

Technical Assessment

Critical Review of Aliso Canyon Winter Risk Assessment and Action Plan

Prepared for Food & Water Watch

By

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1.0 Executive Summary

The August 22, 2016 *Winter Risk Assessment* and *Winter Action Plan* prepared by the California Energy Commission, the California Public Utilities Commission, the California Independent System Operator, the Los Angeles Department of Water and Power and Southern California Gas Company (SoCalGas)¹ demonstrate that the mitigation measures applied to Los Angeles Basin natural gas users will ensure adequate natural gas supply to reliably meet winter peak demand without the Aliso Canyon Storage Facility (Aliso Canyon). Permanent closure of Aliso Canyon will not compromise L.A. Basin natural gas supply, on either the summer peak day or winter peak day, as long as the key mitigation measures described in these documents are kept in place permanently.

The economic benefit to SoCalGas core customers (ratepayers) of the permanent closure of Aliso Canyon is in the range of \$70 million per year. No quantitative information is provided in either the *Winter Risk Assessment* or the *Winter Action Plan* on the magnitude of the economic impact of the mitigation measures on non-core customers (large commercial or wholesale customers). An economic analysis should be conducted that compares the cost savings to SoCalGas core customers realized by permanently closing Aliso Canyon to the cost to non-core customers to comply on a permanent basis with tighter gas balancing rules in the absence of Aliso Canyon.

2.0 Critique of Alison Canyon *Winter Risk Assessment Technical Report, Winter Action Plan, and Independent Evaluator Report*

A. Review of August 22, 2016 *Winter Risk Assessment Technical Report*

The *Winter Risk Assessment* states that the minimum SoCalGas supply available in the winter of 2016-2017 without use of Aliso Canyon will be 5.1 billion cubic feet per day (Bcfd) when a mass balance calculation approach is used to determine available supply, and 4.5 to 4.7 Bcfd based on pipeline hydraulic model simulations.² The *Winter Risk Assessment* also states that, factoring in the new winter 2016-2017 mitigation measures and the continued application of summer 2016 mitigation measures, the maximum 1-in-10 year demand will be 4.1 to 4.2 Bcfd.³

Supply will exceed demand by 0.9 to 1.0 Bcfd without Aliso Canyon assuming the mass balance calculation of available supply. Supply will exceed demand by 0.3 to 0.6 Bcfd without Aliso Canyon assuming the more conservation hydraulic model simulation

¹ SoCalGas is listed as a co-author on the cover of the *Winter Risk Assessment*. SoCalGas is not listed a co-author of the *Winter Action Plan*.

² *Winter Risk Assessment*, Table 1, p. 19.

³ *Ibid*, p. 5; *Winter Action Plan*, Table 1, p. 11 and pp. 17-18 (substituting either 22 MMcfd normal condition or 96 MMcfd N-1 contingency condition for 1,031 MMcfd electric generator forecast).

results. Given the surplus of supply in either scenario, there is no need for Aliso Canyon withdrawals to ensure L.A. Basin natural gas supply reliability in the winter of 2016-2017.

Yet despite the body of the executive summary of the *Winter Risk Assessment* providing the supply and demand values necessary to determine that there is no reliability need for Aliso Canyon to ensure natural gas reliability this winter, the executive summary begins with this erroneous statement (p. 3):

This technical assessment is based on the 1-in-10-year cold winter day design standard that the CPUC established for the SoCalGas/San Diego Gas & Electric (SDG&E) service territories to meet the gas requirements of core and noncore customers on the coldest day with a 10-year recurrence interval. The assessment finds that this standard cannot be met without withdrawing supply from Aliso Canyon during the coming winter months.

On p. 9, in contrast to the supply/demand data already presented, the *Winter Risk Assessment* states:

Without Aliso Canyon providing supply to the Los Angeles Basin, SoCalGas will have to choose whether to send supplies to the Los Angeles Basin or to other Southern California communities.

These statements do not make sense in the context of the supply and demand values provided in the *Winter Risk Assessment*. The authors state in the executive summary that the forecast winter peak day demand is 5.2 Bcfd of natural gas.⁴ Of this total, 1.0 Bcfd is electric generator (EG) demand. Reliably available SoCalGas winter peak supply is identified as 4.7 Bcfd, and potentially as low as 4.5 Bcfd. With no change to the EG demand this represents a shortfall of 0.5 to 0.7 Bcfd of supply on the peak winter day.

However, the California Independent System Operator (CAISO) and the Los Angeles Department of Water and Power (LADWP) confirm that less than 0.1 Bcfd is needed to provide the minimum amount of electric generation necessary to maintain grid reliability in the L.A. Basin.⁵ CAISO and LADWP have the ability to shift generation outside of the L.A. Basin to minimize EG natural gas demand on forecast peak winter days. One of the winter mitigation measures authorizes CAISO to establish a natural gas burn operating

⁴ The winter peak demand forecast stated in the Aliso Canyon *Winter Action Plan* *Winter Action Plan* *Winter Action Plan* is 5.077 Bcfd, Table 1, p. 11, not 5.2 Bcfd.

⁵ *Winter Risk Assessment*, p. 4.

“The LADWP/California ISO joint powerflow study found that electric reliability can be satisfied . . . with a minimum gas burn of 96 million cubic feet per (MMcfd) by electric generation in the SoCalGas/SD G&E service territories in response to post N-1 contingency conditions and as low as a gas burn of 22 MMcfd (with somewhat higher risk) under normal pre-contingency conditions and the ability to import generation into the Los Angeles Basin.”

ceiling for electric generation in the L.A. Basin in advance of potential peak demand days.⁶

The joint parties and SoCalGas project a winter peak load of 4.1 to 4.2 Bcfd when the advance gas burn operating ceiling is imposed and EG is shifted out of the L.A. Basin on winter peak days.⁷ This winter peak demand is well below the minimum of 4.5 to 4.7 Bcfd of supply available on the winter peak day without Aliso Canyon.

This shifting of generation outside the L.A. Basin is not a curtailment, which is generally understood as a cut-off of natural gas in response to an emergency condition. It would be a pre-planned redirection of electricity production to other generating units located outside of the L.A. Basin to meet electric load in the L.A. Basin.⁸ The joint parties and SoCalGas indicate that electric generator dispatch costs would increase with this strategy, although they do not provide quantitative estimate of the increase in dispatch costs.⁹

Winter peak and near-peak demand conditions are likely to occur only a few days each winter. For example, SCE testified in 2007 that SoCalGas pipeline receipt capacity of 3,875 million cubic feet per day (MMcfd) was only exceeded on 9 days in the winter of 2006.^{10,11} As a result, any increase in dispatch costs caused by the shifting of electric generation outside the L.A. Basin due to the imposition of a gas burn operating ceiling would be only for a few days.

The reduction in available winter peak supply from 4.7 to 4.5 Bcfd assumes that Line 3000 is out-of-service during the 2016-2017 winter peak.¹² But that assumption contradicts the action taken by SoCalGas in response to the June 30 – July 1, 2015 curtailment. In that case, a pipeline section (Line 4000) that was out-of-service for remediation work at the time was returned to service and the remediation activities postponed until October 2015, when the summer peak season had passed.¹³ This same commonsense approach to preventative maintenance on Line 3000 should be applied this winter. The *Winter Risk Assessment* identifies Line 3000 as a critical pipeline but does not explain why elective (non-emergency) maintenance or upgrading would be

⁶ Winter Action Plan, p. 25.

⁷ Ibid, p. 5.

⁸ Ibid, p. 14. Impressively, LADWP can meet its LA Basin winter peak day grid reliability requirements with no (LA Basin) gas-fired generation: “*The LADWP will meet reliability requirements even with all gas fired basin generation off, provided two synchronous condensers are available at Scattergood and two are available at Haynes for voltage regulation and support. This is true even after assuming all known planned outages scheduled during December when the winter peak may occur.*”

⁹ Ibid, p. 5.

¹⁰ SCE, SoCalGas/SDG&E/SCE Application A.06-08-026, *SoCalGas/SDG&E/SCE Omnibus Application - Rebuttal Testimony of Dr. Michael Alexander*, April 17, 2007, pp. 8-9, lines 15-17. “There were only nine days this winter in which core demand exceeded the firm receipt point capacity of the SoCalGas system.” Firm receipt capacity = 3,875 MMcfd (p. 8).

¹¹ 2011 California Gas Report Supplement, p. 17. The SoCalGas winter peak day demand in 2006 was 4,145 MMcfd.

¹² Winter Risk Assessment, Table 1, p. 19.

¹³ Summer 2016 Aliso Canyon Risk Assessment Technical Report, April 5, 2016, Appendix A, p. 54.

potentially conducted on Line 3000 at the time of the winter peak demand.¹⁴ Either the resources to complete the maintenance activities by November 2016 should be committed to the project, or the project should be delayed until March or April 2017. The net effect of this action would be to increase available winter peak supply from 4.5 to 4.7 Bcf/d.

The *Winter Risk Assessment* states that the “*The Southern System currently lacks supply diversity.*”¹⁵ Contracting for additional supply at the Otay Mesa receipt point is an off-the-shelf option for increasing winter peak supply from 4.7 Bcf/d up to 5.1 Bcf/d and is a reasonable winter mitigation measure to consider.¹⁶ Although SoCalGas parent company Sempra Energy owns the Costa Azul LNG terminal near Ensenada which could supply natural gas to Otay Mesa, Shell Energy controls 50 percent of the LNG storage capacity at the facility.¹⁷ Contracting for this capacity from Shell would eliminate the affiliate transaction concern associated with contracting for Sempra LNG-sourced supply. However, there does not appear to be a need for this additional supply source when a minimum of 4.5 to 4.7 Bcf/d of supply is already assumed to be available to meet a projected SoCalGas winter peak of 4.1 to 4.2 Bcf/d.

B. Review of August 22, 2016 Aliso Canyon Winter Action Plan

The primary conclusion of the *Winter Action Plan* is that there will be adequate natural gas reliability in the L.A. Basin this winter with: 1) the suite of mitigation measures available to manage natural gas supply and demand, and 2) without Aliso Canyon. These mitigation measures include:

- 5 percent daily balancing by non-core customers.
- Daily balancing by SoCalGas for core customers.
- Imposition of electric generator gas consumption limits on forecast winter peak days.

SoCalGas was not a co-author of the *Winter Action Plan*, but did co-author the *Winter Risk Assessment*. This may be one reason why the *Winter Action Plan* conclusions on winter natural gas reliability without Aliso Canyon are more consistent with the underlying supply/demand data that is presented in the *Winter Action Plan*.

The *Winter Risk Assessment* states that SoCalGas also has tested Line 3000 between the Topock, Arizona, receipt point and the compressor station at Newberry in compliance with CPUC safety requirements and that test results are not expected until late fall. It goes on to state that SoCalGas anticipates, based on experience with testing of pipelines

¹⁴ Winter Risk Assessment, p.29.

¹⁵ Ibid, p. 21.

¹⁶ B. Powers – Powers Engineering, *Is Aliso Canyon Needed to Assure Natural Gas Reliability in Southern California?*, April 8, 2016, Table 1, p. 6. TGN Otay Mesa receipt capacity = 400 MMcf/d.

¹⁷ Wall Street Journal, *Sempra’s Flow to Natural Gas Proves Timely Investment in LNG Comes as Utilities Begin to Shun Coal*, April 7, 2008. “Shell Oil Co., the U.S. arm of Royal Dutch Shell PLC, is leasing half the terminal for 20 years. Sempra is retaining control of the other half and is importing gas from Indonesia under an arrangement with BP PLC.”

of this vintage, that remediation work will be required.¹⁸ The *Winter Risk Assessment* uses this explanation as a basis for assuming that Line 3000 will be unavailable this winter. No explanation is provided as to why SoCalGas would immediately take this remote pipeline out-of-service for remediation as the winter peak season is beginning instead of waiting until March 2017 when the winter peak season is over.

Two heat waves have occurred to date in the summer of 2016 (through August 31st), triggering Flex Alerts requesting that consumers conserve energy, and associated other activities aimed at avoiding gas curtailments and electricity outages.¹⁹

The first of these heat waves began on June 20, 2016. Southern California Edison (SCE) experienced its second highest 1-hour peak load ever recorded in its service territory on Monday, June 20, at 23,564 MW, between 3 and 4 pm. LADWP reached 6,080 MW on that day, the highest ever LADWP load in June and close to its highest ever 1-hr demand of 6,396 MW. There were no gas curtailments on June 20th in the L.A. Basin, no withdrawals from Aliso Canyon, and no back-up fuel was burned by LADWP. The 5 percent daily balancing summer 2016 mitigation measure was in effect for non-core customers during this heat event and it was effective.

The second heat wave occurred from July 18 – July 22, 2016. The peak SCE electricity demand was approximately 21,500 MW on Thursday, July 21, and exceeded 22,000 MW on Friday, July 22.²⁰ There were no gas curtailments on June 20th in the L.A. Basin. There were no curtailments, no withdrawals from Aliso Canyon, and no back-up fuel burned by LADWP during this heat event.

The SCE peak loads were 2,000 MW to 4,000 MW higher during the two 2016 heat waves than on the June 30-July 1, 2015. On those two days, SoCalGas implemented curtailments to a limited number of electric generators in the L.A. Basin.²¹ These curtailments were called at a time when substantially less rigorous balancing requirements were in place for non-core customers. See **Attachment A** for a comparison of the SCE peak loads during the two summer 2016 heat waves and the June 30 – July 1, 2015 SoCalGas curtailment events.

SoCalGas came within 2 percent of its projected 2016 summer peak demand of 3,380 MMcfd on August 16, 2016,²² when natural gas demand reached 3,321 MMcfd.^{23,24} On that day, only 396 MMcfd was withdrawn from storage to meet the total natural gas

¹⁸ Winter Action Plan, p. 9.

¹⁹ Ibid, p. 8.

²⁰ CAISO OASIS Database, System Demand – Actual, July 18 - July 22, 2016. See: <http://oasis.caiso.com/mrioasis/logon.do>.

²¹ Summer 2016 Aliso Canyon Risk Assessment Technical Report, April 5, 2016, Appendix A, pp. 53-56.

²² 2016 California Gas Report, p. 93.

²³ SoCalGas total BTU Factor (Dth/Mcf) = 1.0353, p. 95.

²⁴ SoCalGas Envoy database, August 16, 2016. Sendout = 3,438,000 Decatherms (Dth). Withdrawals from storage = 410,000 Dth. Therefore, total sendout in mmcfd = 3,438,000 Dth ÷ 1.0353 Dth/Mcf = 3,320,777 Mcf (3,321 mmcfd). Total withdrawal from storage = 410,000 Dth ÷ 1.0353 Dth/Mcf = 396,020 Mcf (396 mmcfd).

demand, no gas was withdrawn from Aliso Canyon, and no backup fuel was burned by LADWP. By way of comparison the *Winter Action Plan* states that 1,490 MMcfd is expected to be available for withdrawal from SoCalGas storage this winter, assuming only Honor Rancho, Goleta, and Playa del Rey are available and Aliso Canyon is not utilized.²⁵

The *Winter Action Plan* identifies the forecast 1-in-10 year winter peak day demand as 5.077 Bcfd.²⁶ However, the actual 1-in-10 year SoCalGas winter peak over the last ten winters was 4.910 Bcfd.²⁷ The average peak winter day demand during this period was approximately 4.4 Bcfd as shown in **Attachment B**. In 2015, the SoCalGas winter peak day demand reached only 4.036 Bcfd.²⁸ Natural gas consumption is declining at a projected rate of 1.4 percent per year over the next 20 years.²⁹ The somewhat inflated 1-in-10 year SoCalGas winter peak day demand assumed in the *Winter Action Plan* and *Winter Risk Assessment* add a layer of conservatism to the supply and demand balances in both documents that further reinforces that lack of need for Aliso Canyon to meet the winter peak demand.

The *Winter Action Plan* notes the need to study delivery of natural gas derived from LNG stored at the Sempra LNG near Ensenada, Mexico as further supply support this winter to ensure adequate supply without Aliso Canyon.³⁰ As noted, Shell Energy North America and Sempra share the LNG capacity at this import terminal, and either company could provide natural gas derived from imported LNG at the Otay Mesa receipt point. However, there is no compelling reason to pay for additional backup supply of natural gas at Otay Mesa given the significant winter peak day supply surplus projected with the summer and winter mitigation measures in place.

Finally, the *Winter Action Plan* identifies curtailment of natural gas supplies to refineries as a potential mitigation measure if needed, with the warning that “*The economic consequences of them not being able to operate could be large.*”³¹ However, the economic consequences of idling a significant portion of the L.A. Basin’s refining capacity are well understood. ExxonMobil’s (now PBF Energy) Torrance Refinery, which provides 20 percent of Southern California’s fuel, was shut down for over a year after a February 2015 explosion at the facility.^{32,33} In contrast to the actual extended forced outage at the Torrance Refinery, any hypothetical natural gas curtailments to refineries due to L.A. Basin natural gas supply constraints would last a few days at most,

²⁵ Winter Action Plan, p. 16.

²⁶ Ibid, Table 1, p. 11.

²⁷ 2011 California Gas Report Supplement, p. 17.

²⁸ 2016 California Gas Report, p. 29.

²⁹ Ibid, p. 4.

³⁰ Winter Action Plan, p. 22.

³¹ Winter Action Plan, p. 22.

³² Los Angeles Times, *Torrance refinery unit to restart after major explosion; start-up to temporarily increase emissions*, May 9, 2016.

³³ Los Angeles Times, *Refinery outages and delays in Torrance repairs cause higher L.A. gas prices*, June 11, 2016. “Loss of refining capacity at the Torrance facility caused gas prices to rise as the plant supplies 10% of the refined gasoline in the state and 20% in Southern California.”

at a time of year when fuel demand is reduced compared to the summer peak driving season.³⁴

C. Review of August 19, 2016 Independent Evaluator Assessment of Modeling Used in *Winter Risk Assessment Technical Report*

The *Independent Evaluator Report* makes two sound observations in the recommendations section:³⁵

- Tightening balancing rules to more closely align with standards for interstate pipelines that do not rely on storage facilities, and which are subject to daily balancing requirements, would be an effective mitigation measure.
- Deferring maintenance so that planned pipeline and storage outages do not occur simultaneously, especially during times of peak winter demand, if possible, would also be an effective mitigation measure.

The first observation indirectly acknowledges that there are pipeline systems that do not rely on storage systems that maintain reliability by use tighter balancing rules,³⁶ and that these pipeline systems achieve reliable operation by (in part) use of daily balancing requirements. The effectiveness of daily balancing was demonstrated in the summer of 2016 in the L.A. Basin.

The second observation is a common sense response to concerns about adequate supply resources to meet the winter peak demand. It makes sense to defer maintenance activities to periods when peak demand does not occur. However, in the specific case of Line 3000, regulators and SoCalGas are assuming that remediation work will not be deferred on this line in the winter of 2016. As a result, SoCalGas will lose access to at least 200 MMcfd of net pipeline natural gas supply on the peak winter day. In the summer of 2015, similar work on Line 4000 was deferred to avoid Line 4000 being out-of-service at a time when summer curtailments had the potential to occur.³⁷

However, while providing sound observations on how to operate the SoCalGas system reliably without Aliso Canyon, the *Independent Evaluator Report* also makes unsupported statements regarding the need for Aliso Canyon in the section titled “Review of Modeling Outcomes.” In fact, these statements appear to be a repetition of unsupported and incorrect hearsay in the *Risk Assessment*. They ignore the winter peak supply/demand balance achieved when the mitigation measures are imposed, which will provide sufficient reliable supply to meet the winter peak without Aliso Canyon:³⁸

³⁴ U.S. Energy Information Administration, *Refinery Outages: Fourth-Quarter 2015*, October 2015, pp. 5-7.

³⁵ Independent Evaluator Report, p. 18.

³⁶ See a discussion of this issue in: B. Powers – Powers Engineering, *Is Aliso Canyon Needed to Assure Natural Gas Reliability in Southern California?*, April 8, 2016, p 13.

³⁷ Summer 2016 Aliso Canyon Risk Assessment Technical Report, April 5, 2016, Appendix A, pp. 53-56.

³⁸ *Ibid*, p. 16.

- Using the gas stored in Aliso Canyon is very important to reducing the risk of gas curtailments and electrical service interruption this coming winter.
- Without this reserve available, SoCalGas will have to choose whether to maintain service to their peripheral customers or to supply those within the basin.

The operational changes represented by the summer and winter mitigation measures have eliminated the risk of gas curtailments this winter without use of Aliso Canyon. There will be at least 4.5 to 4.7 Bcfd of supply to meet 4.1 to 4.2 Bcfd of demand on the winter peak day as a result of these operational changes. Supply and demand flows on the SoCalGas L.A. Basin pipeline network will be tightly balanced. SoCalGas will not have to choose whether to maintain service to peripheral customers or supply those within the L.A. Basin.

3.0 Root Cause of Erroneous Curtailment Projections in Aliso Canyon Summer 2016 Risk Assessment and Action Plan

Erroneous claims of up to 14 days of L.A. Basin gas curtailments in the summer of 2016 reverberated unchallenged in the press for months because SoCalGas and regulators failed to update the Summer 2016 Aliso Canyon Risk Assessment (April 5, 2016) in a timely manner. They did not assess summer 2016 curtailment risk in the context of the much tighter summer 2016 supply-demand requirement imposed as a mitigation measure on large non-core natural gas users in the L.A. Basin as of June 1st, and instead relied on the substantially less rigorous monthly balancing requirements then in place to assess curtailment risk. This was a major and preventable disservice to the residents of the L.A. Basin.

Shell Energy North America and the Alliance for Retail Energy Markets advised regulators to update the assessment less than three weeks after it was issued, on April 22, 2016, stating:³⁹

The Reliability Plan should be updated to acknowledge that the [natural gas supply-demand balancing] protocol reduces the potential for gas (and electric) curtailment. . . . No evidence has been produced to show that the current protocol [5% daily balancing] is not adequate to address system-wide balancing issues.

This observation by Shell Energy North America and the Alliance for Retail Energy Markets has been demonstrated to be accurate over the course of the summer. Daily balancing of supply and demand by non-core customers has been adequate to address the potential for summer peak curtailments without Aliso Canyon. The April 2016 Risk Assessment said as much in a hypothetical manner, that application of 5 percent daily balancing by non-core customers would address the potential for summer curtailments,

³⁹ Joint Comments of the Alliance for Retail Energy Markets and Shell Energy North America (US), L.P. on the Aliso Canyon Action Plan to Preserve Gas and Electric Reliability for the Los Angeles Basin, April 22, 2016, pp. 2-3.

but failed to assume that 5 percent daily balancing would be imposed on non-core during the summer of 2016 when projecting the potential for gas curtailments.⁴⁰

4.0 Permanent Closure of Aliso Canyon Represents Potential Net Economic Benefit to Core Customers

The ongoing cost to operate Aliso Canyon storage facility, including routine operations and maintenance (O&M), new wells, and the amortized cost of the new \$200 million Aliso Canyon turbine replacement project, is on the order of \$70 million per year.^{41,42,43} This annual cost does not include emergency expenses associated with integrity testing, injection tubing installation or plugging, and safety valve installation in the wake of the Well SS-25 blowout in October 2015.

The wholesale gas cost has not measurably increased at the Southern California border, a primary receipt point for the SoCalGas pipeline system, relative to other trading hubs as a result of the tighter gas balancing rules imposed on non-core customers in June 2016. A comparison of the spot natural gas price trend over the last year at the Southern California border (SoCal Border) trading hub, the Opal (WY) trading hub, and Henry Hub (LA) is included **Attachment C**. As a result, at least for core customers, a permanent shutdown of Aliso Canyon appears to be economically beneficial.

In contrast, neither the *Winter Risk Assessment* nor the *Winter Action Plan* address how much additional cost is being borne by the non-core users under the mitigation measures now in place. Only qualitative statements are made regarding the costs to non-core users associated with the mitigation measures.⁴⁴

- Some of the new measures are aimed at reducing the impacts to customers, including electric generators, who have experienced additional cost to absorb the operational impact caused by the loss of Aliso Canyon.
- These steps imposed significant cost on LADWP and its customers. Other measures likewise added costs for other customers.
- Noncore customers other than electric generators, including oil refineries and associated facilities that move petroleum products, represent key infrastructure that is essential to California's economy and security. These customers have

⁴⁰ CPUC, CEC, CAISO, LADWP, SoCalGas, *Aliso Canyon Risk Assessment Technical Report*, April 5, 2016, p. 18, pp. 30-31.

⁴¹ B. Powers – Powers Engineering, *Is Aliso Canyon Needed to Assure Natural Gas Reliability in Southern California?*, April 8, 2016, p. 15. Ongoing O&M and new wells, \$40 million per year.

⁴² CPUC, Decision D.13-11-023, *Decision Addressing Application of Southern California Gas Company to Amend Its Certificate Of Public Convenience and Necessity for the Aliso Canyon Gas Storage Facility*, November 14, 2013, p. 2. Capital cost = \$200.9 million.

⁴³ Energy, Economics, and Environment, Inc. (E3), 33% Renewable Portfolio Standard Calculator 2009 Public Version, "Resource Characterizations" worksheet, cell V71, annualized IOU capital cost factor over 20-year = 0.1676. Therefore the annualized cost of the \$200.9 million turbine replacement project investment would be: \$200.9 million × 0.1676 = \$33.7 million per year.

⁴⁴ Winter Action Plan, p. 5, p. 8, p.19.

undoubtedly experienced additional costs, like the electric generators, complying with the tighter balancing rules.

The L.A. Basin electric generator usage ceiling would only be necessary on the order of a handful of days each winter, so the additional cost of limiting L.A. Basin generation would likely be nominal. Without some quantitative supporting documentation on the actual costs being incurred by non-core customers in the L.A. Basin to comply with the mitigation measures in the Winter Action Plan,⁴⁵ it is not possible to assess whether the net economic impact of a permanent shutdown of Aliso Canyon is positive or negative.

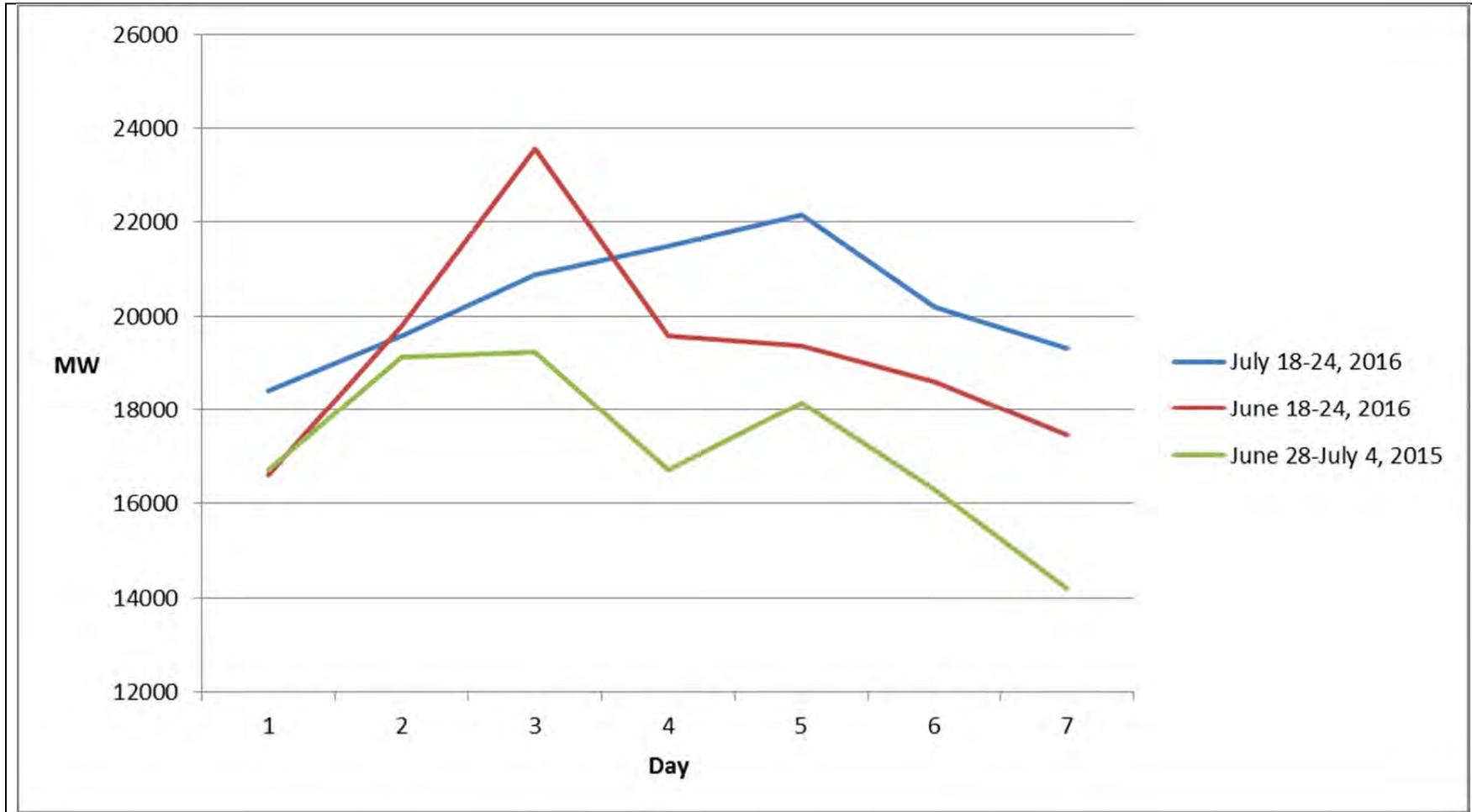
5.0 Conclusions

The *Winter Risk Assessment* and *Winter Action Plan* demonstrate that the mitigation measures applied to L.A. Basin natural gas users will ensure adequate natural gas supply to reliably meet winter peak demand without Aliso Canyon. The peak demand on the SoCalGas system occurs in winter. Permanent closure of Aliso Canyon will not compromise L.A. Basin natural gas supply, on either the summer peak day or winter peak day, as long as the key mitigation measures are kept in place permanently.

It is recommended that an economic analysis be conducted that compares the savings to SoCalGas core customers realized by the permanent closure of Aliso Canyon to the cost increases borne by non-core customers to comply with the permanent imposition of tighter gas balancing rules and other key mitigation measures.

⁴⁵ Ibid, Appendix A, pp. 24-25.

Attachment A. SCE Peak 1-Hour Load Trend During Two Summer 2016 Heat Waves Compared to 1-Hour Load Trend During June 30 – July 1, 2015 When SoCalGas Ordered Gas Curtailments to Some Electric Generators in the LA Basin



Attachment B. SoCalGas Peak Winter Day Natural Gas Demand, 2006-2015

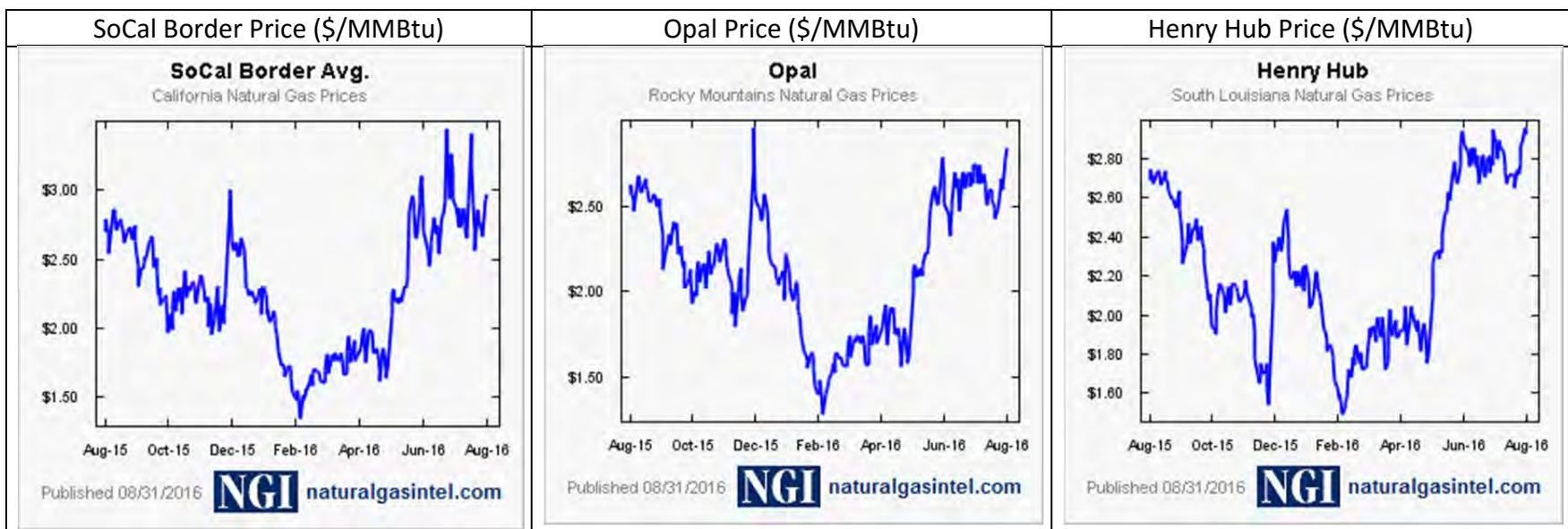
| Year | Day | Peak Winter Day Sendout (MMcfd) |
|------|------------|---------------------------------|
| 2006 | 12/19/2006 | 4,145 |
| 2007 | 01/15/2007 | 4,577 |
| 2008 | 12/17/2008 | 4,910 |
| 2009 | 12/08/2009 | 4,505 |
| 2010 | 11/29/2010 | 4,356 |
| 2011 | 12/12/2011 | 4,152 |
| 2012 | 12/19/2012 | 4,294 |
| 2013 | 12/09/2013 | 4,881 |
| 2014 | 12/31/2014 | 4,325 |
| 2015 | 12/29/2015 | 4,036 |

Sources: 2011 California Gas Report Supplement, p. 17; 2016 California Gas Report, p. 29.

10-year average SoCalGas winter peak day demand = 4,418 MMcfd

Attachment C. SoCal Border, Opal (WY), and Henry Hub (LA): Spot Prices, August, 2015 – August, 2016

[The same macro-price pattern trend is visible in major U.S. natural gas hubs, before and after June 1, 2016. No discernible price spike at SoCal Border following imposition of 5 percent daily balancing on non-core customers.]



http://www.naturalgasintel.com/data/data_products/daily?region_id=south-louisiana&location_id=SLAHH