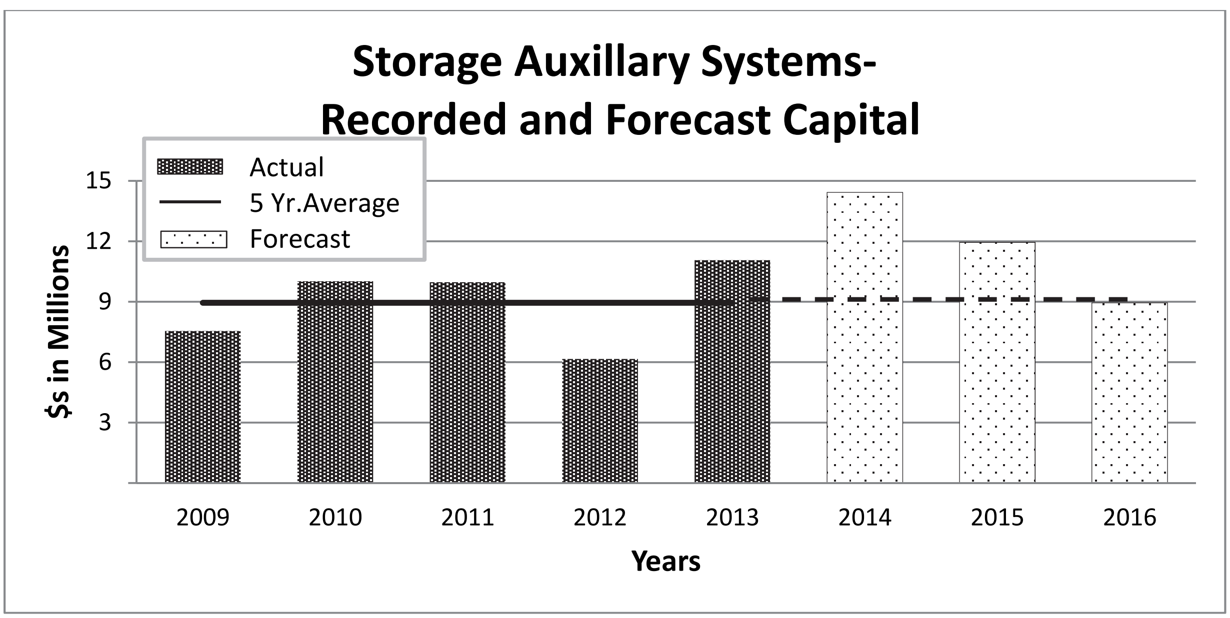
This budget code includes work on various types of field equipment not included in other budget codes such as instrumentation, measurement, controls, electrical, drainage, infrastructure, safety, security, and communications systems. The costs associated with this work are summarized in Table PEB-16 below.

Table PEB-16
Southern California Gas Company
Capital Expenditures for Storage Auxiliary Systems

STORAGE AUXILIARY SYSTEMS	Thousands of 2013 Dollars		
	Estimated 2014	**Estimated 2015**	**Estimated 2016**
F1-Aliso Central Control Room Modernization	$2,021	$1,010	$0
F2-Aliso Main Plant Power Line Upgrade	$1,010	$0	$0
F3-Aliso Sesnon Gathering Plant Project	$1,111	$303	$1,010
F4-Auxiliary Systems Blanket Projects	$10,256	$10,609	$7,938
Total	**$14,398**	**$11,922**	**$8,948**

Figure PEB-11 below depicts the Auxiliary Systems cost forecast from Table PEB-16.

Figure PEB-11
Southern California Gas Company
Historical and Forecasted Auxiliary Systems Capital



The Auxiliary Systems category in this testimony is further described under the following sub-sections:

- F1-Aliso Canyon Central Control Room Modernization
- F2-Aliso Canyon Main Plant Power Line Upgrade
- F3-Aliso Canyon Sesnon Gathering Plant Project
- F4-Auxiliary Equipment Blanket Projects

1. F1-Aliso Central Control Room Modernization

a. Description

SoCalGas plans to update, modernize and reconfigure the control room at the Aliso Canyon storage facility. This project includes modernization of control room displays, communication equipment, and building renovation. Without this upgrade of the control room, the station operators would be unable to efficiently monitor and operate the new equipment. The costs for the Aliso Central Control Room Modernization project in $ million are forecast to be $2.021, $1.010, and $0, for 2014, 2015, and 2016 respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Estimated costs are based on recent projects of similar scope and complexity in addition to recently-received vendor quotes.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed, the skilled workforce and equipment employed, and the cost of materials.

2. F2-Aliso Main Plant Power Line Upgrade

a. Description

SoCalGas plans to improve the overhead power system with new poles and wire to withstand 120 mile per hour wind load requirements. The new system will continue to allow the main plant, dehydration units and gathering plant to be energized by Southern California Edison, onsite generators, or alternate powers sources. Portions of the system will be installed underground. The project will eliminate wood poles, reduce fire danger and strengthen the electrical lines for high wind conditions. This project will provide Aliso Canyon with increased electrical reliability by upgrading the electrical system infrastructure at the main plant, dehydrators, and gathering plants to remain electrified with utility power during "Red Flag" events. South Coast Air Quality Management District variance requests are required for operation of the onsite generators used during red flag events. This project will also decrease the need for air quality permit variances. The costs forecast in $ million are $1.010, $0.500, and $0, for 2014, 2015, and 2016, respectively. Specific details regarding this capital project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Costs are based on previously-completed work of similar content and scope. Similar work that increased the wind load capability of the local electrical system was completed at the Porter water injection site in 2012.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the design, the specialized nature of work performed, the availability of qualified workers and equipment purchases.

3. F3-Aliso Sesnon Gathering Plant Project

a. Description

Safety items of concern identified during a process hazard analysis of the pressure relief system at the Aliso Sesnon Gathering Plant will be addressed with a redesign. The current pressure relief system has several critical low points that could interfere with the gathering plant pressure relieving equipment during a full system blow down. The liquid buildup could potentially overwhelm the liquid removing equipment, causing gas withdrawal rates to be reduced. The relief vessel will be relocated, system piping will be modified to eliminate low points, and relief valves will be replaced to better satisfy process conditions. The costs for this project in $ million are forecast to be $1.111, $0.303, and $1.010, for 2014, 2015, and 2016, respectively. Specific details regarding this work may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

Estimated costs are based on vendor quotes and previously completed work.

c. Cost Drivers

The underlying cost drivers for these capital projects relate to the highly-specialized nature of work performed, the availability of necessarily-skilled workforce and equipment employed and the cost of materials.

4. F4-Auxiliary Systems Blanket Projects

a. Description

SoCalGas plans to perform necessary work to alleviate instrumentation, Supervisory, Control and Data Acquisition, measurement, controls, electrical, cyber security, and other auxiliary systems support issues. This can include work on various equipment including, coolers, scrubbers, boilers, pumps, valves, piping, and power supplies. The upgrade of auxiliary systems will help maintain safety, security, deliverability, and reliability in the delivery of pipeline-quality natural gas. The costs of this project in $ million are estimated to be $10.256, $10.609, and $7.938, for 2014, 2015, and 2016, respectively. Specific details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

b. Forecast Method

This cost estimate is based on historical and expected levels of work.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the highly specialized nature of work performed and the skilled workforce and equipment employed.

IV. CONCLUSION

In this testimony, I describe activities and projects necessary for SoCalGas to achieve its goals of maintaining the safety and reliability of critical gas underground storage infrastructure. The expenditures discussed in this testimony are required to maintain public and employee safety while cost-effectively meeting customer needs, in compliance with mandated regulatory requirements. My O&M and capital forecasts represent a reasonable level of funding for the critical activities and capital projects planned during this forecast period. The forecasts of the planned O&M and capital expenditures represented in this testimony are appropriate and prudently derived, and should be adopted by the Commission. Implementation of the proposed SIMP is justified and prudent and the request for balancing account treatment for SIMP costs is reasonable and should be adopted.

This concludes my prepared direct testimony.

V. WITNESS QUALIFICATIONS

My name is Phillip E. Baker. I am employed by Southern California Gas Company. My business address is 9400 Oakdale Ave., Chatsworth, California 91313-6511.

I am the Director of Storage. In this capacity, I am responsible for maintaining the integrity of the storage system to ensure a safe, reliable supply of natural gas for customers throughout the SoCalGas and SDG&E service territory.

I have a Bachelor of Science degree in Civil Engineering from California State University at Los Angeles. I have worked for SoCalGas for thirty-five years, with a broad background in engineering and gas operations. Throughout my career I have held various staff and operations positions in Gas Distribution, Engineering, Gas Transmission, Fleet, Facilities and Logistics, and Customer Services. In recent years, I have held the positions of Director-Customer Services, Director-Distribution Services, Director-Commercial and Industrial Services. I was named to my present position, Director-Storage, in 2013.

I have previously testified before the Commission.

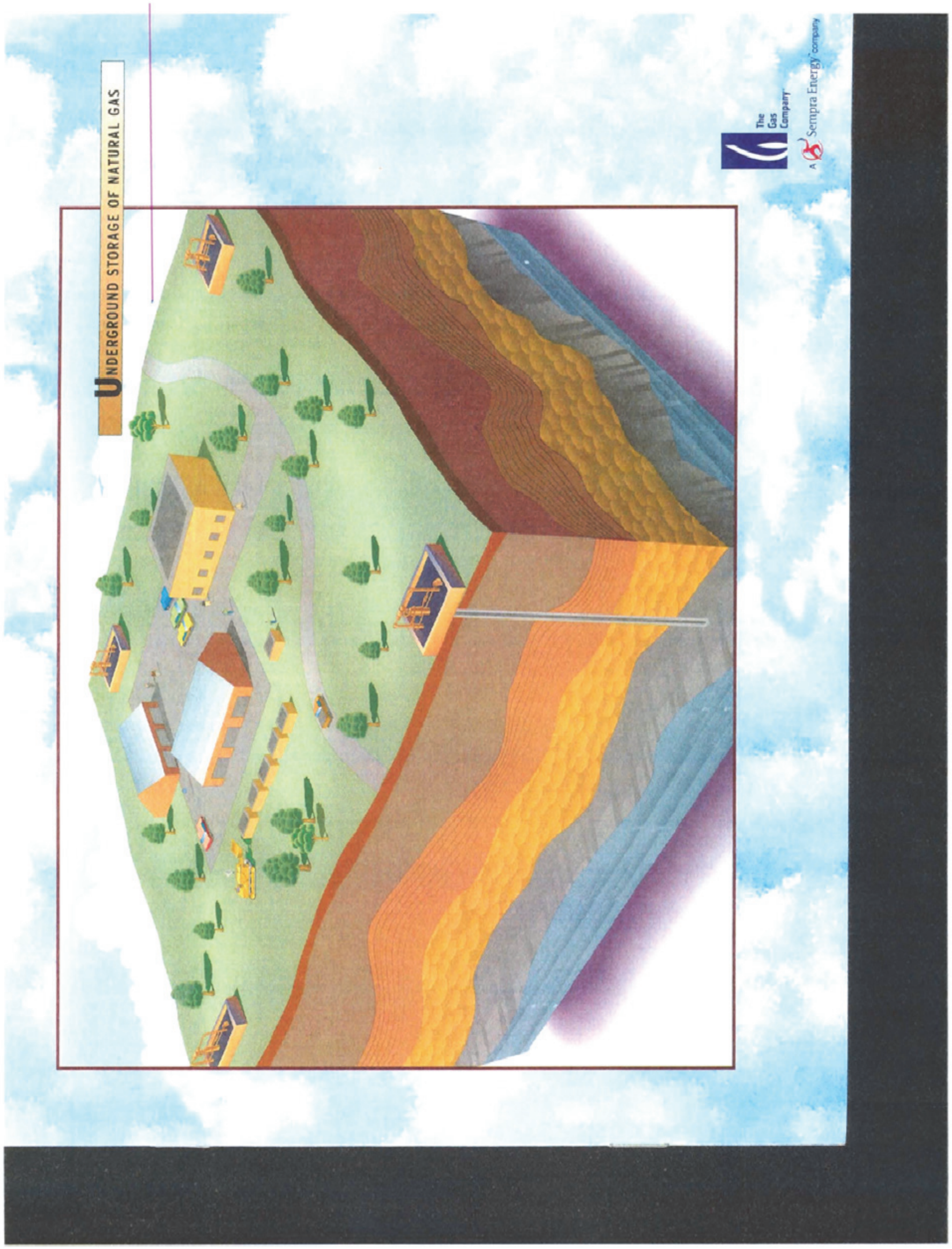
Appendix A

Glossary of Acronyms

BCF	Billion Cubic Feet
BCFD	Billion Cubic Feet per Day
CPUC	California Public Utilities Commission
DIMP	Distribution Integrity Management Program
DOGGR	California Department of Oil, Gas and Geothermal Resources
DOT	United States Department of Transportation
FTE	Full Time Equivalents
MMCF	Million Cubic Feet
MMCFD	Million Cubic Feet per Day
NERBA	New Environmental Regulatory Balancing Account
O&M	Operations and Maintenance
PSIG	Pounds per Square Inch Gauge
SoCalGas	Southern California Gas Company
SIMP	Storage Integrity Management Program
TCAP	Triennial Cost Allocation Proceeding
TIMP	Transmission Integrity Management Program

Appendix B

Underground Storage of Natural Gas


UNDERGROUND STORAGE OF NATURAL GAS
The Gas Company
A Sempra Energy company

STORING NATURAL GAS THE SAME WAY NATURE ALWAYS HAS...DEEP UNDERGROUND

Underground storage is based on the simple premise that if an underground rock formation held oil and gas securely for millions of years, it could continue to do so under controlled conditions.

Most of the natural gas used in Southern California travels from supply sources as far away as Texas and Canada. So, in order to maintain a balance between supply and demand, storage is a necessity. Without it, we might not always be able to meet our customers' needs.

Customer needs change by the season, by the day, even by the hour. On a cold winter day, for example, residential customers can use seven times the amount of gas used on an average summer day.

Five decades ago, balancing customer demand meant relying on gas holding structures, which stood several stories high and resembled oil storage tanks.

In 1941 we introduced a new system to the Southwest: underground storage of natural gas. This system is based on the simple premise that if an underground rock formation held oil and gas securely for millions of years, it could continue to do so under controlled conditions.

Extensive research and our experience have proven that this concept is sound. Depleted oil and gas fields offer ideal storage conditions because they are comprised of natural underground traps. Care is taken that the original formation pressure of the field is not exceeded. These subterranean rock formations can be repeatedly refilled and drawn from to meet the fluctuating needs of our customers.

When out-of-state pipelines can't deliver enough gas to meet heavy demand, which might occur on a cold winter day, we withdraw gas stored underground to supplement pipeline supplies. When customer needs for gas drop below the available pipeline supply, which can happen during the summer, we inject the surplus gas into the underground reservoirs. We also sell storage capacity to other large companies so they will have natural gas (which they purchase on the open market) available to them when they need it.

WHERE IS THE GAS STORED?

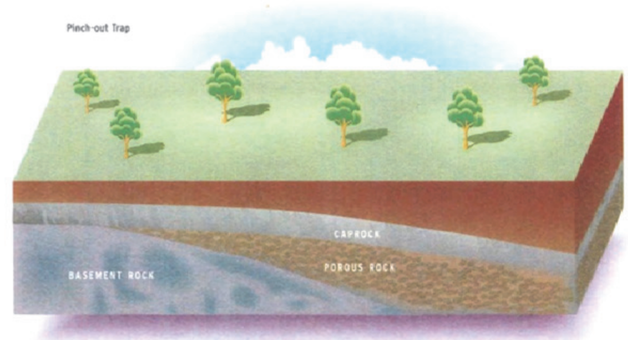
Surplus natural gas is forced down through wells drilled into porous rock formations thousands of feet below the earth's surface, where oil and gas originated. The formations appear solid but are actually sandstone made up of sand, with spaces between the grains.

The rock formations are called "geologic traps" because they are shaped by nature, and trap and hold gas, oil and water within a specific area. Like a sandwich, the basic trap contains porous reservoir rock between layers of nonporous rock. The top layer is commonly called "caprock," while the bottommost layer is often called "basement rock."

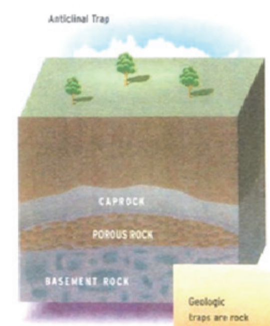
There are several different kinds of geologic traps. One is a pinch-out trap (left, below), in which the caprock meets the basement rock at one end, effectively sealing the porous storage area. The most common geologic trap is the anticlinal trap (right, below), which resembles a buried hill. This is because the caprock arches over the top of the porous rock "reservoir" to stop gas from traveling upward. Another type of trap is formed by shifts in the ancient earth strata that moved one section of rock against another, so that it abuts the caprock, creating a fault-bounded trap.

We can depend upon the force of gravity to separate the gas, oil and water that may already be in any trap. As the lightest component, natural gas will always rise to the top.

Pinch-out Trap

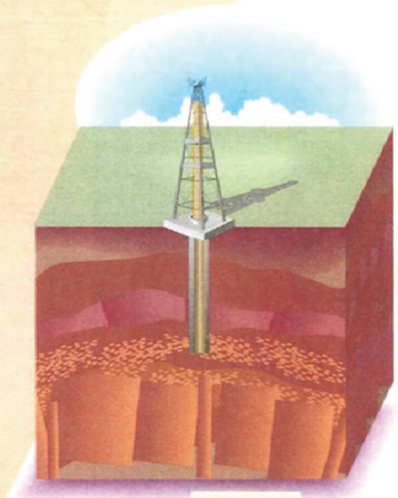


Anticlinal Trap



Geologic traps are rock formations which trap and hold gas, oil and water.

WHAT DETERMINES A GOOD STORAGE FIELD



Core samples are taken by drilling with a hollow core deep into the earth.

Core Samples

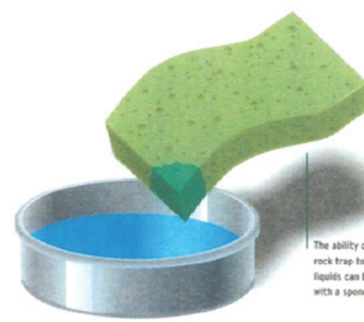
Before using any former oil or gas field for our storage, extensive geologic data of each of the field's rock layers are carefully examined. This usually is accomplished by studying "core samples," which are taken by drilling with a hollow core with a diamond cutting edge deep down through the earth's sedimentary layers.

Numerous core samples and other geologic surveys help us profile a specific field. Measuring anywhere from 10 to 60 feet (3 to 20 meters) long, the core samples tell us the location, depth and condition of the caprock, the storage reservoir and the basement rock. They also determine the present concentrations of any gas, oil or water deposits.

Porosity

The first characteristic we look for when examining the core samples is porosity. Porosity refers to the volume percentage of rock pore space available for gas or liquid retention between the rock or sand grains. It is essential that the reservoir rock have high porosity, because that indicates a high storage capacity.

The ability of porous rock to absorb gas and liquids can be demonstrated with a sponge. Take the sponge and barely touch one corner to the surface of a liquid. Watch it soak up the liquid until saturated, without altering the shape or size of the sponge. The fluid simply fills the small pores of the sponge. Underground storage is based on the same principle.



The ability of a porous rock trap to absorb gas and liquids can be demonstrated with a sponge.

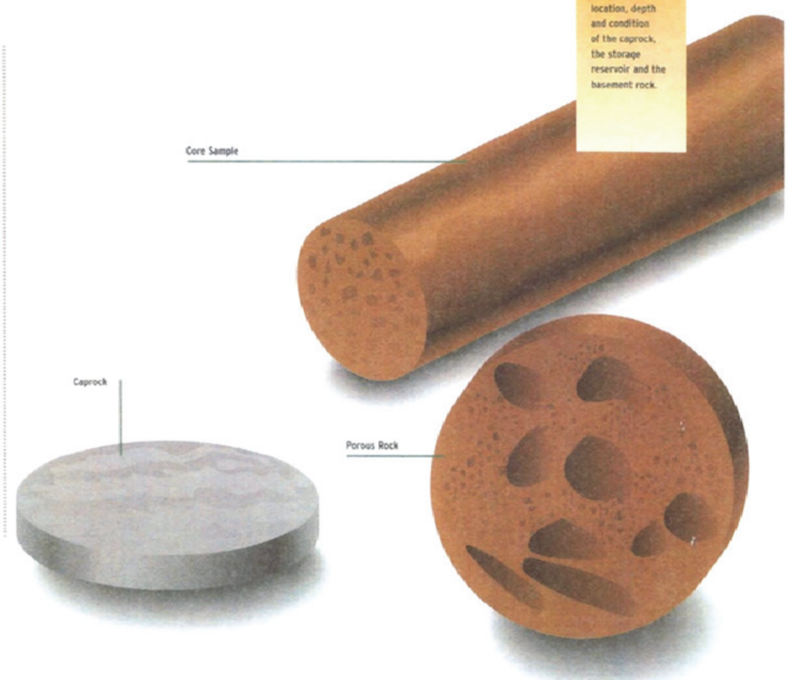
PERMEABILITY

Permeability, closely related to porosity, is another characteristic we look for when evaluating core samples. Permeability is important for efficient gas storage because it measures how well the pore spaces are interconnected.

It is essential that the reservoir rock be highly permeable because the gas must be able to move freely through the storage zone during injection and withdrawal. If the rock isn't very permeable, meaning most of the pore spaces are isolated, then the gas injection and withdrawal rates will be low.

In caprock, we look for just the opposite. A rock such as shale is an ideal caprock since its impermeability prevents natural gas from traveling upwards and being lost.

Below the caprock, we need a porous, permeable layer of rock that will permit gas to flow in and out of the reservoir. The underlying water-saturated rock and dense basement rock trap the lighter gas in place above.



Core samples tell us the location, depth and condition of the caprock, the storage reservoir and the basement rock.

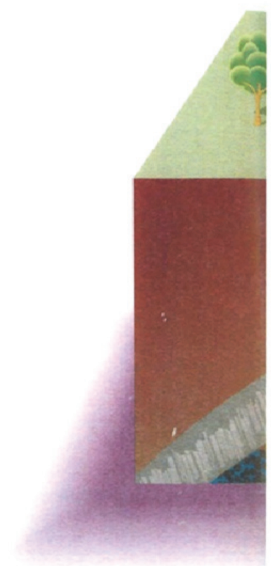
A TYPICAL UNDERGROUND GAS STORAGE FIELD

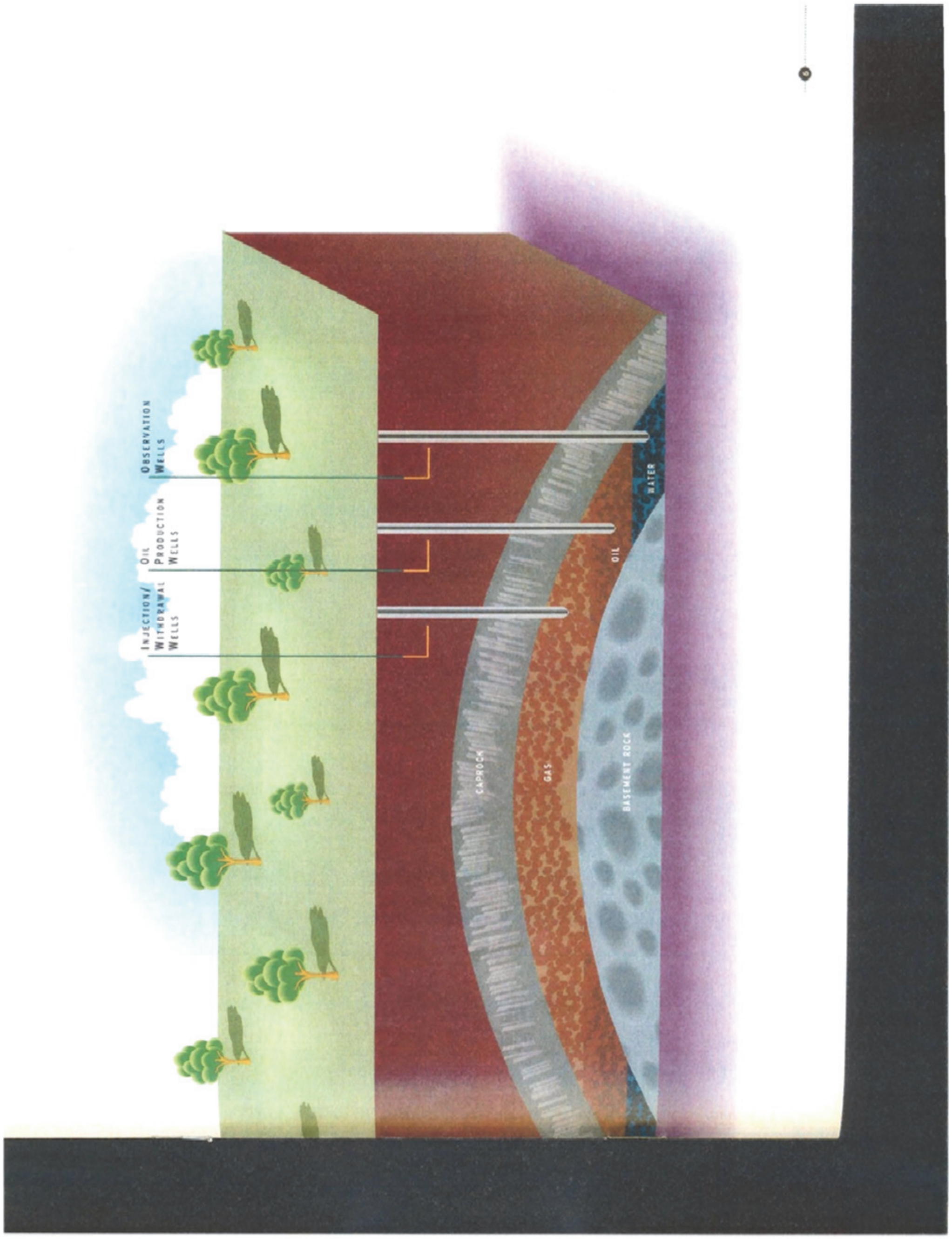
As shown at right, we operate three basic types of wells in our gas storage fields. Some of these wells still produce oil and water when natural gas is withdrawn.

1 INJECTION/WITHDRAWAL WELLS
Functioning in the upper level of the reservoir and at lower depths, these wells are used for withdrawing natural gas from storage. Many of these wells are also used to inject natural gas into the storage zone.

2 OIL PRODUCTION WELLS
To maintain the size and shape of the reservoir, oil and water must be removed from lower reservoir zones whenever gas is injected or withdrawn. This balancing operation prevents the higher-pressure liquids from moving up too far into the gas storage zone. These wells are either free-flowing oil wells or pumping oil wells. They are very similar except that pumping oil wells require pumping assistance because of insufficient reservoir pressure. Since the La Goleta storage field does not produce oil, these wells are not needed there.

3 OBSERVATION WELLS
Observation wells are used for monitoring reservoir pressures and the integrity of the caprock.




Injection/
Withdrawal
Wells
Oil
Production
Wells
Observation
Wells
Caprock
Gas
Oil
Basement Rock
Water

Storage operations are activated on orders from our gas control center to specific storage fields. Customarily, storage is required for seasonal load balancing: injecting summer supplies of gas underground to be held in reserve for winter withdrawal.

Injection

Storage operations are activated on orders from our gas control center to specific storage fields. Customarily, storage is required for "seasonal load balancing" injecting summer supplies of gas underground to be held in reserve for winter withdrawal.

Scrubbing

As natural gas comes from the pipeline, it is run through intake scrubbers to remove any liquids that may have accumulated in the pipeline and might damage the compressors. Only gas that meets set specifications is brought into our pipeline system and injected into our fields.

Compression

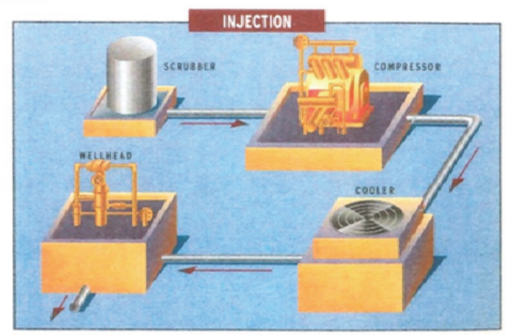
Gas supplies in transmission pipelines flow under pressures often ranging from 250 to 1,030 pounds per square inch (17 to 71 bars). The pressure in the underground storage reservoir, however, can be up to three or four times higher. To force the gas a mile or more down into the porous rock, it must be compressed to 1,500 psi (103 bars) or higher. This function is handled in two stages. Initially, high horsepower engines boost the pressure up to 800 to 1,500 psi (55 to 103 bars), significantly raising the temperature of the gas since compression generates heat. To increase compression efficiency, the gas is next sent through cooling equipment before the second compression stage boosts it to 1,500 to 3,900 psi (103 to 270 bars), completing the process. Before injection, the compressed gas will again be cooled to protect pipelines and other equipment in the storage field.

Cooling

Most of our storage facilities use the unique cooling system known as a "fin-fans." Appropriately named, each cooler contains a set of giant fan blades, whose rapid rotation pulls cool air across a system of tubes containing the gas. The tubes are wrapped with thin aluminum "fins" that assist in the cooling.

The Wellhead

Generally referred to as a "Christmas tree," this collection of piping and valves controls all gas movement in and out of the storage wells. The Christmas tree controls are easily accessible to the crews which operate them during injection and withdrawal of gas.



Withdrawal

Just as in storage injection, the signal to commence withdrawal of gas from storage is relayed to the field from our main gas control center. Withdrawal is usually ordered to meet heavy customer demand (1) throughout the cold, rainy winter season; (2) on air pollution episode days; or (3) during peak-load conditions when gas from storage augments the volumes constantly flowing in from out-of-state suppliers.

The Wellhead

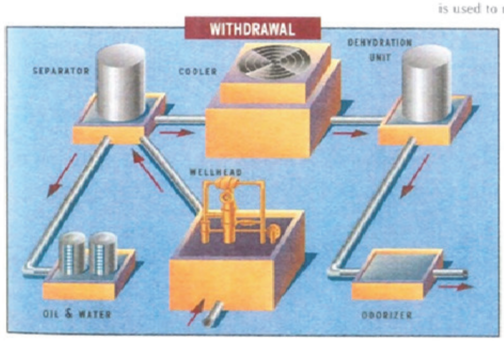
To start withdrawal, valves at the well site must be opened. Both injection/withdrawal wells and oil wells can be used to withdraw natural gas supplies, although the percentage of gas produced by the oil wells is limited.

Separators

When gas is withdrawn from the field, it generally flows under its own pressure directly into special vessels which separate most of the oil and water from the gas coming out of storage. Since gas is lighter than the accompanying fluids, it rises in the vessels, where it is collected for cooling. The oil and water left behind are separated, with the oil stored in tanks to be sold and the water stored for disposal or reinjected into the ground.

Cooling and Dehydration

When gas is removed from underground storage, it brings along petroleum liquids, water vapor and the hot temperatures from the earth a mile or two below. The gas is cooled by running it through a cooling system, and any free liquids are removed by another scrubber. Next, triethylene glycol, a substance similar to the ethylene glycol used as antifreeze in automobile cooling systems, is used to remove water vapor from the gas via a process known as dehydration.



Odorizing

Natural gas is normally odorless. Its characteristic aroma is man-made for safety reasons and after its stay underground the gas loses some of its manufactured scent. To give it that characteristic odor so important in detecting leaks, we add a drop of chemicals (as much as one-half pint per million cubic feet) just before delivering the gas into our distribution lines.

Just as in storage injection, the signal to commence withdrawal of gas from storage is relayed to the field from our main gas control center. Withdrawal is usually ordered to meet heavy customer demand ❶ throughout the cold, rainy winter season; ❷ on air pollution episode days; or ❸ during peak-load conditions when gas from storage augments the volumes constantly flowing in from out-of-state suppliers.

Southern California Gas Company's Underground Storage Sites

Southern California Gas Company, a subsidiary of Sempra Energy, operates four underground storage fields. Each facility has been developed due to unique geologic characteristics which makes it ideal for gas storage. The work done at these sites performs an essential function for all our gas customers in the Southern California area. We work to continue to meet our customers' needs in a safe and environmentally sound manner, thereby assuring the continuance of good neighbor relations with surrounding residents.

Aliso Canyon

Aliso Canyon has been the site of extensive oil and gas drilling since 1938. A storage site since 1972, the Aliso Canyon facility is found in the San Fernando Valley just above Northridge. Located in a remote, rugged area, the field covers some 3,600 acres (15 square kilometers).

Honor Rancho

Established as a Southern California Gas Company storage site in the mid 1970s, Honor Rancho is located in the northern part of Los Angeles County, about 35 miles (65 kilometers) northwest of down town Los Angeles.

La Goleta

Established in the early 1940s, the La Goleta site is located just southeast of the University of California at Santa Barbara campus in Goleta. The subsurface storage structure is a former natural gas reservoir that was developed in the late 1920s.

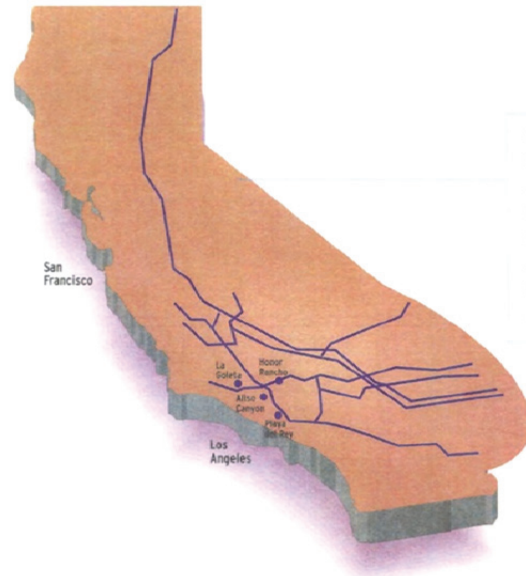
Playa del Rey

Located on the bluff overlooking Marina del Rey, the Playa del Rey site has been in operation since the mid-1940s. Storage operations began under the direction of the U.S. government to assure adequate gas supplies for the war effort. The Gas Company assumed ownership in the early 1950s.

A TRADITION OF SERVICE

Southern California Gas Company has a long tradition of providing dependable service to homes, businesses and industries in over 530 communities in a twelve-county area.

As the largest natural gas distribution company in the nation, we serve most of Central and Southern California. Providing reliable, safe and efficient natural gas service to meet this vast and fluctuating energy demand requires a highly responsive distribution system of more than 45,000 miles (83,000 kilometers) of gas main. The underground storage of natural gas plays a vital role in balancing the region's energy supply and demand.



This map shows the major pipelines which supply The Gas Company's service territory, as well as their strategic location relative to the storage fields.

Safety First

Safety has always been a top priority with us. The technology to monitor and operate an underground gas storage field has developed steadily through the years, and our facilities are in the forefront of safety controls and procedures. In addition, all of our operations are closely monitored for compliance with the safety standards of the California Public Utilities Commission, the Division of Oil and Gas, the Occupational Safety and Health Administration, and local fire departments.

FACTS ABOUT NATURAL GAS

Like other so-called "fossil fuels," such as coal and oil, natural gas was formed millions of years ago as a result of decomposition of plant and animal matter. Natural gas is often found in association with oil and is produced much the same way, by drilling wells into porous rock that contains it.

Natural gas has some important properties:

- It is colorless and odorless. We add the distinctive smell to natural gas as a safety precaution.
- It is lighter than air, which is an important built in safety feature. If natural gas should escape outside, it will rise and dissipate harmlessly into the atmosphere.
- It is the cleanest burning of all hydrocarbon fuels.
- It will burn only when specific concentrations come in contact with an ignition source.

The Gas Company

A Sempra Energy company

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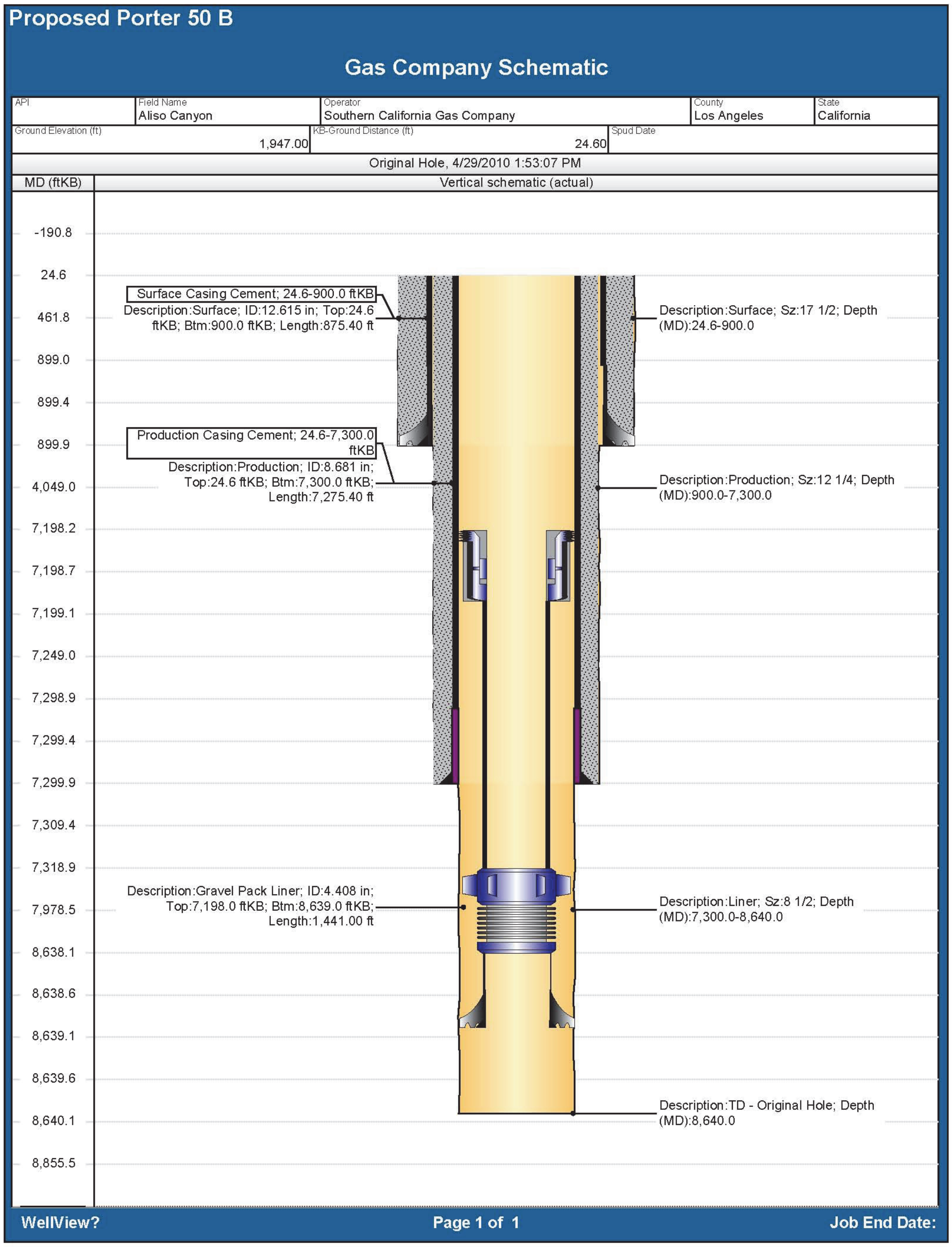
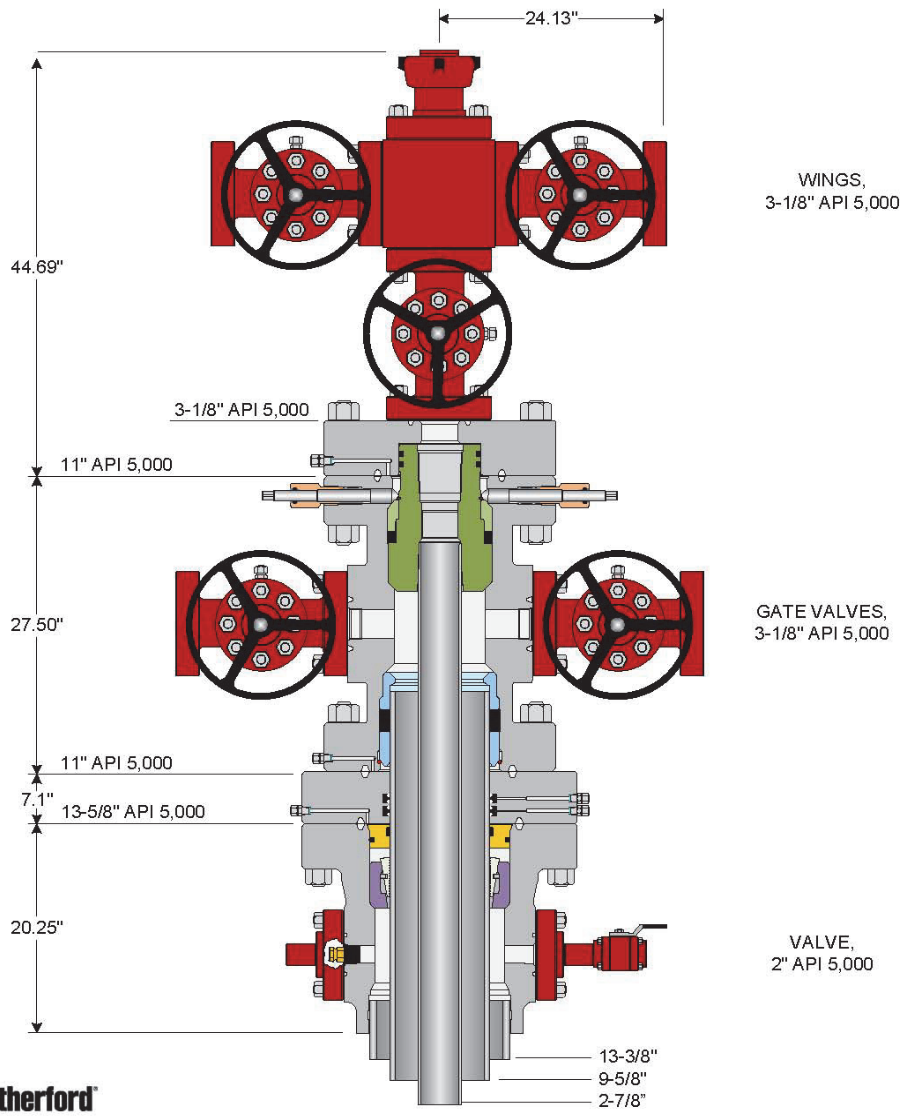
Appendix C

Downhole Schematic and Wellhead Diagram



THIS DRAWING IS NOT TO SCALE. THE DIMENSIONS REFLECTED ON THIS DRAWING ARE ESTIMATED DIMENSIONS AND ARE FOR REFERENCE ONLY.



Weatherford

Customer: SOUTHERN CALIFORNIA GAS CO.	Project: TBD	Quote: TBD
Tender, Project or Well: ALISO CANYON – PORTER 50B	Date: 04-27-2010	Drawn By: JJ