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Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement

Prepared by the Staff of the California Public Utilities Commission, the California Energy Commission, the California Independent System Operator, and the Los Angeles Department of Water and Power

November 28, 2017

CEC-100-2017-002

Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement

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EXECUTIVE SUMMARY

After dozens of steps taken in response to the Aliso Canyon natural gas leak and significant energy conservation by residents, this assessment evaluates the reliability challenges of delivering energy to Southern California for the winter of 2017-18. This assessment concludes that the region faces new challenges and greater uncertainty compared to last winter.

The primary challenge this upcoming winter is that three natural gas transmission pipelines Southern California Gas Company (SoCalGas) relies on to serve its customers are out of operation. One ruptured October 1, and the uncertain return to operation of that pipeline raises significant concerns. Moreover, necessary maintenance on electricity transmission lines to reduce reliability risks begins February 1, 2018. Combine these factors with unexpected but possible events, and this assessment finds that it is likely that the natural gas reserves at the Aliso Canyon storage facility will be needed and under extreme cold weather events there may be insufficient gas supplies to meet demand even relying on withdrawals from all the storage fields. The largest risk to the system is not from a single day with high gas demand, and instead is from multiple days of higher demand that will draw down storage inventories to a point where storage could not be used to meet gas demand later in the winter. As a result, Southern California residents will be called on to turn down thermostats and conserve both electricity and natural gas at a rate greater than a year ago.

Additional factors such as efficiency increases gained from scheduling changes and securing electricity imports from outside the region, could help balance the supply and demand of energy. Yet, cold weather or unexpected deficiencies in either the natural gas or electricity delivery systems would create concerns.

This assessment, a supplement to the 2016-2017 winter technical report,[1] was developed by the Aliso Canyon Technical Assessment Group (ACTAG), which is composed of technical experts from the California Public Utilities Commission (CPUC), the California Energy Commission (Energy Commission), the California Independent System Operator (California ISO), and the Los Angeles Department of Water and Power (LADWP). The ACTAG has also conferred with SoCalGas about circumstances this winter but has largely prepared this analysis independently of SoCalGas.

The 2017-18 winter supplement begins with the same hydraulic modeling inputs and results for the natural gas system as last winter's assessment, which resulted in a maximum system sendout of 4,567 million cubic feet per day (MMcfd).[2] This figure assumes withdrawals from SoCalGas' other three storage fields but none from Aliso Canyon.[3] This figure is then reduced by 200 MMcfd as Line 2000 has

[1] See Aliso Canyon Winter Risk Assessment Technical Report, August 23, 2016. The 2016 report provides background information and an explanation of the hydraulic analysis referenced in this supplement. The 2016 report can be found at http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-02/TN212913_20160823T090035_Aliso_Canyon_Winter_Risk_Assessment_Technical_Report.pdf

[2] Ibid, page 19, Table 1: Supply and Demand for the 1-in-10 Scenarios and Curtailment Requirements

[3] This figure assumes that Line 3000 will remain out of service throughout the winter. According to Envoy, SoCalGas' electronic bulletin board, Line 3000 will not be back in service until May 1, 2018.

been operating at lower pressures since 2011 (pending hydrostatic testing), which reduces the throughput to 80 percent of design capacity.[4] The resulting maximum system capacity is then 4,367 MMcfd. (This reduction was not incorporated into the previous winter analysis.) In addition, SoCalGas Line 235-2 ruptured on October 1, 2017, simultaneously damaging the nearby Line 4000. The resulting outages further reduce maximum system capacity by 800 MMcfd, decreasing maximum system sendout capability to 3,567 MMcfd. In addition, maintenance is scheduled at the Playa del Ray gas storage field from November 7, 2017, through December 18, 2017. This work will reduce maximum system capacity another 260 MMcfd to 3,307 MMcfd.

SoCalGas estimates that Line 4000 will return to service on December 30, 2017.[5] The utility has not yet provided an estimate of when Line 235-2 will return to service. In response to the outages, SoCalGas has implemented two mitigation measures to increase capacity, allowing customers to bring in more supplies.[6] The first mitigation measure temporarily increases capacity at Kramer Junction by 150 MMcfd on an interruptible basis until Line 4000 returns to service. The second measure is aimed at using the full capability of the Southern Zone by obtaining firm pipeline capacity to bring in 200 MMcfd at Otay Mesa.[7] Once Line 4000 returns to service, SoCalGas' system capability increases by 350 MMcfd. At that time, however, the 150 MMcfd of interruptible capacity at Kramer Junction will be discontinued.[8] This cessation results in total maximum sendout without Aliso Canyon of 4,117 MMcfd (with mitigations). Table 1 summarizes how SoCalGas' maximum system capacity is expected to change during the winter with the various outages, mitigations, and service returns. While Table 1 summarizes known outages, there is a risk that additional unplanned outages could further reduce SoCalGas' system capacity.[9]

[4] SoCalGas Envoy reports the reduction as 202 MMcfd, which has been rounded to 200 MMcfd for this analysis.
[5] This information is based on SoCalGas Envoy, Line 4000 Maintenance Update, October 13, 2017.
[6] SoCalGas Gas Acquisition purchases gas for core customers, consisting of primarily residential and small commercial customers.
[7] As of November 8, 2017, SoCalGas Gas Acquisition has authority to contract for up to 200 MMcfd of capacity from December 1, 2017, through February 28, 2018, to deliver gas at Otay Mesa via the North Baja and Gasoducto Baja Norte pipeline systems. Historically, the Otay Mesa receipt point has been used infrequently because it is typically more expensive to bring gas supplies there. This winter assessment assumes that this supply will continue through the winter months.
[8] The 150 MMcfd at Kramer Junction is available only when the other pipelines are out of service. When Line 4000 returns to service, it will increase the system pressure to the point that it is no longer possible to deliver the extra 150 MMcfd of gas to Kramer Junction.
[9] The Independent Review Team recommended in the Aliso Canyon summer 2017 assessment that the probability of an additional unplanned outage be included.

Table 1: SoCalGas Feasible System Sendout[10] (MMcfd) for Winter 2017-18

(MMcfd)	**Period 1: Present-12/18/2017** Outage on Lines 3000, 4000, and 235-2; Maintenance at Playa del Rey	**Period 2:** 12/18/2017-12/30/2017 Outage on Lines 3000, 4000, and 235-2	**Period 3: Post 12/31/2017** Outage on Lines 3000 and 235-2 (Line 4000 Returns to Service)
Maximum Feasible System Capacity Without Gas System Mitigations	3,307	3,567	3,917
Maximum Feasible System Capacity With Gas System Mitigations	3,657	3,917	4,117

This winter's minimum generation requirement, or gas needed by the electricity system operators to maintain electric system reliability, is higher than that of 2016-17.[11] The season-long increase is due to higher demands forecasted on the west side of Los Angeles for LADWP than assumed in last winter's analysis. The minimum generation requirement increases on February 1, 2018, when LADWP begins work to upgrade a key transmission line.[12] While the transmission line is out of service, LADWP will require additional gas-fired generation in the LA Basin to meet electric system reliability requirements. Before February 1, 2018, the California ISO and LADWP combined minimum generation level will require 38 MMcfd. If a contingency event affecting both balancing areas were to occur during this period, 112 MMcfd would be needed to meet demand from electricity generators. After February 1, 2018, a minimum of 219 MMcfd is required under normal conditions, and 293 MMcfd would be needed under a contingency event. These amounts compare to estimates for last winter of 22 MMcfd of gas under normal operations and 96 MMcfd if both the California ISO and LADWP experienced contingency events on their electric systems.

To be clear, moving electric generators to minimum generation is not easy or desirable. The generators need notice to do it. It means shifting generation to less desirable sources and, depending on notice timing and available resources, places both the California ISO and LADWP into one or more levels of

[10] Previous assessments have called this "maximum supported demand." The revised nomenclature is intended to be more descriptive.

[11] Last winter, neither California ISO nor LADWP had to drop to minimum generation levels. SoCalGas did informally ask the two balancing authorities on January 24 and 25, 2017, if they could shift resources to reduce their gas load. Both authorities were able to accommodate that request. Those were the two days that SoCalGas had a curtailment watch posted and withdrew a small amount of gas from Aliso Canyon.

[12] LADWP had planned to begin this work by December 1, 2017, but has postponed it due to the Line 235-2 outage. Electric utilities typically perform transmission maintenance and upgrades during the winter, which is their off-peak season. LADWP in fact has a series of upgrades planned over each of the next several winters designed to increase its capability to import renewable resources and meet the City of Los Angeles' as well as the states' mandates to increase renewable generation.

Energy Emergency Alerts.[13] Moving to minimum generation also assumes that gas is available at the replacement plants and that transmission and energy are available at the quantity and duration necessary to replace the generation and that no other outages occur among electric facilities. It is an accommodation should be limited to extreme circumstances on the gas system.

Should the gas system be unable to provide the gas required to support minimum generation levels (either because demand is higher than assumed, other outages occur, or supply is not delivered to the receipt points) electric reliability is threatened. Prior reliability action plans looked to withdrawals from Aliso Canyon to reduce this risk. As with last winter's assessment, reducing electricity-generator use to these minimum levels is feasible only if all electric transmission lines are fully operational and generation is available outside the LA Basin which the California ISO and LADWP would use as a source for imported electricity.

The other key caveat about system capacity and the maximum feasible sendout pertains to storage inventory levels and the related impact on achievable withdrawals. Hydraulic analysis looks only at a day and does not simulate use of storage over the entire winter. If storage inventory is drawn below certain thresholds, SoCalGas will not have the field pressures to withdraw enough gas to serve core customers[14] should a 1-in-35 extreme peak day occur. Both the gas balance analysis released by SoCalGas on October 30 and the one prepared by the Energy Commission and presented in this assessment show that curtailments of noncore customers may well be needed in December to preserve inventory needed for core customers to protect for the possibility of very cold days in January.[15]

This need to preserve inventory means that under normal weather conditions, it is not clear SoCalGas can avoid December curtailments, even if SoCalGas uses some gas from Aliso Canyon.[16] Were a 1-in-10 cold winter to occur, significant curtailments of gas service to noncore customers would be needed even using gas from Aliso Canyon. On an extreme winter peak day, with 1-in-35 demand by core customers, the deliverability balance remains positive, but only if sufficient inventory has been preserved to support the assumed withdrawal of 2.0 billion cubic feet (Bcf) from storage (including 400 MMcfd from Aliso Canyon) and all the pipeline receipt points into the SoCalGas system are full, with no additional outages or capacity loss of any kind.[17] It also assumes that electricity generators reduced their load to minimum levels.

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[13] Energy Emergency Alerts are defined at http://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-011-1.pdf.

[14] Core customers are the owners of residential homes and small businesses. Noncore customers are larger commercial customers, some of which burn natural gas to produce electricity.

[15] SoCalGas' assessment can be found at http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN221652_20171101T105131_103017_SoCalGas_Response_Letter_to_CPUC_CEC_with_Attachment_AE.pdf.

[16] SoCalGas' October 30 winter assessment cites a minimum inventory requirement of 43.3 Bcf. The ACTAG has no independent confirmation of this figure.

[17] SoCalGas Advice Letter No. 5139, May 19, 2017, projects Aliso Canyon withdrawal capability on October 1, 2017, to be 0.670 MMcfd based on 14.80 Bcf inventory. The withdrawal capability was based on the number of wells

The higher risk of curtailments this winter are largely the result of significant and unprecedented unplanned outages on SoCalGas pipelines combined with a series of other planned maintenance requirements and delays in returning facilities to service. Had these outages not occurred the system would be more able to respond to peak demand.

All the mitigation measures put in place last winter will need to continue. Several new ones have been added or are being considered. Most significantly, LADWP has delayed planned transmission upgrades until February 1, 2018. This delay will reduce LADWP's minimum gas requirements early in the winter while SoCalGas' system capability is lower due to maintenance and outages. The CPUC is pursuing additional requests for gas demand response and conservation programs using smart thermostats and is investigating an emergency moratorium on new gas service connections in Los Angeles County served by Aliso Canyon. Furthermore, the ACTAG offers several other potential mitigation measures later in this report, including greater outreach for energy conservation.

INTRODUCTION

This supplement focuses on the impacts to the gas and electric systems during winter 2017-18. It relies on the same gas system hydraulic modeling assumptions and results as presented in the previous Aliso Canyon Winter Risk Assessment Technical Report (released August 23, 2016). It also recognizes that SoCalGas released its own technical assessment on October 30, 2017, as part of its response to the October 19 request from CPUC President Michael Picker and Energy Commission Chair Robert Weisenmiller. The ACTAG has engaged in discussions with SoCalGas about its analysis as well as the analysis completed by the ACTAG. While the ACTAG treats certain assumptions on the SoCalGas system slightly differently than SoCalGas, the two assessments reach similar conclusions about the risk of gas curtailments this winter and impacts to electric generation.

The key update in this winter's analysis is the incorporation of recent outages that together reduce pipeline capacity from 3,325 MMcfd to between 2,325 MMcfd and 2,675 MMcfd and storage supplies by 260 MMcfd depending on the timing of repairs. The analysis also incorporates two key gas system mitigation measures that replace some of the lost capacity, increasing system capacity by 350 MMcfd. This results in an effective total system capacity without Aliso Canyon for the upcoming winter that ranges from 3,657 at the beginning of the winter to 4,117 MMcfd after December 30, 2017.[18]

On the electricity side, this supplement still assumes that all transmission lines are in service except for LADWP's Valley-Rinaldi Lines 1 and 2 (post-February 1, 2018) and able to import incremental energy that would otherwise be generated inside the balancing area with natural gas. It also assumes that there is sufficient energy available from external suppliers at the quantity and duration necessary to meet these energy import requirements. The minimum gas required is similar to last winter's until February 1, 2018,

SoCalGas expected to bring back to service. However, the number of wells in service is likely less than included in its projection this past May.

[18] This higher number reflects the current estimated return-to-service date for Line 4000, which is December 30, 2017. The actual return-to-service date could vary significantly.

when LADWP begins planned upgrades to the conductors on one of its key in-basin transmission lines. This work increases LADWP's gas requirements in the short term, but in the longer term will allow LADWP to import more renewable energy generated from outside its service area and reduce its gas requirement.

This supplement also presents an updated gas balance simulating operations over the winter season for normal 1-in-2 year weather conditions, 1-in-10 year cold and dry conditions, and an extreme peak winter day with 1-in-35 year demand by core customers. The gas balance provides a detailed analysis of the capacity assumed available and the capacity-related mitigation measures. It also simulates the impact of storage withdrawals, calculating month-end inventory.

Current Operating Status of SoCalGas System

The maximum gas sendout the SoCalGas system can achieve depends on its system conditions (i.e., demand, available operating pipeline capacity, and the ability to withdraw gas from storage) and any facility outages in effect. The results from the 2016-17 winter assessment found that SoCalGas maximum system sendout without Aliso is 4,668 MMcfd assuming 100 percent pipeline utilization with no outages. With Line 3000 remaining out of service, system capacity is reduced to 4,567 MMcfd. This figure is then reduced by 200 MMcfd since Line 2000 has been operating at 80 percent capacity since 2011. This reduces system capacity to 4,367 MMcfd absent delivery of additional supply into SoCalGas' Southern Zone via Otay Mesa. (This reduction was not incorporated into the previous winter analysis.) On October 1, 2017, SoCalGas Line 235-2 ruptured, simultaneously damaging the nearby Line 4000. Together, these outages further reduced SoCalGas system capacity by 800 MMcfd. Planned maintenance at the Playa del Rey storage field reduces supply by another 260 MMcfd between November 7, 2017, and December 18, 2017. Line 4000 is expected to remain out of service until December 30, 2017, at which time 350 MMcfd of the lost 800 MMcfd in capacity is expected to be restored. The utility has not yet indicated when Line 235-2 will return to service.

In response to the outages, SoCalGas and its customers implemented mitigation measures to increase supplies into its system. The first mitigation measure temporarily increases capacity at Kramer Junction by 150 MMcfd of interruptible capacity until Line 4000 returns to service. The operational capacity above firm is available subject to system operating conditions. Under current system operating conditions and gas nomination flow patterns, Kern River says it can deliver 700 MMcfd to Kramer Junction.[19] The second mitigation measure is aimed at using the full capability of the Southern Zone by obtaining capacity to bring in 200 MMcfd at Otay Mesa. Supplies at Otay Mesa are anticipated to be delivered from the El Paso system via the North Baja and Gasoducto Baja Norte pipelines.[20] Table 2

[19] Energy Commission staff contacted Kern River Gas Transmission (Kern) on November 3, 2017, to understand how often Kern can deliver the full 700 MMcfd instead of the normal 550 MMcfd. Kern indicated that it can do so daily "under current system operation conditions and gas nomination patterns."

[20] If these supplies do not materialize, SoCalGas would still have the option of bringing LNG to Costa Azul and delivering it into San Diego Gas & Electric (SDG&E) at Otay Mesa. Previously, the ACTAG believed as much as 400 MMcfd could be delivered via Otay Mesa, capped by daily demand on the SDG&E system. Recently the ACTAG has learned that the line capacity west of Moreno is inadequate to move all of the 1010 MMcfd deliverable at

presents the adjusted pipeline capacity and supply assumptions with and without supply-side mitigation measures.

Table 2: Adjusted SoCalGas Sendout Assumptions (MMcfd)

(MMcfd)	**Period 1: Present-12/18/2017** Outage on Lines 3000, 4000, and 235-2; Maintenance at Playa del Rey	**Period 2: 12/18/2017-12/30/2017** Outage on Lines 3000, 4000, and 235-2	**Period 3: Post 12/31/2018** Outage on Lines 3000 and 235-2
Supported Gas Demand from Table 1 of the 2016 Winter Assessment (Includes Line 3000 Outage)	4,567	4,567	4,567
Combined Outage Lines 4000/235-2	(800)	(800)	(450)
Playa del Rey Maintenance	(260)	0	0
Reduced Operating Pressure at Ehrenberg	(200)	(200)	(200)
Total Supported Demand: No Mitigation	3,307	3,567	3,917
Mitigation 1: Otay Mesa	200	200	200
Mitigation 2: Kramer Junction (Interruptible)	150	150	0
Total Supported Demand with Mitigations	3,657	3,917	4,117

* All scenarios assume 100% pipeline utilization and no withdrawal from Aliso Canyon.

The ACTAG has assumed that the additional outages reduce system capacity on a one-for-one basis. This is consistent with the prior hydraulic analyses. On that basis, the ACTAG believes that a new hydraulic analysis is not required. The Independent Review Team concurs that the assumed one-for-one reduction in system capacity from the additional outage is reasonable and that a new hydraulic analysis is therefore not required. The ACTAG has nonetheless requested a new hydraulic analysis from SoCalGas. That analysis is not yet complete, and the ACTAG will supplement this assessment as needed should that analysis show different results.

If Southern California experiences a peak cold day before Lines 4000 and 235-2 and Playa del Rey return to service, SoCalGas will be unable to meet demand without using some gas from Aliso Canyon. Even using gas from Aliso Canyon, the withdrawal capability will only be sufficient to meet the higher extreme

Ehrenberg into the LA Basin. See p. 58 of February 24, 2004, proposal of SoCalGas and SDG&E in Order Instituting Rulemaking (R.) 04-01-025. This means that some SDG&E demand must be served via Moreno if the full 1010 MMcfd comes in at Ehrenberg. The consequence is that 400 MMcfd could only be delivered via Otay Mesa on a very high-use day in San Diego; roughly 200 MMcfd can be delivered and placed on a firm basis.

peak day demand if enough inventory has been preserved in all four storage fields to support the higher withdrawal needed on such a day.[21]

The current system outages impact SoCalGas' ability to inject gas into its storage fields before the beginning of the winter season. However, during the summer season SoCalGas injected gas into its storage fields to prepare for winter. As of November 1, 2017, the inventory at SoCalGas' storage fields including Aliso Canyon was 67 Bcf. At this time last year, its storage fields held 60.9 Bcf. However, this higher level is more than offset by operational failures on the SoCalGas pipeline system.

LADWP AND CALIFORNIA ISO JOINT IMPACT ANALYSIS AND RESULTS

At the request of the CPUC and CEC, the California ISO and LADWP updated their joint winter seasonal assessment to analyze the natural gas requirements in the LA Basin and Southern California regions during the winter of 2017-18. This analysis determines how much natural gas the power plants must have in order to maintain transmission system reliability under normal and unexpected contingency conditions. The analysis was conducted for two time periods, one before LADWP begins its planned transmission upgrades and the other after LADWP begins the transmission upgrade work. LADWP postponed its transmission upgrades until February 1, 2018, in response to the outages on SoCalGas' system.

The minimum gas burn by electricity generators calculated here is significantly lower than the electricity-generator gas burn under normal circumstances. It is the absolute, extreme minimum that electricity generators must have to maintain electric reliability. This reduction in gas use from normal to minimum levels is effectively a curtailment of gas service to electricity generators. Replacing the generation that would have occurred with this gas means the electricity balancing authorities have replaced generation to other, less-desirable, and more expensive facilities in order to reduce their gas requirement and the stress on the gas system.

Assumptions

The key assumptions on the electricity side consist of a) the electricity load forecast, b) available electricity imports, and c) the impacts of an N-1 contingency, or outage, event.

A. Electricity Load Forecast. The 1-in-10 peak winter load electricity demand forecast for Southern California totals 21,571 MW. It breaks down as follows:
   - SCE = 13,888 MW
   - SDG&E = 3,184 MW

[21] SoCalGas Advice Letter No. 5139, May 19, 2017, projects Aliso Canyon withdrawal capability on October 1, 2017, to be 670 MMcfd based on 14.80 Bcf inventory. The withdrawal capability was based on the number of wells SoCalGas expected to bring back to service. However, the number of wells in service is likely less than included in their projection this past May. An inventory level higher than 14.8 Bcf will increase the withdrawal capacity of individual wells and partially offset a reduction in the number of wells available. Without a flow test, the ACTAG has no better estimate of the current withdrawal capability at Aliso Canyon.

- LADWP = 4,499 MW

B. Imports. The analysis assumes Southern California imports of 15,701 MW of electricity. This is higher than the 13,000 MW of winter imports achieved historically and is based on available transmission capacity. The actual level of imports achievable will depend on the availability of transmission and energy on the days and hours when needed.

C. Outages. The analysis takes into account planned transmission outages. For unplanned facility outages, the analysis reflects an N-1 contingency event assumed to reduce energy available by 503 MW for LADWP and 2,000 MW for the California ISO.[22]

Results

The results below are split into a minimum gas requirement under normal conditions versus a higher gas requirement should electricity system N-1 events occur.

Normal conditions, before LADWP starts their transmission upgrades (Before February 1, 2018)

The total gas burn required to support electric generation in Southern California is projected at 38.2 MMcfd. This is under normal conditions and excludes gas required by Qualifying Facilities (QFs).[23] Of this, 15.8 MMcfd is required by LADWP and 22.4 MMcfd is required by the California ISO. The two balancing authorities must be able to obtain at least this amount of gas in order to maintain electricity reliability.

To recover from an N-1 contingency (Before February 1, 2018)

A contingency (outage event) that would impact both LADWP and California ISO is the most severe electric contingency that could occur in the Southern California region. The gas requirement increases in order to recover from an N-1 electric contingency event as gas-fired generation must be available to replace the lost electricity system component. This higher gas requirement lasts until the lost component can be restored. This gas quantity from an outage event is assumed to be available in the event of an electric system contingency to meet NERC reliability requirements.

The most severe N-1 contingency equates to a loss of 2,000 MW for the California ISO and 503 MW for LADWP. Replacing this lost energy means the California ISO will require an additional gas requirement of 74 MMcfd of natural gas; for LADWP the gas requirement will increase by 53 MMcfd. The total gas needed to cover the additional (non-simultaneous) worst contingency for the ISO and LADWP above normal conditions is based on the higher of the two requirements shown in the following formula:

$$\max(74\ \text{MMcfd}, 53\ \text{MMcfd}) = 74\ \text{MMcfd}$$

Table 3 presents a summary of the minimum generation gas requirements before February 1, 2018.

[22] N-1 is the loss of any generator, transmission line, transformer, or shunt device without a fault or single pole block on a high voltage direct current (HVDC) transmission line

[23] A qualifying facility is a qualifying cogeneration facility or qualifying small power production facility, as defined in the Code of Federal Regulations, Title 18, Part 292.

Table 3: Minimum Generation Gas Requirements Before February 1, 2018 (MMcfd)

Condition	CAISO	LADWP	Total
Normal	22.4	15.8	38.2
N-1	74	53	38.2 + 74 = 112.2

Figure 1 below shows the hourly minimum daily generation needed in both the LADWP and the California ISO balancing authorities to meet normal conditions and to recover from a non-simultaneous contingency on a peak winter day. The generation need is translated into a gas requirement of 38.2 MMcfd and 112.2 MMcfd without the QFs under normal and N-1 contingency conditions, respectively. Table 4 shows the peak hourly generation and gas burn by zone in the SoCalGas area.

Figure 1: Winter Generation in the SoCalGas area (without QFs) before February 1, 2018

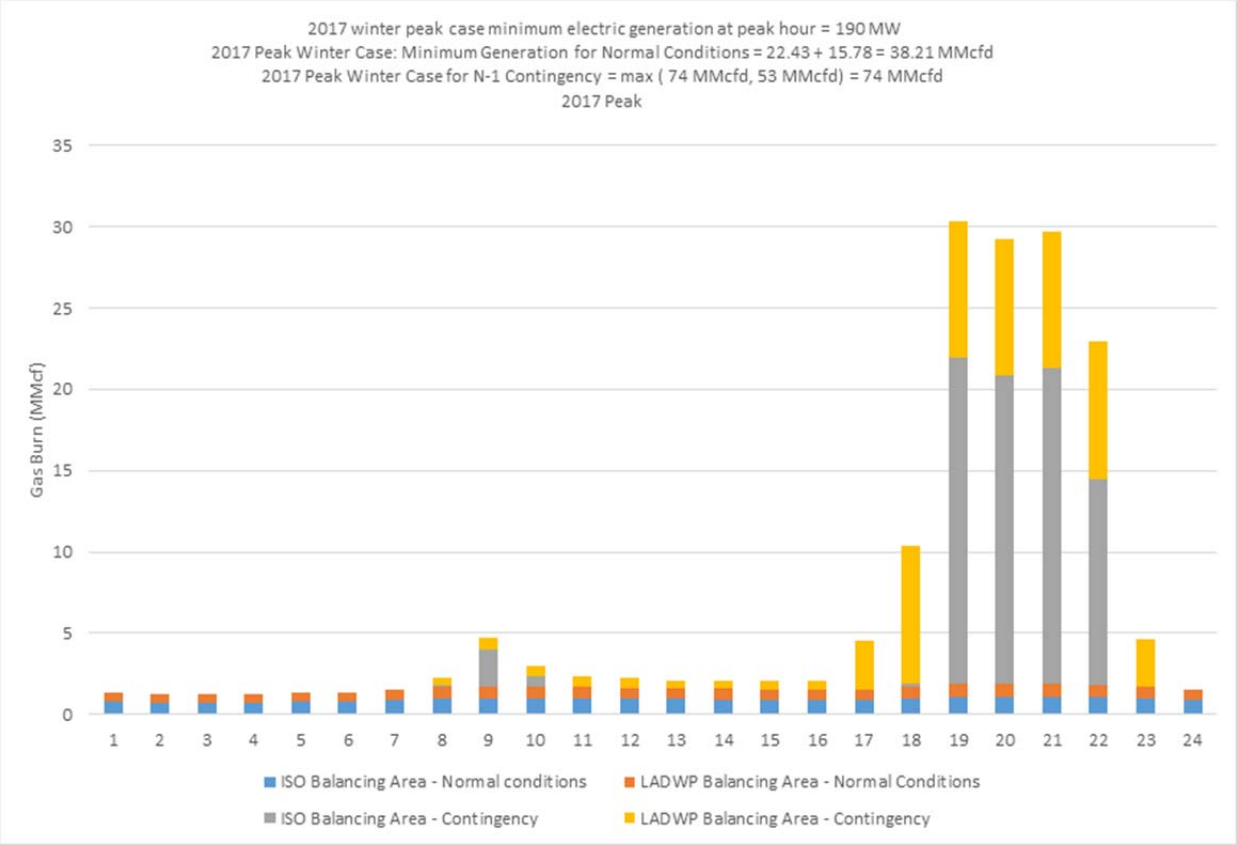


Table 4: 1-in-10 Peak Winter Case without QFs: Peak Hour Energy (MW) and Gas Burn (MMcf per hour) for SoCalGas Area Before February 1, 2018

Zone	Gen (MW)	Gas Burn (MMcfh)
Burbank	0.00	0.00
Coastal	0.00	0.00
Glendale	0.00	0.00
Inland	0.00	0.00
LA Basin	0.00	0.00
LADWP	75.00	0.73
Riverside	45.00	0.44
SDG&E	0.70	0.01
SJV	69.40	0.67
Grand Total	**190.10**	**1.85**

Normal conditions, after LADWP starts their transmission upgrades (After February 1, 2018)

After February 1, 2018, the total gas burn required to support electric generation in Southern California is projected to be 219.3 MMcfd. This is under normal conditions and excludes gas required by Qualifying Facilities (QFs). Of this, 196.9 MMcfd is required by LADWP, while the California ISO requirements remain the same at 22.4 MMcfd as presented in Table 5.

Table 5: Minimum Generation Gas Requirements After February 1, 2018 (MMcfd)

Condition	CAISO	LADWP	Total
Normal	22.4	196.9	219.3
N-1	74	53	219.3 + 74 = 293.3

To recover from an N-1 contingency after February 1, 2018

The gas requirement to recover from an N-1 electric contingency event is the same pre- and post-February 1, 2018: 74 MMcfd.

Figure 2 below shows the hourly minimum daily generation needed in both the LADWP and the California ISO balancing authorities to meet normal conditions and to recover from a non-simultaneous contingency on a peak winter day after February 1, 2018. The generation need is translated into a gas requirement of 219.3 MMcfd and 293.3 MMcfd without the QFs under normal and N-1 contingency conditions, respectively. Table 6 shows the peak hourly generation and gas burn by zone in the SoCalGas area.

Figure 2: Winter Generation in the SoCalGas Area without QFs After February 1, 2018

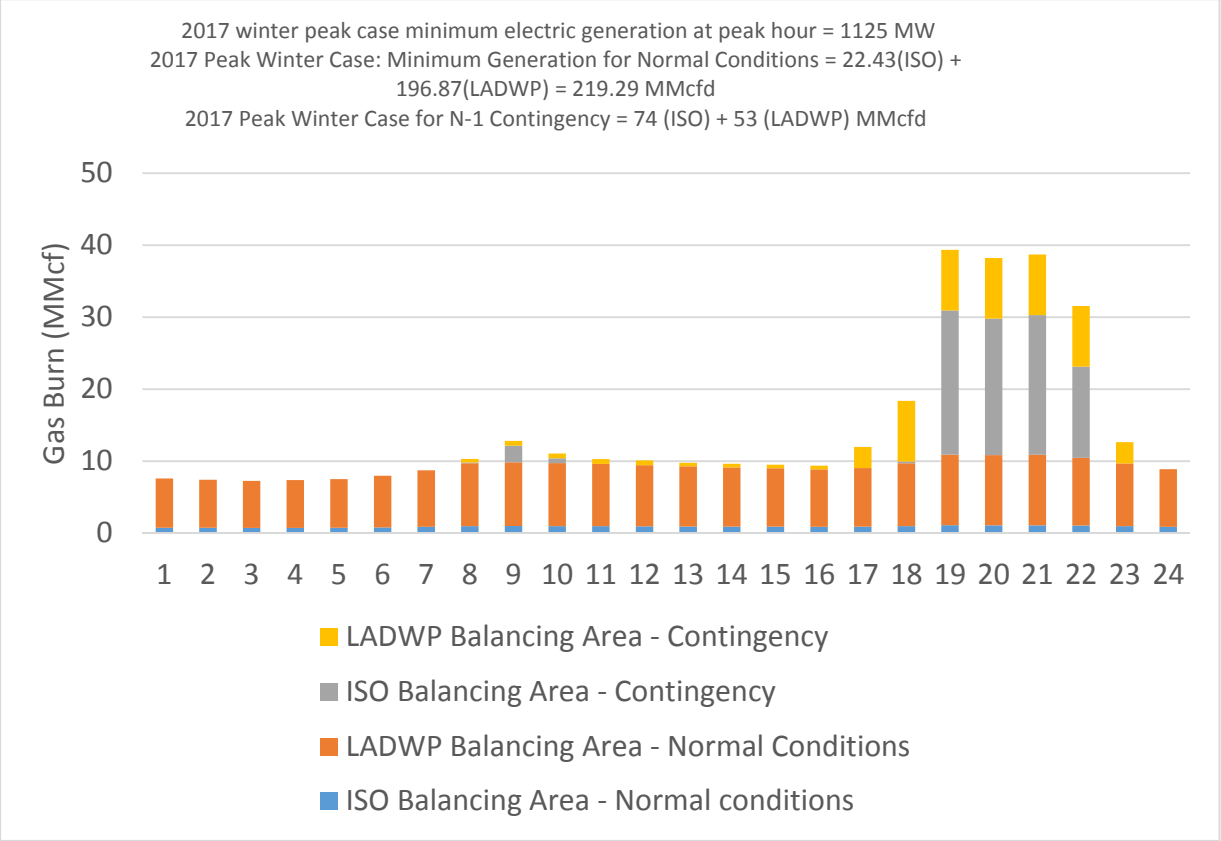


Table 6: 1- 10 Peak Winter Case without QFs: Peak Hour Energy (MW) and Gas Burn (MMcfh) for SoCalGas area After February 1, 2018

Zone	Gen (MW)	Gas Burn (MMcfh)
Burbank	165.00	1.60
Coastal	0.00	0.00
Glendale	15.00	0.15
Inland	0.00	0.00
LA Basin	0.00	0.00
LADWP	830.00	8.06
Riverside	45.00	0.44
SDG&E	0.70	0.01
SJV	69.30	0.67
Grand Total	**1125.00**	**10.93**

Table 7 provides a summary of electric impact on the 2017-2018 winter gas assessment.

Table 7: Summary of Electric Impact on 2017-2018 Winter Gas Assessment

Row	Description	Formula	Before February 1, 2018	After February 1, 2018
1	Actual ISO SoCalGas system gas burn on January 14, 2013 (MMcfd)[24]		685	685
2	Actual LADWP balancing area gas burn on January 14, 2013 (MMcfd)		200	200
3	Combined actual ISO and LADWP gas burns (MMcfd)	row 1 + row 2	885	885
4	ISO SoCalGas system gas burn with minimum generation — with all transmission lines in service and no outages (MMcfd)		22	22
5	LADWP balancing area gas burn with minimum generation — with all transmission lines in service and no outages (MMcfd)		16	197
6	ISO SoCalGas system gas burn to cover additional worst contingency (MMcfd)		74	74
7	LADWP balancing area gas burn to cover additional worst contingency (MMcfd)		53	53
8	Combined ISO and LADWP minimum generation gas burn including the higher of the additional worst contingency from LADWP and ISO (MMcfd)	row 4 + row 5 + max(row 6, row 7)	112	293

Difference between 2016-2017 analysis and 2017-2018 analysis (Before February 1, 2018)

In the 2016-17 winter assessment, the extreme minimum gas burn was 0 MMcfd for LADWP and 22 MMcfd for the California ISO based on the assumption that all transmission lines were in service with import energy to meet load requirements. The ACTAG anticipated that these very low gas burn requirements were sustainable only for a short period of time and such a reduction would occur infrequently because they would be limited to the most extreme conditions on the gas system.

In the 2017-18 winter assessment, the extreme minimum gas burn for LADWP increases to 15.8 MMcfd. The extreme minimum for the California ISO remains at 22.4 MMcfd under normal conditions. The increase in LADWP minimum generation was due to the Westside demand for Los Angeles being greater than the previous Aliso Canyon study case and thus the N-1 contingency of Tarzana-Olympic 230kV Line 3 stresses Tarzana-Olympic 138kV Line 1. This revised minimum generation estimate uses the

[24] January 14, 2013, was chosen for this analysis because it was the highest peak day in recent years. The winter 2016-17 assessment uses this same day.

Scattergood (RS-L) Phase Shifting Transformer to its maximum capability to unload the stressed transmission; even so, some generation is still required.

Difference between 2016-17 analysis and 2017-18 analysis (After February 1, 2018)

After February 1, 2018, the extreme minimum gas burn for LADWP increases to 197 MMcfd, and the California ISO's remains at 22.4 MMcfd. This increase in estimated minimum gas burn is caused primarily by transmission work planned on the LADWP system, which increases LADWP's reliability must-run (RMR) generation requirement.[25] Table 8 shows that the LADWP RMR requirements after February 1, 2018, are more than five times greater than in 2016-17.

Table 8: LADWP RMR Generation After February 1, 2018

Plant	2016-17 Study, MW	2017-18 Study, MW
Haynes	0	500
Scattergood	25	100
Valley	0	230
Burbank	165	165
Glendale	0	15
Total	**190**	**1,010**

Last winter, all LADWP circuits were available. On February 1, 2018, LADWP plans to begin upgrades to its 138/230kV LA Basin Transmission System: Valley-Rinaldi Lines 1 and 2. These outages are necessary to increase the ratings of the circuits by upgrading their conductors, which will increase the ability to import energy, but it is work that must be performed with the circuits de-energized. This work is the first phase of LADWP's transmission system infrastructure improvement program that will require similar season-long outages on other circuits over the next several winter seasons.

These infrastructure improvements are necessary to mitigate existing transmission congestion in the LA Basin. In the future, they will allow LADWP to import more renewable energy into the LA Basin from the north and east. However, during the extended outages on these presently congested paths, far more RMR generation is required to be on-line in the LADWP portion of the LA Basin than in the winter of 2016-17 to: (1) relieve increased flow on remaining circuits that become more heavily loaded during the outages, and (2) prevent exposing other circuits to damaging overloads following the most critical transmission contingency.

Because of these extended outages, the most severe electric contingency for LADWP differs from that of 2016-17. The most critical contingency in the 2016-17 analysis was the loss of the Pacific DC intertie (PDCI), while the most critical loss in the 2017-18 analysis was the Adelanto-Toluca 500kV line 1. Since LADWP's RMR generation is projected to be much higher in winter 2017-18 than in the past, LADWP's recovery from loss of the PDCI requires no additional gas-fired generation to be dispatched from LADWP's fleet. Due to the extended outages described above, loss of LADWP's Adelanto-Toluca 500kV Line 1 is more critical than loss of the PDCI, and recovering from it requires more generation as shown in

[25] Reliability Must-Run (RMR) generation is the amount of generation required to provide transmission reliability.

Table 9. Under normal conditions, 1,010 MW of RMR generation is required, but under N-1 contingency conditions 1,513 MW of RMR generation is required, an increase of 503 MW.

Table 9: LADWP Post-Contingency Generation After February 1, 2018

Plant	LADWP RMR Generation in MW Before Loss of Adelanto-Toluca Line 1	LADWP Generation in MW Required to Recover from Loss of Adelanto-Toluca Line 1	Increase in LADWP Generation in MW to Recover from Loss of Adelanto-Toluca Line 1
Haynes	500	950	450
Scattergood	100	100	None
Valley	230	283	53
Burbank	165	165	None
Glendale	15	15	None
Total	**1,010**	**1,513**	**503**

Potential Gas Curtailment for Electric Generation

Determining the potential gas curtailment for electric generation is a two-step process. The first step is to calculate an adjusted winter peak day gas demand incorporating the minimum electric generation requirements. The next step is to compare the adjusted winter peak demand to the SoCalGas supportable demand or system sendout as shown in Table 2 (above). The impact on electric generation, shown in Table 7 (above), is based on the post N-1 contingency minimum generation combined gas burn of 112.2 MMcfd for the LADWP and California ISO before February 1, 2018, and 293.3 MMcfd after February 1. The analysis considers the amount of electric generation that can be curtailed from what the gas burn would otherwise be on a 1-in-10 peak gas demand day.

Table 10 shows the gas demand that SoCalGas estimates to be needed for normal electric generation on a 1-in-10 peak day (900 MMcfd). It also shows the minimum gas demand necessary to support electric generation under N-1 contingency conditions before and after February 1, 2018, as calculated by LADWP and the California ISO. Before February 1, 2018, electric generation can be curtailed by as much as 788 MMcfd below normal on a peak winter day and still maintain electric reliability that allows the ability to import curtailed gas generation from external generation resources. After February 1, 2018, electric generation can be curtailed by up to 607 MMcfd while maintaining reliability.

Table 10: 1-in-10 Winter Peak Day Demand, Normal and Minimum Electric Generation (MMcfd)

Winter Demand (MMcfd)	**1-in-10 Peak Day Normal Electric Generation[26]**	**1-in-10 Peak Day Minimum Electric Generation, N-1 Contingency, Present to Jan. 31, 2018**	**1-in-10 Peak Day Minimum Electric Generation, N-1 Contingency; LADWP Maintenance Work, Post Feb. 1, 2018**
Core	3,250	3,250	3,250
Noncore, Non-Electric Generation	805	805	805
Noncore, Electric Generation	**900**	**112**	**293**
Total	4,955	4,167	4,348
Estimated Implied Electric Generation Curtailment[27]	N/A	788	607

Operating the electricity system at these minimum levels assumes importing electricity to avoid using local gas-fired electric generation, resulting in an increased cost to serve electric load. It also assumes there is sufficient energy available from external suppliers at the quantity and duration necessary to meet the energy import requirements.

Table 11 compares the SoCalGas system sendout shown in Table 2 (above) to the adjusted winter peak day demand shown in Table 10. The results show supported demand without Aliso Canyon is insufficient to meet the 1-in-10 customer demand, even when it is adjusted to put electric generators at minimum levels. The resulting shortfalls range from 50 MMcfd to 510 MMcfd depending on the time period. The time period reflects the various gas system outages in place during that time and whether LADWP has begun its transmission maintenance work. Shortfalls of this magnitude are serious and imply curtailments of gas service to other noncore customers, such as refineries and large manufacturers. Should a 1-in-10 day occur the options come down to either withdrawing gas from Aliso Canyon or curtail other noncore customers, as any or cut in electric generation once generators are at their calculated minimum would result in electric load shed.

[26] Default reference values estimated by SoCalGas to show readers the magnitude of the voluntary curtailment.
[27] This represents the maximum voluntary reduction in gas use by EG

Table 11: Shortfall on a 1-in-10 Peak Day with Minimum Electric Generation and an N-1 Contingency

(MMcfd)	Present-12/18/2017	12/18/2017-12/30/2017	12/30/2017-1/31/2018	Post-2/1/2018
1-in-10 Customer Demand with Generation Adjusted to Minimum Levels	4,167	4,167	4,167	4,348
Supported Demand without Aliso Canyon	3,657	3,917	4,117	4,117
Shortfall without Aliso Canyon	-510	-250	-50	-231

Winter Gas Balance Analysis

The Energy Commission updated the gas balances it prepared for last winter's technical assessment. A gas balance allows one to assess the gaps between capacity and demand that must be met with gas from storage and to see the impacts of storage drawdown over the course of the winter season. The three tables below present balances for a 1-in-2 normal temperature condition winter, a 1-in-10 "cold and dry" winter, and an extreme winter peak day with 1-in-35 year demand for core customers. All three demand cases come from the gas demand forecast from the 2016 California Gas Report prepared by California's gas utilities with some oversight by staff at the CPUC and Energy Commission.[28] Note that the gas balance is not meant as a projection of what will happen; rather, it is a tool to demonstrate what would happen if the demand, supply, and storage assumptions shown in fact occur.

Another caveat is to recognize that the demand forecasts used are for average daily consumption for each month. Individual days will have higher and lower demand than the averages shown. Weekends can be expected to be lower; days closer to the end of December and beginning of January will likely be higher.

In last winter's analysis, the gas balance showed the storage withdrawals needed to meet demand could be made while achieving a 10 percent "reserve" margin. For this winter, the balance reflects 2,385 MMcfd of pipeline capacity being available on a firm basis, before reflecting the mitigation measures. Capacity at individual receipt points is the same as in the summer 2017 analysis and is broken out in detail in the gas balance tables allowing one to easily assess alternate assumptions. The gas balance also assumes 67 Bcf of storage in inventory on November 1.[29] Any higher inventory that SoCalGas achieves above this level will mitigate these results somewhat. Likewise, any higher pipeline capacity that SoCalGas can achieve, either by getting lines back into service or on an interruptible basis, will mitigate these results, as will weather that is warmer than normal.

[28] SoCalGas' October 30 Assessment states that it also used a demand forecast from the 2016 California Gas Report. SoCalGas has confirmed to the ACTAG that it used the forecast for months from November 2016 to March 2017 instead of November 2017 to March 2018. SoCalGas also converted the data to monthly totals and in so doing applied 28 days to January and 31 to February.

[29] Daily operating data posted on the SoCalGas Envoy electronic bulletin board showed a total inventory in gas storage of 67 Bcf on November 1, 2017, versus a 61 Bcf inventory on November 1, 2016 (including gas stored at Aliso Canyon).

The first finding from this winter's analysis is that, even with the mitigated capacity level of 2,660 MMcfd assumed available on a firm basis due to SoCalGas' current pipeline outages (at least until December 30 when it increases to 2,935 MMcfd), the 10 percent reserve margin cannot be maintained. The balances instead show storage withdrawals to achieve 0 percent margin. The withdrawal quantities shown are those required to meet demand, within general average daily maximums, and end of season inventory. The balances break out approximate withdrawals and inventories for the other three fields (OTFs) versus those for Aliso Canyon. This effectively identifies the demand that cannot be served absent withdrawals from Aliso Canyon. The balance does not constrain the Aliso Canyon withdrawals or the minimum inventory there except to try and use prudent levels of average withdrawals from the other three fields first.

In the normal weather case, storage inventory is drawn down to 47 Bcf at the end of December and 41 Bcf at the end of January. The balance projects a small amount of gas — an average of 41 MMcfd — to be needed from Aliso Canyon in December. Not using gas from Aliso Canyon would mean curtailing noncore load. Otherwise, the additional capacity at Kramer Junction combined with delivering 200 MMcfd at Otay Mesa appears adequate to avoid curtailments of gas service to noncore customers, looking only at average demand for each month and assuming no other outages, with full deliveries at each receipt point.

The cold winter demand case provides starker results. Withdrawals to serve all load in November and December would pull total inventory down to 32 Bcf and would draw Aliso Canyon inventory below even the 15 Bcf maintained there since January 2016. January 2018 looks better as Line 4000 comes back into service. This, however, leaves storage virtually empty by the end of February — a full month early —with inadequate inventory to provide protection to electricity generators until some gas can be reinjected.

On an extreme peak day, which reflects a temperature condition and core customer load expected to occur once in 35 years, the assumed draw from storage is the same as in last winter's analysis: 2,040 MMcfd.[30] Given the storage inventory level shown at the end of December in even the normal demand case, it is not clear that SoCalGas would have enough pressure in its storage fields to be able to withdraw the assumed amount.[31] Preserving the ability withdraw at this level appears to require curtailing noncore load in December. That being said, if electricity generators can reduce their demand to the 112 calculated by CAISO and LADWP shown in Table 3, the deliverability balance stays positive with a margin of 465 MMcfd. Recall that the balance for an extreme peak day is a one-time single event rather than an event of month-long duration. The storage withdrawals shown are sustainable only for a

[30] This figure represents an assumed 300 mmcf from Playa del Rey, 340 MMcfd from La Goleta, 1,000 MMcfd from Honor Rancho, and 400 MMcfd from Aliso Canyon. These are generally the maximum withdrawals that could be achieved.

[31] SoCalGas, in its October 30 Technical Assessment, cited inventory requirements of 43.3 Bcf as the level needed at the end of December to support the maximum withdrawals needed should an extreme peak day event occur in January. The technical assessment team knows of no publicly-vetted analysis that verifies the 43.3 Bcf or the relationship between storage withdrawal capability and inventory.

few days and only if sufficient volumes are held in inventory. In terms of arithmetic, should a withdrawal of 2,040 MMcfd not be achievable, the deliverability balance shown would decrease on a one-for-one basis.

The gas balances run through next summer and fall. This yields a first look — if the weather and outages require storage inventories to be drawn, as projected here, to very low levels this winter — at what the refill might look like. The longer-term look assumes that Line 3000 comes back into service May 1 and that getting some gas back into storage early is important to maintaining protection to electric generation should a summer peak day for electricity occur. The balances suggest reasonable inventory levels can be achieved by the end of May.

Table 12: Normal (Average Temperature) Winter Gas Balance by Month With Gas System Mitigation

SoCalGas Monthly Gas Balance NORMAL WEATHER		2017		2018											
CGR Demand (MMcfd)		**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Core		1,077	1,490	1,428	1,386	1,148	1,004	751	692	630	608	628	714	1,072	1,483
Noncore including EG		1,124	1,153	1,158	1,140	1,033	1,049	1,063	1,089	1,362	1,408	1,526	1,270	1,100	1,136
Wholesale & International		423	518	505	510	419	401	358	377	374	374	392	391	422	521
Co. Use and LUAF		33	40	39	38	33	31	27	27	30	30	32	30	33	40
Subtotal Demand		2,657	3,201	3,130	3,074	2,633	2,485	2,199	2,185	2,396	2,420	2,578	2,405	2,627	3,180
Storage Injection (Other Three Fields)		0	0	0	0	0	100	135	100	0	0	0	0	0	0
Storage Injection (Aliso)		0	0	0	0	0	50	10		0	0	0	0	0	0
Storage Injection Total		0	0	0	0	0	150	145	100	0	0	0	0	0	0
System Total Throughput		2,657	3,201	3,130	3,074	2,633	2,635	2,344	2,285	2,396	2,420	2,578	2,405	2,627	3,180
Supply (MMcfd)															
California Line 85 Zone		60	60	60	60	60	60	60	60	60	60	60	60	60	60
Wheeler Ridge Zone		765	765	765	765	765	765	765	765	765	765	765	765	765	765
Blythe (Ehrenberg) into Southern Zone		1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010
Otay Mesa into Southern Zone		100	200	200	200	0	0	0	0	0	0	0	0	0	0
Kramer Junction into Northern Zone		625	625	550	550	550	550	550	550	550	550	550	550	550	550
North Needles into Northern Zone		0	0	350	350	350	350	350	350	350	350	350	350	350	350
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0	0	540	540
Sub Total Pipeline Receipts		2,560	2,660	2,935	2,935	2,735	2,735	2,735	2,735	2,735	2,735	2,735	2,735	3,275	3,275
Storage Withdrawal (Other Three Fields)		97	500	195	139	0	0	0	0	0	0	0	0	280	220
Storage Withdrawal (Aliso)		0	41	0	0	0	0	0	0	0	0	0	0	0	225
Total Supply		2,657	3,201	3,130	3,074	2,735	2,735	2,735	2,735	2,735	2,735	2,735	2,735	3,555	3,720
DELIVERABILITY BALANCE (MMcfd)		0	0	0	0	102	100	391	450	339	315	157	330	928	540
Reserve Margin		0%	0%	0%	0%	4%	4%	17%	20%	14%	13%	6%	14%	35%	17%
OTF Month-End Storage Inventory (Bcf)	45	42	27	21	17	17	20	24	27	27	27	27	27	18	12
Aliso Month-End Storage Inventory (Bcf)	22	22	21	21	21	21	22	23	23	23	23	23	23	23	16
Total Storage Inventory	67	64	47	41	37	37	42	46	49	49	49	49	49	41	27

Table 13: Cold Winter Gas Balance by Month with Gas System Mitigation

SoCalGas Monthly Gas Balance Cold Yr WEATHER		2017		2018											
CGR Demand (MMcfd)		**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Core		1,189	1,704	1,627	1,566	1,281	1,100	787	712	637	610	633	742	1,183	1,696
Noncore including EG		1,174	1,212	1,226	1,199	1,075	1,109	1,122	1,201	1,473	1,492	1,616	1,325	1,150	1,188
Wholesale & International		450	566	558	557	459	435	389	388	384	382	398	399	453	577
Co. Use and LUAF		35	44	43	42	35	33	29	29	31	31	33	31	35	44
Subtotal Demand		2,848	3,526	3,454	3,364	2,850	2,677	2,327	2,330	2,525	2,515	2,680	2,497	2,821	3,505
Storage Injection (Other Three Fields)		0	0	0	0	0	0	108	305	110	120	45	80	0	0
Storage Injection (Aliso)		0	0	0	0	0	50	300	100	100	100	10	0	0	0
Storage Injection Total		0	0	0	0	0	50	408	405	210	220	55	80	0	0
System Total Throughput		2,848	3,526	3,454	3,364	2,850	2,727	2,735	2,735	2,735	2,735	2,735	2,577	2,821	3,505
Supply (MMcfd)															
California Line 85 Zone		60	60	60	60	60	60	60	60	60	60	60	60	60	60
Wheeler Ridge Zone		765	765	765	765	765	765	765	765	765	765	765	765	765	765
Blythe (Ehrenberg) into Southern Zone		1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010
Otay Mesa into Southern Zone		100	200	200	200	115									
Kramer Junction into Northern Zone		625	625	550	550	550	550	550	550	550	550	550	550	550	550
North Needles into Northern Zone		0	0	350	350	350	350	350	350	350	350	350	350	350	350
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0	0	540	540
Sub Total Pipeline Receipts		2,560	2,660	2,935	2,935	2,850	2,735	2,735	2,735	2,735	2,735	2,735	2,735	3,275	3,275
Storage Withdrawal (Other Three Fields)		288	500	500	150	0	0	0	0	0	0	0	0	86	500
Storage Withdrawal (Aliso)			366	19	279	0	0	0	0	0	0	0	0	0	270
Total Supply		2,848	3,526	3,454	3,364	2,850	2,735	2,735	2,735	2,735	2,735	2,735	2,735	3,361	4,045
DELIVERABILITY BALANCE (MMcfd)		0	0	0	0	0	8	0	0	0	0	0	158	540	540
Reserve Margin		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	19%	15%
OTF Month-End Storage Inventory (Bcf)	45	36	21	5	1	1	1	5	14	17	21	22	25	22	9
Aliso Month-End Storage Inventory (Bcf)	22	22	11	10	2	2	4	13	16	19	22	23	23	23	14
Total Storage Inventory	67	58	32	15	3	3	5	18	30	36	43	45	47	45	23

Table 14: Winter Peak Day (1-in-35 Core Demand) Balance with Gas System Mitigation

SoCalGas Peak Day Gas Balance		
	Dec	**Jan**
Demand (MMcfd)		
Core	2,944	2,944
Noncore, Non-electricity generators	1,019	1,019
Electricity generators (Redispatched to Minimum with N-1 protection)	**112**	**112**
Total Demand	**4,235**	**4,235**
Supply (MMcfd)		
California Production	60	60
Wheeler Ridge Zone	765	765
Blythe (Ehrenberg) into Southern Zone	1,010	1,010
Otay Mesa into Southern Zone	200	200
Kramer Junction into Northern Zone	625	550
North Needles into Northern Zone	0	350
Topock into Northern Zone	0	0
Total Flowing from Receipt Points	**2,660**	**2,935**
Storage Withdrawal		
Three Others (PdR 300 +Goleta 340+HR 1000)	1,640	1,640
Aliso Canyon	400	400
Subtotal Gas from Storage	2,040	2,040
Total Supply	**4,700**	**4,975**
DELIVERABILITY BALANCE (MMcfd)	**465**	**740**
Reserve Margin %	**5%**	**17%**

ADDITIONAL MITIGATION MEASURES

All of the mitigation measures implemented previously will remain in place to help manage potential natural gas curtailments for the upcoming 2017-18 winter. (Certain of those measures are implemented via changes to California ISO's tariff and require approval by the Federal Energy Regulatory Commission.[32]) As indicated previously, LADWP has delayed until February the transmission upgrade work it had planned to begin in December, during its off-peak load season. This delay significantly reduces natural gas demand this winter. Beginning that work in February should allow LADWP to complete it in time for its summer peak.

The ACTAG expects, based on this assessment, SoCalGas will need to use gas from Aliso Canyon more this winter than last. First, the recent pipeline outages have furthermore significantly strained the SoCalGas system. Second, the minimum gas required to support electric generation is higher this winter. Last winter's analysis assumed the other three storage fields were used to the maximum extent achievable. With reduced pipeline capacity and the slightly higher minimum generation requirements from electric generators, the non-Aliso Canyon fields will likely be insufficient to serve all demand this winter. The likelihood of needing to use gas from Aliso Canyon is higher this winter than last and even that may not allow gas customers to avoid curtailments.

Several additional mitigation measures are under consideration. One is to launch greater outreach to encourage gas conservation by core customers and expand programs that use smart thermostats for demand response. On November 16, 2017, the CPUC asked SoCalGas to develop a program for implementation in December to allow dispatch of the thousands of smart thermostats that are already in place in the SoCalGas service area. It also asked that the program allow dispatching during several events per season, including during early morning and evening event periods; allow thermostat set point changes; enroll as many smart thermostat customers as possible (throughout the SoCalGas service area, not limited to the LA Basin); and increase the rebates to customers to facilitate enrollment and participation.[33] The CPUC will also work with both SoCalGas and Southern California Edison to continue current thermostat rebate programs.

Another potential measure is for Los Angeles County to implement an emergency moratorium on new natural gas service connections in the areas of the county served by Aliso Canyon. A moratorium on new connections would avoid increased demand for natural gas by residential, commercial, and industrial customers. Los Angeles County has allowed continued housing construction, for example, in the Porter Ranch area, where home prices average more than $1,000,000, and the costs of alternatives to gas heating (ground mount geothermal heat exchangers, as an example) are easily absorbed. One practical

[32] See http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.aspx

[33] See November 16, 2017, letter from CPUC Energy Division Director Ed Randolph to SoCalGas. http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN221814_20171117T141213_Letter_from_CPUC_to_SoCal_Gas_re_Demand_Response.pdf

amendment could allow large gas customers seeking a connection to sponsor demand response and energy efficiency efforts to offset their connection. The CPUC is investigating its ability to impose an emergency moratorium in the event the County is unwilling to act.

Another potential mitigation measure is for electricity generators to more frequently shift generation to facilities located outside SoCalGas system to reduce its gas use in December. This could allow SoCalGas to preserve storage inventories deeper into the winter. Doing so would increase the cost of electricity (and for the California ISO may require additional FERC approval),but smaller reductions in gas burns by electricity generators early in the winter could push off the need to implement minimum generation levels until later in the winter. Both CAISO and LADWP are prepared to respond to requests from SoCalGas to voluntary reduce gas demand to the extent possible. The idea here is to perhaps expand the frequency of those requests in hopes of reducing their magnitude. This measure could also have implications for core gas procurement cost that the CPUC would need to approve: core would use flowing supply coming in at the receipt points that might cost more than the gas it has in storage.

Another potential measure would be to slightly increase the volume of gas that can be stored at Aliso Canyon in order to maintain energy reliability in the region. Aliso Canyon has reached the maximum inventory, 23.6 Bcf, allowed under what is known as the Section 715 report. [34, 35] That maximum was calculated assuming one natural gas transmission line being out of operation, not three, and focused more on the withdrawal needed on a single day than on inventory needed through the winter. The ACTAG recommends updating the Section 715 report analysis to explore increasing the maximum target inventory by 1 Bcf to 3 Bcf in order to avoid virtually empty storage reserves at the end of a colder than normal winter.

Next, the supply-side mitigation measures in the gas balance (and in SoCalGas' October 30 analysis) assume 200 MMcfd of additional supply will be delivered via Otay Mesa. Should it be infeasible to deliver pipeline supply to Otay Mesa using the North Baja and Gasoducto Baja Norte pipelines, the assessment anticipates that SoCalGas will initiate efforts to instead acquire liquefied natural gas (LNG) for delivery via Otay Mesa. Noncore customers can also arrange to deliver supply and use the Otay Mesa receipt point and should in general prepare for interruption to gas supply.

Lastly, the situation this winter will require constant monitoring and weekly communication. The CPUC and Energy Commission have already been watching natural gas prices carefully for price spikes. Staff at both agencies is monitoring daily operations, including storage inventories and receipt point deliveries, and conferring with SoCalGas frequently. The California Office of Emergency Services has been briefed and the Legislature will be briefed with the release of this assessment. Updates to the public, including requests for additional conservation on high demand days, will be made as needed.

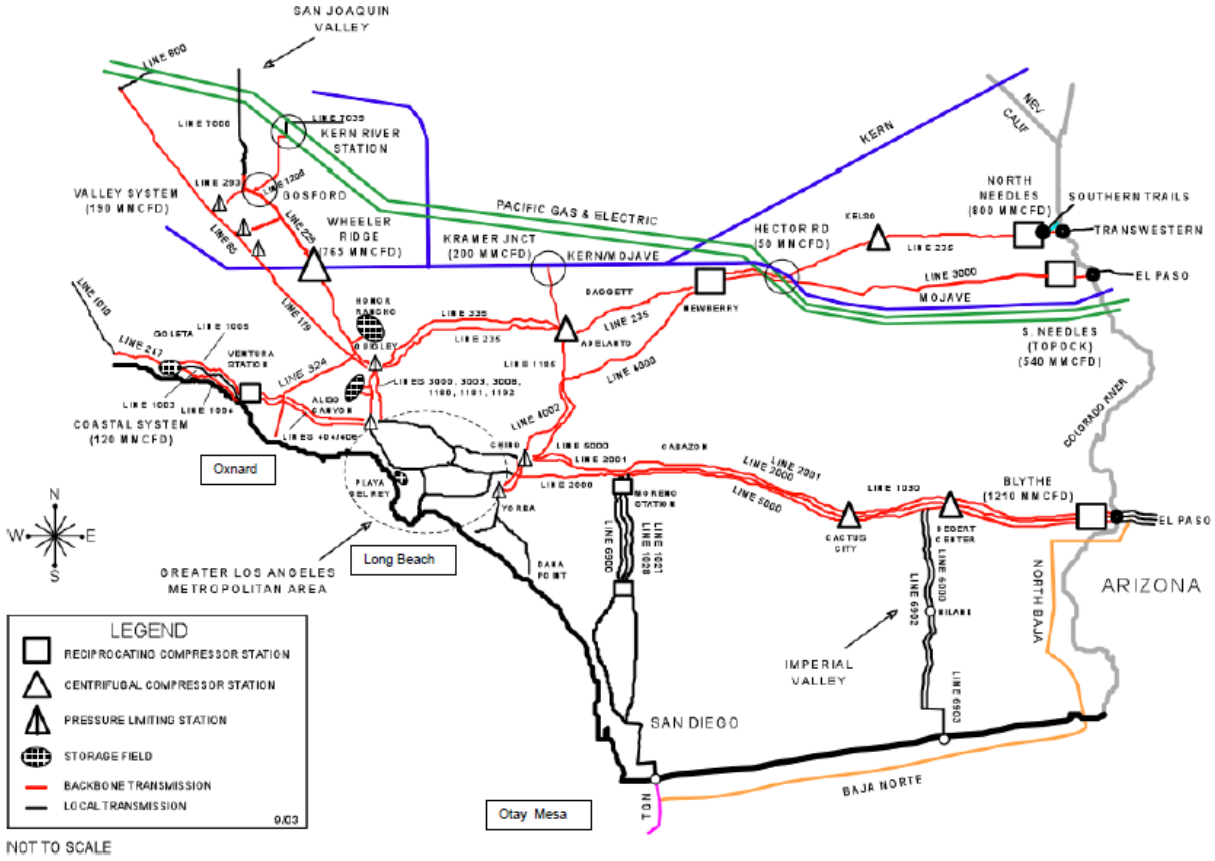
[34] http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/ReportReliability.pdf

[35] Public Utilities Code Section 715

CONCLUSION

Unprecedented pipeline outages (including an October 1, 2017, pipeline rupture) on the SoCalGas system mean that reliable natural gas service this winter to noncore customers, including electric generators, is threatened. This threat occurs even though there is more gas in storage than at this time last year. Any actions consumers take to reduce natural gas use in December will help preserve gas in storage for January (when 1-in-35 year demand days remain possible) would help. While the ACTAG offers several mitigation measures in this assessment, including using gas at Aliso Canyon, it is not clear that they and the prior measures already in place will be sufficient to avoid gas service curtailments to noncore customers in Southern California this winter. Assuming no additional gas system or electric transmission system outages and that full supplies arrive at the pipeline receipt points, the need for curtailments depends entirely on the weather and by how much consumers can decrease gas demand

APPENDIX A: SoCalGas System Map Highlighting Outages Affecting Northern Zone Receipts (Needles, Topock and Newberry)



Source: February 24, 2004 Phase I Proposal by SoCalGas and SDG&E in R. 04-01-025-

APPENDIX B: Mitigation Measures

Prudent Aliso Canyon Use	1. Make Available 15 Bcf Stored At Aliso Canyon to Prevent Summer Electricity Interruptions
	2. Efficiently Complete the Required Safety Review at Aliso Canyon to Allow Safe Use of the Field
	3. Implement Tighter Gas Balancing Rules
	4. Modify Operational Flow Order (OFO) Rule
	5. Call Operational Flow Orders Sooner in Gas Day
Tariff Changes	6. Provide Market Information to Generators Before Cycle 1 Gas Scheduling
	7. Consider ISO market changes that increase gas-electric coordination
	8. Increase Electric and Gas Operational Coordination
	9. Establish More Specific Gas Allocation among Electric Generators In Advance of Curtailment
Operational Coordination	10. Determine Whether the Reliability Benefits of Deferring Any Gas Maintenance Tasks Outweigh the Safety Risks
	11. Update Physical Gas Hedging Practice
LADWP Operational Flexibility	12. Update Economic Dispatch Practice
	13. Update Block Energy and Capacity Sales Practice
	14. Explore Dual Fuel Capability
Reduce Natural Gas and Electricity Use	15. Ask customers to Reduce Natural Gas and Electricity Energy Consumption
	16. Expand Gas and Electric Efficiency (EE) Programs Targeted at Low Income Customers
	17. Expand Demand Response (DR) Programs
	18. Reprioritize Existing Energy Efficiency Towards Projects with Potential to Impact Usage
	19. Reprioritize Solar Thermal Program Spending to Fund Projects for Summer and by end of 2017 and add/accelerate solar PV programs
	20. Accelerate Electricity Storage
Market Monitoring	21. Protect California Ratepayers
Gas-targeted Programs to Further Reduce Usage	22. Develop and Deploy Gas Demand Response (DR) Program
	23. Develop and Deploy Gas Cold Weather Messaging
Winter Operations Changes	24. Create Advance Gas Burn Operating Ceiling for Electric Generation
	25. Keep the Tighter Balancing Rules
	26. Modify Core Balancing Rules
Use of Gas from Aliso Canyon	27. Update the Aliso Canyon Withdrawal Protocol and Gas Allocation Process
Reduce Gas Maintenance Downtime	28. Submit Reports Describing Progress on Restoring Pipeline Service
Increase Gas	29. Identify and solicit additional gas supply sources including more CA Natural Gas

Supply	Production
	30. Prepare to Buy LNG
Refineries Added Summer 2017	31. Monitor Natural Gas Use at Refineries and Gasoline Prices
	32. Increase Gas Inventories at the Other SoCalGas Storage Facilities
	33. Delay LADWP's Transmission Upgrade Work
	34. Use More Gas From Aliso Than Last Winter
	35. Turn Thermostats Down and Deploy More Smart Thermostats
	36. Use Electricity Generators' Generation Shift to Help Reduce Gas Demand/Preserve Inventory
NEW for Winter 2017-18	**37. Update Section 715 Report's Aliso Canyon Inventory Target for New Circumstances**
	38. Bring LNG to Otay Mesa if Cannot Acquire Pipeline Capacity
	39. Monitor and Communicate Constantly, Including to Public