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California Public Utilities Commission

Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability for Reliability

Final Supplemental Report for Winter 2017-18

Public Utilities Code Section 715

December 11, 2017

Energy Division

Introduction

This Supplemental Report provides an update to the Public Utilities Code Section 715 Report of July 19, 2017.[1] That report established the then-relevant range of working gas for Aliso Canyon (Aliso); the necessary production, i.e. the withdrawal capacity from the storage facility; the number of production wells needed; and the availability of those wells. On July 19, 2017, Southern California Gas Company (SoCalGas) received California Public Utilities Commission (CPUC) approval to inject into Aliso Canyon and to maintain Aliso Canyon working gas inventory between 14.8 and 23.6 billion cubic feet (Bcf).

The determinations in this Supplemental Report reflect significantly changed conditions, most notably an unprecedented level of outages on the SoCalGas system that include all of the major system elements: storage facilities, pipelines, and compressor stations.[2] The outages collectively put SoCalGas system reliability at risk this winter. It is likely that SoCalGas will withdraw gas from Aliso Canyon this winter in order to meet gas demand that cannot be met by gas from pipelines or other storage fields. This Supplemental Report authorizes a greater range of Aliso Canyon gas inventory so that SoCalGas may store and withdraw more gas inventory from Aliso Canyon in order to meet gas demand on a peak winter demand day (a 1-in-10 year cold day), as well as under "normal" conditions (average temperature winter throughout the season).

Summary of Determinations

The CPUC authorizes SoCalGas to maintain Aliso Canyon working gas inventory within a range of 0 Bcf to 24.6 Bcf. As mentioned above, the CPUC's previous authorization was for a range of 14.8 Bcf to 23.6 Bcf. The new maximum inventory of 24.6 (1 Bcf above the previous maximum of 23.6) allows for improvement in withdrawal capacity and overall supply and is consistent with the Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement (2017-18 Winter Supplement) referenced in footnote 2 below. The lower minimum of 0 Bcf (from a former minimum of 14.8 Bcf) increases the amount of gas available for use. Effectively, by lowering the minimum of the range, SoCalGas can access 24.6 Bcf of the gas stored compared to 8.8 Bcf under the previous range. Aliso Canyon

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[1] See Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability for Reliability, July 19, 2017.

[2] The series of outages and maintenance issues are described in detail in the 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. The report is available at: http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN221863_20171128T103411_Aliso_Canyon_Winter_Risk_Assesment_Technical_Report_201718_Supp.pdf.

inventory may not be drawn down below zero Bcf of working gas *or* the level that a prudent operator would maintain in order to preserve the integrity of the field.

The maximum of 24.6 Bcf of working gas may provide the withdrawal capacity needed to meet winter demand reliably. This assumes that the 44 Aliso withdrawal wells reported by SoCalGas to the CPUC as in-service remain in-service and that there are no further changes to expected well withdrawal numbers. Stated differently, the Aliso withdrawal capacity in addition to the total inventory levels across all fields as of November 26, 2017, will provide sufficient withdrawal capacity to meet a 1-in-10 year cold day peak demand, as well as "normal," i.e. average temperature winter demand throughout the season. It should be noted that multiple peak days requiring the use of Aliso could occur during a "normal" winter. There will remain a risk of curtailments should a "cold" winter develop during the remainder of the season, i.e., December through March.

Background

Public Utilities Code Section 715 (Section 715) requires the CPUC to publish a report assessing the need for natural gas from the Aliso Canyon storage facility to meet the region's natural gas and electricity demand. Specifically, the statute requires the CPUC to determine:

1. *The range of working gas necessary at the Aliso Canyon storage facility to ensure safety and reliability at just and reasonable rates in California;*
2. *The amount of natural gas production at the facility needed to meet safety and reliability requirements;*
3. *The number of wells and associated injection and production capacity required; and*
4. *The availability of sufficient natural gas production wells that have satisfactorily completed required testing and remediation.*

Consistent with Section 715 requirements, prior reports made the four determinations independently of each other. They also noted that the four determinations are highly interdependent. This report provides responses to the determinations that recognize the interrelationships among inventory, withdrawal capacity, and the number of wells available for withdrawal.

This update to the Section 715 report incorporates information acquired since January 17, 2017, chiefly from the 2017-18 Winter Supplement dated November 28, 2017. In addition, this update incorporates changes to storage levels, well conditions, and storage withdrawal capacity at all SoCalGas storage facilities since the time of the Aliso Canyon Risk Assessment Technical Report Summer 2017.[3] This Supplemental Report also uses SoCalGas storage

[3] Aliso Canyon Risk Assessment Technical Report Summer 2017Assessment prepared by the Staff of the California Public Utilities Commission, the California Energy Commission, The California Independent System

inventory numbers as of November 26, 2017. The actual November 26, 2017, inventory is higher than the storage inventory projection in the 2017-18 Winter Supplement due to unusually warm November weather. Barring additional problems, well conditions at Aliso Canyon are likely to remain relatively static during the remainder of the winter season. It is unlikely that a significant number of additional wells will be brought into service beyond mid-December. However, as indicated previously, there are a sufficient number of wells available to provide the necessary withdrawal capacity. There is an opportunity to inject additional gas into Aliso to reach an inventory level consistent with this report's findings. This will increase both the available supply level and the withdrawal capacity.

This Supplemental Report incorporates the impact of recent significant pipeline outages on Lines 3000, 4000, and 235-2. This Supplemental Report also accounts for planned outages for system upgrades on the Los Angeles Department of Water and Power's (LADWP) electric transmission system. These planned upgrades were deferred to February 2018 in an attempt to mitigate the impact of SoCalGas outages by reducing reliance on in-basin electric generation. Upon completion, the electric transmission upgrades will reduce reliance on natural gas as fuel for electric generation.

This Supplemental Report also includes one significant factor not incorporated in the 2017-18 Winter Assessment: the warm weather experienced through the month of November to date (and expected over the remainder of November and into December) and its impact on storage levels. Because there were only very limited withdrawals relative to injections during November, total inventory levels across all storage fields have increased and will be significantly higher at the beginning of December than the cold year estimate in the 2017-18 Winter Supplement (69 Bcf versus 58 Bcf, respectively).

This report also considers:

1. *The methodology and revised tables that form the monthly gas balance and storage simulation that was prepared by the California Energy Commission and incorporated in the 2017-18 Winter Supplement;*
2. *Forecasted gas demand information provided by SoCalGas for the 2016 California Gas Report (CGR);*[4]

Operator, and the Los Angeles Department of Water and Power with input from Southern California Gas Company.. May 19, 2017. The report is available at: http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN217639_20170519T104800_Aliso_Canyon_Risk_Assessment_Technical_Report_Summer_2017_Asses.pdf.

[4] *2016 California Gas Report*. Southern California Gas Company, Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southwest Gas Corporation City of Long Beach Gas & Oil Department, Southern California Edison Company.

3. *Publicly available data including information posted on the Sempra Envoy website (https://scgenvoy.sempra.com), which provides historical daily operating information including information on sendout and receipts and storage injections, withdrawals and inventory levels; and*
4. *Additional data provided by SoCalGas in response to CPUC data requests*.

The determination of whether and how the storage facility will be used over the long term will be the subject of CPUC proceeding I.17-02-002.

Statutorily Required Determinations

Consistent with SB 380, the CPUC has a statutory requirement to make four determinations concerning the Aliso Canyon storage facility prior to the approval of injections. These determinations are presented below.

1. *The range of working gas necessary at the Aliso Canyon storage facility to ensure safety and reliability at just and reasonable rates in California:*

   Taking into account new conditions, the CPUC has determined that 24.6 Bcf of inventory at the Aliso Canyon Storage Field is sufficient for SoCalGas to maintain safe and reliable service, limited by the mandated maximum safe operating pressure as specified by Division of Oil Gas and Geothermal Resources (DOGGR).[5] This represents a 1 Bcf increase in inventory at the field. As seasonal demand declines, the inventory may be appropriately drawn down if necessary but should be maintained within a range of 0 Bcf to 24.6 Bcf. However, there are practical limits and potentially significant impacts on withdrawal capacity when operating at low inventory levels. Managing the facility in this manner is estimated to address safety and reliability needs while providing sufficient flexibility to respond to gas market conditions to support just and reasonable rates.

   It is noted that there remains a risk of curtailments, particularly should a "cold" winter weather season develop into January. This risk declines after the end of January. Cold weather to California's east is still a factor, however, that could reduce pipeline deliveries and require gas from storage in order to avoid curtailments.

   Range Maximum

[5] DOGGR identified safe pressure for the field based on its current information. That pressure corresponds to an inventory level of 67 Bcf. The inventory range in this report at 23.6 Bcf falls significantly below that limit.

The 24.6 Bcf maximum reflects the Aliso inventory needed to provide the withdrawal capacity needed to meet peak day winter demand and to balance the system overall.

Peak Day Demand

The 2017-18 Winter Supplement determined that, on a winter peak 1-in-10 year cold day, Aliso Canyon would need to be used to avoid curtailments of electric load.[6] That is, after taking all steps available to reduce demand, additional supply not available from pipeline sources or non-Aliso storage would need to come from Aliso. If that supply were not provided by withdrawals from Aliso Canyon, electric generators would be curtailed at a level that would not allow them to fully serve their customers.

The level of withdrawal capacity needed from Aliso to address the projected supply shortfall is estimated to be at its highest in mid-December 2017. That shortfall is 510 million cubic feet per day (MMcfd) if electric generators are able to reduce their demand to the minimum generation levels identified in the 2017-18 Winter Supplement. The shortfall is expected to decline after mid-December based on the return of some portion of Line 4000 capacity. The estimated shortfall is expected to increase beginning February 1, 2018. The increase reflects the initiation of LADWP's deferred planned transmission line improvement outages. Table 8 of the 2017-18 Winter Supplement, reproduced below, presents the demand in MMcfd needed after taking steps to reduce demand; the supply supported without using Aliso Canyon; and the resulting shortfall. The shortfall would need to be supported with withdrawal capacity from Aliso.[7]

SoCalGas asserts in its Advice Letter 5208[8] and in its own Winter 2017-18 Technical Assessment[9] that in order to meet peak demand, SoCalGas requires a systemwide minimum inventory level of 43.3 Bcf throughout winter. This figure is also used in the analysis in the 2017-18 Winter Supplement. During a "cold" winter there remains a risk

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[6] Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement, Table 11, page 19.

[7] Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement, 11/28/17. Table 8, p. 16.

[8] SoCalGas Advice Letter 5208, page 9, available at https://www.socalgas.com/regulatory/tariffs/tm2/pdf/5208.pdf. This figure is based on having the following levels of inventory at each field: 22 Bcf at Honor Rancho, 11 Bcf at La Goleta, 1.5 Bcf at Playa del Rey, and "the 8.8 Bcf available to use at Aliso Canyon." The 8.8 Bcf SoCalGas refers to is the amount of gas available given the range of working gas authorized at Aliso under the previous version of this Supplemental Report (23.6 Bcf – 14.8 Bcf = 8.8 Bcf). As noted in footnote 16 of the 2017-18 Winter Supplement, SoCalGas' estimate of minimum systemwide inventory has not been independently confirmed.

[9] Southern California Gas Company Winter 2017-18 Technical Assessment, October 30, 2017, p. 5

that systemwide inventory could drop below 43.3 Bcf, which could result in curtailments if a peak day should occur in the month of January.

Based on the current Aliso maximum inventory level of approximately 23.6 Bcf and the number of wells currently reported as in service, Aliso Canyon is estimated to be able to support a withdrawal capacity rate of approximately 675 MMcfd.[10] This rate is sufficient to meet the shortfall of 510 MMcfd under conditions that could occur from the present time through December 18, 2017.

Table 8: Shortfall on a 1-in-10 Year 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
Adjusted 1-in-10 Customer Demand	4,167	4,167	4,167	4,348
Supported Demand without Aliso	3,657	3,917	4,117	4,117
Shortfall without Aliso	-510	-250	-50	-231

A balance analysis estimating monthly inventory levels at Aliso and other storage fields demonstrates that in a normal winter there will be sufficient withdrawal capacity to meet the shortfalls and the peak demands shown in the table. The analysis also supports the need to increase the Aliso maximum to provide more inventory to meet the withdrawal demands of a possible late-January cold snap and to provide a base for inventory going into the following winter. Finally, the changes in the range minimum and maximums will reduce, but not eliminate, the risk of curtailments during a cold winter.

Range Minimum

The minimum amount of working gas at Aliso Canyon is set at zero Bcf. Aliso Canyon inventory may not be drawn down below zero Bcf of working gas *or* the level that a prudent operator would maintain in order to preserve the integrity of the field.

2. The amount of natural gas production at the facility needed to meet safety and reliability requirements;

[10] The Aliso withdrawal rate is based on current in-service wells and estimated withdrawal rates at the current inventory level. SoCalGas has received permission from the CPUC to conduct flow tests and those tests are currently underway and expected to conclude in early December 2017. The tests should verify Aliso withdrawal rates and may produce results differing from current estimates.

To meet peak day demand 510 MMcfd of production capacity is necessary.

3. The number of wells and associated injection and production capacity required;

Approximately 37 wells would be needed under current estimates to provide for the necessary production capacity of 510 MMcfd. Well flow tests currently underway will confirm the number of production wells needed.

4. The availability of sufficient natural gas production wells that have satisfactorily completed required testing and remediation.

Currently there are a sufficient number of wells (44) that have completed all safety tests and are available for withdrawal in order to meet the reliability needs in determination #3.

Comment Responses

SoCalGas timely submitted comments on the draft version of this report on December 6, 2017. No other comments were received.

SoCalGas makes the following assertions in its comments:

1. Current pipeline outages are not unprecedented: SoCalGas states that a "combination of supply shortfalls and outages on the SoCalGas system, or upstream of SoCalGas' system, has in the past reduced system capacity to the levels we see today.
2. Natural gas storage provides resiliency: SoCalGas asserts that Aliso Canyon is safe to operate and that the storage facility would improve resiliency if it could be filled to the level allowed by DOGGR and operated without reference to the Aliso Withdrawal Protocol.
3. The 715 Report overstates the value of adding 1 Bcf: SoCalGas states that an additional 1 Bcf will add to inventory but will have only a minimal impact on Aliso's withdrawal capacity.
4. The 715 Report overstates the value of lowering the range minimum: SoCalGas states that it is uncertain how the storage field will perform at low inventories.
5. The 715 Report makes withdrawal capacity and inventory determinations based on minimum electric generation and an N-1 Contingency" levels: SoCalGas notes that the 715 Report uses 1-in-10 peak winter day gas demand with minimum electric generation and an N-1 contingency rather than the 1-in-10 peak winter gas demand forecasted in the 2016 California Gas Report.
6. The 715 Report potential conflicts with the Aliso Withdrawal Protocol: SoCalGas notes that the Aliso Withdrawal Protocol requires Aliso to be used as an asset of last resort and asserts that electric generation must be curtailed down to the minimum

generation levels determined in the 2017-18 Winter Supplement before Aliso can be used.

Discussion

1. Current pipeline outages are not unprecedented: While SoCalGas may be correct that a "*combination* [emphasis added] of supply shortfalls and outages on the SoCalGas system, or upstream of SoCalGas' system, has in the past reduced system capacity to the levels we see today," the current outages are entirely on the SoCalGas system.
2. Natural gas storage provides resiliency: While SoCalGas appears to want to return the field to historic operating parameters, there is significant uncertainty about the role of Aliso Canyon at this time, which will be addressed in I.17-02-002 and other venues.
3. The 715 Report overstates the value of adding 1 Bcf: The addition of 1 Bcf was intended to increase inventory so that the current withdrawal capacity could be maintained longer. This action comports with SoCalGas' own logic in its 2017-18 Winter Assessment:

> …if SoCalGas is able to increase Aliso Canyon's inventory above 23.6 Bcf, it will increase gas supply in storage for subsequent high demand periods, increase withdrawal rates, extend the time high withdrawal rates can be maintained, better enable SoCalGas to meet reliability needs, and create an additional operating margin to support sufficient inventory at all fields throughout the winter season.[11]

4. The 715 Report overstates the value of lowering the range minimum: The lowering of the range minimum was a direct response to SoCalGas' suggestion in its 2017-18 Winter Assessment, in which the utility stated the following:

> If SoCalGas is able to withdraw gas from Aliso Canyon below 14.8 Bcf, more natural gas supply will be available to respond to customer demand… To establish inventory levels that better support energy reliability, the CPUC should expeditiously issue its next 715 Report that either lifts inventory restrictions entirely or includes a greater range of inventory that SoCalGas can maintain at Aliso Canyon.[12]

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[11] Southern California Gas Company Winter 2017-18 Technical Assessment, October 30, 2017, p. 7.

[12] Southern California Gas Company Winter 2017-18 Technical Assessment, October 30, 2017, p. 7.

In response to SoCalGas comments, the CPUC modified the 715 Report to allow SoCalGas to maintain Aliso Canyon's working gas inventory within a range of 0 Bcf to 24.6 Bcf instead of 5 Bcf to 24.6 Bcf.

5. The 715 Report makes withdrawal capacity and inventory determinations based on minimum electric generation and an N-1 Contingency" levels: SoCalGas' observation is correct. The 715 Report was based on the analysis in the 2017-18 Winter Supplement.
6. The 715 Report potential conflicts with the Aliso Withdrawal Protocol: No part of the 715 Report should be construed as conflicting with the Aliso Withdrawal Protocol[13], and should there be any conflict, the Aliso Withdrawal Protocol controls. It should also be noted that the Aliso Withdrawal Protocol *does not* require that electric generation be curtailed down to the minimum generation levels determined in the 2017-18 Winter Supplement before Aliso can be used. Should SoCalGas have questions regarding gaps, conflicts, or ambiguities regarding the 715 Report or the Aliso Withdrawal Protocol, SoCalGas should contact CPUC Energy Division staff for clarification.

The assumptions used to complete this report are likely to change based on a number of conditions. For example, SoCalGas recently completed a round of flow testing on in-service wells at Aliso Canyon. The results indicate that the withdrawal capacity is higher than the 675 MMcfd estimated for this report. This report also notes that warm November weather led to higher storage inventories than those assumed in the 2017-18 Winter Supplement. The weather, storage levels, well operational status, facility outages, and storage withdrawal capacity will continue to change throughout the winter. We remain open to issuing further updates to the Section 715 Report should changing circumstances make such action necessary.

[13] The Aliso Withdrawal Protocol is available at http://www.cpuc.ca.gov/aliso/; the most recent version as of the time of this Supplemental Report is dated November 2, 2017.