PRNC PORTER RANCH neighborhood council
P.O. Box 7337
Porter Ranch, California 91327-7337
818.217.0279
prnc.org • facebook.com/PorterRanchNC • twitter.com/porterranchnc

January 31, 2017

Submitted via email to:
Public.advisor@cpuc.ca.gov

Attn: Public Advisor's Office
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, California 94102

Re: Comments on the "Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability".

The opinions expressed in this document are those of the Porter Ranch Neighborhood Council, and not necessarily those of the City of Los Angeles

To Whom It May Concern:

The Porter Ranch Neighborhood Council (PRNC) appreciates the opportunity to submit these comments to the California Public Utilities Commission (CPUC) on the report titled: "*Draft Update to Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability for Reliability*". The PRNC is comprised of 11 publicly elected representatives of the Porter Ranch community within the City of Los Angeles. As you are well aware, Porter Ranch is the community of 30,000 citizens of the State of California who endured through four months of the worst gas blowout in the United States, and who continue to endure through episodes of uncontrolled gas releases from the Aliso Canyon gas facility, and persistent health ailments by a large number of our community members.

The PRNC has reviewed the above-referenced report released by the CPUC on Tuesday, January 17, 2017 and wishes to address the following main areas of concern regarding the findings:

1. Volume Calculation
2. Lack of a Risk Analysis Component
3. Status of the Facility

We ask that you seriously consider our concerns as you finalize your report. In addition, the PRNC prepared a detailed analysis of the natural gas supply and demand in the SoCalGas service area and concluded that the system can be reliability operated without the need for gas withdrawal from the Aliso Canyon facility. The report is incorporated into our submittal as an attachment to this document and we ask that it be made part of the record.

Volume Calculation

On page 9, the report states "…*SoCalGas could support a gas demand of 4.1 Bcf without the use of Aliso Canyon*". The report references the Winter Technical Assessment report as the source of this value. In our examination of that report, we noted that this value is based on limiting the supply to 85% of capacity. We see no reason to make this assumption for the one max-day demand. SoCalGas already states in the report (page 29) that even with line 3000 out of service, it can deliver 4.5 Bcf into the system without Aliso Canyon, and without losing system pressure. If this value were used, the total storage volume required in Aliso Canyon decreases to only 18.2 Bcf. Furthermore, the relationship between volume and withdrawal rate is based on the assumption that only 31 wells are available for withdrawal. When the number of wells that pass the battery of tests increases to 38, the emergency max-day supply from Aliso can be met with only 15 Bcf in the field.

Considering the lack of rationale for limiting the receipts to 85% of capacity, and the fact that DOGGR's website already shows that SoCalGas has 35 wells that have passed all tests, we see no reason to increase the storage volume to any value greater than the current value of 15 Bcf.

Lack of a Risk Analysis Component

We are concerned that all the decisions being made regarding the use of Aliso Canyon are based on a mere mathematical calculations of supply, demand, and cost. However, considering the event that led to this point, we find it imperative that any decision regarding Aliso Canyon must include and incorporate a thorough Risk Analysis that provides a reasonable weight to the potential health risk to the community and damage to the environment that is incurred with the re-opening of this facility. Clearly, the impact of any CPUC decision on the community and the environment must be taken into consideration.

Status of the Facility

We recognize that CPUC's primary goal is to maintain the reliability of gas supply into Southern California, and we very much support that goal. We understand that this goal is the driver behind the need to maintain a specific gas volume in the field. However, this does not mean that the facility needs to be returned into service as an operating facility. The current status of Aliso Canyon is an "emergency supply" facility. Whether the volume is 15 Bcf or 29 Bcf, there is no reason to change its status.

Therefore, we ask that the PUC mandate that the facility remain as an emergency supply facility only until further notice, and that any emergency withdrawal from the facility must be accompanied by a full accounting of demand and supply and an explanation of why the withdrawal was needed, and a confirmation that all other mitigation measures had been considered before the emergency withdrawal was implemented. This information should be provided to the PUC and the public within 24 hours of the withdrawal.

Respectfully Yours,

Porter Ranch Neighborhood Council

Issam Najm, Ph.D., P.E.
President

cc: The Honorable Edmund G. Brown, Jr., Governor, State of California
Mr. Jason Marshall, Cief Deputy Director, Department of Conservation
Senator Henry Stern, California 27th District
Mr. Dante Acosta, California Assembly Member, 38th District
Ms. Kathryn Barger, Supervisor, Los Angeles County Board of Supervisors
Mr. Mitchell Englander, Councilman, Los Angeles City Council
Mr. Eric Garcetti, Mayor, City of Los Angeles
Mr. Steve Knight, United States Representative, CA-25
Mr. Brad Sherman, United States Representative, CA-30

Reliable Gas Delivery without the Aliso Canyon Gas Storage & Processing Facility

Technical Report

Submitted to:
California Public Utilities Commission

Prepared by
Issam Najm, Ph.D., P.E.

on behalf of the
Porter Ranch Neighborhood Council

The statements and opinions expressed in this document are those of the Porter Ranch Neighborhood Council, and not necessary those of the City of Los Angeles

January 15, 2017

1.0 OBJECTIVE OF THIS REPORT

The Porter Ranch Neighborhood Council (PRNC) has taken the position that the Aliso Canyon gas storage and processing facility is a threat to public health and is not safe to operate in such close proximity to thousands of families. The PRNC also believes that while the Aliso Canyon facility has been used as an integral part of the overall gas delivery system, it is by no means a critical component of that system. This report presents an in-depth analysis of the gas demand, supply, and storage data publicly available, and demonstrates that the gas delivery system can be safely and reliably operated without the Aliso Canyon gas storage facility.

2.0 SOURCES OF DATA AND INFORMATION

The primary source of data used in the analysis presented in this report was the SoCalGas ENVOY website, which can be found at https://scgenvoy.sempra.com. Daily Operations data were downloaded for 1/1/2007 through 12/31/2016 to represent 10 years of operation. Additional data were downloaded for the period of 1/1/2017 through 1/12/2017. Additional gas supply data were obtained from the website of the *El Paso Natural Gas Company* (EPNG) which can be found at this link. EPNG is one of the wholesale gas suppliers to SoCalGas. Three other documents were reviewed in advance of preparing this report, and they include:

- *Aliso Canyon Winter Risk Assessment Technical Report* (August 23, 2016), prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water & Power, and Southern California Gas Company.

- *Aliso Canyon Gas and Electric Reliability Winter Action Plan* (August 22, 2016), prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, and the Los Angeles Department of Water & Power.

- *Independent Review of Hydraulic Modeling for Aliso Canyon Risk Assessment* (August 19, 2016), prepared by Walker & Associates and Los Alamos National Laboratories for the California Energy Commission, California Public Utilities Commission, California Independent System Operator, and the Los Angeles Department of Water & Power.

3.0 ANALYSIS OF GAS DEMAND

The first step in this analysis was to identify the gas demand to be used in the calculations. The analysis conducted in the *Aliso Canyon Winter Risk Assessment Technical Report* (August 23, 2016) utilizes a 10-year maximum-day demand of 5.2 Bcf/day.

The ENVOY system database includes a listing of the daily total gas deliveries, but does not separate them between deliveries to core customers, non-core customers, electric generators (EGs), or others. Therefore, we can only use these deliveries to represent the overall system gas demand. Figure 1 presents the daily gas deliveries from January 2007 through December 2016 (10 year period). This figure confirms that the maximum system demand over the last 10 years was 5.2 Bcf/day, which took place on January 14, 2013. However, it is important to note that this demand lasted for only one day. Figure 2 shows a close-up of the daily demands around that day. As shown, the demand was 4.6 Bcf the day before and 4.7 Bcf the day after. Similarly, while the maximum daily delivery was 5.0 Bcf on one day in December 2008 and one day in December 2013, it was at that level for only one day, and then at less than 4.7 Bcf the day before and the day after each event.

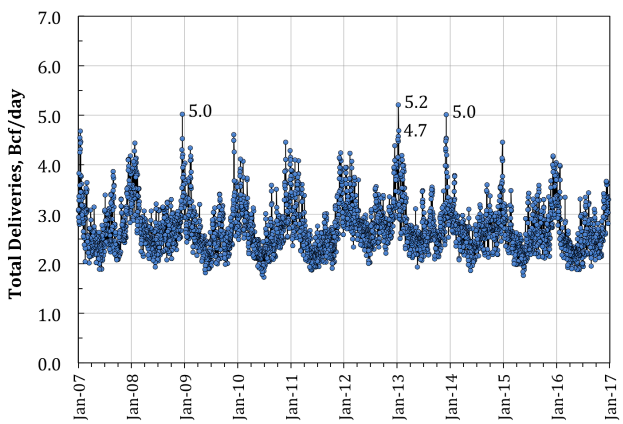

Figure 1 – Profile of Daily Gas Demand from January 2007 through December 2016

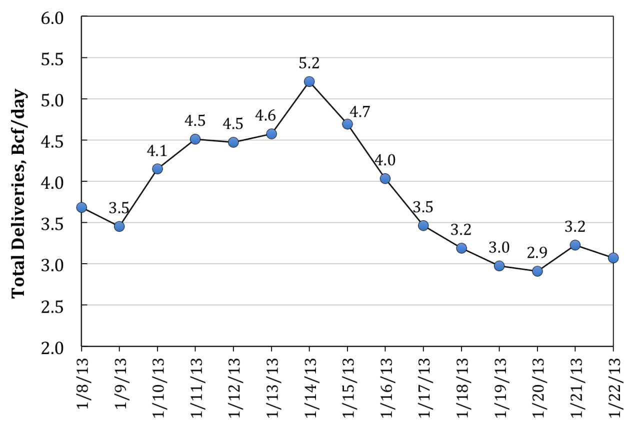

Figure 2 – Gas Demand Profile around the 10-Year Max-Day Gas Demand

It is known that the primary cause of fluctuations in gas demand is temperature, especially for core customers. Figure 3 presents the daily fluctuations in the temperature as reported by SoCalGas' ENVOY database from December 2009 through 2016.[1] Gas deliveries to core customers is highest during the cold winter season due primarily to home heating demand, while EG daily gas demand is highest during the hot summer season due to high electricity demand for indoor cooling and air-conditioning. As shown in Figure 3, the lowest temperature in the database was recorded at 39 °F in the winter of 2013, while the highest temperature was recorded at 86 °F in the summer of 2015. It is important to note that these are not minimum and maximum air temperatures, but what SoCalGas refers to as *Composite Weighted Temperature*, which is a more representative indicator of the overall weather temperature as it relates to gas demand across the entire SoCalGas service area.

An interesting analysis of the relationship between daily deliveries and temperature is presented in Figure 4. This plot shows the magnitude of the two seasonal gas demand peaks: On the high temperature side, the data show that the maximum summer demand over the last six years was no higher than 3.6 Bcf/day. On the low temperature side, the graph repeats the earlier observations that the extreme maximum gas demand has been 5.2 Bcf/day, while a more common expectation is to have a maximum winter day demand of approximately 4.7 Bcf/day.

1 The ENVOY database does not include temperature values for days prior to 12/15/2009.

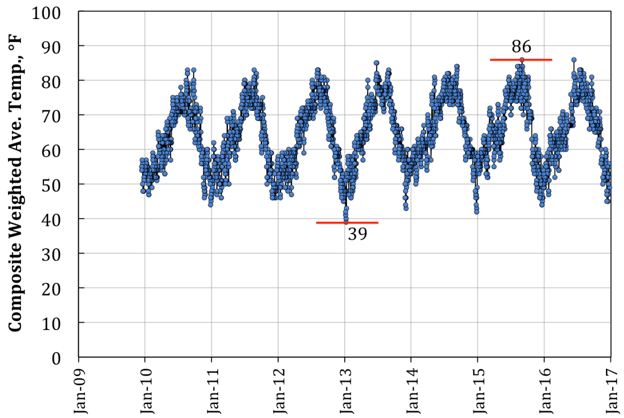

Figure 3 – Profile of Daily Composite Weighted Average Temperature

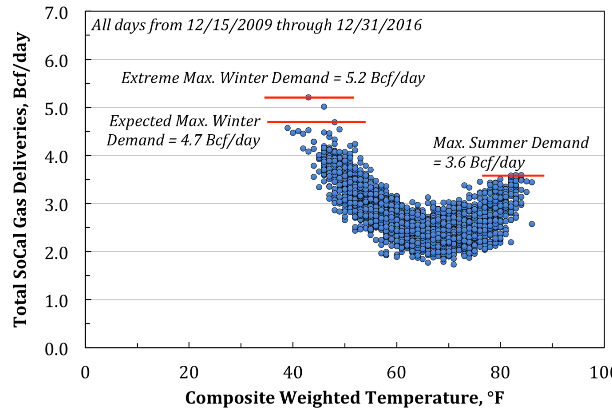

Figure 4 – Relationship between Temperature and Total Gas Demand (i.e., Deliveries)

Based on the above analysis, the demand analysis shows that, while the maximum-day demand during the last 10 years has been 5.2 Bcf/day, it is important to recognize that this demand level lasted for only one day, and that the demand on the days before it and after it were at or below 4.7 Bcf/day. Therefore, if the 5.2 Bcf/day value were to be used to represent the design demand, it should not be assumed that this demand will be required on multiple consecutive days. In fact, in its document titled "*Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability and Reliability*", dated January 17, 2017, the CPUC already lowered its projected maximum winter-day demand to 4.94 Bcf citing *"..a decline in winter electric generation demand resulting from an increase in renewable energy sources and replacement of older gas generation with new, more efficient generation."*

In addition, while the focus of this report is on the Winter demand, the data analysis shows that the maximum daily summer demand has been no higher than 3.6 Bcf/day. Considering that the gas delivery system is more than capable of delivering 3.6 Bcf/day to Southern California, there should be no concern over any electricity shortages during the summer season.

Furthermore, it is interesting to note in Figure 3 that the temperature profile in 2016 has been fairly similar to those in prior years, yet Figure 1 shows that the gas deliveries in December 2016 were significantly lower than those during the same cold season of prior years. To explore this difference, a comparison between the relationship between temperature and deliveries in 2016 was compared to the relationships in prior years. The results, which are shown in Figure 5, clearly demonstrate that there is a clear impact of the mitigation measures implemented in 2016 on the maximum gas demand during cold-weather conditions. While the minimum temperature reached in 2016 was as low as 45 °F, the maximum daily gas deliveries was only 3.67 Bcf/day (large red circles in Figure 5). However, in prior years, the daily gas deliveries at the same temperature were higher by as much as 1.3 Bcf/day, reaching 5.0 Bcf/day at a temperature of 46 °F. This important observation suggests that historical gas demand data may not be a good indicator of the true gas demand that southern California will experience under the new operating rules required by the

CPUC and implemented by SoCalGas and its customers. While more in-depth analysis of this large difference would shed more light on its cause, it requires a breakdown of the daily deliveries between core customers, EGs, and other noncore customers. Unfortunately, this information is not available in the ENVOY database.

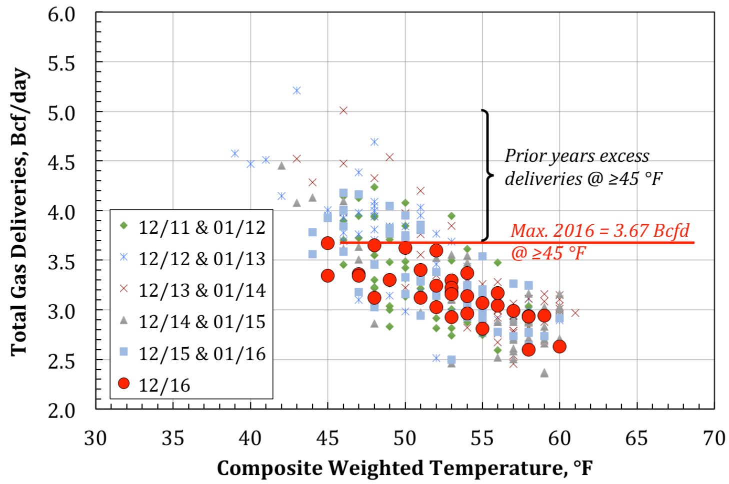

Figure 5 – Comparison between Cold-Temperature Deliveries in 2016 and those in Prior Years at the Same Temperature Values

Nonetheless, *based on the preliminary analysis presented herein, it appears that the gas demand in the SoCalGas service area is unlikely to exceed 4.5 Bcf/day under the coldest composite weighted temperature recorded over the last 10 years (39 °F), as long as the system is operated under the rules currently in place. Future analysis may further show that this maximum value may not even exceed 4.0 Bcf/day. Either value is substantially lower than the 5.2 Bcf/day currently assumed to be the design demand upon which all supply and storage calculations have been made.*

4.0 HYDRAULIC ANALYSIS

We recognize that gas demand and deliveries are highly dynamic and vary between morning, mid-day, evening, and night hours. Under high daily demand conditions, fluctuations in the hourly demands can cause wide swings in system pressure. SoCalGas conducted hydraulic modeling to determine the maximum daily demand it can deliver to the system without going outside the required operating pressure range, and while returning to the morning pressure at the end of the 24-hour cycle. With this model, SoCalGas determined that the maximum gas demand it can satisfy without using Aliso Canyon is 4.7 Bcf/day. An independent review of the hydraulic modeling was conducted by Walker & Associates and the Los Alamos National Laboratories. It is noted that the independent review did not verify the modeling methodology and its calculations, but only conducted an assessment of the validity of the assumptions upon which the model simulations were conducted. These assumptions remained confidential and were not available to us. Therefore, in the absence of additional details, we will assume that the model calculations are valid, and that the maximum demand that can be satisfied without Aliso Canyon is 4.7 Bcf/day due to local hydraulic limitations. *This also implies that as long as the gas demand remains below 4.7 Bcf/day, SoCalGas can continue to reliably operate its system without Aliso Canyon*. SoCalGas claims that there is also a limitation in the hourly fluctuations in gas demand that cause wide fluctuations in system pressure. We note that this is merely a hydraulic challenge that can be fixed by looking for and removing system bottlenecks and, if necessary, utilize inline compressors to manage system pressure. However, this requires an operator who actually wants to implement these changes, or a State regulatory agency that mandates it.

5.0 SUPPLY ANALYSIS

Figure 6 presents the daily gas receipts (i.e., supply) into the SoCalGas system. As shown, daily gas receipts fluctuated greatly with winter receipts being significantly lower than summer receipts. This has been primarily driven by the common practice of importing gas at a lower-cost during the lower-demand summer months and storing it the four storage fields, primarily Aliso Canyon, and then cutting back on gas purchases during the winter months and utilizing the stored gas to meet the majority of the demand.

Table 2 in the *Winter Action Plan* suggests that a receipt capacity of 3.0 Bcf/d is more reflective of SoCalGas' experience, while a receipt capacity of 3.4 Bcf/day is an "optimistic" value. Figure 6 demonstrates that the total receipts capacity has been at 3.4 Bcf/day many times during the last 10 years. It is clear that 3.4 Bcf/day is a reliable supply capacity into the system. Figure 7 shows a cumulative frequency distribution profile for the gas supply. Figure 7 shows that the daily supply exceeded 3.0 Bcf/day 20% of the time (which is two full years out of the last 10 years). In our opinion, an assumed flowing supply of only 3.0 Bcf/day is an overly conservative value, and a 3.4 Bcf/day is a demonstrated capacity, not an "optimistic" capacity as stated in Table 2 of the *Winter Action Plan*.

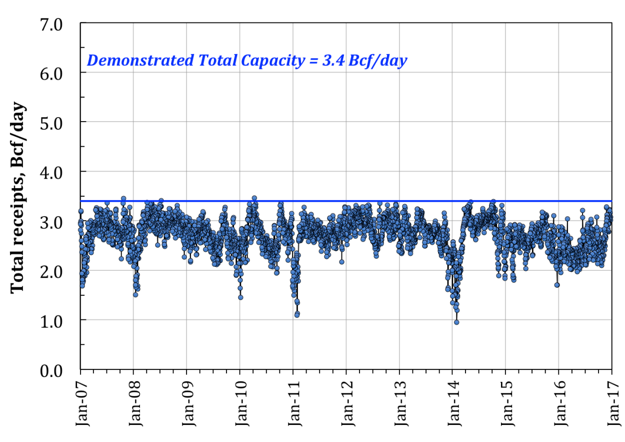

Figure 6 – Total daily receipts into the SoCalGas system over the last 10 years

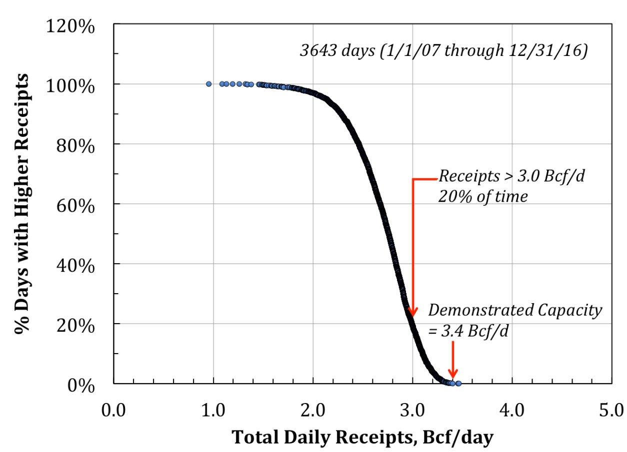

Figure 7 – Cumulative Frequency Distribution of the daily receipts over the last 10 years

Furthermore, to develop a better understanding of the true supply capacity, a review of the historical receipts from each individual zone was conducted. The assumption is that the delivery from each zone is independent of the delivery from another zone. Figures 8 through 11 present the historical daily receipts for the following four zones: 1) California Producers (CP), 2) Southern Zone, 3) Northern Zone, and 4) Wheeler Ridge. The CP receipts were as high as 0.26 Bcf/day in 2007, and have since decreased to approximately 0.04 to 0.08 Bcf/day. SoCalGas states that this was due to "aging fields ... and low oil prices". In the *Winter Action Plan*, SoCalGas uses 0.06 Bcf/day as the planned CP capacity. This value will be used in this analysis as well.

Figure 9 shows the historical daily receipts from the Southern Zone. Over the last 10 years, SoCalGas has demonstrated that it can receive as much as 1.21 Bcf/day from this zone as shown in Figure 9. This is also the Southern Zone capacity assumed in the *Winter Action Plan*.

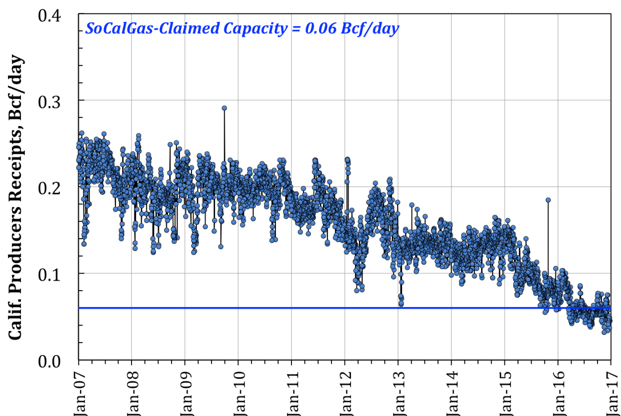

Figure 8 – Historical daily receipts from the California Producers [2007 – 2016]

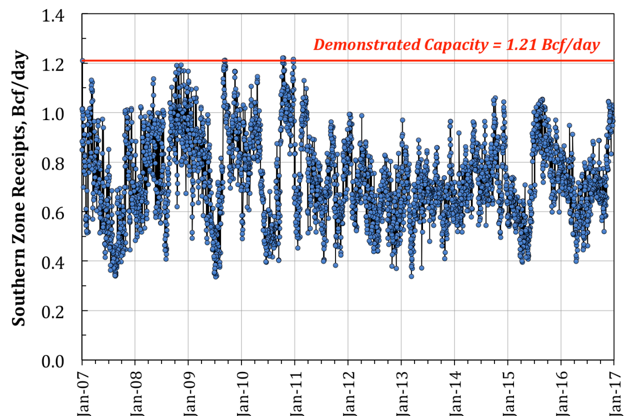

Figure 9 – Historical daily receipts from the Southern Zone [2007 – 2016]

Figure 10 shows the total daily gas received from the Northern Zone over the last 10 years. SoCalGas states that the capacity of this zone is 1.59 Bcf/day. However, it has demonstrated numerous times during the last 10 years that the zone production capacity is as much as 1.64 Bcf/day. Similarly, Figure 11 shows the historical daily receipts from the Wheeler Ridge zone over the last 10 years. Again, while SoCalGas states that the maximum capacity of this zone to be only 0.765 Bcf/day, it has demonstrated over the years that it can be as high as 0.90 Bcf/day or higher.

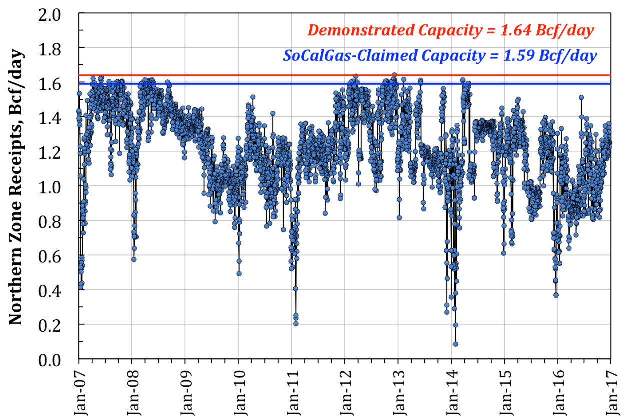

Figure 10 – Historical daily receipts from the Northern Zone [2007 – 2016]

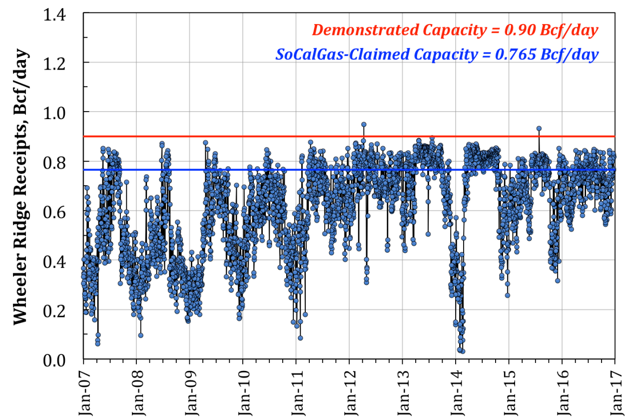

Figure 11 – Historical daily receipts from the Wheeler Ridge Zone [2007 – 2016]

Table 1 presents an overall summary of the capacities used in the various calculations. The first column represents the combined receipt point capacities in each zone. These were calculated based on the receipt point capacities listed in in ENVOY. While these are not the capacities that can be received in the SoCalGas system, they represent the total capacities that can be delivered to the State transmission pipes. The total sum of the receipt point capacities is as high as 6.64 Bcf/day. Even without the California Producers, the total receipt point capacity is as high as 6.2 Bcf/day. This suggests that, *with sufficient transmission capacity, the gas supply into southern California can be as high as 6.2 Bcf/day, which is higher than the maximum historical daily demand of 5.2 Bcf/day.*

Table 1 – Capacity Analysis

Zone	Combined Receipt Point Capacity, Bcf/d	Zone Hydraulic Capacity,(1) Bcf/d	SoCalGas–Claimed Zone Capacity,(2) Bcf/d	Demonstrated Zone Capacity,(3) Bcf/d
California Producers (CP)	0.442	0.15	0.060	0.06
Southern Zone	2.28	1.265	1.210	1.21
Wheeler Ridge Zone	1.56	0.848	0.765	0.90
Northern Zone	2.365	1.62	1.59	1.64
Total	**6.64**	**3.88**	**3.62**	**3.81**

(1) https://scgenvoy.sempra.com/#nav=/external/availschedcap/availSchedCap.html%3Frand%3D142
(2) Capacities selected by SoCalGas in the *Aliso Canyon Winter Risk Assessment Technical Report.*
(3) Based on Figures 8 through 11.

The second column in Table 1 lists the Zone capacities as listed on the ENVOY site. We assume that these represent the maximum hydraulic capacity of each zone. However, since no value is provided for the total CPs, it was assigned a value of 0.15 Bcf/day as the mid-range of the capacity demonstrated over the last 10 years. Therefore, the total hydraulic capacity of all four zones adds up to 3.88 Bcf/day. The third column includes the values listed by SoCalGas in the *Winter Action Plan*. Finally, the last column in Table 1 includes the demonstrated zone capacities based on the profiles presented earlier in Figures 8 through 11. It is important to note that these values are not the theoretical capacities, but rather the actual demonstrated transmission capacities delivered by SoCalGas during the last 10 years. The total demonstrated supply is calculated at 3.81 Bcf/day. It is understood that this supply capacity may not be sustainable over multiple days. However, it is reasonable to rely on it during the one-day event of an extreme demand such as the 5.2 Bcf/day recorded on January 14, 2013. For other days with a sustained maximum daily demand of 4.7 Bcf/day, a lower supply of 3.4 Bcf/day may be a more reasonable assumption.

6.0 STORAGE VOLUME

One of the arguments made for the need to increase the volume of gas stored in Aliso Canyon includes 1) the need for maintaining a minimum local supply volume, and 2) the need to maintain enough pressure in the fields to support the required withdrawal rate. The current cumulative storage volume is approximately 60 Bcf, including 15 Bcf in Aliso Canyon. This leaves 45 Bcf in the remaining three storage fields.

Figure 12 shows a profile of the total stored gas volume over the last 10 years. In four of these 10 years, the storage volume was less than 60 Bcf. The lowest volume was recorded during the winter of 2014 when the stored volume was reduced to as low as 19 Bcf in all four fields. To our knowledge, there was no expression of concern from SoCalGas about this low storage volume similar to the concern being expressed today. Moreover, Figure 13 shows the daily injection/withdrawal rates during the same period (January 1 through March 12, 2014). On February 5, as the stored volume was approximately 55 Bcf, SoCalGas was withdrawing as much as 2.6 Bcf/day from the four fields. Even when the stored volume was as low as 20 Bcf, the withdrawal rate was still as high as 1.1 Bcf/day as shown in Figure 13. We understand that these rates may not be achieved today with the current restriction of tube-withdrawal only. However, Figures 12 and 13 emphasize the point that the current volume of 60 Bcf is not a critically low storage volume that has not been experienced by SoCalGas in the past. Moreover, SoCalGas' own ENVOY website lists the currently available withdrawal rate at 1.7 Bcf/day. Therefore, a deficit of 1.0 Bcf/day is by no means a critical figure.

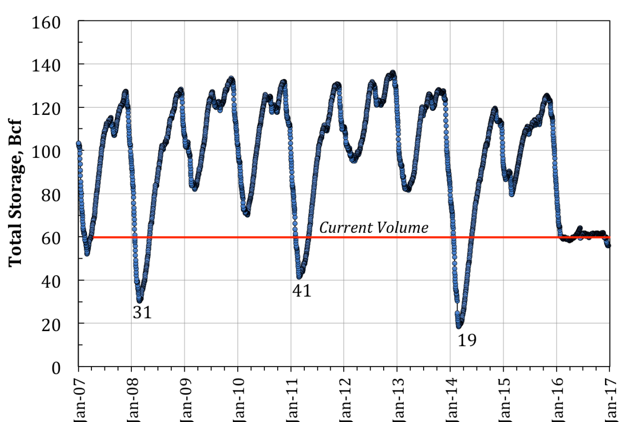

Figure 12 – Gas volume stored in SoCalGas' four storage fields [2007 – 2016]

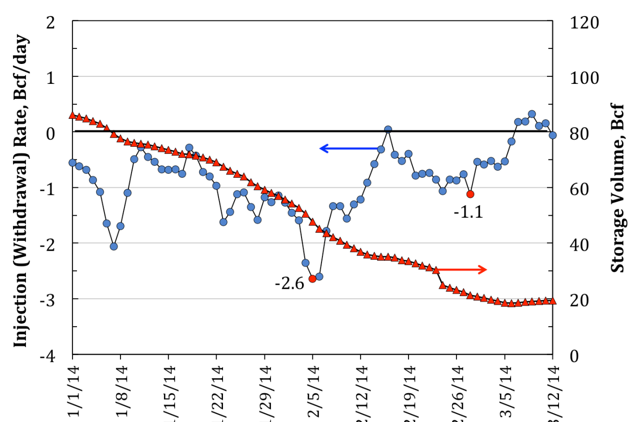

Figure 13 – Storage volume and injection/ withdrawal Rates during the Winter of 2014

7.0 GAS-SHORTAGE CONCERNS?

Since the implementation of the balancing rules, the gas company and its customers have been able to maintain the balance between supply and demand with no problems. Figures 14 and 15 illustrate this point. Figure 14 shows the profile of gas receipts and gas deliveries since April 1, 2016 and through 12/31/16. Figure 15 shows the daily difference between the total receipts and total demand and shows how the two have been balanced within 0.5 Bcf/day the entire year, until December. Clearly, the balancing rules were working quite well before then. *So what happened in December?*

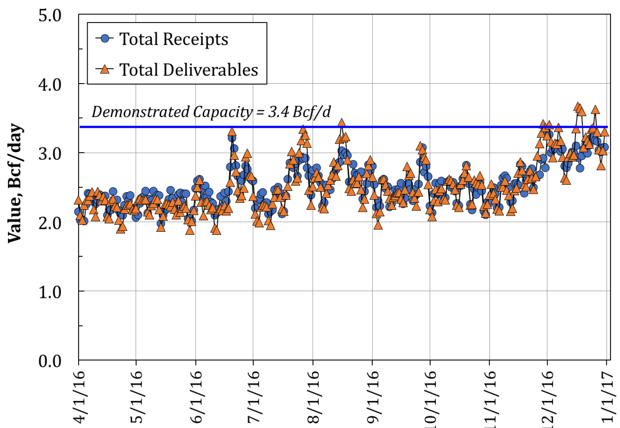

Figure 14 – Balancing of Gas Supply & Demand between April 1 and Dec 31, 2016

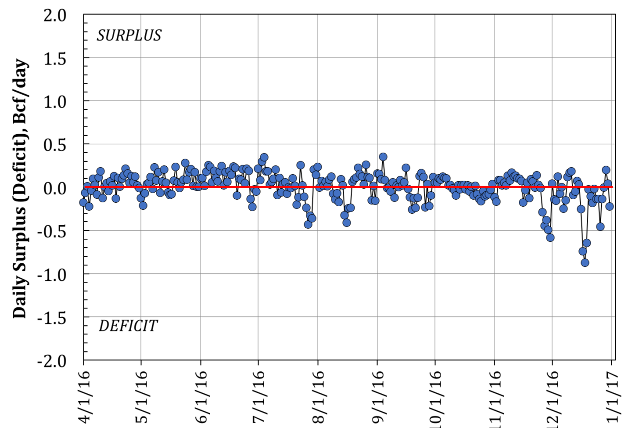

Figure 15 – Daily Surplus (Deficit) between April 1 and December 31, 2016

Figures 16 and 17 present an analysis of the balancing during the months of November and December 2016. Figure 16 shows the injection/withdrawal rates (blue circles) and the storage volume (red triangles). On 12/18/2016, the withdrawal rate was 0.9 Bcf/day, and that's the day that SoCalGas issued a pending gas shortage warning. Figure 17 shows a plot of the receipts and deliveries for the same period and shows the gap between the receipts and the deliveries for that same day. It is clear that the demand (i.e., deliveries) went up, but the supply (i.e., receipts) actually went down! Figures 18 and 19 zoom in further on the days before and after December 18 and provide a more detailed picture of the supply and demand for that period. Up to December 15, the gas receipts were perfectly aligned with the gas demand, but then the gas demand began to increase and peaked at 3.7 Bcf/day, but instead of increasing the gas receipts, SoCalGas actually decreased it to 2.8 Bcf, which resulted in the deficit of 0.87 Bcf that triggered the public notice. Had they increased their receipts to the demonstrated capacity of 3.4 Bcf/day, or even to 3.2 Bcf/day, the deficit would have been within the normal range of 0.5 Bcf/day. It is important to note that the Gas Company should have had the full expectation of an increase in demand because, by its own account, the weather was getting colder. This is illustrated in Figure 19, which shows the composite weighted average temperature reported by SoCalGas for those days.

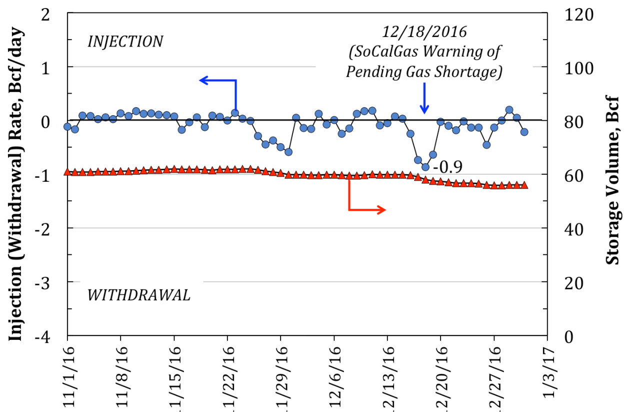

Figure 16 – Injection/Withdrawal Rates and Gas Storage in Nov. and Dec. 2016

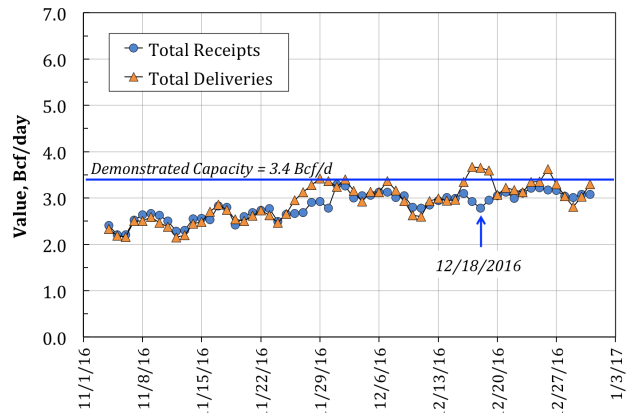

Figure 17 – Supply and Demand Balancing in November & December 2016

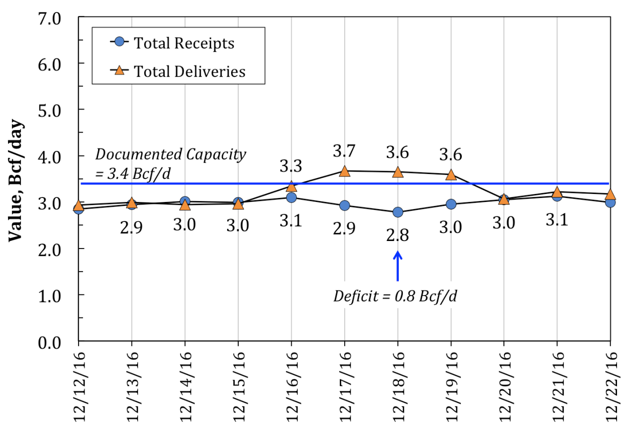

Figure 18 – Demand and Supply Balancing between 12/12/16 and 12/22/16

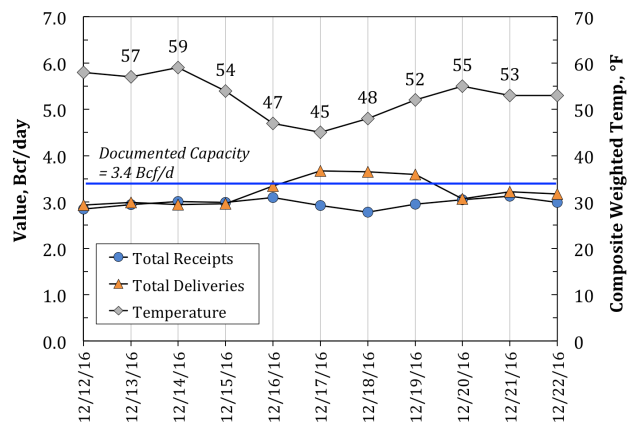

Figure 19 – Temperature relationshiop to Demand and Supply Balancing between 12/12/16 & 12/22/16

The above analysis clearly shows that the reason for the apparent gas shortage was simply a result of the Gas Company's own actions, or lack thereof. Whether this was intentional or unintentional remains to be seen. We are not privy to the breakdown in demand between core and non-core customers, but we suspect that the Gas Company may have grossly underestimated the core demand, which resulted in the large imbalance.

It is important to note that the above imbalance was not caused by a lack of supply. Figures 20 and 21 show the total gas receipts for the Southern Zone and Northern Zone, respectively, in November and December 2016. The demonstrated receipt capacity from each zone is noted on the graph illustrating the point that at least an additional 0.5 Bcf/day was available from these two zones that SoCalGas did not tap into. The receipt from the Southern Zone on December 18 was only 0.8 Bcf compared to the available zone capacity of 1.2 Bcf. Another 0.4 Bcf was available from the Northern zone for that day as shown in Figure 21.

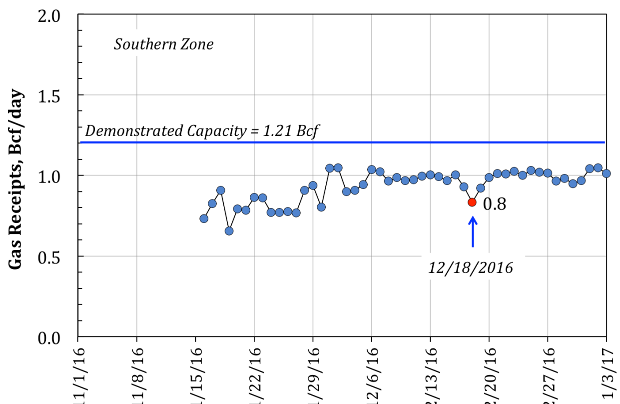

Figure 20 – Gas Receipts from the Southern Zone in November and December 2016

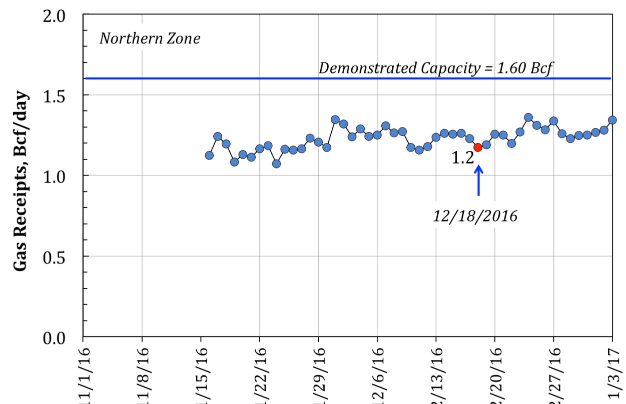

Figure 21 – Gas Receipts from the Northern Zone in November and December 2016

During past discussions on why the system was not running at full capacity, we were often told that there are typically problems with gas deliveries from out of State that limit the available supply. In anticipation of this excuse, we went to the website of the El Paso Natural Gas (EPNG) company, which is one of the gas wholesalers to SoCalGas, and we downloaded and analyzed their gas deliveries for the period of November and December 2016. The analysis clearly shows that there was ample gas supply available at SoCalGas' receipt points. Figures 22 through 25 show the details of our findings. Each figure shows a profile of the operating capacity and available quantity of gas at the Ehernberg, North Baja, PG&E Topock, and Mojave receipt points in November and December 2016. For example, Figure 22 shows that on December 18, 2016, SoCalGas had approximately 0.6 Bcf to it from the Ehrenberg receipt point alone, which is in the Southern Zone. The other figures show similar profiles from three other receipt points available to SoCalGas. Therefore, there was absolutely no shortage of supply on any day during this period, and certainly not on December 18, 2016.

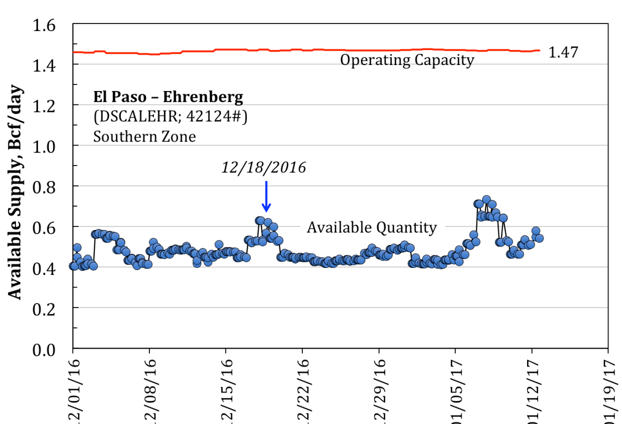

Figure 22 – Available Gas Supply at the Ehrenberg Receipt Point in 12/16, as Reported by EPNG

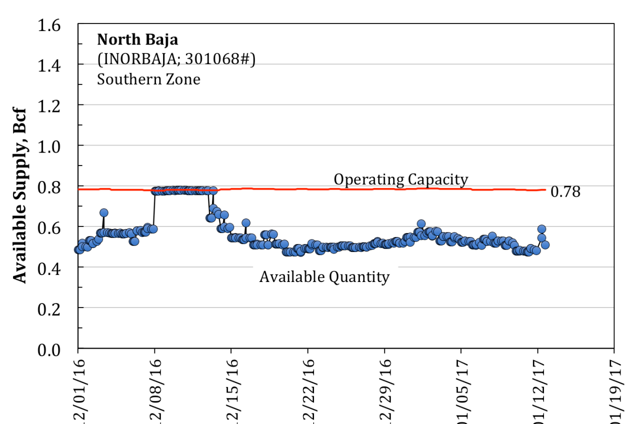

Figure 23 – Available Gas Supply at the North Baja Receipt Point in 12/16, as Reported by EPNG

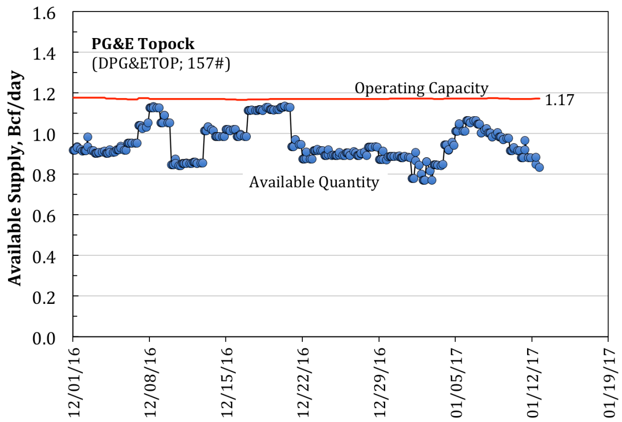

Figure 24 – Available Gas Supply at the PG&E Topock Receipt Point in 12/16, as Reported by EPNG

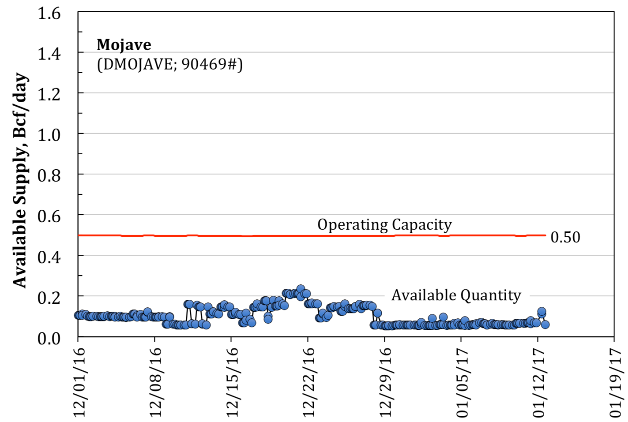

Figure 25 – Available Gas Supply at the Mojave Receipt Point in 12/16, as Reported by EPNG

8.0 PREDICTING GAS DEMAND

We do not know what SoCalGas uses to predict gas demand in its system and plan gas deliveries. We assume it is a sophisticated model that is based on their vast historical database. In our review of the demand and its relationship to weather temperature, we developed a simple set of equations that correlated total gas demand to the composite weighted temperature reported by SoCalGas since December 2009 (2,573 days). We did not have the benefit of separation between daily core and non-core demand, and thus our equations can certainly be refined if this information were made available. Nonetheless, for the purpose of full transparency, these equations are presented in Table 2 below. There is one equation for each day of the week because our analysis showed that gas usage varies between days of the week, and particularly between weekdays and weekend days. Again, if we had the benefit of the separation between core and non-core demand, we suspect we can do an even better prediction for core demand since it is likely to be more strongly correlated to weather conditions (i.e., temperature) than non-core demand, which is primarily driven by business practices.

Table 2 – Gas Demand Predictive Equations

[T = Composite Weighted Average Temperature, °F]

Day of Week	Temperature-Based Equation
Monday	Demand, Bcf = $-1.63E\text{-}06\times T^3 + 3.90E\text{-}03\times T^2 - 5.07E\text{-}01\times T + 1.94E{+}01$
Tuesday	Demand, Bcf = $1.44E\text{-}05\times T^3 + 6.45E\text{-}04\times T^2 - 2.90E\text{-}01\times T + 1.47E{+}01$
Wednesday	Demand, Bcf = $2.17E\text{-}05\times T^3 - 7.33E\text{-}04\times T^2 - 2.03E\text{-}01\times T + 1.28E{+}01$
Thursday	Demand, Bcf = $3.50E\text{-}05\times T^3 - 3.46E\text{-}03\times T^2 - 1.77E\text{-}02\times T + 8.63E{+}00$
Friday	Demand, Bcf = $2.91E\text{-}05\times T^3 - 2.41E\text{-}03\times T^2 - 7.92E\text{-}02\times T + 9.75E{+}00$
Saturday	Demand, Bcf = $1.22E\text{-}05\times T^3 + 7.11E\text{-}04\times T^2 - 2.71E\text{-}01\times T + 1.35E{+}01$
Sunday	Demand, Bcf = $9.36E\text{-}06\times T^3 + 1.38E\text{-}03\times T^2 - 3.24E\text{-}01\times T + 1.48E{+}01$

In spite of their simplicity, the equations presented in Table 2 fit the historical gas demand data quite well. The quality of that fit is presented in Figure 26, which shows a distribution of the percent of time the predicted demand deviated from the actual demand by a certain amount. What Figure 26 shows is that the equations in Table 2 match the historical gas demand within 0.5 Bcf/day 97% of the time, and within 0.95 Bcf/day 100% of the time (out of 2,573 days of data). The equations were used to predict the gas demand around the December 18, 2016, event when SoCalGas issued the warning, and the result is shown in Figure 27. The "diamonds" represent the demand predicted by the equations compared to the actual demand (triangles). The difference between the predicted and actual demands is within 0.3 Bcf. Had SoCalGas made a similar effort to properly predict gas demand, the gas shortage warning would never have been needed at all.

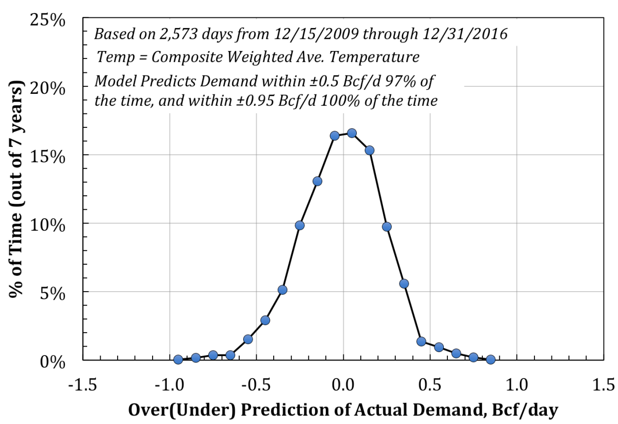

Figure 26 – Distribution of Agreement between Predictive Equations in Table 2 and Actual Gas Demand between 12/15/2009 & 12/31/2016

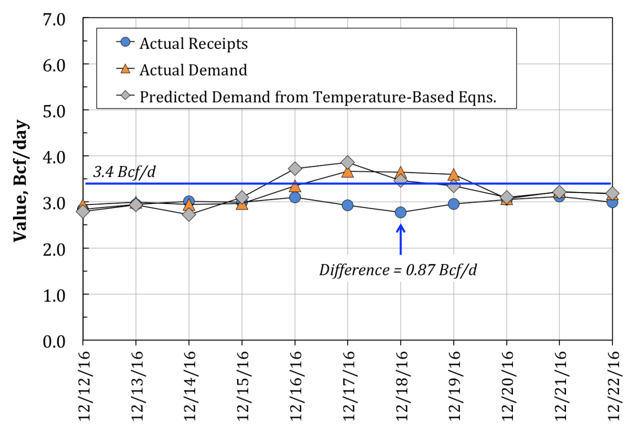

Figure 27 –Agreement between Predictive Equations in Table 2 and the Actual Gas Demand around December 18, 2016

The preceding analysis clearly shows that there was plenty of available supply capacity in December 2016 when SoCalGas issued its warning of a pending gas shortage, and SoCalGas had no reason not to anticipate the higher demand based on the temperature it tracked on a daily basis.

Moreover, prior to December 16, the Gas Company maintained the total gas storage volume in all its four fields at 60 Bcf. However, since then, it has been withdrawing gas from the three operating fields on a daily basis, even though the demand has been lower than the available supply for most days. For example, Figure 28 shows the profiles of supply (receipts), demand (deliveries), and storage volume from January 1 through January 12, 2017. During this period, the supply was lower than the demand for most days, in spite of the fact that the demand was lower than the available demonstrated supply capacity of 3.4 Bcf/day for the majority of the days in this period. As a result, the Gas Company steadily withdrew gas from the operating fields from 56 Bcf on January 1 to 52 Bcf on January 12. Had the Gas Company had the intention of maintaining the storage volume at 60 Bcf, they could have easily ramped up the supply on numerous days during this period and recharged the fields. Incidentally, Figure 29 shows a profile of the actual demand and predicted demand using the equations listed in Table 2. This figure shows that, using only the predicted temperature, the Gas Company should have easily predicted the actual demand and adjusted the supply to recharge the storage fields.

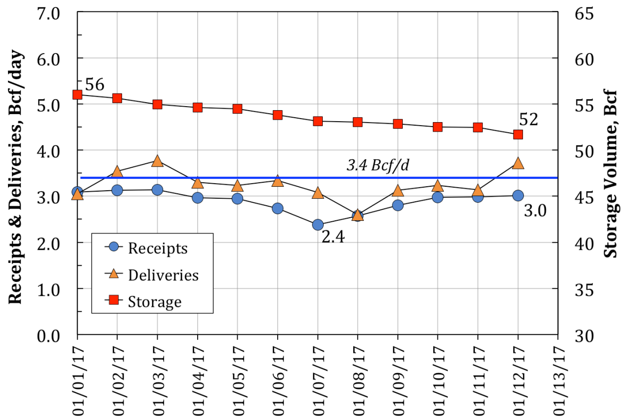

Figure 28 – Gas Supply, Demand, and Storage Profiles between Jan. 1 and Jan. 12, 2017

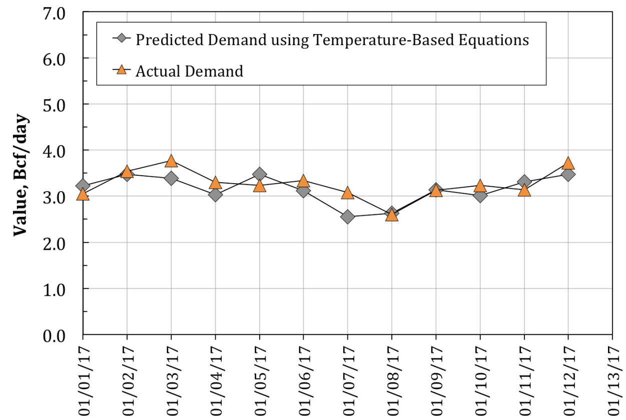

Figure 29 – Actual vs. Predicted Demand between Jan. 1 and Jan. 12, 2017

9.0 CONCLUSIONS

This report goes through a detailed analysis of the historical gas supply and demand data available from the Gas Company and other sources. The report clearly demonstrates that the gas delivery system can satisfy the full demand of the system without the need to use the Aliso Canyon facility. Table 3 summarizes the supply and demand balance that can be achieved by the Gas Company if they chose to do so. This balance does not take into consideration the hydraulic bottlenecks in the system, but they demonstrate that the withdrawal rates available from the other three operating fields are sufficient to satisfy the system demand on days when the demand exceeds the available flowing supply capacity of 3.4 Bcf/day. It is noted that the withdrawal rates of 0.83 Bcf/day, 0.34 Bcf/day, and 0.30 Bcf/day from the Honor Rancho, La Goleta, and Playa Del Rey fields, respectively, are the values reported by the Gas Company. With these rates, Table 3 shows that there is actually a surplus supply under all peak day assumptions. However, we recognize that the system has hydraulic bottlenecks that limit the max-day delivery into the system to 4.5 Bcf/day (including the lower withdrawal rates from the tubes instead of the casings). Table 4 presents a summary of the supply and demand balancing considering this limitation. If the system demand exceeds 4.5 Bcf/day, then these bottlenecks may force the gas company to curtail gas supply to non-core users by an absolute maximum of 0.7 Bcf/day during the extreme winter Peak Day demand, which the Electric Generators (EGs) already indicated they can do with sufficient notice. *Nonetheless, the Gas Company should have no reason to curtail gas supply when the demand is lower than 4.5 Bcf/day since their own analysis has clearly demonstrated that they should be able to meet this daily demand, and its associated hourly fluctuations, without Aliso Canyon and without gas curtailment*.

Table 3 – Supply & Demand Balance (Bcf/day) During Peak Winter Day Demand [without consideration of pressure limitations]

Demand/Supply	Extreme Peak Day	Sustained Peak Day	Expected Future Peak Day
Total Demand	–5.2	–4.7	–4.5
Flowing Supplies	+3.8	+3.4	+3.4
Honor Rancho	+0.83	+0.83	+0.83
La Goleta	+0.34	+0.34	+0.34
Playa Del Rey	+0.30	+0.30	+0.30
Surplus (Deficit)	+0.07	+0.17	+0.37

Table 4 –Supply & Demand Balancing (Bcf/day) During Peak Winter Day Demand [with consideration of system bottlenecks & tube withdrawal rates]

Demand/Supply	Extreme Peak Day	Sustained Peak Day	Expected Future Peak Day
Total Demand	–5.2	–4.7	–4.5
Max. Serviceable Demand without Aliso Canyon	+4.5	+4.5	+4.5
Surplus (Deficit)	–0.7	–0.2	0
EG & Other Winter-Time Demand Reduction	+0.7	+0.2	0
Surplus (Deficit) After Demand Reduction	0	0	0

10.0 MOVING FORWARD

Based on the analysis presented in this report and its conclusions we urge the CPUC to consider the following:

1. Mandate that SoCalGas develop better predictions of its gas demand, including hourly fluctuations. This is a technically feasible task.

2. Mandate that SoCalGas impose on itself the same core-demand balancing requirements as those imposed on its non-core customers.

3. Mandate that SoCalGas maintain the same gas storage volume of 60 Bcf in its four fields as it had done between April and November 2016. This includes no more than 15 Bcf in Aliso Canyon.

4. Mandate that SoCalGas restrict its use of Aliso Canyon as an emergency supply only, and only after maximizing its supply capacity.

5. Mandate that SoCalGas expeditiously replenish any gas it withdraws from its fields to restore them to the "emergency" supply volume of 60 Bcf noted above.

6. Mandate that SoCalGas provide full transparency on days that it withdraws gas from any of its storage fields. This should include an explanation for why the supply was not sufficiently adjusted to match its demand.

7. Mandate that SoCalGas design and implement the necessary measures to remove the hydraulic bottlenecks from its system.

8. Mandate that SoCalGas develop a clear and expeditious short-term roadmap to retiring the Aliso Canyon facility and upgrading its transmission system to maintain reliable gas supply into Southern California without Aliso Canyon.