September 28, 2018

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation
Docket No. ER18-_____-000

Filing to Temporarily Extend Previously Approved Measures to Address Potential Gas Limitations

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this tariff amendment[1] to address the effects of natural gas system limitations on the CAISO's system and market operations, as previously approved by the Commission.[2] These tariff revisions will temporarily keep in place, with no modifications, seven previously approved tariff measures necessary to address gas system limitations related to the limited operability of the Aliso Canyon gas storage facility (Aliso Canyon) that would otherwise automatically expire, on November 30, 2018 and December 16, 2018.[3]

The CAISO continues to need these measures in order to operate the CAISO grid reliably and efficiently in light of continued limited operability of Aliso Canyon. As reported by the California Public Utilities Commission (CPUC), the Southern California region continues to face natural gas supply shortages due to

[1] The CAISO submits this filing pursuant to section 205 of the Federal Power Act (FPA), 16 U.S.C. § 824d.

[2] *Cal. Indep. Sys. Operator Corp.,* 161 FERC ¶ 61,232 (2017) (Aliso Phase 3 Order); and *Cal. Indep. Sys. Operator Corp.*, Commission delegated letter order, Docket No. ER18-375-000 (Dec. 15, 2017) (accepting the CAISO's emergency filing to temporarily re-implement previously approved and expired measures to address potential gas limitation) (Aliso Phase 4 Order).

[3] *See* Aliso Phase 3 Order at P 5; and *see* Aliso Phase 4 Order. As explained below, there have been five Commission proceedings on CAISO tariff amendments to address Aliso Canyon-related issues: the Aliso Phase 1, Aliso Phase 2, Aliso Phase 3, Aliso Phase 4 proceedings, which are completed, and the Aliso Phase 5 proceeding initiated by this filing. CAISO Governing Board approval was not required for the temporary extension of the tariff provisions.

limitations on withdrawals from Aliso Canyon, continued pipeline outages on the Southern California Gas Company (SoCalGas) system, and declines in inventory at non-Aliso Canyon storage facilities.[4]

The CAISO respectfully requests that the Commission issue an order accepting the seven separate measures by November 27, 2018. As discussed further below, the CAISO requests that the three of the tariff measures become effective November 30, 2018, and the remaining four become effective December 16, 2018. The Commission's acceptance of these tariff amendments will ensure that the CAISO has the tools it needs available to address the risks to electric system reliability posed by the limited operability of Aliso Canyon and limitations on the gas system in Southern California for the 2018-19 winter season and beyond.

Each of the seven measures the CAISO proposes to extend are just and reasonable on their own and are independent of each other. The CAISO can also implement each measure separately.

The first three measures the CAISO seeks to extend consist of certain tariff provisions that provide market participants greater bidding flexibility to better reflect their fuel costs in their commitment costs and default energy bids. These are the same provisions the Commission previously accepted in Aliso Phase 3, without modification.

1) Day-ahead market gas index: This measure better enables suppliers to reflect cost expectations in day-ahead market bids by approximating the next-day gas index published the morning of the day-ahead market run to calculate commitment costs and default energy bids.

2) Adjustments to commitment cost caps and default energy bids: This measure enables the CAISO to increase or decrease the gas commodity price index used to calculate commitment costs and default energy bids for resources in the SoCalGas and San Diego Gas & Electric Company (SDG&E) gas regions by applying commodity price scalars, for purposes of distinguishing resources affected by the gas limitations from resources in the rest of the CAISO market areas, and covering resources' costs if those resources are dispatched. The CAISO applies the scalars to the gas index used for the real-time markets.

[4] *See* California Public Utility Commission, *Aliso Canyon Working Gas Inventory, Production Capacity, and Well Availability for Reliability: Summer 2018 Supplemental Report* (July 6, 2018) (Summer 2018 Supplemental Report), provided as Attachment D to this filing, available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/715Report_Summer2018_Final.pdf.

3) After-the-fact fuel cost recovery: This measure allows scheduling coordinators to seek after-the-fact fuel costs regarding their default energy bids and generated bids from the Commission pursuant to an FPA section 205 filing, to the extent they are unable to recover their costs through the CAISO's bid cost recovery mechanisms.

The CAISO requests that the Commission accept these three proposed tariff measures effective November 30, 2018, to be in place on a temporary basis until no later than December 31, 2019. These measures will only be necessary until the CAISO implements new commitment costs and default energy bid enhancements in 2019, which was developed through a separate stakeholder process.[5] The CAISO expected to implement the CCDEBE changes by the end of 2018, which would have implemented more permanent solutions to provide market participants greater flexibility to reflect their gas-related costs in the CAISO markets. However, the CAISO has determined it will need to delay its implementation until the fall of 2019. In addition, the CAISO is continuing to refine elements of the CCDEBE proposal in other pending stakeholder initiatives. Therefore, the CAISO must request that the Commission extend the interim provisions until the CAISO can implement the CCDEBE improvements.

The next three proposed tariff measures will temporarily enable the CAISO to implement the maximum gas constraint. These are the exact same provisions the Commission previously approved in Aliso Phase 4.

4) Maximum gas constraint: This measure enables the CAISO to enforce a constraint that limits the maximum gas burn in the SoCalGas and SDG&E gas regions in order to (a) better ensure that market dispatches are consistent with observed gas system limitations; (b) reflect these restrictions in market clearing prices; and (c) avoid further stressing the gas system, which could in turn adversely affect electric grid reliability.

5) Competitive path assessment: When and where the CAISO employs a maximum gas constraint, this measure allows the CAISO to override manually the dynamic competitive path assessment to determine whether the CAISO should deem transmission constraints non-competitive. This allows the CAISO to reflect supply limitations in its market power mitigation process.

[5] The CAISO conducted the Commitment Cost and Default Energy Bid Enhancements stakeholder initiative (CCDEBE). Information regarding the CAISO's CCDEBE stakeholder process is available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts_DefaultEnergyBidEnhancements.aspx.

6) Virtual bidding: When the CAISO employs a maximum gas constraint, this measure allows the CAISO to suspend virtual bidding if the CAISO identifies market inefficiencies related to enforcing the constraint.

The CAISO also proposes to extend the provision of pre-day-ahead information also previously accepted by the Commission.

7) Pre-day-ahead information: This measure provides scheduling coordinators, for informational purposes only, advisory commitment schedules produced in the preliminary residual unit commitment process conducted on a two-day-ahead basis and based on available bids and forecasts of system conditions. Although these advisory schedules are not binding physically or financially, they assist scheduling coordinators with gas procurement decisions and gas nomination processes. [6]

The CAISO requests that the Commission accept these last four measures effective December 16, 2018, to be in place on a temporary basis until December 31, 2019. If the CAISO determines it will need these measures beyond December 31, 2019, the CAISO will seek appropriate relief before that date.

Experience over more than the past year and a half provides valuable information to the CAISO as to what the markets need to reflect better gas system limitations in electric system operations. For example, the CAISO has employed the greater bidding flexibility rules over the past year, which has allowed the market to optimize the energy market considering the costs reflected in participants bids of gas system constraints. Similarly, the maximum gas constraint has proven to be a useful and discrete tool to reflect the interactions of gas limitations in the CAISO market optimization. Therefore, the CAISO proposes to continue using these measures on a temporary basis over the next year as needed. Given the limitations of the current market rules and the expectation that Aliso Canyon will continue to have limited operability, combined with other limitations on the gas system in Southern California, the measures proposed herein are just and reasonable to address known gas system limitations.[7]

[6] When the CAISO files the CCDEBE changes, the CAISO will be requesting the Commission make this measure permanent as part of those proposed enhancements.

[7] *See ISO New England Inc., et al.*, 144 FERC ¶ 61,204, at PP 21, 42 (2013) (accepting ISO New England's Winter Reliability Program on an interim basis).

I. Background and Need for Filing

A. Applicable CAISO Market Provisions and Existing Tariff Authority

1. Overview of CAISO Market Structure and Operation

The CAISO administers both day-ahead and real-time wholesale electricity markets. A primary objective of these interrelated markets is to ensure there is a sufficient supply of electricity to satisfy demand in the region while maintaining the reliability of the transmission system the CAISO operates (*i.e.*, the CAISO controlled grid). These markets simultaneously optimize the procurement of energy and ancillary services and allocate transmission capacity on the CAISO controlled grid based on locational marginal prices at both internal nodes (*i.e.*, locations within the CAISO balancing authority area, including the Energy Imbalance Market balancing authority areas for the real-time market) and the interties (*i.e.*, locations for imports to and exports from the CAISO balancing authority area).[8] The tariff sets forth rules for the submission of bids and self-schedules for all of the CAISO markets.[9] The tariff also provides for communications between the CAISO and scheduling coordinators, including communications prior to the day-ahead market.[10]

The CAISO market optimization utilizes various information, which includes transmission constraints that the CAISO enforces consistent with good utility practice, to ensure, to the extent possible, that the market model used in the CAISO market reflects all the factors that contribute to actual real-time flows on the CAISO controlled grid, and that the CAISO market results align better with actual physical conditions on the CAISO controlled grid.[11] Market participants can engage in convergence bidding (also called virtual bidding) to hedge their physical market positions, and manage their exposure to differences between day-ahead and real-time prices.[12] The CAISO has the authority to suspend or limit virtual bidding activities that can detrimentally affect system reliability or grid

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8 Existing tariff section 27, *et seq.* For the sake of clarity, this transmittal letter distinguishes among existing tariff provisions (*i.e.*, provisions in the current CAISO tariff that apply absent the effectiveness of the temporary measures approved in the Aliso Phase 1, Phase 2, Phase 3, and Phase 4 proceedings), and proposed tariff provisions (*i.e.*, new provisions that the CAISO proposes to add to the tariff in this filing, which are all identical to proposed tariff provisions approved in the Aliso Phase 3 and Phase 4 proceedings).

9 Existing tariff section 30, *et seq.*

10 Existing tariff section 6, *et seq.*

11 Existing tariff section 27.5.6.

12 Existing tariff section 30.9.

operations.[13]

The existing tariff includes local market power mitigation procedures to enable the CAISO to mitigate the market effects of any conduct that would substantially distort competitive outcomes in the CAISO markets.[14] The local market power mitigation procedures include calculating default energy bids and running an automated process for determining whether transmission constraints are competitive or non-competitive and to mitigate energy bids that the market must dispatch to relieve non-competitive transmission constraints.[15]

2. Commitment and Compensation of Generating Resources

Pursuant to its tariff, the CAISO optimizes economic commitment and dispatch of supply resources in its markets based on resources' energy bids and commitment costs. The tariff also guarantees recovery of commitment costs and energy bid costs for CAISO-committed resources through a bid cost recovery mechanism.[16]

a. Commitment Costs

In the day-ahead market, (*i.e*., the integrated forward market (IFM) and the residual unit commitment (RUC) process), the CAISO commits long-start units and publishes a financially binding day-ahead schedule for IFM awards. The costs the market considers when making commitment decisions consist of the costs of starting up resources (start-up costs), the costs of running resources at their minimum operating levels (minimum load costs),[17] transition costs for resources that can operate in different configurations,[18] as well as energy bid costs.

To the extent resources do not recover their start-up costs, minimum load costs, and transition costs through the market, resources recover them through the bid cost recovery process based on the sum of cost components specified in

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13 Existing tariff section 7.9*.*

14 Existing tariff section 39, *et seq.*

15 Existing tariff section 39.7, *et seq.*

16 *See* existing tariff section 11.8, *et seq.*

17 *See* existing tariff section 31.3; appendix A to the CAISO tariff, existing definitions of "Start-Up Cost" and "Minimum Load Costs."

18 The tariff refers to these resources as "multi-stage generating resources" (MSG resources). *See* appendix A to the CAISO tariff, existing definitions of "Multi-Stage Generating Resources" and "Transition Cost."

the tariff that reflect the resources' unit-specific performance parameters relative to their market revenues for those cost components.[19] For natural gas-fired resources, this includes bid in costs, subject to commitment cost bid caps or mitigation to the default energy bid,[20] which includes a formulaic value adjusted for fuel-cost variation on a daily basis using a natural gas price calculated as discussed below.[21] Gas-fired and non-gas-fired resources can also submit daily bids for their start-up costs, minimum load costs, and transition costs that are between zero and a cap of 125 percent of the calculated proxy cost (the bid cap).[22]

Prior to requesting the Aliso Canyon interim measures, the CAISO used a natural gas price index to estimate the formulaic generator commitment and energy cost values for a gas-fired resource subject to the proxy cost methodology.[23] Absent the effectiveness of tariff revisions accepted on a temporary basis in the Aliso Phase 3 and Phase 4 proceedings as discussed below, the CAISO calculates the gas price index between 7:00 p.m. and 10:00 p.m. Pacific Time using up to three (but at least two) natural gas commodity prices published that day from the following sources: Natural Gas Intelligence (NGI), SNL Energy/BTU's Daily Gas Wire (SNL), and Platt's Gas Daily.[24] The CAISO uses this blended gas price index in the day-ahead market run for the following trading day. The same gas price index forms the basis of the CAISO's resource cost calculations used in the next day's real-time market.

Absent the Aliso Canyon interim measures, in market situations involving a spike in gas commodity prices the CAISO would use a more recent gas price. Specifically, if a daily gas price reported by ICE on the morning of the day-ahead market run exceeds 125 percent of the gas price index calculated for the day-ahead market between 7:00 p.m. and 10:00 p.m. on the preceding day, the CAISO will utilize the daily gas price reported by ICE on the morning that the

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[19] Existing tariff sections 30.4.1.1.1(a) and 30.4.1.1.2(a). Under the CAISO tariff, all resources except for those with use limitations recover their commitment costs pursuant to this "proxy cost methodology." Use-limited resources have the option of utilizing the "registered cost methodology" under which they recover their commitment costs pursuant to registered fixed values. Existing tariff section 30.4.1.2.

[20] The default energy bid is only relevant when the resource is mitigated and is subject to its default energy bid and not the competitive locational marginal price.

[21] Existing tariff section 30.4.1.1.1(a).

[22] Existing tariff sections 30.4.1.1.1(b), 30.4.1.1.2(b), 30.4.1.1.5, 30.7.9(c), and 30.7.10.

[23] See tariff section 39.7.1.1.1.3(a) as it read prior to Commission acceptance of temporary revisions to the tariff section in the Aliso Phase 1 and Phase 2 proceedings.

[24] All times listed in this transmittal letter are Pacific Time. After December 31, 2017, the Intercontinental Exchange (ICE) index stopped being published and the CAISO can no longer use it in the daily calculation of the blended index.

day-ahead market is running in all CAISO cost formulas and market processes for the day-ahead market running that day.[25] The CAISO adopted this procedure based in part on the fact that prior to this spring, ICE usually published gas commodity prices by 10:00 a.m., which is the time when the CAISO's day-ahead market closes. Effective April 1, 2016, however, ICE changed its publication time to 11:30 a.m., *i.e*., after the CAISO day-ahead market closes.

b. Default Energy Bids under the Variable Cost Option

When a resource's bid is mitigated, the CAISO systems substitute the greater of the default energy bid or the competitive portion of the locational marginal price for the resource's bid in the market clearing process and use the default energy bid to determine the resource's bid cost recovery compensation.[26] Default energy bids also factor into the settlement of residual imbalance energy and exceptional dispatches in some circumstances.[27] The default energy bid allows the resource to recover its marginal cost of producing energy.[28]

Each scheduling coordinator can choose one of the following three options as its preferred option for calculating default energy bids: (1) the variable cost option; (2) the negotiated rate option; or (3) the locational marginal price option.[29] For a gas-fired resource subject to the variable cost option, that option calculates the default energy bid based on incremental fuel costs, which are determined using the same tariff provisions that are used to determine the gas price under the proxy cost methodology as described above. All default energy bids under the variable cost option include an adder of 10 percent to the CAISO's calculation of costs based on the gas price indices.[30]

The CAISO calculates default energy bids for the day-ahead and real-time markets respectively using the same gas commodity price formulas described above for commitment costs.

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[26] *See* existing tariff sections section 39.7.1, *et seq* and 11.8, *et seq.*

[27] *See* existing tariff sections 11.5.5-11.5.6.

[28] *See Cal. Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274, at PP 1004-14, 1033-71 (2006).

[29] Existing tariff sections 39.7.1-39.7.1.3. Further, a scheduling coordinator for a frequently mitigated unit has a fourth option for calculating default energy bids, the frequently mitigated unit option. Existing tariff section 39.7.1.4.

[30] Existing tariff sections 39.7.1.1-39.7.1.1.1 and 39.7.1.1.1.3-39.7.1.1.1.4.

c. Generated Bids

The CAISO generates cost-based bids when a scheduling coordinator does not submit a bid for a resource that is subject to a must-offer requirement, such as a resource adequacy resource, or pursuant to the generally applicable scheduling and infrastructure bidding rules as set forth in the CAISO tariff and the business practice manual.[31] As with start-up costs, minimum load costs, transition costs, and default energy bids under the variable cost option, the CAISO determines gas costs for generated bids of gas-fired resources using the gas pricing provisions described above. Like default energy bids under the variable cost option, generated bids include an adder of 10 percent.

d. Bid Cost Recovery Process

The CAISO guarantees recovery of start-up costs, minimum load costs, transition costs, and energy bid costs for resources committed by the CAISO through the bid cost recovery mechanism set forth in its tariff.[32] To the extent a resource's market revenues based on locational marginal prices are insufficient for the resource to recover such costs, the CAISO will pay the resource uplift to ensure that it recovers its costs.

B. Natural Gas Leak at Aliso Canyon

The CAISO refers the Commission to attachment C to this filing for background information regarding the natural gas leak at Aliso Canyon and the implications thereof, including the risk posed to the reliability of electric service.

C. Prior Proceedings to Address the Impact on the CAISO Balancing Authority Area of the Limitations on Aliso Canyon

The CAISO filed two successive tariff amendments, in the Aliso Phase 1 proceeding and later the Aliso Phase 2 Aliso proceeding, to incorporate interim measures to address reliability issues that could arise due to the limited operability of Aliso Canyon.[33] The Commission approved the first set interim measures in the Aliso Phase 1 proceeding for a period of approximately five months (*i.e.*, until November 30, 2016)[34] and the second set, which was largely

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[31] *See* existing tariff sections 30.7.3.4 and 40.6.8; appendix A to the CAISO tariff, existing definition of "Generated Bid."

[32] *See* existing tariff section 11.8, *et seq.*

[33] The Aliso Phase 1 proceeding was in Docket No. ER16-1649-000 and the Aliso Phase 2 proceeding was in Docket No. ER17-110-000.

[34] *See Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,224 (2016) (Aliso Phase 1 Order); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,135 (2016) (accepting filing submitted by CAISO

the same as the first, in the Aliso Phase 2 proceeding for an additional 12 months (*i.e.*, until November 30, 2017).[35] In the Aliso Phase 3 proceeding, the CAISO proposed to extend some of those interim measures for another 12 months (*i.e.*, until November 30, 2018) and to make permanent and modify in some respects the balance of the previously accepted interim measures.[36] The Commission authorized the CAISO to extend the interim measures and rejected its proposal to make permanent and modify the balance of the measures, but expressly permitted the CAISO to submit a filing to extend those latter measures for an additional year.[37]

In the Aliso Phase 4 proceeding, the CAISO subsequently submitted a tariff amendment asking for expedited treatment to provide the CAISO with the authority to implement four measures temporarily that the Commission previously rejected when the CAISO asked for these same provisions on a permanent basis and for wider footprint of its market.[38] The Commission accepted the expedited filing effective December 16, 2017, to expire on December 16, 2018.[39]

Attachment C to this transmittal letter provides more detail on the individual Aliso Canyon filing phases.

D. Assessment of the Need to Address Continuing Concerns Related to the Limited Operability of Aliso Canyon and Limitations on the Gas System in Southern California

The limited operability of Aliso Canyon, which prompted the measures proposed and accepted in the Aliso Phase 1, Phase 2, Phase 3, and Phase 4 proceedings, still presents challenges today and will continue to do so into the near future. There has been little change in the Southern California gas system

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to comply with directives in Aliso Phase 1 Order and granting CAISO motion for clarification regarding that Order); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,093 (2016) (granting CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions accepted in Aliso Phase 1 Order); *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,029 (2016) (granting subsequent CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions accepted in Aliso Phase 1 Order); Commission Letter Order, *Cal. Indep. Sys. Operator Corp.*, Docket No. ER16-1649-006 (Feb. 24, 2017) (accepting eTariff changes to reflect actual effective date of certain tariff revisions accepted in Aliso Phase 1 Order).

35 *See* Aliso Phase 2 Order at P 25; Commission Letter Order, Docket No. ER17-110-001 (Mar. 24, 2017) (accepting filing submitted by CAISO to comply with directives in Aliso Phase 2 Order).

36 The Aliso Phase 3 proceeding was in Docket No. ER17-2568-000.

37 Aliso Phase 3 Order at PP 25-26, 53-63.

38 The Aliso Phase 4 proceeding was in Docket No. ER18-375-000.

39 *See* Aliso Phase 4 Order.

since the Commission accepted the CAISO's Aliso Phase 3 and Phase 4 filings. The Aliso Canyon facility continues to experience limited operability. Several critical gas pipelines serving the Southern California gas system remain out of service or operating at reduced capacity, with no firm timetable for restoration. In addition, the CPUC has identified declines in inventory at non-Aliso Canyon storage fields that affect their withdrawal capacity.

On July 6, 2018, the CPUC issued its Summer 2018 Supplemental Report regarding Aliso Canyon reliability impacts. The Summer 2018 Supplemental Report reviewed reliability concerns for both the summer 2018 and winter 2018-19 seasons. The CPUC found that in scenarios that assume continuing pipeline outages, "peak demand cannot be met without curtailments, even if Aliso [Canyon] were filled to the maximum inventory … deemed to be safe."[40] The report also notes that "[p]ipeline capacity has not improved appreciably since winter 2017-18, and there is a chance that it could deteriorate further."[41]

The Summer 2018 Supplemental Report provides detailed analysis regarding the Southern California gas system's ability to meet 1-in-10 peak day demand through the 2018-19 winter season. The CPUC studied two pipeline capacity scenarios under both average and cold weather sensitivities. In the first scenario, the CPUC assumed that current gas pipeline outages continue and an additional 180 million cubic feet per day (MMcfd) of pipeline capacity is lost in September. In the second scenario, the CPUC assumed a significant increase in pipeline capacity resulting from the restoration of SoCalGas Line 4000 and no additional pipeline outages. As indicated above, there is no indication that Line 4000 will actually be returned to service prior to the 2018-19 winter season.

The CPUC's analysis demonstrates a risk of gas shortfalls in every scenario, indicating gas that must be either withdrawn from Aliso Canyon or there must be gas delivery curtailments to noncore customers, including electric generators. Shortfalls were exacerbated under cold weather conditions, with maximum shortfalls in excess of 1,400 MMcfd. In the scenario with pipeline outages, the "shortfalls could not be met without curtailments"[42] even if Aliso Canyon was filled to its maximum safe inventory level of 68.6 billion cubic feet (Bcf). The study recommended increasing the maximum allowable Aliso Canyon inventory to 34 Bcf.[43] This represents a 9.4 Bcf increase from the 2017 maximum allowable inventory, but is still well below Aliso Canyon's 68.6 Bcf maximum safe inventory level.

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40 Summer 2018 Supplemental Report at p. 2.

41 *Id.* at p. 7.

42 *Id.* at p. 12.

43 *Id.* at p. 14.

The 2018 Supplemental Report recognizes that even with the increased availability from Aliso Canyon resulting from the 34 Bcf cap, the January peak cannot be met in the outage scenario under cold weather conditions. The 2018 Supplemental Report also acknowledges that if pipeline outages continue, it may not be possible to fill Aliso Canyon to 34 Bcf. The report emphasizes that "even with 34 Bcf at Aliso [Canyon], the SoCalGas system would not meet the 1-in-10 design standard with the pipeline outages assumed in the [outage] Scenarios. Southern California would remain vulnerable to disruptions in energy supply that could lead to curtailments of noncore customers, including electric generators."[44]

Two SoCalGas natural gas transmission pipelines continue to be either out of service or operating at significantly reduced capacity. SoCalGas relies on these pipelines to serve core and noncore customers. Specifically, SoCalGas Line 235-2 ruptured on October 1, 2017, also damaging the nearby Line 4000. The continued outage of Line 235-2 and the limited operability of Line 4000 reduces maximum system capacity by 800 MMcfd. The CAISO does not expect that operational status of these lines will change until after the winter 2018-19 season, at the earliest.[45] Similar to previous years, there is still a risk of additional unplanned outages that could further reduce maximum capacity on the SoCalGas system. SoCalGas has adopted mitigation measures to address these outages, which in part depend on deliveries using alternative pipelines.

The CAISO anticipates that the upcoming 2018-19 winter's minimum generation requirement (*i.e.*, the gas needed by the electricity system operators to maintain electric system reliability) by the Los Angeles Department of Water and Power (LADWP) and the CAISO will be higher than it was for 2017-2018. This is primarily due to the fact that LADWP has planned a transmission line outage beginning in the last week of November 2018. Once the LADWP line goes out of service, LADWP will require additional gas-fired resources in the Los Angeles Basin to meet electric reliability needs. LADWP's planned transmission maintenance increases the balancing authorities' combined minimum electric generation requirement in the Southern California area.[46] Without adequate gas

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[44] *Id.* at p. 15.

[45] See SoCalGas Response to CPUC Letter Regarding the Status of Natural Gas Transmission Lines at pp. 6-7, available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/SCGResponse%5ECPUC%20June%2018Letter.pdf.

[46] The 2017-2018 Aliso Canyon Winter Risk Assessment Technical Report found that electric minimum generation would require 219 MMcfd of gas under normal conditions and 293 MMcfd during a contingency event with the LADWP transmission outages. Without the transmission outages, the electric minimum generation required only 22 MMcfd and 96 MMcfd, for normal and contingency conditions, respectively. The transmission outages are likely to have a similar impact on the 2018-2019 electric minimum generation requirements. *See Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement,* Prepared by the Staff of the

to meet the minimum generation requirement, electric reliability is threatened.

In sum, the winter 2018-19 gas system capacity conditions will be virtually unchanged from winter 2017-18 conditions and minimum electric generation requirements in the Southern California area are expected to be higher. Absent the availability of gas from Aliso Canyon, a shortfall occurring this winter on a 1-in-10-year demand day will require curtailments of noncore customers, including electric generators, even if the generators reduce their output to the minimum.[47] The Summer 2018 Supplemental Report makes clear that there are increased risks to reliability this winter due to the continued limited operability of Aliso Canyon and continuing outages on the gas pipelines in Southern California.

II. Proposed Tariff Revisions

The CAISO proposes to extend temporarily until December 31, 2019, the exact same seven measures approved by the Commission in prior proceedings, which are set to automatically expire on November 30, 2018, and December 16, 2018.[48] Extending these seven measures will ensure the CAISO can continue to manage its system reliably when faced with gas constraints posed by the limited operability of Aliso Canyon and known outages on the Southern California gas pipeline system.

The first three measures provide market participants greater flexibility to reflect the higher incremental and start-up and minimum load costs due to gas constraints. This will allow the CAISO move the gas burn away from resources in areas in which there are gas constraints, and will allow market participants to reflect their higher costs due to the absence of Aliso Canyon, which in turn will ensure recovery of those costs if the resource is actually dispatched. The CAISO only requires the continued effectiveness of these provisions temporarily until the CAISO implements more permanent measures that arise from the CAISO's separate CCDEBE stakeholder initiative. The CAISO has completed the CCDEBE stakeholder process but the CAISO cannot implement these changes until the end of 2019. The CAISO also continues to refine elements of the CCDEBE proposal in an ongoing stakeholder proceeding. The CCDEBE initiative is the appropriate forum for proposing more permanent solutions to enhance its cost-based framework to reflect the need to balance gas-electric system requirements in a manner that supports system reliability and market efficiency by having correct costs, appropriate price signals, and supplier cost recovery. The CAISO plans to file a tariff amendment in 2019 to implement the CCDEBE enhancements in fall 2019. Consequently, the CAISO proposes to

CPUC, California Energy Commission (CEC), the CAISO, and the LADWP at p. 5., available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=221863.

47 Summer 2018 Supplemental Report at p. 15.

48 This filing initiates the Aliso Phase 5 proceeding.

extend the specified temporary measures until it implements the permanent CCDEBE solutions.

The next three proposed tariff measures consist of measures that allow the CAISO to enforce a maximum gas constraint that enables the CAISO to operate the system reliably when faced with natural gas system constraints in the southern region of the CAISO's system related to the limited operability of Aliso Canyon. The CAISO's experience over the past years has shown that prudent use of this tool in its current form has proven effective in avoiding negative impacts on electric reliability.

The last of the seven tariff measures consists of the provision of information regarding possible day-ahead market schedules two-days prior to inform participants of their possible gas requirements. The CAISO will request that the Commission make this measure permanent as part of the CCDEBE filing.

Although the CAISO is filing to extend these measures in the same tariff amendment, each measure is just and reasonable on its own and is not dependent on any of the others. The CAISO can implement each of the measures on their own because, although they are related they are not interdependent and are severable.

A. Maintain Existing Interim Bidding Flexibility Market Measures until no Later than December 31, 2019

1. Maintain Interim Tariff Provisions that Improved the Day-Ahead Gas Price Methodology

The CAISO proposes to maintain until no later than December 31, 2019, the existing interim tariff provisions that the Commission accepted in the Aliso Phase 3 proceeding to improve the accuracy of the gas commodity price indices the CAISO uses to calculate commitment cost proxy costs, generated bids, and default energy bids used by the day-ahead market, by reflecting the most recent gas commodity price information. Using information that more accurately reflects prevailing gas commodity costs enhances the day-ahead market's ability to dispatch resources efficiently. These provisions also better ensure that resources cleared in the day-ahead market will be compensated based on fuel prices that better reflect their actual costs of procurement.[49] Maintaining the interim tariff provisions will particularly help reflect constrained gas conditions that result from the limited operability of Aliso Canyon. However, consistent with

[49] As explained above, permitting adequate recovery of such costs accords with Commission precedent. *See Cal. Indep. Sys. Operator Corp.*, 145 FERC ¶ 61,082, at PP 21-24; (2013); *Cal. Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274, at PP 1004-14, 1033-71 (2006).

the existing interim tariff provisions, these provisions will continue to apply to all resources in the CAISO balancing authority area so the day-ahead market uses consistent and more accurate gas prices system-wide.

Specifically, the CAISO proposes to maintain the tariff provisions stating that, for the day-ahead market, the CAISO will use a volume-weighted average price reported between 8:00 a.m. and 9:00 a.m. that the ICE calculates based on trades transacted on ICE during its next-day trading window, *i.e.*, on the morning of the CAISO's day-ahead market.[50] If, for any reason, the volume-weighted average price is not available from ICE during this period, the CAISO will use the most recently calculated price indices.[51] For example, if the CAISO cannot obtain price data on a particular day, it will use the prior evening's price index.

The Commission previously found that this procedure constituted a just and reasonable improvement upon the CAISO's existing tariff provisions that should enable the CAISO to address limitations in the natural gas delivery system in Southern California and to facilitate fuel cost recovery by generators.[52] Maintaining the tariff provisions will allow them to continue serving these purposes.

The Commission previously accepted "CAISO's proposal to use an ICE-generated index" in implementing its proposed tariff revisions to improve the accuracy of the natural gas price index the CAISO uses to calculate commitment costs, generated bids, and default energy bids in the day-ahead market.[53] This filing permits the CAISO to continue calculating these amounts using a volume-weighted average gas price that is available in ICE between 8:00 a.m. and 9:00

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[50] Proposed tariff section 39.7.1.1.1.3(b). The entirety of proposed tariff section 39.7.1.1.1.3 in this filing is identical to the same section approved in the Aliso Phase 2 proceeding. As it did in that earlier proceeding, the CAISO has broken section 39.7.1.1.1.3 out into new subsections (a) through (d) to make the organization of the provisions in the section more clear. New subsections (c) and (d) are discussed below.

[51] Proposed tariff section 39.7.1.1.1.3(a). In addition, the CAISO proposes to maintain the effectiveness of the tariff provisions regarding public market information that were approved in the Aliso Phase 2 and Aliso Phase 3 proceedings to clarify that the CAISO will publish daily greenhouse gas price indices and the natural gas price used for the real-time market when available. These are revised tariff section 6.5.2.3.4 and proposed tariff section 6.5.4.2.3., both of which are identical to those same sections as accepted in the Aliso Phase 2 and Aliso Phase 3 proceedings.

[52] Aliso Phase 1 Order at P 12 & n.13; Aliso Phase 2 Order at P 26; and Aliso Phase 3 Order at PP 25-26.

[53] Aliso Phase 1 at P 12 & nn.13-14. The Commission also noted that in order to use an index reported by ICE, the index must conform to the Commission's policy statement on price indices. *Id.* at P 12 n.14. The Commission confirmed that the index does conform to the policy statement. 157 FERC ¶ 61,029, at P 10.

a.m., *i.e.*, prior to the running of the CAISO's day-ahead market.

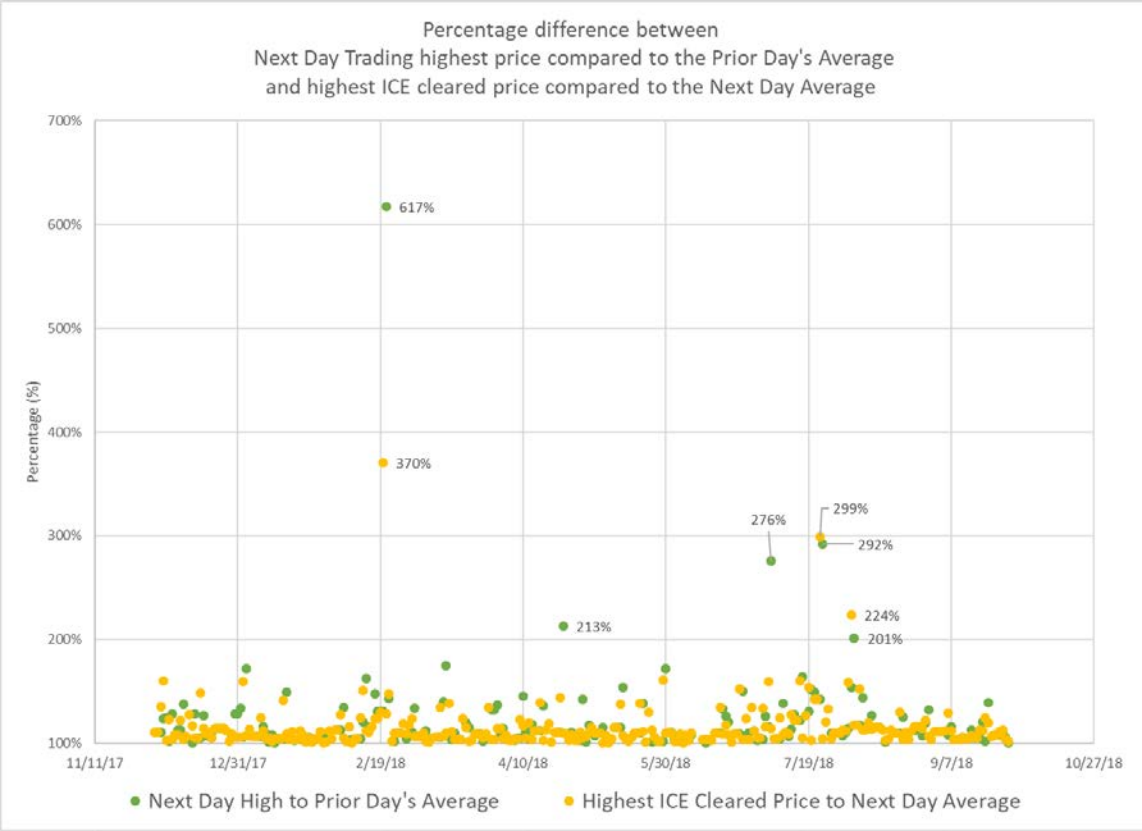
The procedure set forth in the proposed tariff provisions revises and replaces the CAISO's day-ahead procedure that would apply in the absence of the procedure approved in the Aliso Phase 1, Phase 2 and Phase 3 proceedings that the CAISO now proposes to extend. The former (*i.e.*, pre-Aliso Phase 1, Phase 2, and Phase 3) procedure would require that the CAISO calculate its day-ahead gas price index two days prior to the applicable trading day using at least two or more of the following publications: NGI, SNL and Platt's Gas Daily.[54] After December 31, 2017, the ICE gas index is no longer published and the CAISO, therefore, cannot use it in the nightly calculation.

The market data from November 2017 through today, shown in Figure 1 below, supports continuing to use the revised procedure, which improves upon the former procedure. In Figure 1, the CAISO calculated the premium needed to reflect the highest traded price relative to the next-day index used by the day-ahead market and by the real-time market.[55] For the day-ahead market, the CAISO calculated the percent difference between (i) the highest prices for trades on or reported by NGI, SNL, or ICE and (ii) ICE's next-day gas price index published for the following day (depicted as green circles). For the real-time market, the CAISO calculated the percent difference between (i) the highest prices traded on ICE and (ii) ICE's next-day gas index published on the morning of the day-ahead market (depicted as yellow dots).

[54] The revised day-ahead procedure that the CAISO proposes to maintain in this filing does not affect the calculation of the real-time gas price index, which will continue to be based on two or more of these publications. *See* revised tariff section 39.7.1.1.1.3(c).

[55] The next section of this transmittal letter concerns the tariff provisions the CAISO proposes to maintain regarding the real-time gas price.

Figure 1



As reflected in Figure 1, continuing to use the more up-to-date price data produced by ICE pursuant to the revised procedure will account for fuel cost increases that may develop on a given day, better reflecting resources' actual fuel costs when they purchase gas for the operating day. This, in turn, will result in a more efficient and informed day-ahead market dispatch because the bids will incorporate more timely information regarding the resource's actual gas costs. Using the gas price index reported by ICE on the morning of the day-ahead market reflects gas trading for the next operating day.

The CAISO's Department of Market Monitoring's (DMM) comments submitted to the Aliso Phase 2 stakeholder process supported this change and recommended that the CAISO permanently include in its tariff a feature to eliminate the one-day lag in gas prices used in the day-ahead market.[56] Although the CAISO agrees that this change is an improvement over the CAISO existing process, in this filing, the CAISO proposes to include such a measure in

[56] *See* DMM's Comments on the Draft Final Proposal for Aliso Canyon Gas-Electric Coordination – Phase 2 (September 28, 2016) (DMM Comments on Phase 2 Draft Final Proposal), available at: http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas-ElectricCoordinationPhase2DraftFinalProposal.pdf.

the tariff only as an interim measure. As part of the CCDEBE stakeholder initiative, the CAISO plans on proposing to make this measure a permanent feature, beyond December 31, 2019, in conjunction with the additional measures developed in the CCDEBE stakeholder initiative.

As was previously the case, continuing to use the interim procedure will also obviate the need for the CAISO to retain the manual gas price spike procedure it employed under the former procedure, which authorizes the CAISO, when a gas price spike occurred, to calculate gas price indices for gas-fired resources manually using a daily gas price available on ICE the morning of the day-ahead market run.[57] The CAISO adopted this procedure for use only when the CAISO experienced price spiking conditions based, in part, on the availability of the ICE gas index. However, the manual procedure was infeasible because the ICE gas price index published at approximately 11:30 a.m., after the CAISO market had already closed, and the market started to run with the goal of publishing the day-ahead results by 1:00 p.m.[58] Waiting for 11:30 a.m. to calculate the day-ahead gas price indices would require the CAISO to re-open bidding in the day-ahead market after 11:30 a.m., close the day-ahead market until about 12:45 p.m., and then publish the day-ahead market results potentially by about 3:45 p.m. Changing the day-ahead market timeline in this manner would not be ideal because it would delay the ability of gas-fired resources to prudently procure and nominate gas to meet CAISO dispatch instructions.

This issue was further complicated when ICE ceased publishing its gas price index on December 31, 2017. Absent the Aliso Canyon interim measures, the otherwise applicable manual process would be infeasible because there is no longer an applicable ICE gas price index. For these additional reasons, it is necessary to maintain the interim procedure the Commission previously approved to allow the CAISO to continue to calculate day-ahead gas price indices based on price information released on the morning of the day-ahead market run.[59]

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[57] *See* tariff section 39.7.1.1.1.3(b) as deleted in the Aliso Phase 2 and Aliso Phase 3 proceedings, and in this filing.

[58] See section I.A(2)(a) of this transmittal letter.

[59] Deleted tariff section 39.7.1.1.1.3(b). To reflect the deletion of these provisions, the CAISO also proposes to delete the cross-references to the provisions that appear elsewhere in the tariff. Proposed tariff section 39.7.1.1.1.3(a); deleted tariff sections 30.4.1.2(b),) and 31.6.1(v). The Commission approved all of these same deletions in the Aliso Phase 2 and Aliso Phase 3 proceedings.

2. Maintain the Interim Tariff Provisions Implementing an Increased Gas Price Applicable to Commitment Cost Caps and Default Energy Bids for the Real-Time Market

The CAISO proposes to maintain until no later than December 31, 2019, the interim tariff provisions the Commission approved in the Aliso Phase 2 and Phase 3 proceedings that allow the CAISO to use an increased (or decreased) gas price to calculate commitment cost bid caps for gas-fired resources subject to the proxy cost methodology,[60] generated bids for resource adequacy resources, and default energy bids under the variable cost option used for mitigation. The existing interim tariff provisions permit such an increase or decrease by an amount necessary to ensure the real-time market appropriately recognizes the increased constraints of resources in the Southern California region. As the Commission previously found, these tariff provisions allow resources to manage gas balancing requirements under the tightened balancing tolerance bands and to better recover fuel costs during the current interim period of potential volatility.[61]

Gas-fired and non-gas-fired resources can submit daily bids for their start-up costs, minimum load costs, and transition costs that are between zero and a cap of 125 percent of the calculated proxy cost (the bid cap).[62] If mitigated, resources may also be subject the default energy bid. The commitment costs bid caps and the default energy bid, include a formulaic value adjusted for fuel-cost variation on a daily basis using a natural gas price calculated.[63] Prior to requesting for the Aliso Canyon interim measures, for the real-time market, the CAISO used a natural gas price index to estimate the formulaic generator commitment and energy cost values for a gas-fired resource subject to the proxy cost methodology.[64] The CAISO proposes to continue have the authority to increase or decrease the gas price component of these formulas as necessary in the real-time market to reflect the constraints on the Southern California gas system arising from the continued limited operability of Aliso Canyon.

Although Aliso Canyon operations may increase in the future, at this time the CAISO anticipates that (1) Aliso Canyon will have only limited operability; (2)

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60 As discussed above in section I.A(2)(a) of this transmittal letter, resources subject to the proxy cost methodology are permitted to submit daily bids for their commitment costs, so long as those bids are greater than zero and less than or equal to 125 percent of the proxy commitment costs calculated by the CAISO.

61 Aliso Phase 1 Order at P 29; Aliso Phase 2 Order at P 26; Aliso Phase 3 Order at PP 25-26.

62 Existing tariff sections 30.4.1.1.1(b), 30.4.1.1.2(b), 30.4.1.1.5, 30.7.9(c), and 30.7.10.

63 Existing tariff section 30.4.1.1.1(a).

64 See tariff section 39.7.1.1.1.3(a) as it read prior to Commission acceptance of temporary revisions to the tariff section in the Aliso Phase 1 and Phase 2 proceedings.

intra-day (*i.e.*, real-time) gas availability will likely decrease; and (3) tightened gas balancing requirements will apply. The CAISO expects that the current commitment costs, generated bids, and default energy bids likely will not fully account for these conditions. Because the CAISO's current calculation of the gas commodity price is based on trading for next-day delivery, it does not include information from the intra-day gas commodity markets regarding gas prices or risk of noncompliance with gas balancing rules. Therefore, absent retaining these tariff provisions, the resulting commitment costs, generated bids, and default energy bids may not allow resources to manage gas-balancing requirements within tightened tolerance bands, and the calculated gas price may not fully capture real-time gas commodity prices on all days.

Further, the limited operability of Aliso Canyon and continued gas pipeline outages means there is a lack of nearby gas capacity to respond to electric ramping needs and, when there is a deterioration of gas pipeline pressure, there is limited ability for SoCalGas and SDG&E to support large increases of gas receipts onto their systems relative to their scheduled capacity or deliver the increased amounts of gas in real-time to generators. Because of these constraints, it is better if the real-time market dispatch generators on these gas systems only to meet local electrical needs and avoid dispatching them to meet general CAISO system needs that can be met by resources not subject to these strict gas limitations. Failure to retain the existing tariff provisions could result in the commitment cost bid caps, generated bids, and default energy bids resulting from the gas price index based on the next-day gas commodity price by the real-time market being too low to allow the resource to bid commitment costs or reflect generated or mitigated energy offers in the real-time market that reflect gas system limitations. The higher commitment cost and energy bids allowed by the use of the scalers will tend to avoid the real-time market economically dispatching a generator on the affected gas system for system needs. When generators on the affected gas system are under tightened gas balancing requirements, they will presumably reflect these tightened balancing requirements in their bids, which should achieve the desired result of the real-time market dispatching these resources only for local electrical needs.

The commitment cost costs, generated bids, and default energy bids resulting from the gas price index that the CAISO used in the real-time market based on the rules in effect before the CAISO adopted the Aliso measures, *i.e.*, without the scalars, may be insufficient to allow generators on the affected gas systems to manage their gas balancing requirements under tightened balancing tolerance bands. This can occur even if the CAISO enforces the maximum natural gas constraint that it proposes to also maintain until December 31, 2019, in this filing, thus limiting the incremental dispatch of generators in a particular area to a maximum or minimum gas usage. Even when the CAISO enforces the maximum gas constraint, it is preferable for the CAISO to differentiate between generators that are at risk of violating balancing rules and those that have gas

available to respond to dispatch. This allows the market dispatches and prices to reflect the resources' expected costs.

One example of how these circumstances can occur is that, under a low-operational flow order (OFO) scenario, the pipeline pressure is low because nominated gas is lower than the actual gas demand. To maintain the pressure, customers must maintain their withdrawals within a tolerance band of their nominated flows. If a generator withdraws outside the tolerance band and is unable to procure and nominate flow to reduce this imbalance, the generator would need to either reduce its gas burn, or incur a noncompliance penalty. Under the interim tariff provisions that the CAISO proposes to maintain, the generator will be able to hold or reduce its gas burn by bidding into the CAISO market at higher costs, making the real-time market less likely commit the resource or dispatch it up.

To address these problems and reflect expectations regarding real-time commodity prices, the CAISO proposes to maintain the effectiveness of the interim tariff provisions to increase the gas commodity price for resources connected to either the SoCalGas or the SDG&E system for purposes of determining the CAISO's real-time gas price indices.[65] Specifically, for the real-time market, if conditions warrant, the CAISO will increase or decrease the calculated gas price for resources receiving gas service from SoCalGas and SDG&E by an amount that it determines is necessary to: (1) improve the dispatch of these resources so they are more likely to be dispatched to address local needs rather than system needs; (2) better account for systematic differences between day-ahead and same-day natural gas prices; and (3) improve the ability to manage the generators' gas usage within applicable gas balancing rules. Maintaining these tariff provisions will enable the real-time market clearing process to continue to avoid dispatching these resources for system needs and increase its ability to dispatch the resources only to address local needs. If conditions warrant, the increased amount should also be sufficient to continue allowing resources to account more effectively for systematic differences between day-ahead and same-day gas commodity prices in their bids. Further, the increased amount will continue to provide additional headroom to reflect costs of generators operating within the applicable gas balancing rules.

To achieve these goals, for resources connected to the SoCalGas or SDG&E systems for the real-time market, if it is necessary to trigger the scalars,

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[65] Proposed tariff section 39.7.1.1.1.3(d). The proposed tariff section in this filing is identical to the same new section approved in the Aliso Phase 2 and Aliso Phase 3 proceedings. Additional detail regarding the application of the proposed tariff section is provided in the *Aliso Canyon Gas-Electric Coordination Phase 3 Draft Final Proposal* at pp 37-38 (June 30, 2017) (provided as attachment D to the Aliso Phase 3 proceeding initial filing) (Aliso Phase 3 Draft Final Proposal), available at: http://www.caiso.com/Documents/DraftFinalProposal-AlisoCanyonGas-ElectricCoordinationPhase3. pdf.

the CAISO would increase of the gas commodity price used for determining commitment costs by 75 percent as it did previously. However, it is not appropriate to hardwire this amount because the CAISO may need to increase or decrease the gas commodity price based on its evaluation of whether the current level is enough to accomplish the three criteria described above, or whether a greater or lesser increase is necessary. However, any increase in the commitment cost gas price will remain capped at $2.50 per therm, plus two times the next-day gas index price. The CAISO will continue to use this same procedure to determine default energy bids under the variable cost option, except that the initial increase will remain 25 percent, and any increase in the generated or default energy bid gas commodity price will be capped at 100 percent.[66]

During the stakeholder process for the Aliso Canyon Phase 3 proceeding, DMM requested that the CAISO assess whether the current level of the gas price scalars for resources supplied by the Aliso Canyon gas system are appropriate or should be reduced or set to zero.[67] In response to DMM's comments, the CAISO reevaluated the setting of the scalars and concluded to leave the gas scalars at the same original levels of 175 percent and 125 percent.

Starting in May 2016, the CAISO applied a gas price index in the commitment cost proxy cost calculation scaled at 175 percent of the gas commodity price and a gas price index in the default energy bid calculation scaled at 125 percent of the gas commodity price. As of August 1, 2017, the CAISO stopped continuously activating of the gas scalars for both the commitment cost and default energy bid calculations and set them to 100 percent (*i.e.*, effectively having no scalar). Consistent with the DMM's recommendations, the CAISO applied the scalars only as needed and not on a continuous basis, and only reinstated them based on the CAISO's reevaluation based on the criteria set forth in the interim tariff provisions.

The CAISO has continued to monitor gas and electric system conditions and adjusted the scalars only when necessary. On August 3, 2017, because of gas curtailments in the Southern California area due to an unplanned pipeline outage, the CAISO again adjusted the scalars to 175 percent and 125 percent for commitment cost and default energy bid calculations effective August 4, 2017. On August 7, 2017, because the CAISO no longer expected curtailments in the

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66 Such increases above existing gas commodity prices are sometimes called scalars, *e.g.*, the 75-percent initial increase of the gas commodity prices for the commitment cost proxy cost constitutes a 75-percent scalar.

67 *See* DMM Comments on Aliso Canyon Gas-Electric Coordination Phase 3 Initiative Straw Proposal at p. 2 (DMM Comments on Phase 3 Straw Proposal), available at: http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationPhase3StrawProposal.pdf; DMM Comments on Phase 3 Draft Final Proposal at pp. 3-4, available at: http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationPhase3DraftFinalProposal.pdf.

near future and based on the level of loads in the CAISO system, the CAISO lowered the scalars to 100 percent (additional percentage of zero) for the commitment cost and default energy bid calculations effective August 8, 2017. On December 7, 2017, the CAISO activated the gas scalars due to concerns with low temperatures and system conditions, including the wildfires in the Southern California region. That activation continued through January 31, 2018. The CAISO again activated the scalars from February 20 to March 7, 2018, as cold weather lead to high gas usage and potential gas curtailments in the Southern California area.

As demonstrated by these actions, the CAISO agrees with DMM that when conditions do not warrant the scalars, the CAISO should de-activate them, or potentially modify them within the applicable scalar range, based on need.

As previously discussed, the reasons for the scalars is essentially threefold: (1) to improve the dispatch of resources so that they are more likely to be dispatched to address local needs rather than system needs; (2) to better account for systematic differences between day-ahead and same-day natural gas prices, which allows resources to better recover for their gas costs if dispatched in the real-time market; and (3) to improve the ability to manage the generators' gas usage within applicable gas balancing rules. Fundamentally, the scalars provide the ability to displace generation in the Southern California area economically through the market dispatch, rather than through manual action. When the CAISO activated the gas scalars during 2018, there was already some level of gas price separation between Southern California and the rest of the system. Although this natural price separation between gas prices in the SoCalGas system and the PG&E system economically displaced gas generation in Southern California, the goal of activating the scalars is to ensure that there is further separation if needed and displace generation from the Southern California area. The CAISO understands the criticism that because there is already separation the scalars are not needed. However, to judge the need for the scalar on this basis ignores the reason for the scalars in the first place. The goal of the scalars is to capture the cost of increased constraints in the south and ameliorate the market's ability to issue an economic dispatch that reflects the costs of the constraints in the south. It is entirely possible that prices between the south and the north will separate but it may not be enough to address a particular issue on the gas system in the south.

The CAISO evaluated the performance of these scalars for the last two events when they were activated at the end of 2017 and the beginning of 2018 and discussed its findings with market participants at the Market Performance

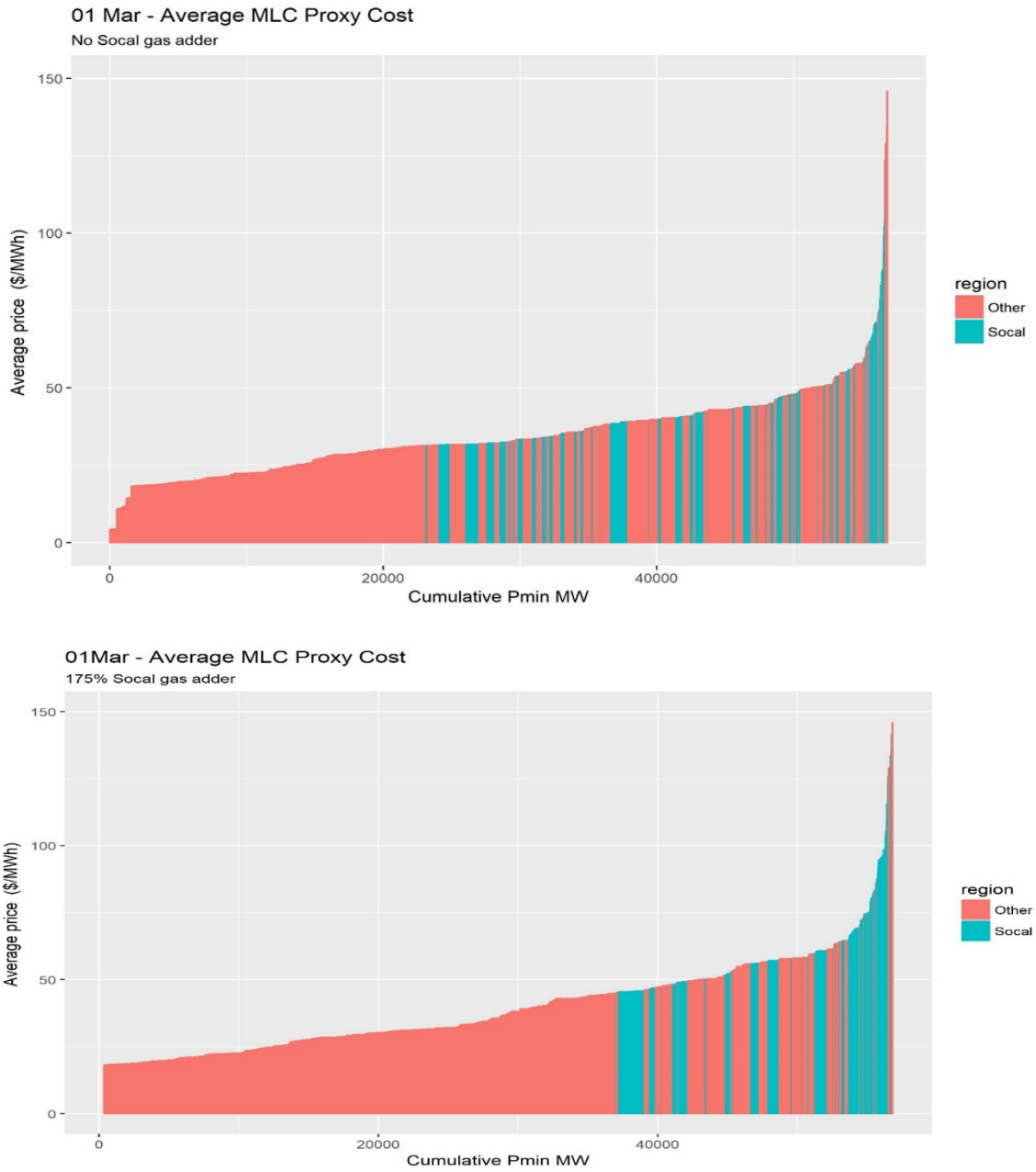
and Planning Forum meetings held in February and April 2018.[68] There are two challenges with no longer having the scalars on at all times and instead using them on an as needed basis. First, there is an inherent delay in actually applying the scalars, which means there may be days when the scalars could have worked but the CAISO could not have activated them in time to capture the increased costs experienced in the south. If CAISO detects conditions that warrant activation of the scalars early in the morning, the CAISO must activate the scalars manually as part of the scheduled calculation that takes place at the end of the day each night. The scalars then become effective on next trade date. This causes an inherent delay in the activation of the scalars. Second, because the CAISO cannot just switch the scalars on and off dynamically, once it puts them on it may have to leave them on for some time if believes conditions may warrant their use. This inherent delay limits how fast the CAISO can dynamically adjust the scalars to capture the changing conditions and this requires the CAISO to be judicious in not deactivating the scalars prematurely.

As an example, when the CAISO activated the scalars during January 2018 event, gas prices in the Southern California Edison Company (SCE) area doubled from one day to the next, and a few days later gas prices returned to the previous levels. With the benefit of hindsight, one might conclude that the scalars were not needed when gas prices in the SCE area were twice as high as prices in the Pacific Gas and Electric Company (PG&E) area. However, on days when prices were the same between the SCE and PG&E areas, the scalars provided the headroom needed. If the CAISO had tried to be more targeted and had not activated the scalars when prices were already separated, it would have missed the gas system conditions for early January described above. Both the increase and decrease of these price separations could not be captured due to the inherent delay associated with implementing gas scalars.

Figure 2 shows a comparison for March 1, which was a day in which natural price separation between southern California (orange area) and the rest of the system (area on green) was not as pronounced as the beginning of the period when the scalars were activated. The first plot in Figure 2 shows the duration curve for minimum load cost if the scalar was not activated and the second plot shows the duration curve with the scalar activated. The second plot illustrates the possible range of generation displacement (*i.e.*, the area in green moved to the right side of the duration curve) that can occur with the activation of the gas scalar because of the additional headroom provided to resources in the southern part of the system.

[68] February and April presentations for the market performance forum meetings are available at http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=A0B1FAE7-9075-4907-BD30-68E707FF3AFB.

Figure 2: Comparison of duration curve without and with gas scalars



Although the CAISO proposes to retain the same flexibility it has today under the interim measures to set the scalar at an appropriate level to obtain the desired effect of distinguishing costs in the gas constraint areas from those in other unaffected areas, as a general matter, if the CAISO increases the scalars, it will increase them to their initial values, *i.e.*, 175 percent for the commitment cost calculation and 125 percent for the default energy bid cost index calculation.

The CAISO agrees with DMM that it is important to monitor the performance of these two allowable increases and commits to continue evaluating the market to determine whether they remain effective in achieving the three goals expressly stated in the tariff provisions, or whether either or both of the amounts should be adjusted to achieve those objectives. The CAISO would discuss any such changes with DMM. In addition, pursuant to the proposed tariff provisions, upon determining that a change in the gas commodity price is necessary, the CAISO would issue a market notice specifying the amount of any price increase or decrease.[69]

3. Maintain the Interim Tariff Provisions that Allow Scheduling Coordinators to Seek After-the-Fact Cost Recovery of Default Energy Bid-Related Costs from the Commission Pursuant to an FPA Section 205 Filing

The CAISO proposes to maintain until December 31, 2019, the tariff provisions that permit scheduling coordinators to seek after-the-fact recovery of fuel-related incremental fuel costs associated with default energy bids and with generated bids by submitting an FPA section 205 filing to the Commission.[70]

As the Commission has recognized, the tariff provisions permitting such FPA section 205 filings address the possibility that fuel costs may exceed the amounts recoverable under the CAISO's normal cost recovery provisions due to the uncertainty and potential price volatility introduced into the market by the limited operability of Aliso Canyon.[71] The Commission has also found that permitting such FPA section 205 filings is a reasonable interim solution given the situation facing the CAISO and the need to ensure reliable operation of the grid at just and reasonable rates.[72]

Given the likelihood that Aliso Canyon will not be fully functional for the foreseeable future, these same considerations will remain equally valid for a significant amount of time after November 30, 2018, when the interim provisions are set to expire. The CAISO anticipates that scheduling coordinators will, in almost all circumstances, be able to recover their fuel-related costs pursuant to

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69 *See* proposed tariff section 39.7.1.1.1.3(d).

70 Proposed tariff sections 30.12, 39.7.1.7, and 40.6.8.1.6. All of these new sections in this filing are identical to the same new sections approved in the Aliso Phase 2 proceeding, and extended again in the Aliso Phase 3 proceeding. As discussed above in section I.C(1) of this transmittal letter, the CAISO has also implemented on a permanent basis a separate but similar process that allows scheduling coordinators to seek after-the-fact cost recovery pursuant to FPA section 205 filings of unrecovered commitment costs that exceed the commitment cost bid cap.

71 Aliso Phase 1 Order at P 91; Aliso Phase 2 Order at P 26; Aliso Phase 3 Order at P 26.

72 Aliso Phase 1 Order at P 92.

the normal tariff provisions allowing cost recovery and thus will not need to submit FPA section 205 filings.

The CAISO has developed additional measures to improve resources' cost recovery, including fuel cost recovery, in its CCDEBE stakeholder initiative, which includes incorporating the after-the-fact cost recovery measures for energy costs on a permanent basis and for the whole CAISO footprint as part of the CAISO's compliance with the Commission's Order No. 831.[73] The CAISO anticipates that it will submit its tariff amendment and compliance filing with Order No. 831 in support of those changes in the early part of 2019 for implementation in the fall of 2019. Therefore, the tariff provisions the CAISO proposes to maintain temporarily will serve as an appropriate backstop measure if a scheduling coordinator cannot recover its fuel-related costs associated with default energy bids or generated bids through the normal tariff mechanisms until the permanent solutions are implemented.

B. Temporarily Extend Previously Approved Tariff Provisions Allowing the CAISO to Use a Maximum Natural Gas Constraint in the SoCalGas and SDG&E Gas Regions

1. Overview of and Rationale for the CAISO Proposal

The CAISO proposes to temporarily extend the same tariff provisions the Commission previously approved in the Aliso Phase 2 and Aliso Phase 4 proceedings to implement a gas constraint that limits the maximum amount of natural gas that can be burned by natural gas-fired resources in the SoCalGas and SDG&E gas regions.[74] Although the other bidding rules and measures approved in the prior Aliso proceedings provide an opportunity to reflect better the constrained gas system in the CAISO real-time market, additional tools are necessary to ensure that CAISO operators can maintain the system reliability to address known gas constraints and challenges posed by the continued limited operability of Aliso Canyon.[75] Extending the CAISO's authority to employ the maximum natural gas constraint will permit CAISO operators to enforce in the day-ahead and real-time markets constraints to limit the dispatch of generators in the affected areas to a maximum gas usage if there is a limitation on the

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[73] *Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators,* 157 FERC ¶ 61,115 (2016) (Order No. 831).

[74] Proposed tariff section 27.11 and revised tariff section 6.2.1.3, both of which are identical to the versions of those sections approved in the Aliso Phase 2 proceeding. Aliso Phase 2 Order at P 27; Aliso Phase 4 Order.

[75] *See* the discussion of these issues above in section I.D of this transmittal letter and in attachment C to this filing.

maximum amount of gas used.[76] The constraints will also limit CAISO market dispatch of the affected generators in the real-time market to a maximum gas usage if there is a limitation that relates to differences between gas scheduled with the gas company and gas consumed during the operating day due to gas system imbalance limitations. The tariff provisions are a reasonable and necessary measure to ensure the reliable operation of the electric grid within the bounds imposed on the CAISO by the operation of the natural gas system.[77]

The CAISO requests that these provisions remain in place on an interim basis until December 31, 2019. The CAISO anticipates it will evaluate next year through a stakeholder process whether or not these, or similar measures, are needed beyond the end of 2019. If the CAISO determines additional measures are needed beyond the end of 2019, the CAISO will seek the appropriate approval from the Commission.

2. Enforcement of the Maximum Gas Constraint

Under the tariff provisions that allow the CAISO to enforce the gas constraint, the CAISO will apply a constraint for the day-ahead market, the real-time market, or both, to limit the gas burn in specific areas if the CAISO observes constraints on the gas system, which could come in the form of curtailments or requests for conservation to noncore customers. The CAISO will enforce the constraint based on its assessment of gas and electric conditions, but will coordinate with the affected gas companies in Southern California to the maximum extent possible to ensure that the limitations imposed by the constraint in the market are consistent with the limitations observed on the gas system.

For example, the CAISO would apply a maximum gas constraint as follows:

- The CAISO will develop and define a constraint for the SoCalGas or SDG&E gas region.

- The CAISO may enforce the constraint in both the day-ahead and the real-time markets to ensure the CAISO market does not dispatch or commit resources that exceed the maximum gas burn in the specified region. If gas system constraint occurs after the day-ahead market or a gas curtailment is issued during the real-time market, the CAISO may enforce the constraint in the real-time market run only.

[76] The CAISO will inform the affected generators that they are subject to the constraint(s).

[77] *See* Aliso Phase 1 Order at P 48.

- Similarly, the CAISO may enforce the constraint if it anticipates that large imbalances between gas schedules and gas consumed could compromise gas reliability or electric system reliability. The CAISO will retain the flexibility to modify the level of the constraint, or to remove the constraint, if the CAISO determines that the constraint is leading to adverse market impacts.

If there are known and identifiable constraints on the natural gas system, over-dispatching resources in gas-constrained regions could negatively affect pipeline conditions, exacerbating existing gas system limitations. This, in turn, potentially could lead to significant outages or curtailments of gas-fired generating resources, thereby threatening the reliability of the electric system. For example, if the gas system experiences limitations affecting a specific region of the CAISO controlled grid, but the CAISO market system is unable to capture those limitations through market constraints, the market could clear generation based on submitted bids and system conditions that do not account for gas system limitations. This could potentially occur in the real-time market even if the bids of generators on the affected systems reflect tightened gas balancing requirements. Such dispatches could aggravate already constrained gas system conditions, thereby compromising gas reliability and resulting in gas curtailments because gas generators cannot access gas needed to serve the electric grid system reliably. If this occurs and electric generators cannot access gas to serve electric load and power cannot be delivered into the local area, electric curtailments are also likely.

Extending the existing interim tariff provisions will allow the CAISO to respond to gas system conditions proactively as they develop, better ensuring that market dispatches reflect actual gas system conditions. It is critical for purposes of both gas and electric system reliability that the CAISO have the authority to be proactive and act in advance of such occurrences to ensure the dispatch reflects the conditions on the natural gas system to the maximum extent possible.

3. The Effect of Enforcing the Maximum Gas Constraint

When binding, the maximum gas constraint ensures that generation in the day-ahead or real-time markets is dispatched taking into consideration gas system limitations. Because the CAISO cannot predict exactly how and when the gas system will be constrained, it seeks an extension the same authority the Commission previously approved, which is to reflect any such limitations through market constraints based on its observations of gas system limitations and how those limitations could affect electric reliability.[78]

[78] The CAISO provides a detailed mathematical description of the constraint in the *Aliso Canyon Gas-Electric Coordination – Phase 2 Draft Final Proposal* at pp. 22-26 (September 23,

As necessary, the CAISO will implement the maximum gas constraint using generation nomograms that include the generators within the affected areas.[79] The nomogram will affect the congestion component of the relevant generators' locational marginal prices and have a relaxation parameter value (*i.e.*, a "penalty price") associated with relaxing the gas constraint. The CAISO will apply this parameter to function appropriately relative to the parameters for other constraints enforced in the market and has specified the parameter in the business practice manual for market operations.[80] Use of the constraint parameter in this manner is consistent with the finding in the Aliso Phase 1 Order that using generator nomograms with a penalty factor is an appropriate means of employing the gas constraint to ensure electric reliability.[81] Currently that price penalty parameter is set at the same value used for any other transmission constraint.

Based on the analysis of the performance of the gas constraint from previous events, the CAISO also worked on an enhancement to the constraint formulation so that it could be similarly situated to other constraints.[82] The CAISO has not found a reason to adjust the parameter used for the penalty price for constraint relaxation. Still, based on further analysis of the constraint performance, the CAISO has developed software enhancements allowing the adjustment of this penalty price parameter to any desired value if, based on subsequent performance analysis, the CAISO determines that an adjustment is necessary.

The CAISO noted in its Aliso Phase 4 filing that it was working on a software enhancement and once completed it would modify the business practice

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2016) (provided as Attachment D to the Aliso Phase 2 proceeding initial filing) (Aliso Phase 2 Draft Final Proposal), available at: http://www.caiso.com/Documents/DraftFinalProposal-AlisoCanyonGasElectricCoordinationPhase2.pdf.

79 A nomogram is a set of operating or scheduling rules that are used to ensure that simultaneous operating limits are respected. Appendix A to the CAISO tariff, existing definitions of "Nomogram" and "Contingency." Detailed mathematical information regarding nomograms is provided in the Aliso Phase 3 Draft Final Proposal at pp. 29-34, available at: http://www.caiso.com/Documents/DraftFinalProposal-AlisoCanyonGas-ElectricCoordinationPhase3.pdf.

80 The constraint parameter establishing the penalty price for the gas constraint is a "penalty factor" that governs the conditions under which constraints may be relaxed and if relaxed will impact the prices at applicable locations. The parameters that impact prices are specified in existing tariff section 27.4.3 with further detail provided in the business practice manual for market operations. A detailed description of how the CAISO establishes the penalty price relative to other penalty prices used in the market is provided in the Aliso Phase 3 Draft Final Proposal at pp 26-29.

81 *See* Aliso Phase 1 Order at P 48.

82 *See* CAISO Answer to DMM Comments, Docket No. ER17-2568-000, at p. 17 (Nov. 8, 2017).

manual for market operations to reflect the new parameter setting if needed to change. The CAISO has not modified the business practice manual because the parameter did not change. However, just prior to this filing, the DMM asked the CAISO to explain why it had not made any change to the business practice manuals to reflect the parameter changes. The CAISO explained that it had not done so because the parameter had not changed, but agreed to verify the business practice manual and ensure the constraint formulation is still depicted accurately. The CAISO concluded that the formulation in the business practice manual still reflects the correct formulation. However, the CAISO is adding additional detail to describe how the constraint may be shaped. Specifically, the CAISO is adding a note in the business practice manual for full network model to inform market participants that both the left- and right-hand side of the equation that represents the gas constraint is multiplied by a constant of 100. The CAISO further explains that adjusting both sides of the constraint does not alter the relationship of the generators contribution to the total gas burn limitation, but it sets the constraint to similar level of effectiveness of any other transmission constraint. This factor of 100 is an approximation of the average heat rate of units in Southern California and approximates the coefficients of the left hand side of the constraint to a value of one per unit.[83]

Pursuant to the extended tariff provisions proposed in this filing, as was previously the case, when the maximum gas constraint is binding, the shadow price of the constraint will be reflected in the marginal cost of congestion component of the resource-specific locational marginal prices of the affected gas-fired resources. The shadow price of the constraint will not be reflected in the marginal cost of congestion component of point-of-receipt locational marginal prices, including trading hub and other aggregated locations, and will not be reflected in locational marginal prices used for settling supply other than the affected generators, load, virtual bids, or congestion revenue rights.[84] The CAISO will implement its approach of applying the constraint only to the resource-specific price at the network connectivity node (CNode)[85] used to dispatch affected generators but not to the bus location reflecting the point of

[83] Details on this business manual change are available on the CAISO Business Practice Manual Change Management webpage at: https://bpmcm.caiso.com/Pages/default.aspx. The relevant Proposed Revision Request is PRR 1091.

[84] The tariff provisions also specify how the CAISO will allocate any non-zero amounts attributable to the price differential between the marginal cost of congestion used for settling a generating unit's scheduled or dispatched amounts at their location and the marginal cost of congestion used for settling demand, virtual bids, or congestion revenue rights. Proposed tariff section 27.11.

[85] Although this transmittal letter uses the capitalized term "CNode" as a convenient shorthand signifying a network connectivity node, that term is not defined in the tariff but is used in the CAISO's business practice manuals.

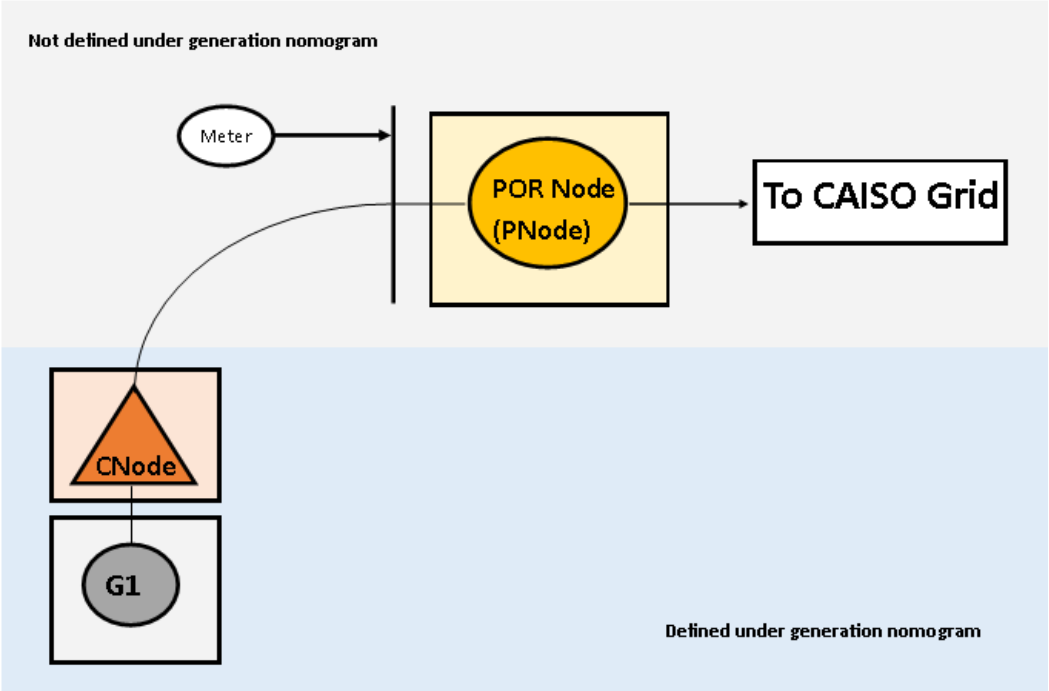
delivery or receipt on the CAISO controlled grid.[86] It is just and reasonable to apply the shadow price of the constraint only to the resource-specific locational marginal price for generators connected to the affected gas systems because they are the only market participants subject to the gas limitations.

When the constraint is binding, the market will ensure generation subject to the constraint will not be dispatched higher or lower than the constraint's limits. When a maximum gas constraint is binding, the CNode locational marginal price (*i.e.*, the affected generator's locational marginal price) will decrease, which will tend to reduce the amount of energy the CAISO market dispatches from an affected generator.

Figures 3 and 4 below illustrate the locations at which the CAISO will set prices when it enforces a gas constraint. The grey circle represents a generator's (G1) physical topological connection to a network node, the CNode. In this example, there is only one piece of equipment connected to a CNode. Therefore, the CNode and bus pricing node (PNode) are unique. Figure 3 also shows the connection between the CNode and the PNode, which represents the point at which the injection is received into the CAISO controlled grid for supply, or withdrawal is delivered out of the CAISO controlled grid for demand. Generally, the PNode of a generating unit will coincide with the CNode and is where the relevant revenue quality meter is connected or compensated, and reflects the point at which the generating unit is connected to the CAISO balancing authority area. This location is referred to as the "point of receipt" (POR) and is considered to be a PNode. However, the PNode and CNode can differ in the CAISO's network model.

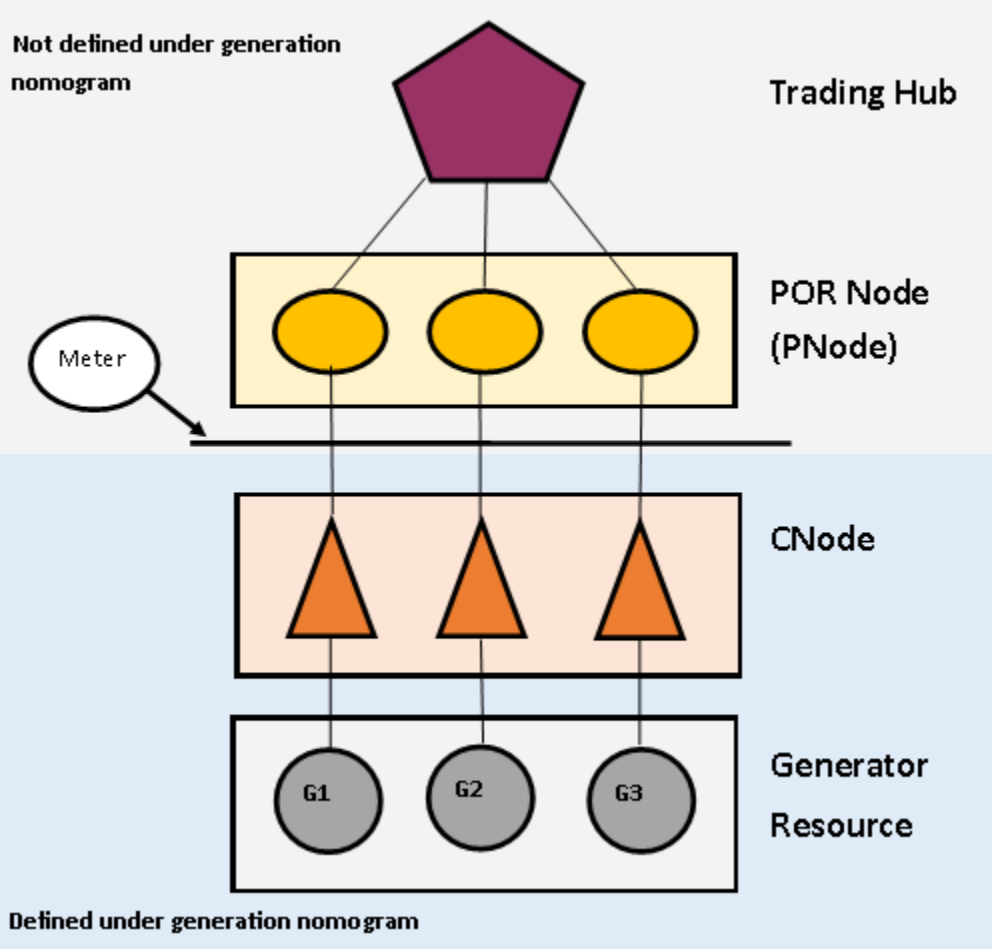
[86] The full network model is composed of CNodes interconnected with network branches. A CNode represents a connection point used to define the physical topological connectivity of the network and only one load or generation device can be connected to a CNode. Each piece of equipment has a CNode associated with it and rolls up into a bus which represents all the topological nodes associated with a generating resource.

Figure 3



With respect to aggregated locations such as trading hubs, the settlement of transactions using these locations would be based on price information from the PNodes that are aggregated into the aggregated pricing node (APNode), and do not use price information from the CNode(s). Figure 4 below shows the relationship between the generators (represented by grey circles), CNodes (represented by orange triangles), and PNodes that are aggregated into the Trading Hub's APNode. Figure 4 illustrates that the PNode contributes to the pricing of the trading hub price represented by the purple pentagon and not the CNode.

Figure 4



The CAISO proposes to continue to implement the tariff language authorizing it to settle injections into the CAISO controlled grid in the SoCalGas and SDG&E gas regions at prices influenced by the maximum gas constraint. The CAISO will accomplish this by pricing such resources based on the resource-specific locational marginal prices at the CNode rather than the PNode prices shown in Figures 3 and 4. For all other transactions, the CAISO will continue using the PNode-related prices. Consequently, only prices for generators on the affected gas systems at the specific resource location will reflect the cost of honoring the constraint.

The maximum gas constraint will establish just and reasonable prices at affected generator locations, because under a maximum gas constraint the price should decrease according to the constrained availability of gas available to fuel generating power at that location. This is similar to how a supply source behind a transmission constraint is priced higher to reflect the congestion cost associated with dispatching that supply.

As was the case before the previously approved tariff authority, the price for load, virtual bids, and congestion revenue rights will not reflect the shadow price of the maximum gas constraint. An incremental injection at the point of receipt locational marginal price is not assumed to come from the generators under this constraint that may reside at the point of receipt locations. Because the constraint depends only on the generation group under it and not on a general injection at that location, the nomogram does not change. In particular, if the incremental change in injection at the point of receipt location was actually an increment in load at the location, the generation group under the constraint would not change and, therefore, the impact of the constraint is not captured at the point of receipt locations. The locational marginal prices for the point of receipt should send accurate marginal price signals associated with the incremental change in injection or demand at that specific location.

It is just and reasonable not to reflect the shadow price of the maximum gas constraint in the price of congestion revenue rights and virtual bids. If congestion revenue rights and virtual schedules settle on locational marginal prices that reflect the shadow price of the constraint, financial entities might be able to take large positions at little or no cost and inappropriately profit at the expense of revenue inadequacy balancing accounts allocated largely to load serving entities.

When the maximum gas constraint is binding in the day-ahead market, congestion revenue rights that source at a node impacted by the constraint and sink at a node not impacted by the constraint will continue to be paid based on the shadow price of the constraint. There likely will be such source and sink node pairs with few to no other constraints creating price separation between the source and sink nodes. Therefore, market participants could obtain large quantities of such congestion revenue rights at little to no cost and with very little downside risk. When the gas usage constraint binds in the day-ahead market, these positions could be lucrative for the financial entities and costly for the load serving entities that would pay the revenue inadequacy uplift charges.

Also, when the maximum gas constraint is enforced in the real-time market but not in the day-ahead market, virtual supply at a node whose settlement price is affected by the constraint, offset by virtual demand at a node whose settlement price is not affected by the constraint, will continue to be paid based on the real-time shadow price of the constraint. As described in the paragraph above, there are likely to be node pairs with few or no other constraints creating price separation between the virtual supply and virtual demand nodes. Therefore, using the shadow price of the constraint to settle virtual bids could result in market participants obtaining large quantities of offsetting virtual supply and demand schedules at little to no cost and with very little downside risk. When the constraint is binding in the real-time market, these offsetting virtual positions could be lucrative for the financial entities and costly

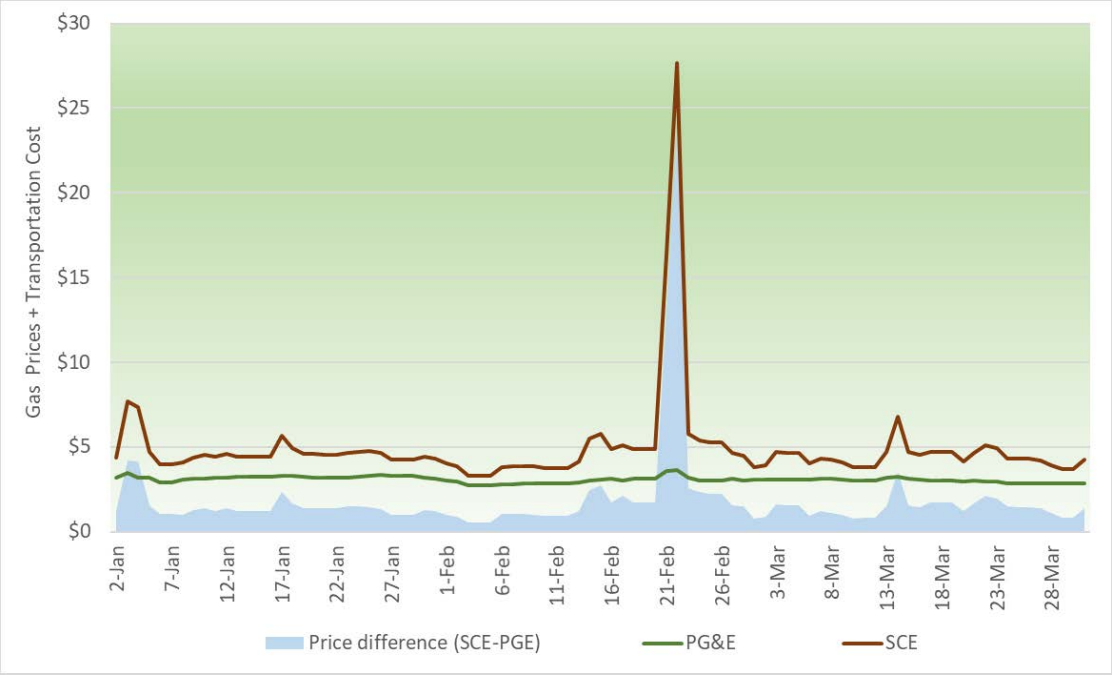
for the load serving entities that would pay the imbalance energy uplift charges. Further, the Commission and market participants will have transparency regarding the effects of the tariff revisions on the CAISO markets pursuant to the quarterly reports on market issues and performance that DMM issues.[87]

4. Analysis of the Use and Impact of the Constraint in 2018

The CAISO employed the gas constraint in the day-ahead and real-time markets in the early part of 2018 to manage actual and anticipated gas curtailments. The gas constraints were enforced in the day-ahead market for February 21, 22, and February 24 through March 5, 2018, in the real-time market, the gas constraints were enforced from February 20 to February 23, and February 26 through March 5, 2018.[88] The CAISO determined it was necessary to employ the gas constraint after it was informed by SoCal Gas of concerns with the gas supply in Southern California due to cold weather, gas pipeline limitations and storage availability.

Figure 5 below shows the difference in prices between the northern and southern parts of the CAISO controlled grid.

Figure 5 Gas price trends in the CAISO system



87 DMM's quarterly market performance reports are available on the CAISO website at http://caiso.com/market/Pages/MarketMonitoring/MarketIssuesPerfomanceReports/Default.aspx.

88 Prior to 2018, the gas nomograms were enforced on January 23 to 26, 2017 and August 3 and 4, 2017.

The constraints used in 2018 were the most effective tools available to the CAISO to limit the gas burn in areas affected by the gas limitations, *i.e.,* the Southern California region.

The CAISO conducted an analysis of the performance of the gas constraints and its impact on the markets. This analysis was presented and discussed with participants at the April 2018 Market Performance and Planning Forum meeting. The CAISO provided metrics on the overall gas conditions impact on day-ahead congestion rents, and the real-time energy and congestion offsets.[89] The majority of the impact occurred during the first four days of the event, as the gas prices in the Southern California area were the highest and the gas constraints were enforced. Although high congestion rents and offsets coincided with the CAISO's enforcement of the gas nomogram, it is important to note that not all of these costs were solely due to the gas constraint. During this time, the gas conditions, along with transmission constraints, were significantly constrained in the CAISO's footprint. While the constraint was in place, day-ahead congestion rents were higher than normal for some days but lower than normal on other days.

There are three separate factors that contributed to the higher costs. First, although it is not easy to isolate, the enforcement of the constraint will have an overall cost impact when the constraint is binding. Second, naturally higher gas prices, irrespective of whether or not the constraint is enforced will contribute to total costs on the system. Simply put, even without enforcing the gas constraint, the electric market observed naturally higher energy prices because of more expensive generation from gas units. The naturally higher gas prices also cause higher congestion costs because congestion will reflect the marginal re-dispatch of more expensive generation used for congestion management, as any real-time offset will be settled on these higher prices. This is best illustrated by the market results observed in July 2018. In the last week of July 2018, high gas prices were observed in the Southern California region (similar in pattern to the February 2018 events, though greater in magnitude). As a result of the high gas prices in the Southern California region, the CAISO experienced very high day-ahead congestion rents and congestion offsets, even though no gas constraints were enforced.[90]

Third, higher costs are compounded by the effect of simultaneously managing gas constraints and transmission constraints on the CAISO's system.

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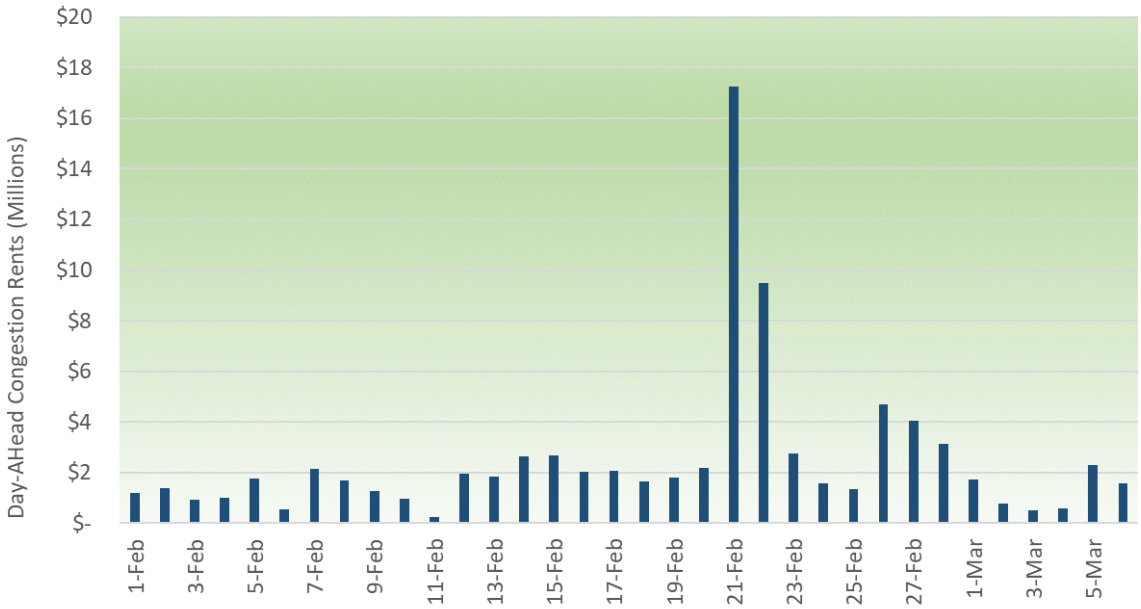
[89] Subsequently, in July 2018 DMM reported in its DMM Q1 2018 Report that the "[e]nforcement of gas burn nomograms in peak hours in the real-time market from February 20 to 23 is concurrent with very high levels of real-time energy offset, totaling about $19 million and accounting for most of the $21 million total offset cost for the quarter." *See* DMM Q1 2018 Report at p. 50.

[90] CAISO *Market Performance Report – July 2018* (Sep. 19, 2018), available at: http://www.caiso.com/Documents/MarketPerformanceReportforJuly2018.pdf.

The more constrained the market is, the more expensive the market solution will be. This is not an inefficient outcome of the market, but an actual reflection of the additional costs required to manage more operational constraints that impact the system. There are occurrences when congestion management of the gas constraint requires some generation units to be dispatched downward, while at the same time the congestion management of transmission constraints require these units to be dispatched upward. The market is the most efficient mechanism to determine the optimal dispatch for the impacted generators and it will reflect that trade-off in price signals. This is not just a market dynamic, rather it is an actual operational need to coordinate the gas and electric constraints on the system.

Figure 6 Day-Ahead Congestion Rents



Similarly, as shown in Figures 7 and 8 below, the real-time congestion offset and real-time energy offset fluctuated on those days, February 20 to March 4, 2018, significantly.

Figure 7: Real-Time Congestion Offset

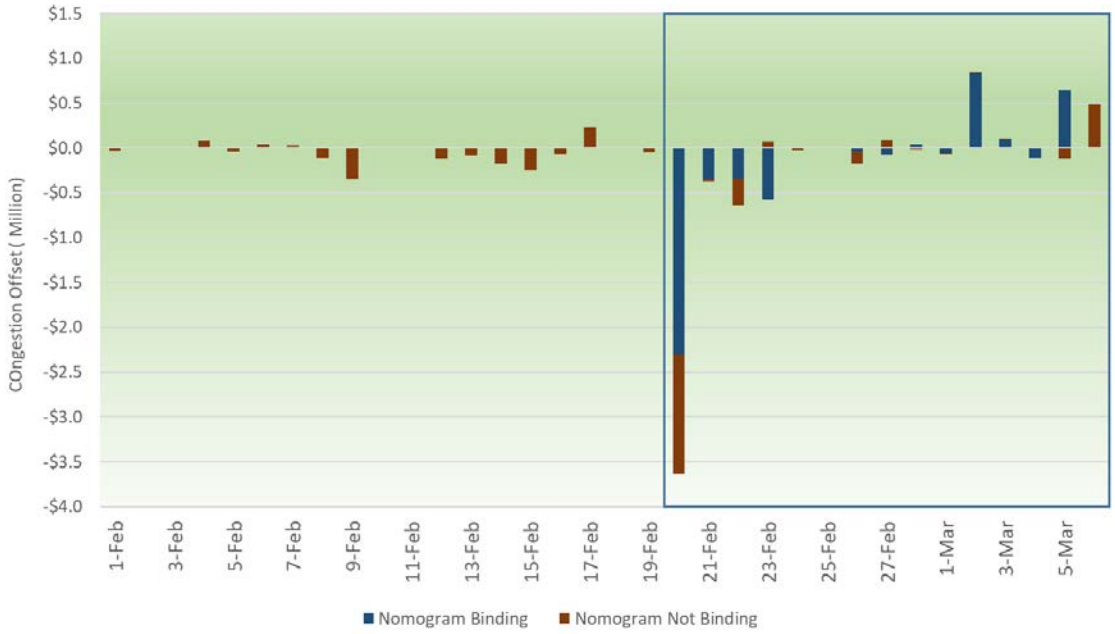
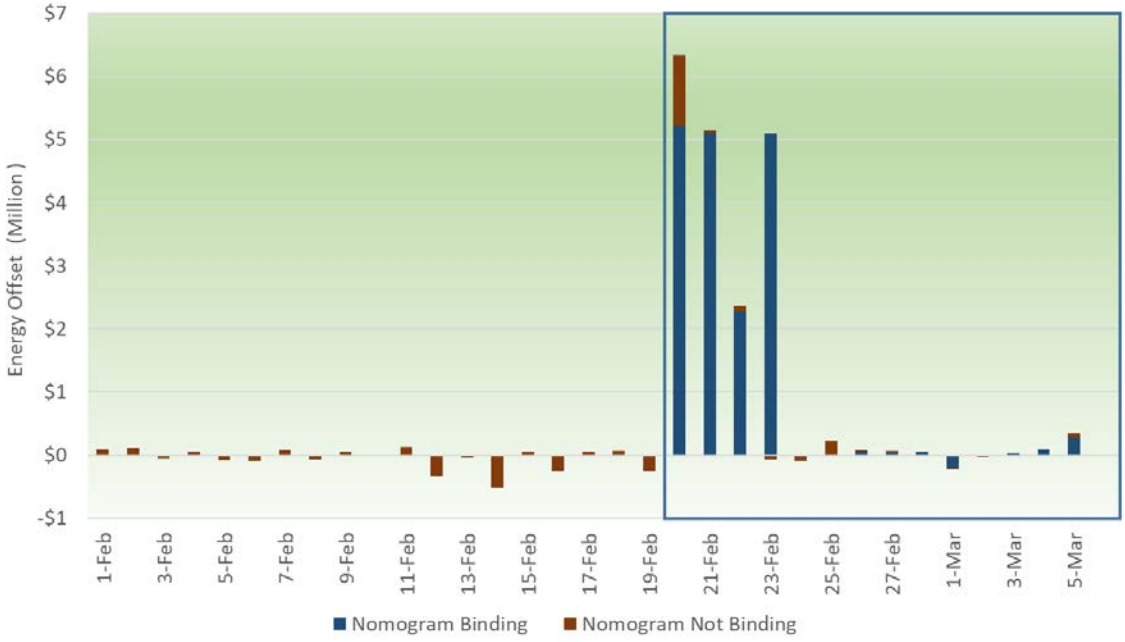


Figure 8: Real-time Energy Offset



Although, Figures 7 and 8 demonstrate that the offsets were more substantial when the nomograms were binding. The fact that the nomograms were binding reflects the general tight conditions on the CAISO's system, potentially resulting in the need for some form of manual action to address the gas constraints absent the use of the nomograms. As the CAISO was assessing

the need for the constraints and prior to implementation of the nomograms, the CAISO was required to issue exceptional dispatches to address gas curtailment issues. On February 20, 2018, the CAISO administered a number of exceptional dispatches in addition to utilizing the nomograms for the real-time market, and additional exceptional dispatches were necessary through February 22, 2018, as the CAISO transitioned to implement the nomogram.[91]

The CAISO operators believe the use of the nomogram is superior to conducting manual exceptional dispatches to address gas burn conditions. In the past, absent the nomogram, the operators were required to take the gas burn values from the gas company and translate those into exceptional dispatches in an expedited manner. This created more burden on the operator when circumstances were such that reliability was already at risk. Moreover, exceptional dispatch outcomes can be less efficient than dispatch with the gas constraint in place, as careful calculation of which resources to move is required, whereas the gas constraint allows the market software to optimize the best solution based on bids, resource characteristics, and all modeled constraints. When gas curtailments occur, operators must issue an exceptional dispatch to generators currently online to either shut down or limit their output, but also dispatch any offline units with start-up times less than 4.5 hours. If the operators were to only exceptionally dispatch online units, without further instructions, the market may begin starting-up offline units to replace the reduced energy. Without the use of the constraint, the CAISO has to let the day-ahead market run and then determine what exceptional dispatches are necessary to dispatch down impacted units down to lower levels, and exceptionally dispatch additional units online to meet demand and operating reserve requirements. Moreover, the exceptional dispatches need to be updated on an hourly basis to follow the electric load changes such as day-ahead awards, transmission constraints, forced outages, and the like.

The CAISO sought to use the gas nomogram in order to alleviate a potential untenable situation for the operators. Using the gas nomogram in the real-time market allows the CAISO to maximize the gas usage while still managing transmission constraints on a five-minute basis. The day-ahead gas nomogram also ensures unit commitments and energy awards do not violate the curtailment level while managing transmission constraints. The CAISO is concerned that a large number of exceptional dispatches and hourly adjustments will increase the risk of data entry error by the operators.

Therefore, when considering the costs in the CAISO market that coincide with the use of the constraint, it is crucial to consider what costs with the CAISO market incurs, absent the constraint and with similar electric and gas system conditions.

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[91] DMM Q1 2018 Report at p. 50.

In the DMM Q1 2018 Report, DMM reported that its review of the CAISO's "limited experience with maximum gas usage constraints suggests that while such constraints may be a useful tool in the future, additional refinement of the software and operational processes through which the constraints are implemented is necessary before expanding usage of the constraint to other parts of the ISO or EIM."[92] The CAISO agrees that refinements will be necessary before the CAISO expands the use of the gas constraint to other parts of the CAISO markets. The CAISO does not propose such extensions in this filing and would need to make an additional tariff amendment to expand its authority beyond using the constraint in the southern part of its system.

The DMM noted in the DMM Q1 2018 Report, that "while gas usage constraints are modeled as 15-minute constraints in the ISO's real-time market, these gas constraints are actually applicable only over a much longer multi-hour time period. Although operators are able to adjust constraints in real-time in response to changing conditions, the ISO does not adjust these constraints in real time based on actual gas usage in prior hours. Therefore, when these gas constraints bind in the ISO's real-time market during the peak ramping hours, there appears to be surplus gas from hours prior in the day when actual usage was well below the constraint as modeled by the ISO."[93] The DMM argued that this "represents a significant design flaw that remains in the gas nomograms" and for this reason, "DMM continues to recommend that the ISO improve how gas usage constraint limits are set and adjusted in real-time based on actual gas usage in prior hours."[94]

When evaluating the need to enforce the constraint, the CAISO looks at two variables. First is the determination of the actual definition of the limitation itself, which is the gas burn limitation that needs to be imposed on the CAISO's electric system. Second is the CAISO going to enforce that limitation. One option is to use the gas constraint and another is to issue exceptional dispatches. Regardless of how the limitation is enforced, the CAISO must still define the limitation. The CAISO understands the DMM concern to better handle the limitations used for the gas conditions. However, the challenge is with defining the limitation and not the mechanism of enforcing that limitation once defined. To complicate matters, operators must manually count and track the curtailments overtime that must be imposed on each unit in order to achieve the overall limitation.

One complexity in the defining the gas limitation for the real-time market is that it is dynamic, *i.e.*, the gas limitation can change over time as conditions

92 *Id.* at p. 51.

93 *Id.*

94 *Id.*

progress. Based on the events of February 2018, the CAISO started an internal evaluation of its process to better define the gas limitations that operators could use to impose in the market. As part of this process, the CAISO worked with SoCalGas to better define the northern and southern portions of its system. The CAISO developed new market nomograms and gas burn forecasts that align with these new regions. The new nomograms allow the CAISO to manage the gas burn limitation over a larger region rather than small sub-regions. The use of sub-regions was causing the market to leave gas constrained in one region and not available for use in the other regions.

C. Temporarily Extend Previously Approved Tariff Provisions to Address Market Issues Related to the Enforcement of the Maximum Gas Constraint

To address potential market issues, the CAISO also proposes to extend the interim tariff provisions previously approved in the Aliso Phase 2 and Aliso Phase 4 proceedings regarding two measures related to use of the maximum gas constraint. First, the CAISO proposes to extend the criteria for designating a transmission constraint as competitive or non-competitive, separate from applying the dynamic competitive path assessment in the CAISO's local market power mitigation process.[95] The separate criteria provides that, notwithstanding application of the dynamic competitive path assessment, when the CAISO enforces the maximum natural gas constraint, it may deem selected internal constraints to be non-competitive for specific days or hours based on its determination that actual electric supply conditions may be non-competitive due to anticipated electric supply conditions in the SoCalGas and SDG&E gas regions. Extending this authority is consistent with the Commission's findings in the Aliso Phase 1 Order, and temporarily extended in the Aliso Phase 2 Order and Aliso Phase 2 Order, where such provisions are a reasonable measure to address actual electric supply conditions that are found to be non-competitive when the constraint is enforced due to anticipated electric supply conditions in gas regions.[96]

In its rejection of this tariff provision in the Aliso Phase 3 order, the Commission stated that the "CAISO's maximum gas constraint should not require frequent manual interventions into its market power mitigation process, which has an automated process designed to guard against over and under-mitigation."[97] As evidenced by its limited use of the constraint over the past twelve months, the CAISO does not anticipate using the constraint frequently and therefore, does not expect that it would be required to frequently manually

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[95] Revised tariff section 39.7.2.2, which is identical to the same revised tariff section approved in the Aliso Phase 2 and Phase 4 proceedings.

[96] *See* Aliso Phase 1 Order at P 52; Aliso Phase 2 Order at P 27; Aliso Phase 4 Order.

[97] *See* Aliso Phase 3 Order at P 63.

intervene in the market power mitigation process. The CAISO has not automated this feature as requested by DMM because it has not yet determined whether or when it will return to request authority to use the constraint on a permanent basis in the rest of the CAISO system. In this filing the CAISO is again requesting authority to use the constraint only in the southern part of the CAISO system, as it has before. If the CAISO seeks more expansive authority, it will determine the proper automation to avoid intervening manually in the market power mitigation processes.

Second, consistent with the Aliso Phase 1 Order,[98] to ensure that virtual bidding cannot detrimentally affect the CAISO markets, the CAISO proposes to temporarily extend the tariff provisions previously approved in the Aliso Phase 2 and Aliso Phase 4 proceedings, which allow the CAISO to suspend or limit virtual bidding activities in circumstances where submitted virtual bids detrimentally affect CAISO market efficiency related to enforcement of a natural gas constraint.[99] These tariff provisions are just and reasonable because virtual bidding behavior that adversely affects market efficiency can cause problems for system reliability, which the tariff language is expressly intended to protect.[100] Further, as the Commission recognized in the Aliso Phase 1 Order, with the limited operability of a gas region and the measures that CAISO may have to undertake to address electric and gas reliability, there may be times when promoting price convergence may run contrary to the efficient economic solution of the market.[101] There may also be sustained differences in prices between locations and between the day-ahead and real-time markets that could be exploited by virtual bidders without yielding any market benefits.[102] Implementing the tariff provisions will allow the CAISO to address these issues as they may arise.

As was the case before the previously approved tariff provisions automatically expired on November 30, 2017, if the CAISO suspends or limits virtual bidding pursuant to the tariff provisions, the CAISO will file an informational report with the Commission explaining why it took such action. The CAISO has included details regarding this tariff authority in its business practice manuals. The Commission previously noted that "[v]irtual bidding was designed to enhance the efficiency of CAISO's markets, and that purpose should not be undermined by new permanent features of CAISO's markets."[103] The CAISO

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98 *See* Aliso Phase 1 Order at PP 80, 83.

99 Proposed tariff section 7.9.2(d), which is identical to the same proposed tariff section approved in the Aliso Phase 2 and Aliso Phase 4 proceedings.

100 *See* existing tariff section 7.9.2.

101 Aliso Phase 1 Order at P 80.

102 *Id.*

103 Aliso Phase 3 Order at P 63.

does not propose in this proceeding that the ability to suspend virtual bidding be a permanent feature of the CAISO market.

D. Temporarily Expand Previously Approved Tariff Provisions Allowing the CAISO to Give Generators Advisory Information Regarding Their Potential Day-Ahead Commitments Prior to the Day-Ahead Market Run

The CAISO proposes to temporarily extend the tariff provisions previously approved in the Aliso Phase 2 and Phase 4 proceedings, under which the CAISO helps scheduling coordinators make more informed gas procurement decisions by providing them with advisory information regarding their resources' potential commitment in the day-ahead market that the CAISO produces through its existing two-day-ahead process.[104] This involves the CAISO running the commitment process based on available bids and estimates of system conditions at that time. As was the case before the previously approved tariff provisions expired on November 30, 2017, the CAISO will provide this information to scheduling coordinators only to advise them of their potential commitments; the information will not be binding. The CAISO will continue to conduct its actual day-ahead market runs the day prior to the operating day to produce financially and physically binding commitments and dispatches.

The advisory information provided to scheduling coordinators will come in the form of the MWh advisory schedule produced by the residual unit commitment process conducted as part of the typical day-ahead market. The CAISO communicates the advisory resource-specific RUC schedule to each scheduling coordinator for its resources through the CAISO's secure communication system and does not include pricing information.[105] Although the precise constraints that operations personnel use may change between market runs until the final set of constraints for the real-time market is determined, the CAISO and stakeholders believed that providing scheduling coordinators with the two-day-ahead residual unit commitment process results will improve their ability to plan for gas procurement. The Commission reached the same conclusion in approving this mechanism in the Aliso Phase 1 Order, finding that this information will help reduce gas and electric reliability risks.[106] Those same reasons support retaining this tool on a temporary basis.

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[104] Proposed tariff section 6.5.2.2.3, which is identical to the same proposed tariff section approved in the Aliso Phase 2 and Aliso Phase 4 proceedings.

[105] The CAISO notes that the results of the two-day-ahead run will be meaningful only to the extent there are bids available in the CAISO's systems to represent clearing of the two-day-ahead market based on bid-in supply and bid-in demand.

[106] *See* Aliso Phase 1 Order at P 16; Aliso Phase 2 Order at PP 6, 25-26; Aliso Phase 3 Order at P 26 (authorizing extension of tariff provisions for an additional 12 months).

Without this information, scheduling coordinators would be required to wait until publication of the day-ahead market results, which is typically at 1:00 p.m. on the day prior to the operating day, for any forecast of their potential commitment. The CAISO understands that most gas trading for delivery on the CAISO's trading day occurs earlier in the morning before the day-ahead market publication time. Although market participants can consider demand forecasts and bilateral gas and electric market activity and can plan based on their expectations of where economics will place their bids in the CAISO day-ahead market supply curve relative to the demand bid curve, scheduling coordinators are limited in their ability to predict day-ahead market schedules because such schedules are also affected by the numerous constraints modeled by the CAISO market. The advisory schedules will enable scheduling coordinators to make more informed decisions regarding gas procurement.

As was previously the case, the CAISO will provide advisory information only to the responsible scheduling coordinator for resources bidding into the day-ahead market and not to all market participants. The information reflects confidential schedules, which the CAISO tariff restricts the CAISO from sharing with other market participants. This restriction is reasonable because the scheduling coordinators for these resources are the entities that must ensure they have procured and nominated sufficient gas to perform consistent with expected CAISO dispatches. The Commission found in the Aliso Phase 1 Order that it is just and reasonable to provide the information only to the responsible scheduling coordinator.[107] The same reasoning continues to apply.

III. Effective Date

The CAISO requests that the following tariff provisions become effective on the date specified in the table below:

Tariff Section	Proposed Effective Date
6.2.1.3	December 16, 2018
6.5.2.2.3	December 16, 2018
6.5.2.3.4	November 30, 2018
6.5.4.2.3	November 30, 2018
7.9.	December 16, 2018
27.11	December 16, 2018
30.4.1.2	November 30, 2018
30.12	November 30, 2018
30.12.1	November 30, 2018
30.12.2	November 30, 2018
30.12.3	November 30, 2018

[107] Aliso Phase 1 Order at P 17.

Tariff Section	Proposed Effective Date
30.12.4	November 30, 2018
31.6.1	November 30, 2018
39.7.1.1.1.3	November 30, 2018
39.7.1.7	November 30, 2018
39.7.2.2	December 16, 2018
40.6.8.1.6	November 30, 2018

IV. Temporary Effectiveness of the Tariff Revisions Until December 31, 2019, to the Extent the Commission Does Not Permit Them to Remain in Effect Beyond that Date Pursuant to a Subsequent CAISO Filing

For these reasons discussed in this filing, the CAISO requests that the Commission permit the proposed tariff revisions to remain in place until December 31, 2019.

To implement this temporary approach, the CAISO is submitting two sets of tariff records – one set that contains the proposed tariff revisions and shows the November 30, 2018, and December 16, 2018, effective dates discussed above, and a second set that contains the tariff sections revised by this filing as they read in the existing tariff (*i.e.*, omitting the tariff revisions) and shows an effective date of December 31, 2019.[108] Pursuant to this approach, to the extent the Commission accepts the tariff revisions and does not later take action to continue their effectiveness until December 31, 2019, on that date the first set of tariff records described above will automatically be superseded by the second set of tariff records, and thus the tariff sections revised by this filing will revert to how they read before the CAISO submitted its Aliso Phase 1 proceeding initial filing.

[108] The clean tariff sheets and red-lined document provided in attachments A and B to this filing reflect only the first set of tariff records described above.

V. Communications

In accordance with the Commission's regulations,[109] correspondence and other communications regarding this filing should be addressed to the following individuals, whose names should be placed on the official service list established by the Commission with respect to this filing:

Roger E. Collanton
General Counsel
Anna Alfano McKenna
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VI. Service

The CAISO has served copies of this filing on the CPUC, the CEC, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

VII. Contents of Filing

In addition to this transmittal letter, this filing includes the following attachments:

Attachment A	Clean CAISO tariff sheets for this tariff amendment;
Attachment B	Red-lined document showing the revisions contained in this tariff amendment;
Attachment C	Additional background information regarding Aliso Canyon; and
Attachment D	Summer 2018 Supplemental Report.

[109] 18 C.F.R. § 385.203(b).

VIII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission issue an order by November 28, 2018, that accepts the tariff revisions contained in this filing effective November 30, 2018, and December 16, 2018, respectively.

Respectfully submitted,

/s/ Anna McKenna

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Anna Alfano McKenna
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Attachment A – Clean Tariff

Aliso Canyon Gas-Electric Coordination Phase 4

California Independent System Operator Corporation

6.2.1 Scheduling Coordinators

* * * * *

6.2.1.3 Individually Assigned Login Accounts

The CAISO will provide an interface for data exchange between the CAISO and Scheduling Coordinators who shall each have individually assigned login accounts via digital certificates. Through the use of the security provisions of CAISO's secure communication system, data will be provided by the CAISO to Scheduling Coordinators on a confidential basis (such as Day-Ahead Schedules and resource-specific pricing data resulting from the enforcement of a natural gas constraint as specified in Section 27.11 for individual Scheduling Coordinators). Other CAISO data that is not confidential (such as CAISO Demand Forecasts) will be published on the public access reporting system of the CAISO Website and be available to anyone.

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6.5.2 Communications Prior to the Day-Ahead Market

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6.5.2.2.3 Advisory Day-Ahead Market Results

The CAISO may provide to the responsible Scheduling Coordinator its MWh amounts scheduled in the preliminary RUC process the CAISO conducts two (2) days prior to the Trading Day, that is based on Bids and forecasts of system conditions as available in the CAISO Market systems at the time the CAISO conducts the preliminary RUC process. This information is for advisory purposes only and is not financially binding.

* * * * *

6.5.2.3.4 Greenhouse Gas Price Indices

The CAISO will publish daily greenhouse gas price indices when available.

* * * * *

6.5.4 RTM Communications Before the Trading Hour

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6.5.4.2.3 The CAISO will publish the natural gas price indices used for the Real-Time Market when available.

* * * * *

7.9.2 Reasons for Suspension or Limitation

The CAISO may suspend or limit the ability of one or more Scheduling Coordinators to submit Virtual Bids if the CAISO determines that virtual bidding activities of one or more Scheduling Coordinators on behalf of one or more Convergence Bidding Entities detrimentally affect System Reliability or grid operations. Virtual bidding activities can detrimentally affect System Reliability or grid operations if such activities contribute to threatened or imminent reliability conditions, including but not limited to the following circumstances:

(a) Submitted Virtual Bids create a substantial risk that the CAISO will be unable to obtain sufficient Energy and Ancillary Services to meet Real-Time Demand and Ancillary Service requirements in the CAISO Balancing Authority Area.

(b) Submitted Virtual Bids render the CAISO Day-Ahead Market software unable to process Bids submitted into the Day-Ahead Market.

(c) Submitted Virtual Bids render the CAISO unable to achieve an alternating current (AC) solution in the Day-Ahead Market for an extended period of time.

(d) Submitted Virtual Bids detrimentally affect CAISO Market efficiency related to enforcement of natural gas constraint pursuant to Section 27.11.

* * * * *

27.11 Natural Gas Constraint

The CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the Southern California Gas Company and San Diego Gas & Electric Company gas regions, based on limitations in applicable gas regions anticipated by the CAISO during specific hours. In the event that such a constraint is binding, the Shadow Price of the constraint will be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices of only the affected natural gas-fired resources. The Shadow Price of the constraint will not be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices for purposes of settling cleared Demand, Virtual Bids, or Congestion Revenue Rights. The same Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights is used for the calculation of the Real-Time Congestion Offset pursuant Section 11.5.4.1.1. The CAISO will allocate any non-zero amounts that are attributable to the price differential between the Marginal Cost of Congestion used for settling a Generating Unit's scheduled or Dispatched amounts at their location and the Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights pursuant to Section 11.5.4, except that for Day-Ahead settlements the CAISO will allocate the difference through the CRR Balancing Account pursuant to Section 11.2.4.5. The CAISO will provide, through the procedures set forth in Section 6.5.10.1.1, information on whether the CAISO plans to enforce a natural gas constraint in the Day-Ahead Market, and after the Day-Ahead Market is executed, whether it enforced a natural gas constraint in the Day-Ahead Market. In addition, to the extent feasible in advance of the deadline for submitting Bids for the Day-Ahead or Real-Time Market, as applicable, the CAISO will issue a notice through its market notification system indicating its intent to enforce a natural gas constraint along with the affected areas and the magnitude and expected duration of the natural gas constraint.

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30.4.1 Start-Up and Minimum Load Costs

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30.4.1.2 Registered Cost Methodology

Under the Registered Cost methodology, the Scheduling Coordinator for a Use-Limited Resource may register values of its choosing for Start-Up Costs and/or Minimum Load Costs in the Master File subject to the maximum limit specified in Section 39.6.1.6. A Scheduling Coordinator for a Multi-Stage Generating Resource that is a Use-Limited Resource registering a Start-Up Cost must also register Transition Costs for each feasible MSG Transition, subject to the maximum limit specified in Section 39.6.1.7. For a Use-Limited Resource to be eligible for the Registered Cost methodology there must be sufficient information in the Master File to calculate the value pursuant to the Proxy Cost methodology, which will be used to validate the specific value registered using the Registered Cost methodology. Any such values will be fixed for a minimum of 30 days in the Master File unless: (a) the resource's costs for any such value, as calculated pursuant to the Proxy Cost methodology, exceed the value registered using the Registered Cost methodology, in which case the Scheduling Coordinator may elect to switch to the Proxy Cost methodology for the balance of any 30-day period, except as set forth in Section 30.4.1.2(b); or (b) any cost registered in the Master File exceeds the maximum limit specified in Section 39.6.1.6 or Section 39.6.1.7 after this minimum 30-day period, in which case the value will be lowered to the maximum limit specified in Section 39.6.1.6 or Section 39.6.1.7. If a Multi-Stage Generating Resource elects to use the Registered Cost methodology, that election will apply to all the MSG Configurations for that resource. The cap for the Registered Cost values for each MSG Configuration will be based on the Proxy Cost values calculated for each MSG Configuration, including for each MSG Configuration that cannot be directly started, which are also subject to the maximum limits specified in Sections 39.6.1.6 and 39.6.1.7.

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30.12 Eligibility to Submit Filings to Recover Marginal Fuel-Related Costs

30.12.1 Applicability

A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator may seek to recover through a FERC filing pursuant to Section 205 of the Federal Power Act any actual marginal fuel procurement costs that cannot be recovered through CAISO market revenues under the following conditions:

(a) A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator is mitigated to its Default Energy Bid that is calculated pursuant to any of the options set forth in Section 39.7.1, or the competitive LMP through the Local Market Power Mitigation as specified in Sections 31.2 and 34.1.5;

(b) A Scheduling Coordinator whose Exceptional Dispatch is mitigated pursuant to Section 39.10 for any of the options set forth in Section 39.7.1, or submits no Bid, and the Exceptional Dispatch is settled at the greater of the applicable Default Energy Bid or resource-specific LMP;

(c) A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator that is required by FERC order to submit Bids no greater than its Default Energy Bid calculated pursuant to any of the options set forth in Section 39.7.1, and submit Bids at the Default Energy Bid; or

(d) A Scheduling Coordinator that is subject to a Generated Bid as set forth in Sections 30.7.3.4, 39.7.1.1.1, and 40.6.8.

30.12.2 Notice and Process

The Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator must notify the CAISO within thirty (30) Business Days after the Operating Day on which the resource incurred the unrecovered costs, and must submit the filing to FERC within ninety (90) Business Days after that Operating Day. Within sixty (60) Business Days after the Operating Day for which the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator provides notice to the CAISO per this Section, the CAISO will provide the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator with a written explanation of any effect that events or circumstances in the CAISO Markets

and fuel market conditions may have had on the resource's inability to recover the costs on the Trading Day.

30.12.3 Documentation Required for FERC Filing

Each filing the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator submits to FERC must include:

(a) Data supporting the Scheduling Coordinator's or EIM Participating Resource Scheduling Coordinator's claim to the unrecovered costs it seeks, including invoices related to the unrecovered costs;

(b) A description of the resource's participation in any gas pooling arrangements;

(c) An explanation of why recovery of the costs is justified; and

(d) A copy of the written explanation from the CAISO to the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator described above in this Section.

30.12.4 Payment and Allocation Costs Recovered Pursuant to a FERC Order

To the extent that FERC authorizes the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator to recover any costs pursuant to the Scheduling Coordinator's or EIM Participating Resource Scheduling Coordinator's filing, the CAISO will pay the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator any amounts FERC deems recoverable and will allocate such amounts pursuant to Section 11.14.

* * * * *

31.6.1 Criteria for Temporary Waiver of Timing Requirements

The CAISO may at its sole discretion implement any temporary variation or waiver of the timing requirements of this Section 31 and Section 6.5.3 (including the omission of any step) if any of the following criteria are met:

(i) such waiver or variation of timing requirements is reasonably necessary to preserve System Reliability, prevent an imminent or threatened System Emergency or to retain Operational Control over the CAISO Controlled Grid during an actual System Emergency;

(ii) because of error or delay, the CAISO requires additional time to fulfill its responsibilities;

(iii) problems with data or the processing of data cause a delay in receiving or issuing Bids or publishing information on the CAISO's secure communication system; and

(iv) problems with telecommunications or computing infrastructure cause a delay in receiving or issuing Day-Ahead Schedules or publishing information on the CAISO's secure communication system.

* * * * *

39.7.1 Calculation of Default Energy Bids

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39.7.1.1.1.3 Calculation of Natural Gas Price

(a) The CAISO will use different gas price indices for the Day-Ahead Market and the Real-Time Market. If a gas price index is unavailable for any reason, the CAISO will use the most recent available gas price index as set forth in Section 39.7.1.1.1.3(c).

(b) For the Day-Ahead Market, the CAISO will use a gas price index based on natural gas prices reported by the Intercontinental Exchange one (1) day prior to the applicable Trading Day between 8:00 and 9:00 a.m. Pacific Time for natural gas deliveries on the Trading Day, which is a volume-weighted average price calculated by the Intercontinental Exchange based on trades transacted that day on the Intercontinental Exchange during its next-day trading window.

(c) For the Real-Time Market, the CAISO will calculate a gas price index using at least two (2) prices from two (2) or more of the following publications: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, Platt's Gas Daily, and the Intercontinental Exchange. The CAISO will update the gas price indices for the Real-Time Market between 19:00 and 22:00 Pacific Time using natural gas prices published one (1) day prior to the applicable Trading Day for natural gas deliveries on the Trading Day, unless gas prices are not published on that day, in which case the CAISO will use the most recently published prices that are available.

(d) For the Real-Time Market, the CAISO will increase the gas price calculated pursuant to Section 39.7.1.1.1.3(c) for resources receiving gas service from Southern California Gas Company and San Diego Gas & Electric Company by an amount that: (1) improves the dispatch of these resources so that they are more likely to be dispatched to address local needs rather than system needs; (2) better accounts for systematic differences between day-ahead and same-day natural gas prices; and (3) improves the ability to manage the generators' gas usage within applicable gas balancing rules. For applicable resources, the CAISO will initially increase the gas commodity price used in the calculation of Start-Up Costs, Minimum Load Costs, and Transition Costs pursuant to Section 30.4.1.1, and Generated Bids pursuant to Section 40.6.8, by seventy-five (75) percent, and may decrease this amount or increase it further by an amount not to exceed $2.50/therm plus two (2) times the next-day gas index price calculated pursuant to Section 39.7.1.1.1.3(b). For applicable resources, the CAISO will initially increase the gas commodity price used in the calculation of Default Energy Bids pursuant to Section 39.7.1.1 by twenty-five (25) percent, and may decrease this amount or increase it further by an amount not to exceed one hundred (100) percent. Upon determining that a subsequent change in the gas price is necessary after the initial increase, the CAISO will issue a Market Notice specifying the amount of any price change.

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39.7.1.7 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

A Scheduling Coordinator for a resource subject to any of the Default Energy Bid Options in Section 39.7.1 may seek to recover actual marginal fuel procurement costs pursuant to a filing with FERC in accordance with Section 30.12.

39.7.2 Competitive Path Designation

39.7.2.1 Timing of Assessments

For the DAM and RTM, the CAISO will make assessments and designations of whether Transmission Constraints are competitive or non-competitive as part of the MPM runs associated with the DAM and

RTM, respectively. Only binding Transmission Constraints determined by the MPM process will be assessed in the applicable market.

39.7.2.2 Criteria

(A) Notwithstanding the provisions in Section 39.7.2.2(B), when the CAISO enforces the natural gas constraint pursuant to Section 27.11, the CAISO may deem selected internal constraints to be non-competitive for specific days or hours based on its determination that actual electric supply conditions may be non-competitive due to anticipated electric supply conditions in the Southern California Gas Company and San Diego Gas & Electric Company gas regions.

(B) Subject to Section 39.7.3, for the DAM and RTM, a Transmission Constraint will be non-competitive only if the Transmission Constraint fails the dynamic competitive path assessment pursuant to this Section 39.7.2.2.

(a) **Transmission Constraints for the DAM** - As part of the MPM process associated with the DAM, the CAISO will designate a Transmission Constraint for the DAM as non-competitive when the fringe supply of counter-flow to the Transmission Constraint from all portfolios of suppliers that are not identified as potentially pivotal is less than the demand for counter-flow to the Transmission Constraint. For purposes of determining whether to designate a Transmission Constraint as non-competitive pursuant to this Section 39.7.2.2(a):

(i) Counter-flow to the Transmission Constraint means the delivery of Power from a resource to the system load distributed reference bus. If counter-flow to the Transmission Constraint is in the direction opposite to the market flow of Power to the Transmission Constraint, the counter-flow to the Transmission Constraint is calculated as the shift factor multiplied by the resource's scheduled Power. Otherwise, counter-flow to the Transmission Constraint is zero.

(ii) Fringe supply of counter-flow to the Transmission Constraint means all available capacity from internal resources not controlled by the identified potentially pivotal suppliers and all internal Virtual Supply Awards not controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission

Constraint. Available capacity reflects the highest capacity of a resource's Energy Bid adjusted for Self-Provided Ancillary Services and derates.

(iii) Demand for counter-flow to the Transmission Constraint means all internal dispatched Supply and Virtual Supply Awards that provide counter-flow to the Transmission Constraint.

(iv) Potentially pivotal suppliers mean the three (3) portfolios of net sellers that control the largest quantity of counter-flow supply to the Transmission Constraint.

(v) Portfolio means the effective available internal generation capacity under the control of the Scheduling Coordinator and/or Affiliate determined pursuant to Section 4.5.1.1.12 and all effective internal Virtual Supply Awards of the Scheduling Coordinator and/or Affiliate. Effectiveness in supplying counter-flow is determined by scaling generation capacity and/or Virtual Supply Awards by the shift factor from that location to the Transmission Constraint being tested.

(vi) A portfolio of a net seller means any portfolio that is not a portfolio of a net buyer. A portfolio of a net buyer means a portfolio for which the average daily net value of Measured Demand minus Supply over a twelve (12) month period is positive. The average daily net value is determined for each portfolio by subtracting, for each Trading Day, Supply from Measured Demand and then averaging the daily value for all Trading Days over the twelve (12) month period. The CAISO will calculate whether portfolios are portfolios of net buyers in the third month of each calendar quarter and the calculations will go into effect at the start of the next calendar quarter. The twelve (12) month period used in this calculation will be the most recent twelve (12) month period for which data is available. The specific mathematical formula used to perform this calculation will be set forth in a Business Practice Manual. Market Participants without physical resources will be deemed to be net sellers for purposes of this Section 39.7.2.2(a)(vi).

(vii) In determining which Scheduling Coordinators and/or Affiliates control the resources in the three (3) identified portfolios, the CAISO will include resources

and Virtual Supply Awards directly associated with all Scheduling Coordinator ID Codes associated with the Scheduling Coordinators and/or Affiliates, as well as all resources that the Scheduling Coordinators and/or Affiliates control pursuant to Resource Control Agreements registered with the CAISO as set forth Section 4.5.1.1.13. Resources identified pursuant to Resource Control Agreements will only be assigned to the portfolio of the Scheduling Coordinator that has control of the resource or whose Affiliate has control of the resource pursuant to the Resource Control Agreements.

(b) **Transmission Constraints for the RTM** - As part of the MPM processes associated with the RTM, the CAISO will designate a Transmission Constraint for the RTM as non-competitive when the sum of the supply of counter-flow from all portfolios of potentially pivotal suppliers to the Transmission Constraint and the fringe supply of counter-flow to the Transmission Constraint from all portfolios of suppliers that are not identified as potentially pivotal is less than the demand for counter-flow to the Transmission Constraint. For purposes of determining whether to designate a Transmission Constraint as non-competitive pursuant to this Section 39.7.2.2(b):

(i) Counter-flow to the Transmission Constraint has the meaning set forth in Section 39.7.2.2(a)(i).

(ii) Supply of counter-flow from all portfolios of potentially pivotal suppliers to the Transmission Constraint means the minimum available capacity from internal resources controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission Constraint. The minimum available capacity for the current market interval will reflect the greatest amount of capacity that can be physically withheld. The minimum available capacity is the lowest output level the resource could achieve in the current market interval given its dispatch in the last market interval and limiting factors including Minimum Load, Ramp Rate, Self-Provided Ancillary Services, Ancillary Service Awards (in the Real-Time Market only), and derates.

(iii) Potentially pivotal suppliers mean the three (3) portfolios of net sellers that control the largest quantity of counter-flow supply to the Transmission Constraint that can be withheld. Counter-flow supply to the Transmission Constraint that can be withheld reflects the difference between the highest capacity and the lowest capacity of a resource's Energy Bid (not taking into account the Ramp Rate of the resource), measured from the Dispatch Operating Point for the resource in the immediately preceding fifteen (15) minute FMM interval or the preceding five (5) minute RTD interval, as applicable (taking into account the Ramp Rate of the resource), adjusted for Self-Provided Ancillary Services and derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM, or adjusted for Ancillary Service Awards and derates in determining whether to designate a Transmission Constraint as non-competitive for the FMM. In determining whether to designate a Transmission Constraint as non-competitive for the RTM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of sixty (60) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval of the FMM. In determining whether to designate a Transmission Constraint as non-competitive for the RTM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of fifteen (15) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval.

(iv) Portfolio means the effective available internal generation capacity under the control of the Scheduling Coordinator and/or Affiliate determined pursuant to Sections 4.5.1.1.12 and 39.7.2.2(a)(vii). Effectiveness in supplying counter-flow is determined by scaling generation capacity by the shift factor from that location to the Transmission Constraint being tested.

(v) A portfolio of a net seller has the meaning set forth in Section 39.7.2.2(a)(vi).

(vi) Fringe supply of counter-flow to the Transmission Constraint means all available capacity from internal resources not controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission Constraint. Available capacity reflects the highest capacity of a resource's Energy Bid (not taking into account the Ramp Rate of the resource), measured from the Dispatch Operating Point for the resource in the immediately preceding fifteen (15) minute interval of the FMM or five (5) minute interval of the RTD, as applicable (taking into account the Ramp Rate of the resource), adjusted for Self-Provided Ancillary Services and derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM, or adjusted for Ancillary Service Awards and derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM.

(vii) Demand for counter-flow to the Transmission Constraint means all internal dispatched Supply that provides counter-flow to the Transmission Constraint.

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40.6.8 Use of Generated Bids

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40.6.8.1.6 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

A Scheduling Coordinator for a resource subject to a Generated Bid may seek to recover actual marginal fuel procurement costs pursuant to a filing with FERC in accordance with Section 30.12.

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Attachment B – Marked Tariff

Aliso Canyon Gas-Electric Coordination Phase 4

California Independent System Operator Corporation

6.2.1 Scheduling Coordinators

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6.2.1.3 Individually Assigned Login Accounts

The CAISO will provide an interface for data exchange between the CAISO and Scheduling Coordinators who shall each have individually assigned login accounts via digital certificates. Through the use of the security provisions of CAISO's secure communication system, data will be provided by the CAISO to Scheduling Coordinators on a confidential basis (such as Day-Ahead Schedules and resource-specific pricing data resulting from the enforcement of a natural gas constraint as specified in Section 27.11 for individual Scheduling Coordinators). Other CAISO data that is not confidential (such as CAISO Demand Forecasts) will be published on the public access reporting system of the CAISO Website and be available to anyone.

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6.5.2 Communications Prior to the Day-Ahead Market

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6.5.2.2.3 Advisory Day-Ahead Market Results

The CAISO may provide to the responsible Scheduling Coordinator its MWh amounts scheduled in the preliminary RUC process the CAISO conducts two (2) days prior to the Trading Day, that is based on Bids and forecasts of system conditions as available in the CAISO Market systems at the time the CAISO conducts the preliminary RUC process. This information is for advisory purposes only and is not financially binding.

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6.5.2.3.4 Greenhouse Gas Price Indices

The CAISO will publish ~~relevant natural gas price indices and~~ daily greenhouse gas price indices when available.

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6.5.4 RTM Communications Before the Trading Hour

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6.5.4.2.3 The CAISO will publish the natural gas price indices used for the Real-Time Market when available.

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7.9.2 Reasons for Suspension or Limitation

The CAISO may suspend or limit the ability of one or more Scheduling Coordinators to submit Virtual Bids if the CAISO determines that virtual bidding activities of one or more Scheduling Coordinators on behalf of one or more Convergence Bidding Entities detrimentally affect System Reliability or grid operations. Virtual bidding activities can detrimentally affect System Reliability or grid operations if such activities contribute to threatened or imminent reliability conditions, including but not limited to the following circumstances:

(a) Submitted Virtual Bids create a substantial risk that the CAISO will be unable to obtain sufficient Energy and Ancillary Services to meet Real-Time Demand and Ancillary Service requirements in the CAISO Balancing Authority Area.

(b) Submitted Virtual Bids render the CAISO Day-Ahead Market software unable to process Bids submitted into the Day-Ahead Market.

(c) Submitted Virtual Bids render the CAISO unable to achieve an alternating current (AC) solution in the Day-Ahead Market for an extended period of time.

(d) Submitted Virtual Bids detrimentally affect CAISO Market efficiency related to enforcement of natural gas constraint pursuant to Section 27.11.

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27.11 Natural Gas Constraint~~[Not Used]~~

The CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the Southern California Gas Company and San Diego Gas & Electric Company gas regions, based on limitations in applicable gas regions anticipated by the CAISO during specific hours. In the event that such a constraint is binding, the Shadow Price of the constraint will be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices of only the affected natural gas-fired resources. The Shadow Price of the constraint will not be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices for purposes of settling cleared Demand, Virtual Bids, or Congestion Revenue Rights. The same Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights is used for the calculation of the Real-Time Congestion Offset pursuant Section 11.5.4.1.1. The CAISO will allocate any non-zero amounts that are attributable to the price differential between the Marginal Cost of Congestion used for settling a Generating Unit's scheduled or Dispatched amounts at their location and the Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights pursuant to Section 11.5.4, except that for Day-Ahead settlements the CAISO will allocate the difference through the CRR Balancing Account pursuant to Section 11.2.4.5. The CAISO will provide, through the procedures set forth in Section 6.5.10.1.1, information on whether the CAISO plans to enforce a natural gas constraint in the Day-Ahead Market, and after the Day-Ahead Market is executed, whether it enforced a natural gas constraint in the Day-Ahead Market. In addition, to the extent feasible in advance of the deadline for submitting Bids for the Day-Ahead or Real-Time Market, as applicable, the CAISO will issue a notice through its market notification system indicating its intent to enforce a natural gas constraint along with the affected areas and the magnitude and expected duration of the natural gas constraint.

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30.4.1 Start-Up and Minimum Load Costs

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30.4.1.2 Registered Cost Methodology

~~(a)~~ Under the Registered Cost methodology, the Scheduling Coordinator for a Use-Limited Resource may register values of its choosing for Start-Up Costs and/or Minimum Load Costs in the Master File subject to the maximum limit specified in Section 39.6.1.6. A Scheduling Coordinator for a Multi-Stage Generating Resource that is a Use-Limited Resource registering a Start-Up Cost must also register Transition Costs for each feasible MSG Transition, subject to the maximum limit specified in Section 39.6.1.7. For a Use-Limited Resource to be eligible for the Registered Cost methodology there must be sufficient information in the Master File to calculate the value pursuant to the Proxy Cost methodology, which will be used to validate the specific value registered using the Registered Cost methodology. Any such values will be fixed for a minimum of 30 days in the Master File unless: (a) the resource's costs for any such value, as calculated pursuant to the Proxy Cost methodology, exceed the value registered using the Registered Cost methodology, in which case the Scheduling Coordinator may elect to switch to the Proxy Cost methodology for the balance of any 30-day period, except as set forth in Section 30.4.1.2(b); or (b) any cost registered in the Master File exceeds the maximum limit specified in Section 39.6.1.6 or Section 39.6.1.7 after this minimum 30-day period, in which case the value will be lowered to the maximum limit specified in Section 39.6.1.6 or Section 39.6.1.7. If a Multi-Stage Generating Resource elects to use the Registered Cost methodology, that election will apply to all the MSG Configurations for that resource. The cap for the Registered Cost values for each MSG Configuration will be based on the Proxy Cost values calculated for each MSG Configuration, including for each MSG Configuration that cannot be directly started, which are also subject to the maximum limits specified in Sections 39.6.1.6 and 39.6.1.7.

~~(b) If the alternative natural gas price set forth in Section 39.7.1.1.1.3(b) is triggered, and a Use-Limited Resource's Start-Up Costs or Minimum Load Costs calculated pursuant to the Proxy Cost methodology using the alternative gas price exceeds the value registered in the Master File, then the CAISO will switch the Use-Limited Resource to the Proxy Cost methodology. Any Use-Limited Resource switched to the Proxy Cost methodology~~

~~pursuant to Section 30.4.1.2(b) will revert to the Registered Cost methodology when the Use-Limited Resource's alternative Proxy Cost calculation no longer exceeds the value registered using the Registered Cost methodology. These determinations will be made separate for both Start-Up Costs and Minimum Load Costs. The CAISO will not make a separate determination for Transition Costs but if a Start-Up Cost is switched to the Proxy Cost methodology, the Transition Costs of the Use-Limited Resource will also be switched to the Proxy Cost methodology.~~

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30.12 Eligibility to Submit Filings to Recover Marginal Fuel-Related Costs ~~[Not Used]~~

30.12.1 Applicability ~~[Not Used]~~

A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator may seek to recover through a FERC filing pursuant to Section 205 of the Federal Power Act any actual marginal fuel procurement costs that cannot be recovered through CAISO market revenues under the following conditions:

(a) A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator is mitigated to its Default Energy Bid that is calculated pursuant to any of the options set forth in Section 39.7.1, or the competitive LMP through the Local Market Power Mitigation as specified in Sections 31.2 and 34.1.5;

(b) A Scheduling Coordinator whose Exceptional Dispatch is mitigated pursuant to Section 39.10 for any of the options set forth in Section 39.7.1, or submits no Bid, and the Exceptional Dispatch is settled at the greater of the applicable Default Energy Bid or resource-specific LMP;

(c) A Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator that is required by FERC order to submit Bids no greater than its Default Energy Bid calculated pursuant to any of the options set forth in Section 39.7.1, and submit Bids at the Default Energy Bid; or

(d) A Scheduling Coordinator that is subject to a Generated Bid as set forth in Sections 30.7.3.4, 39.7.1.1.1, and 40.6.8.

30.12.2 Notice and Process ~~[Not Used]~~

The Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator must notify the CAISO within thirty (30) Business Days after the Operating Day on which the resource incurred the unrecovered costs, and must submit the filing to FERC within ninety (90) Business Days after that Operating Day. Within sixty (60) Business Days after the Operating Day for which the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator provides notice to the CAISO per this Section, the CAISO will provide the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator with a written explanation of any effect that events or circumstances in the CAISO Markets and fuel market conditions may have had on the resource's inability to recover the costs on the Trading Day.

30.12.3 Documentation Required for FERC Filing ~~[Not Used]~~

Each filing the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator submits to FERC must include:

(a) Data supporting the Scheduling Coordinator's or EIM Participating Resource Scheduling Coordinator's claim to the unrecovered costs it seeks, including invoices related to the unrecovered costs;

(b) A description of the resource's participation in any gas pooling arrangements;

(c) An explanation of why recovery of the costs is justified; and

(d) A copy of the written explanation from the CAISO to the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator described above in this Section.

30.12.4 Payment and Allocation Costs Recovered Pursuant to a FERC Order~~[Not Used]~~

To the extent that FERC authorizes the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator to recover any costs pursuant to the Scheduling Coordinator's or EIM Participating Resource Scheduling Coordinator's filing, the CAISO will pay the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator any amounts FERC deems recoverable and will allocate such amounts pursuant to Section 11.14.

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31.6.1 Criteria for Temporary Waiver of Timing Requirements

The CAISO may at its sole discretion implement any temporary variation or waiver of the timing requirements of this Section 31 and Section 6.5.3 (including the omission of any step) if any of the following criteria are met:

(i) such waiver or variation of timing requirements is reasonably necessary to preserve System Reliability, prevent an imminent or threatened System Emergency or to retain Operational Control over the CAISO Controlled Grid during an actual System Emergency;~~.~~

(ii) because of error or delay, the CAISO requires additional time to fulfill its responsibilities;

(iii) problems with data or the processing of data cause a delay in receiving or issuing Bids or publishing information on the CAISO's secure communication system; and

(iv) problems with telecommunications or computing infrastructure cause a delay in receiving or issuing Day-Ahead Schedules or publishing information on the CAISO's secure communication system~~; and~~ .

~~(v) the alternative natural gas price set forth in Section 39.7.1.1.1.3(b) is triggered.~~

* * * * *

39.7.1 Calculation of Default Energy Bids

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39.7.1.1.1.3 Calculation of Natural Gas Price

(a) ~~Except as set forth in Section 39.7.1.1.1.3(b), t~~The CAISO will use different gas price indices for the Day-Ahead Market and the Real-Time Market ~~and a gas price index will be calculated using at least two prices from two or more of the following publications: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, Platt's Gas Daily, and the Intercontinental Exchange~~. If a gas price index is unavailable for any reason, the CAISO will use the most recent available gas price

index as set forth in Section 39.7.1.1.1.3(c).

(b) For the Day-Ahead Market, the CAISO will use a gas price index based on natural gas prices reported by the Intercontinental Exchange one (1) day prior to the applicable Trading Day between 8:00 and 9:00 a.m. Pacific Time for natural gas deliveries on the Trading Day, which is a volume-weighted average price calculated by the Intercontinental Exchange based on trades transacted that day on the Intercontinental Exchange during its next-day trading window.

(c) For the Real-Time Market, the CAISO will calculate a gas price index using at least two (2) prices from two (2) or more of the following publications: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, Platt's Gas Daily, and the Intercontinental Exchange. The CAISO will update the gas price indices for the Real-Time Market between 19:00 and 22:00 Pacific Time using natural gas prices published one (1) ~~on the day that is two (2)~~ day~~s~~ prior to the applicable Trading Day for natural gas deliveries on the Trading Day, unless gas prices are not published on that day, in which case the CAISO will use the most recently published prices that are available.

(d) For the Real-Time Market, the CAISO will increase the gas price calculated pursuant to Section 39.7.1.1.1.3(c) for resources receiving gas service from Southern California Gas Company and San Diego Gas & Electric Company by an amount that: (1) improves the dispatch of these resources so that they are more likely to be dispatched to address local needs rather than system needs; (2) better accounts for systematic differences between day-ahead and same-day natural gas prices; and (3) improves the ability to manage the generators' gas usage within applicable gas balancing rules. For applicable resources, the CAISO will initially increase the gas commodity price used in the calculation of Start-Up Costs, Minimum Load Costs, and Transition Costs pursuant to Section 30.4.1.1, and Generated Bids pursuant to Section 40.6.8, by seventy-five (75) percent, and may decrease this amount or increase it further by an amount not to exceed $2.50/therm plus two (2) times the next-day gas index price calculated pursuant to Section 39.7.1.1.1.3(b). For applicable resources, the CAISO will initially increase the gas commodity price used in the calculation of Default Energy Bids pursuant to Section 39.7.1.1 by twenty-five (25) percent, and may decrease this amount or increase it further by an amount not to exceed one hundred (100) percent. Upon determining that a subsequent change in the gas price

is necessary after the initial increase, the CAISO will issue a Market Notice specifying the amount of any price change.

~~(b) If a daily gas price reported by the Intercontinental Exchange on the morning of the Day-Ahead Marked run exceeds one hundred twenty-five (125) percent of any natural gas price index calculated for the Day-Ahead Market between 19:00 and 22:00 Pacific Time on the preceding day, the CAISO will utilize the gas price reported by the Intercontinental Exchange in all CAISO cost formulas and market processes for that day's Day Ahead Market that would normally utilize the natural gas price index calculated pursuant to this Section 39.7.1.1.1.3.~~

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39.7.1.7 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

A Scheduling Coordinator for a resource subject to any of the Default Energy Bid Options in Section 39.7.1 may seek to recover actual marginal fuel procurement costs pursuant to a filing with FERC in accordance with Section 30.12.

39.7.2 Competitive Path Designation

39.7.2.1 Timing of Assessments

For the DAM and RTM, the CAISO will make assessments and designations of whether Transmission Constraints are competitive or non-competitive as part of the MPM runs associated with the DAM and RTM, respectively. Only binding Transmission Constraints determined by the MPM process will be assessed in the applicable market.

39.7.2.2 Criteria

(A) Notwithstanding the provisions in Section 39.7.2.2(B), when the CAISO enforces the natural gas constraint pursuant to Section 27.11, the CAISO may deem selected internal constraints to be non-competitive for specific days or hours based on its determination that actual electric supply conditions may be non-competitive due to anticipated electric supply conditions in the Southern California Gas Company and San Diego Gas & Electric Company gas regions.

(B) Subject to Section 39.7.3, for the DAM and RTM, a Transmission Constraint will be non-

competitive only if the Transmission Constraint fails the dynamic competitive path assessment pursuant to this Section 39.7.2.2.

(a) **Transmission Constraints for the DAM** - As part of the MPM process associated with the DAM, the CAISO will designate a Transmission Constraint for the DAM as non-competitive when the fringe supply of counter-flow to the Transmission Constraint from all portfolios of suppliers that are not identified as potentially pivotal is less than the demand for counter-flow to the Transmission Constraint. For purposes of determining whether to designate a Transmission Constraint as non-competitive pursuant to this Section 39.7.2.2(a):

(i) Counter-flow to the Transmission Constraint means the delivery of Power from a resource to the system load distributed reference bus. If counter-flow to the Transmission Constraint is in the direction opposite to the market flow of Power to the Transmission Constraint, the counter-flow to the Transmission Constraint is calculated as the shift factor multiplied by the resource's scheduled Power. Otherwise, counter-flow to the Transmission Constraint is zero.

(ii) Fringe supply of counter-flow to the Transmission Constraint means all available capacity from internal resources not controlled by the identified potentially pivotal suppliers and all internal Virtual Supply Awards not controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission Constraint. Available capacity reflects the highest capacity of a resource's Energy Bid adjusted for Self-Provided Ancillary Services and derates.

(iii) Demand for counter-flow to the Transmission Constraint means all internal dispatched Supply and Virtual Supply Awards that provide counter-flow to the Transmission Constraint.

(iv) Potentially pivotal suppliers mean the three (3) portfolios of net sellers that control the largest quantity of counter-flow supply to the Transmission Constraint.

(v) Portfolio means the effective available internal generation capacity under the control of the Scheduling Coordinator and/or Affiliate determined pursuant to

Section 4.5.1.1.12 and all effective internal Virtual Supply Awards of the Scheduling Coordinator and/or Affiliate. Effectiveness in supplying counter-flow is determined by scaling generation capacity and/or Virtual Supply Awards by the shift factor from that location to the Transmission Constraint being tested.

(vi) A portfolio of a net seller means any portfolio that is not a portfolio of a net buyer. A portfolio of a net buyer means a portfolio for which the average daily net value of Measured Demand minus Supply over a twelve (12) month period is positive. The average daily net value is determined for each portfolio by subtracting, for each Trading Day, Supply from Measured Demand and then averaging the daily value for all Trading Days over the twelve (12) month period. The CAISO will calculate whether portfolios are portfolios of net buyers in the third month of each calendar quarter and the calculations will go into effect at the start of the next calendar quarter. The twelve (12) month period used in this calculation will be the most recent twelve (12) month period for which data is available. The specific mathematical formula used to perform this calculation will be set forth in a Business Practice Manual. Market Participants without physical resources will be deemed to be net sellers for purposes of this Section 39.7.2.2(a)(vi).

(vii) In determining which Scheduling Coordinators and/or Affiliates control the resources in the three (3) identified portfolios, the CAISO will include resources and Virtual Supply Awards directly associated with all Scheduling Coordinator ID Codes associated with the Scheduling Coordinators and/or Affiliates, as well as all resources that the Scheduling Coordinators and/or Affiliates control pursuant to Resource Control Agreements registered with the CAISO as set forth Section 4.5.1.1.13. Resources identified pursuant to Resource Control Agreements will only be assigned to the portfolio of the Scheduling Coordinator that has control of the resource or whose Affiliate has control of the resource pursuant to the Resource Control Agreements.

(b) **Transmission Constraints for the RTM** - As part of the MPM processes associated with

the RTM, the CAISO will designate a Transmission Constraint for the RTM as non-competitive when the sum of the supply of counter-flow from all portfolios of potentially pivotal suppliers to the Transmission Constraint and the fringe supply of counter-flow to the Transmission Constraint from all portfolios of suppliers that are not identified as potentially pivotal is less than the demand for counter-flow to the Transmission Constraint. For purposes of determining whether to designate a Transmission Constraint as non-competitive pursuant to this Section 39.7.2.2(b):

(i) Counter-flow to the Transmission Constraint has the meaning set forth in Section 39.7.2.2(a)(i).

(ii) Supply of counter-flow from all portfolios of potentially pivotal suppliers to the Transmission Constraint means the minimum available capacity from internal resources controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission Constraint. The minimum available capacity for the current market interval will reflect the greatest amount of capacity that can be physically withheld. The minimum available capacity is the lowest output level the resource could achieve in the current market interval given its dispatch in the last market interval and limiting factors including Minimum Load, Ramp Rate, Self-Provided Ancillary Services, Ancillary Service Awards (in the Real-Time Market only), and derates.

(iii) Potentially pivotal suppliers mean the three (3) portfolios of net sellers that control the largest quantity of counter-flow supply to the Transmission Constraint that can be withheld. Counter-flow supply to the Transmission Constraint that can be withheld reflects the difference between the highest capacity and the lowest capacity of a resource's Energy Bid (not taking into account the Ramp Rate of the resource), measured from the Dispatch Operating Point for the resource in the immediately preceding fifteen (15) minute FMM interval or the preceding five (5) minute RTD interval, as applicable (taking into account the Ramp Rate of the resource), adjusted for Self-Provided Ancillary Services and

derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM, or adjusted for Ancillary Service Awards and derates in determining whether to designate a Transmission Constraint as non-competitive for the FMM. In determining whether to designate a Transmission Constraint as non-competitive for the RTM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of sixty (60) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval of the FMM. In determining whether to designate a Transmission Constraint as non-competitive for the RTM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of fifteen (15) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval.

(iv) Portfolio means the effective available internal generation capacity under the control of the Scheduling Coordinator and/or Affiliate determined pursuant to Sections 4.5.1.1.12 and 39.7.2.2(a)(vii). Effectiveness in supplying counter-flow is determined by scaling generation capacity by the shift factor from that location to the Transmission Constraint being tested.

(v) A portfolio of a net seller has the meaning set forth in Section 39.7.2.2(a)(vi).

(vi) Fringe supply of counter-flow to the Transmission Constraint means all available capacity from internal resources not controlled by the identified potentially pivotal suppliers that provide counter-flow to the Transmission Constraint. Available capacity reflects the highest capacity of a resource's Energy Bid (not taking into account the Ramp Rate of the resource), measured from the Dispatch Operating Point for the resource in the immediately preceding fifteen (15) minute interval of the FMM or five (5) minute interval of the RTD, as applicable (taking into account the Ramp Rate of the resource), adjusted for Self-Provided Ancillary Services and derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM, or adjusted for Ancillary Service Awards and

derates in determining whether to designate a Transmission Constraint as non-competitive for the RTM.

(vii) Demand for counter-flow to the Transmission Constraint means all internal dispatched Supply that provides counter-flow to the Transmission Constraint.

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40.6.8 Use of Generated Bids

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40.6.8.1.6 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

A Scheduling Coordinator for a resource subject to a Generated Bid may seek to recover actual marginal fuel procurement costs pursuant to a filing with FERC in accordance with Section 30.12.

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Attachment C – Additional Background Information

Aliso Canyon Gas-Electric Coordination Phase 4

California Independent System Operator Corporation

ATTACHMENT C

ADDITIONAL BACKGROUND INFORMATION REGARDING ALISO CANYON, APPLICATION OF GAS SCALARS, AND CAISO STAKEHOLDER PROCESS

I. Implications Regarding the Natural Gas Leak at the Aliso Canyon Gas Storage Facility

A. The Aliso Canyon Facility

Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E) own and operate an integrated gas transmission system located in southern California, for which SoCalGas is responsible. Using a network of transmission pipelines and four interconnected storage fields, SoCalGas and SDG&E deliver natural gas to more than five million business and residential customer accounts, which equals approximately 21 million residents.[1]

The largest of the gas storage fields is the Aliso Canyon facility (Aliso Canyon) located near Los Angeles.[2] Aliso Canyon is an integral part of the gas and electric system and is normally used year round. For summer operations, the SoCalGas Control department strives to completely fill Aliso Canyon to provide firm injection services to customers and prepare for the upcoming winter. For winter operations, Aliso Canyon provides needed winter supply and withdrawal services and allows preparation for the following summer.[3]

Aliso Canyon is integral to the reliable operation of the electric grid and infrastructure that the CAISO operates in California. Its gas storage acts as a shock absorber for the real-time dynamic variations in electric demand. Aliso Canyon also provides additional gas delivery capacity when gas demand exceeds the amount of flowing supply and provides a place to inject unutilized gas when electric demand is less than expected.[4]

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[1] Aliso Canyon Risk Assessment Technical Report Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, and Southern California Gas Company (Apr. 5, 2016), at pp. 5-7 (2016 Risk Assessment Report), available at: http://www.energy.ca.gov/2016_energypolicy/documents/2016-04-08_joint_agency_workshop/Aliso_Canyon_Risk_Assessment_Technical_Report.pdf. Information is available on the CAISO website page dedicated to the Aliso Canyon Gas-Electric Coordination stakeholder initiative: http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.aspx.

[2] 2016 Risk Assessment Report at p. 7. The other three gas storage fields are the Honor Rancho, La Goleta, and Playa del Rey facilities. *Id.*

[3] *Id.* at pp. 7-8.

[4] *Id.* at p. 10.

B. The Gas Leak at Aliso Canyon, Subsequent Events, and Potential Consequences of Limited Operability of Aliso Canyon

On October 23, 2015, a significant gas leak was detected at Aliso Canyon, which was not sealed until February 18, 2016. Based on discussions with SoCalGas, the CAISO understands that slightly over 20 billion cubic feet of gas (Bcf) is being stored at Aliso Canyon as an actual working gas inventory. SoCalGas currently has only limited ability to withdraw gas from Aliso Canyon.

On January 6, 2016, the Governor of California issued an Emergency Proclamation that included a number of directives related to the leak, including the continuation of a moratorium on gas injections into Aliso Canyon established following the leak until a comprehensive review of the "safety of the storage wells and the air quality of the surrounding community is completed," and a directive that the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC), in coordination with the CAISO, "shall take all actions necessary to ensure the continued reliability of natural gas and electricity supplies in the coming months during the moratorium."[5] Among the actions taken pursuant to the latter directive were the organization of an Inter-Agency Task Force and the preparation and issuance of the 2016 Risk Assessment Report and the 2016 Reliability Action Plan,[6] as well as other materials discussed below, by the members of the Inter-Agency Task Force – the CPUC, CEC, CAISO, SoCalGas, and the Los Angeles Department of Water and Power (LADWP).

Gas pipeline companies impose daily gas balancing requirements, based on the difference between nominated gas flows and actual gas demand (*i.e.*, burned gas), that are commonly referred to in southern California as operational flow orders (OFOs) and emergency flow orders (EFOs). Gas customers that exceed the balancing requirements by a specified tolerance band may have to pay penalties.[7] Gas-fired resources often manage these gas balancing

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[5] Governor Brown Issues Order on Aliso Canyon Gas *Leak* (January 6, 20166) (Emergency Proclamation) at PP 7, 10, available at: https://www.gov.ca.gov/news.php?id=19264.

[6] Aliso Canyon Action Plan to Preserve Gas and Electric Reliability for the Los Angeles Basin Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, and the Los Angeles Department of Water and Power (2016) (2016 Reliability Action Plan). The 2016 Reliability Action Plan is available at: https://www.energy.ca.gov/2016_energypolicy/documents/2016-04-08_joint_agency_workshop/Aliso_Canyon_Action_Plan_to_Preserve_Gas_and_Electric_Reliability_for_the_Los_Angeles_Basin.pdf.

[7] A gas pipeline company will issue a "high" OFO or EFO when the gas pipeline pressure is increasing because the amount of nominated gas is higher than the actual gas demand; to enable the pipeline to balance the pressure at a more sustainable level, gas customers must either decrease their nominated flows or reduce their demand. Conversely, a gas pipeline company will issue a "low" OFO or EFO when the gas pipeline pressure is decreasing because

requirements in part by bidding their commitment costs and energy offers into the CAISO real-time market at levels intended to ensure that the gas burns resulting from CAISO acceptance or non-acceptance of their bids will allow them to stay within the tolerance band, thus avoiding such penalties. For example, in situations in which a resource receives an OFO or EFO that puts the resource at risk of incurring a penalty if the resource burns an amount of gas above the tolerance band, the resource may seek to hold or decrease its gas burn by bidding higher costs into the CAISO real-time market, so that the CAISO real-time market is less likely to dispatch the resource up. Conversely, in situations where a resource receives an OFO or EFO that puts the resource at risk of incurring a penalty if the resource burns an amount of gas below the tolerance band, the resource will seek to not be dispatched down so that it does not decrease its gas burn, by bidding lower costs into the CAISO real-time market.

The limited operability of Aliso Canyon caused gas-balancing conditions in the Southern California area to become more strained, over both the SoCalGas and SDG&E gas systems, and these conditions were expected to worsen during the summer of 2016. As detailed in the 2016 Risk Assessment Report and the 2016 Reliability Action Plan, the Inter-Agency Task Force performed analyses that identified the risks to the SoCalGas operating region starting that summer. To address the risks, the Inter-Agency Task Force proposed a total of 18 mitigation measures, including changes to the CAISO market to improve gas-electric coordination.

The CAISO and other entities in California took a number of actions to address the risks presented by the limited operability of Aliso Canyon. In the May 9, 2016, tariff amendment the CAISO filed in Phase 1 of its Aliso Canyon stakeholder initiative (Aliso Phase 1 Tariff Amendment),[8] the CAISO explained that while it expected these actions to prove instrumental in mitigating the challenges posed, significant electric grid reliability concerns remained that stemmed from the interaction between gas balancing requirements and the reliance on gas-fired resources to serve load in southern California. The CAISO stated that it proposed the Phase 1 tariff revisions both to address these reliability concerns and to avoid exacerbating issues caused by an already constrained gas system.[9] Most of those tariff revisions went into effect on June 2, 2016, with more of the tariff revisions going into effect on July 6, 2016.

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the amount of nominated gas is lower than the actual gas demand; to enable the pipeline to balance the pressure at a more sustainable level, gas customers must either increase their nominated flows or increase their demand.

[8] The three phases of the Aliso Canyon stakeholder initiative are described further in section III of this attachment.

[9] Transmittal letter for Aliso Phase 1 Tariff Amendment at pp. 2-5; attachment C to Aliso Phase 1 Tariff Amendment.

The CAISO also established an ongoing practice of holding biweekly calls with the gas companies regarding outage planning. In addition, during normal operations, the CAISO provides two-day-ahead and one-day-ahead gas burn schedules to the gas companies, holds daily calls with them regarding the gas burn schedules, and notifies the gas companies if real-time gas burns are higher than the gas burn schedules. When peak operations are necessary during a day, the CAISO issues flex alerts or imposes restricted maintenance operations, holds peak-day reliability calls that include the gas companies, the Peak Reliability Coordinator (Peak RC),[10] participating transmission owners, and neighboring balancing authorities, and holds peak-day market calls with all market participants.

When gas limitation conditions occur in the SoCalGas service territory, CAISO personnel follow a CAISO procedure addressing gas-electric operations coordination under such conditions.[11] Pursuant to the procedure, if SoCalGas notifies the CAISO of a gas curtailment watch, the CAISO can manage the electric system by using gas constraints, adjusting internal transfer capability, or issuing exceptional dispatch instructions to resources. In the event that SoCalGas notifies the CAISO of a *pro rata* gas curtailment, or the CAISO has reason to believe that constrained gas conditions may cause electric reliability issues, the CAISO can manage the electric system using gas constraints or issuing exceptional dispatch instructions. The CAISO issues market notifications when it takes such action.

Based on the 2016 Inter-Agency Task Force winter assessment, the CAISO expected that Aliso Canyon would not be operational through the end of 2016 and during the bulk of 2017.[12] The Inter-Agency Task Force performed analyses that identify the risks presented by the limited operability of Aliso Canyon for winter 2016-2017.[13] In particular, the CAISO and LADWP used gas curtailment estimates to determine how much of a gas curtailment the electric generators could absorb and whether electric service interruptions could occur. Their analysis concluded that, although the risk to electric reliability was expected to be less than it was the preceding summer, challenges for electric reliability

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[10] Peak RC is currently the reliability authority for the CAISO balancing authority area.

[11] SoCalGas Service Area Limitations or Outages Procedure 4120C, available on the CAISO website at: http://www.caiso.com/Documents/4120C.pdf.

[12] See http://www.argusmedia.com/pages/NewsBody.aspx?id=1324396&menu=yes.

[13] See the Aliso Canyon Winter Risk Assessment Technical Report Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, and Southern California Gas Company (Aug. 22, 2016) (2016 Winter Risk Assessment Report), available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=212904; and the Aliso Canyon Gas and Electric Reliability Winter Action Plan Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, and the Los Angeles Department of Water and Power (Aug. 22, 2016) (2016 Winter Action Plan), available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=213406.

would continue through the winter 2016-2017 due to the limited operability of Aliso Canyon.

The CAISO and LADWP used gas curtailment estimates to determine how much of a gas curtailment the electric generators could absorb and whether electric service interruptions could occur. Their analysis concluded that, although the risk to electric reliability was expected to be less than it was the prior summer, challenges for electric reliability would continue through the winter 2016-2017 due to the limited operability of Aliso Canyon.

Specifically, the analysis found that gas-fired electric generation could be susceptible to gas curtailments during the winter without Aliso Canyon under certain conditions. Although electric load is generally lower in the winter compared with the summer, the availability of electric generation supply may be reduced during the winter due to the commitment of fewer generators on-line and outages for scheduled maintenance. The analysis determined that any gas curtailments occurring that winter were not expected to result in electric load interruption, even with reduced availability of electric generation, so long as gas supply and receipt point utilization remained approximately 84 percent or higher (corresponding to a system capacity of 4.1 billion cubic feet per day (Bcfd) of gas) on peak gas demand days. At or above this 84-percent level, the CAISO and LADWP expected to be able to secure sufficient generation outside of the SoCalGas and SDG&E service territories to avoid interrupting electric load. If, however, the gas supply and receipt point utilization fell below the 84-percent level, there was a risk that system capacity would not be sufficient to source gas to meet all customer needs. In that event, absent withdrawal of sufficient gas from Aliso Canyon to make up the shortfall, gas curtailment of electric generation might occur, potentially interrupting service to electric load.[14]

The CAISO and LADWP analyzed their ability to absorb a potential gas curtailment of 0.7 Bcf, which was the amount that would need to be curtailed if a 1-in-10-year winter peak demand event occurred based on SoCalGas's planning criteria for meeting gas demand of all customers (core and non-core). The analysis found that the CAISO and LADWP could absorb most but not all of a potential 0.7 Bcf gas curtailment, if: (1) electric transmission import capability remained unimpaired; (2) no gas-fired generation that was needed outside of the SoCalGas service area was out of service; and (3) every generating resource that the CAISO and LADWP sought to use had natural gas to operate.[15]

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[14] 2016 Winter Risk Assessment Report at pp. 30-40. This analysis assumed that multiple outages would not occur on the electric and gas system. *Id.* at p. 40. The 2016 Winter Risk Assessment Report also discussed the consequences of various scenarios with levels of system capacity different from the 4.1 Bcfd amount discussed above.

[15] 2016 Winter Action Plan at pp. 4-5, 17-18.

The CAISO and LADWP would need a small amount of additional gas to support minimum generation requirements, such as those requirements needed to maintain transmission system reliability or respond to local contingencies. There also remained some risk of electric service interruption due to reliability rules that require balancing authorities such as the CAISO and LADWP to maintain operating reserve margins. Gas-fired resources are normally used to maintain these operating reserves because they can respond rapidly to operating instructions. Even if the CAISO and LADWP can serve all electricity demand without using gas-fired resources, they need some gas to serve resources providing the operating reserves. If the CAISO and LADWP have no natural gas because of a gas curtailment, they could be required to shed load, thus resulting in the curtailment of electricity service to meet the operating reserve requirement.[16]

In addition to the mitigation measures for the summer referenced above, the 2016 Winter Action Plan "identifie[d] 10 new measures to help reduce, but not eliminate, the possibility of gas curtailments large enough to cause electricity service interruptions th[at] winter":

- SoCalGas establishing a gas demand response program.
- Further efforts by SoCalGas to establish a gas conservation messaging campaign.
- Continuing a set of tighter gas balancing rules for non-core customers that was established pursuant to a settlement approved by the CPUC and that was scheduled to expire on November 30, 2016.
- Establishing gas balancing rules applicable to SoCalGas core customers.
- SoCalGas submitting reports to the CPUC describing rapid progress in restoring pipeline service during maintenance outages.
- Exploring the feasibility of purchasing liquefied natural gas for delivery into the SDG&E system.

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[16] *Id.* at p. 5. The risks related to gas capacity limitations discussed above were a primary driver of the threat to electric reliability that winter. A lesser though still-present risk was that posed by gas imbalances from non-core customers for gas, which include gas-fired electric generators. The majority of demand for gas shifts in the winter from non-core customers to core customers (*i.e.*, residential and small commercial and industrial customers), with core customers using approximately 60 percent of gas supply. Also, demand for electricity is lower in the winter and there is more flexibility to shift responsibility to resources located outside of Southern California for providing electricity into Southern California, subject to transmission and generation outages. Non-core electric generators will, however, be the first to be curtailed if on-system gas is needed to meet core demand in the winter. *See* 2016 Winter Risk Assessment Report at pp. 6-7, 14-16; 2016 Winter Action Plan at pp. 10-12, 17-20.

- Exploring what, if anything, natural gas producers could do to increase deliveries into the SoCalGas system.

- The CPUC updating a protocol that would apply if and when some of the gas stored being held at Aliso Canyon were withdrawn.

- The CEC monitoring refinery gas use and operations and California Attorney General monitoring gasoline prices for potential price manipulation.

- The CAISO using a maximum limit on electric generator gas burns in advance of very cold days.[17]

Based on these findings, the CAISO concluded that maintaining authority to employ the maximum natural gas constraint would allow the CAISO to use the constraint in advance of very cold days as recommended in the 2016 Winter Action Plan. The 2016 Winter Action Plan also recognized that efforts to make changes to the CAISO market to improve gas-electric coordination were ongoing.[18] The Commission approved the CAISO's proposal to maintain the mitigation measures through November 2017.[19]

In early 2017, the staffs of the CPUC, CEC, CAISO, and LADWP, with input from SoCalGas, continued to assess the risks to electric reliability in the greater Los Angeles and Southern California area during the summer months due to the limited operability of Aliso Canyon. The group issued a report on May 19, 2017.[20] The 2017 Risk Assessment Report calculated the system capacity of the SoCalGas/SDG&E gas transmission system, based on peak hour(s) supportable demand, and determined the ability for the electric balancing authorities to maintain power system reliability during a 1-in-10-year peak summer electric load.

The 2017 Risk Assessment Report found that the CAISO and the LADWP's ability to meet the 1-in-10-year peak summer electric load was

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17 2016 Winter Action Plan at pp. 5, 20-25.

18 *Id.* at p. 24.

19 See section III of this attachment.

20 Aliso Canyon Risk Assessment Technical Report Summer 2017 Assessment Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, with Input from Southern California Gas Company (May 19, 2017) (2017 Risk Assessment Report). The 2017 Risk Assessment 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.

dependent on the amount of SoCalGas/SDG&E's system receipt point utilization and withdrawal capability from storage facilities other than Aliso Canyon.[21]

To summarize, the hydraulic analyses discussed in the 2017 Risk Assessment Report produced several findings:

- The maximum gas "sendout" that can be supported based on the inputs provided to SoCalGas without Aliso Canyon is 3.638 Bcfd. Of this total, 2.2 Bcfd is available to support electric generation. Achieving this maximum sendout requires: (1) that no other transmission or storage facility outage occurs; (2) 100 percent utilization of receipt point capacity; and (3) needed withdrawal capacity is available at the other three fields (which assumes those fields hold sufficient storage inventory to support that full withdrawal).[22]

- Any loss of flowing supply from 100 percent of the current receipt point utilization will reduce sendout capacity on a one-to-one basis.[23]

The electric analysis produced the following findings:

- Based on 3.373 Bcfd gas system capacity, which represents 90 percent flowing pipeline supplies and maximum storage withdrawal rate capability of 1.470 Bcfd during peak hours excluding Aliso Canyon, the LADWP/CAISO joint 2017 power-flow study found that there was sufficient gas to meet the minimum electric reliability requirement. This assumed there was enough energy supply outside Southern California and sufficient electric transmission import capability into Southern California.[24]

- As with the prior summer, during peak summer load conditions and historical electric transmission utilization patterns, incremental gas-fired generation may be required to meet electric reliability. If gas supply was insufficient to meet the increased gas demand, access to replacement energy may require emergency assistance from neighboring balancing authorities, and electric load shed in the Southern California region may be necessary.[25]

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21 *Id.* at p. 4.

22 *Id*. at p. 5.

23 *Id.*

24 *Id.*

25 *Id.*

- This analysis assessed the minimum generation needed to maintain reliability and minimize gas burns. However, dispatch did not represent the least-cost dispatch for meeting 1-in-10-year peak summer load. Electric reliability is planned daily based on least-cost generation resources to meet load. Economic operation of the generation assets would require gas usage above the outcome of the reliability study. Using resources other than those that are most efficient and economic would result in increased energy dispatch costs and higher electricity prices to ratepayers.[26]

- If transmission import capability decreases or demand response resources are limited, the electricity system would need more gas to avoid service interruptions. Should storage withdrawal or flowing gas supplies also drop, the electricity system would not be able to get that gas and would be at risk.[27]

In July 2018, the CPUC's Energy Division Staff released its Aliso Canyon Working Gas Inventory, Injection Capacity, and Well Availability for Reliability Summer 2018 Supplemental Report (Summer 2018 Supplemental Report).[28]

On July 6, 2018, the CPUC issued its Summer 2018 Supplemental Report regarding Aliso Canyon reliability impacts. The Summer 2018 Supplemental Report reviewed reliability concerns for both the summer 2018 and winter 2018-19 seasons. The CPUC found that in scenarios that assume continuing pipeline outages, "peak demand cannot be met without curtailments, even if Aliso [Canyon] were filled to the maximum inventory … deemed to be safe."[29] The reports also notes that "[p]ipeline capacity has not improved appreciably since winter 2017-18, and there is a chance that it could deteriorate further."[30]

The Summer 2018 Supplemental Report provides detailed analysis regarding the Southern California gas system's ability to meet 1-in-10 peak day demand through the 2018-19 winter season. The CPUC studied two pipeline capacity scenarios under both average and cold weather sensitivities. In the first scenario, the CPUC assumed that current gas pipeline outages continue and an

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26 *Id.*

27 *Id.* at 5-6.

28 Aliso Canyon Working Gas Inventory, Production Capacity, Injection Capacity, and Well Availability for Reliability Summer 2018 Supplemental Report, prepared by the Energy Division Staff of the California Public Utilities Commission (July 6, 2018) (Summer 2018 Supplemental Report). The Summer 2018 Supplemental Report is available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/715Report_Summer2018_Final.pdf.

29 Summer 2018 Supplemental Report at p. 2.

30 *Id.* at p. 7.

additional 180 million cubic feet per day (MMcfd) of pipeline capacity is lost in September. In the second scenario, the CPUC assumed a significant increase in pipeline capacity resulting from the restoration of SoCalGas Line 4000 and no additional pipeline outages. As indicated above, there is no indication that Line 4000 will actually be returned to service prior to the 2018-19 winter season.

The CPUC's analysis demonstrates a risk of gas shortfalls in every scenario, indicating gas that must be either withdrawn from Aliso Canyon or curtailments of noncore customers. Shortfalls were exacerbated under cold weather conditions, with maximum shortfalls in excess of 1,400 MMcfd. In the scenario with pipeline outages, the "shortfalls could not be met without curtailments"[31] even if Aliso Canyon was filled to its maximum safe inventory level of 68.6 billion cubic feet (Bcf). The study recommended increasing the maximum allowable Aliso Canyon inventory to 34 Bcf.[32] This represents a 9.4 Bcf increase from the 2017 maximum allowable inventory, but is still well below the 68.6 Bcf maximum safe inventory level.

The 2018 Supplemental Report recognizes that even with the increased availability of Aliso Canyon resulting from the 34 Bcf cap, the January peak cannot be met in the outage scenario under cold weather conditions. The 2018 Supplemental Report also acknowledges that if pipeline outages continue, it may not be possible to fill Aliso Canyon to 34 Bcf. The report emphasizes that "even with 34 Bcf at Aliso [Canyon], the SoCalGas system would not meet the 1-in-10 design standard with the pipeline outages assumed in the [outage] Scenarios. Southern California would remain vulnerable to disruptions in energy supply that could lead to curtailments of noncore customers, including electric generators."[33]

The primary challenge is that two SoCalGas natural gas transmission pipelines continue to be either out of service or operating at significantly reduced capacity. SoCalGas relies on these pipelines to serve core customers. Specifically, SoCalGas Line 235-2 ruptured on October 1, 2017, also damaging the nearby Line 4000. The continued outage of Line 235-2 and the limited operability of Line 4000 reduces maximum system capacity by 800 MMcfd. The CAISO does not expect that operational status of these lines will change until after the winter 2018-2109 season, at the earliest.[34] Similar to previous years, there is still a risk of additional unplanned outages that could further reduce maximum

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31 *Id.* at p. 12.

32 *Id.* at p. 14.

33 *Id.* at p. 15.

34 See SoCalGas Response to CPUC Letter Regarding the Status of Natural Gas Transmission Lines at pp. 6-7, available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/SCGResponse%5ECPUC%20June%2018Letter.pdf.

capacity on the SoCalGas system. SoCalGas has adopted mitigation measures to address these outages, which in part depend on deliveries on alternative pipelines.

The CAISO anticipates that the upcoming 2018-19 winter's minimum generation requirement (*i.e.*, the gas needed by the electricity system operators to maintain electric system reliability) estimated by the Los Angeles Department of Water and Power (LADWP) and the CAISO will be higher than it was for 2017-2018. This is primarily due to the fact that LADWP has planned a transmission line outage beginning in the last week of November 2018. Once the LADWP line goes out of service, LADWP will require additional gas-fired resources in the Los Angeles Basin to meet electric reliability needs. LADWP's planned transmission maintenance increases the balancing authorities' combined minimum electric generation requirement in the Southern California area.[35] Without adequate gas to meet the minimum generation requirement, electric reliability is threatened.

Increased pressure to conserve gas use because of low storage inventory means that SoCalGas will not have the field pressures needed to withdraw enough gas to serve core customers. Curtailments of noncore customers, including electric generators, may occur to preserve inventory needed for core customers on cold days.

In sum, the winter 2018-19 gas system capacity conditions will be virtually unchanged from winter 2017-18 conditions. Absent the availability of gas from Aliso Canyon, a shortfall occurring this winter on a 1-in-10-year demand day will require curtailments of noncore customers, including electric generators, even if the generators reduce their output to a minimum.[36] The Summer 2018 Supplemental Report makes clear that there are increased risks to reliability this winter due to the continued limited operability of Aliso Canyon and continuing outages on the gas pipelines in Southern California.

Based on these findings, the CAISO expects that Aliso Canyon will continue to be limited and that gas transmission line outages will continue in the remaining months of 2018, and continuing into 2019. These natural gas system limitations will have impacts on the electric system.

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35 The 2017-2018 Aliso Canyon Winter Risk Assessment Technical Report found that electric minimum generation would require 219 MMcfd of gas under normal conditions and 293 MMcfd during a contingency event with the LADWP transmission outages. Without the transmission outages, the electric minimum generation required only 22 MMcfd and 96 MMcfd, for normal and contingency conditions, respectively. The transmission outages are likely to have a similar impact on the 2018-2019 electric minimum generation requirements. *See Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement,* Prepared by the Staff of the CPUC, California Energy Commission (CEC), the CAISO, and the LADWP at p. 5., available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=221863.

36 Summer 2018 Supplemental Report at p. 15.

II. CAISO Stakeholder Initiatives and Resulting Filings

To date, the CAISO's Aliso Canyon stakeholder initiative has had four phases.[37] The purpose of the instant tariff amendment is to extend the application of the currently effective Aliso Canyon-related measures. An overview of the previous Aliso Canyon-related filings is provided below.

A. Phase 1

1. Procedural History

On March 16, 2016, the CAISO established Phase 1 of the initiative on an expedited basis to address the risks posed by the limited operability of Aliso Canyon. Following a series of working group and stakeholder meetings to develop the Phase 1 proposals, as reflected in successive papers issued by the CAISO, the CAISO Governing Board (Board) authorized the filing of a tariff amendment to implement Phase 1 at its May 4, 2016, meeting.[38]

The CAISO filed the Aliso Phase 1 Tariff Amendment on May 9, 2016, requesting that the Commission accept the Phase 1 tariff revisions on an interim basis until November 30, 2016.[39] On June 1, 2016, the Commission issued an order conditionally accepting the tariff amendment, subject to the CAISO submitting a compliance filing within 30 days. The Commission also ordered a technical conference to be held several months after the CAISO implemented the tariff revisions to discuss lessons learned and potential longer-term solutions.[40] The Commission later issued an order accepting the compliance filing the CAISO submitted and granting a motion for clarification the CAISO filed regarding the Aliso Phase 1 Order.[41] The tariff revisions went into effect as of the dates initially proposed by the CAISO and subsequently modified.[42]

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37 *See* http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.aspx (providing stakeholder materials, filings, and orders related to the three phases of this initiative).

38 *See* http://www.caiso.com/informed/Pages/BoardCommittees/Default.aspx (providing Board materials related to the three phases of the initiative).

39 The Aliso Phase 1 Tariff Amendment was initiated in Docket No. ER16-1649-000.

40 *Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,224 (2016) (Aliso Phase 1 Order). The technical conference was held at the Commission on September 16, 2016.

41 Cal. Indep. Sys. Operator Corp., 156 FERC ¶ 61,135 (2016).

42 *See* Aliso Phase 1 Order at Ordering Paragraph (A); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,093 (2016) (granting CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions); *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,029 (2016) (granting subsequent CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions); Commission Letter Order, *Cal. Indep. Sys. Operator Corp.*, Docket No. ER16-1649-006 (Feb. 24, 2017) (accepting eTariff changes to reflect actual effective date of certain

On August 19, 2016, the CAISO filed a tariff amendment to maintain on a permanent basis, after November 30, 2017, a subset of the tariff revisions accepted on an interim basis in the Aliso Phase 1 Order.[43] The Commission issued an order accepting those permanent tariff revisions effective November 30, 2016.[44]

2. Substantive Proposals

In the Aliso Phase 1 proceeding, the Commission accepted the tariff revisions submitted by the CAISO to implement measures that included:

a. Maximum gas constraint:

The Commission conditionally accepted the CAISO's proposal to institute a maximum natural gas constraint in its market solution to reflect gas limitations under certain conditions. The Commission found that this proposal "is a reasonable measure to ensure the reliable operation of the electric grid within the bounds necessarily imposed on it by the operation of the natural gas system, which is outside of CAISO's control." The Commission "agree[d] with CAISO that these measures are necessary because electric reliability could be compromised if market inputs do not accurately reflect gas system constraints," and found that the CAISO's "proposed method of using generator nomograms with a penalty factor is an appropriate interim means to achieve this goal."[45]

b. Competitive path assessment:

In conjunction with the CAISO's proposal to enforce the gas constraint, the Commission also accepted the CAISO's proposed tariff provisions allowing it to designate a transmission constraint as non-competitive when necessary based on actual system conditions. The Commission found that "CAISO has provided

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tariff revisions).

[43] Specifically, the CAISO proposed to make permanent the Commission-approved tariff revisions to: (1) allow scheduling coordinators to seek after-the-fact cost recovery of unrecovered commitment costs that exceed the commitment cost bid cap as a result of actual marginal fuel procurement costs pursuant to a filing submitted under section 205 of the Federal Power Act; (2) allow resources to rebid commitment costs in the CAISO real-time market if they were not committed in the day-ahead market; and (3) ensure the CAISO short-term unit commitment process does not commit resources that did not submit bids into the real-time market unless they were scheduled or committed in the day-ahead or had a real-time must-offer obligation. This tariff amendment was filed with the Commission in Docket No. ER16-2445-000.

[44] Cal. Indep. Sys. Operator Corp., 157 FERC ¶ 61,138 (2016).

[45] Aliso Phase 1 Order at P 48.

sufficient justification for this measure because, as CAISO explains, actual electric supply conditions may be non-competitive when the natural gas constraint is enforced due to anticipated electric supply conditions in the SoCalGas and SDG&E gas regions." In this regard, the Commission agreed with the analysis of the CAISO Department of Market Monitoring (DMM) finding that "the impact of the natural gas constraint on the assessment of competitive paths can only be assessed based on actual system conditions once the constraint is in place."[46]

c. Virtual bidding:

The Commission accepted the CAISO's proposed tariff provisions authorizing the CAISO to suspend virtual bidding when and if it determines that such trading runs counter to market economic efficiency. The Commission found that "during the interim period, with the limited operability of Aliso Canyon and the operational steps that CAISO may undertake to address electric and gas reliability, there may be times when promoting price convergence may run contrary to the efficient economic solution of the market." The Commission also stated that there might be "sustained differences in prices between locations and between day-ahead and real-time markets that could be exploited by virtual bidders without yielding any market benefits." Further, the Commission explained that "[g]iven the uncertainty surrounding the extent to which CAISO may have to use internal transfer capability or enforce the gas constraint to address threats to reliability, or the impact that these actions will have on market outcomes, we find that CAISO has demonstrated a potential need for limited intervention in market outcomes to ensure these measures achieve their stated objectives."[47]

d. Pre-day-ahead information:

The Commission accepted the CAISO's proposal to provide scheduling coordinators with advisory day-ahead commitment schedules produced in the residual unit commitment process on a two-day-ahead basis. The Commission found this advisory information "can help scheduling coordinators make more informed gas procurement decisions and more closely match their gas procurement with their potential gas consumption by nominating an amount of gas to match their expected generation output for each hour." The Commission stated that the information can thereby

46 *Id.* at P 52.

47 *Id.* at P 80.

"help reduce gas and electric reliability risks associated with imbalances between the amount of gas that electric generators nominate and the amount of gas that they burn." The Commission concluded that the CAISO's proposal was "just and reasonable and not unduly discriminatory in the interim period when there is uncertainty about the operation of Aliso Canyon and the associated impact on gas and electric system reliability."[48]

B. Phase 2

1. Procedural History

On September 2, 2016, the CAISO established Phase 2 of the initiative to evaluate whether tariff provisions accepted in the Phase 1 proceeding to address the limited operability of Aliso Canyon should be maintained, modified, or discontinued after November 30, 2016. Following the issuance of a series of papers and discussions with stakeholders, the Board authorized the filing of a tariff amendment to implement Phase 2 at a special session meeting held on October 3, 2016.

On October, 14, 2016, the CAISO filed the Phase 2 tariff amendment to maintain the tariff revisions in effect until November 30, 2017.[49] The Commission issued an order accepting the tariff revisions on November 28, 2016, subject to the CAISO's submittal of a compliance filing within 30 days.[50]

2. Substantive Proposals

In the Aliso Phase 2 proceeding, the CAISO proposed to extend for 12 additional months (i.e., until November 30, 2017), with some modifications, the four previously approved measures listed above (as well as other previously approved measures not addressed in this filing). The CAISO explained that, to the extent the Commission accepted the measures but did not later take action to continue their effectiveness beyond November 30, 2017, the measures would automatically expire on that date and thus the tariff sections reflecting the measures would revert to how they read prior to the Aliso Phase 1 and Phase 2 proceedings.

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48 *Id.* at P 16.

49 The Phase 2 tariff amendment proceeding was initiated with the Commission in Docket No. ER17-110-000.

50 *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,151 (2016) (Phase 2 Order). The Commission subsequently accepted the CAISO's compliance filing by letter order issued in Docket No. ER17-110-001 on March 24, 2017.

The Commission accepted the CAISO's proposal and explained that "continuation of the interim measures for an additional year should improve scheduling coordinators' ability to manage their gas procurement and enhance their ability to recover gas procurement costs, while also providing CAISO with flexible tools to maintain reliability and avoid adverse market outcomes related to the limited operability of Aliso Canyon."[51]

C. Phase 3

1. Procedural History

In this Phase 3 of the initiative, the CAISO worked with stakeholders to continue to address the limited operability of Aliso Canyon. In particular, the CAISO evaluated which of the tariff revisions accepted in Phase 2 should be maintained or modified to continue in effect for another year – *i.e.*, until November 30, 2018 – and which Phase 2 tariff revisions should be made permanent unless and until they are modified in the future pursuant to a filing submitted pursuant to section 205 of the Federal Power Act.

On June 2, 2017, the CAISO issued a market notice that (1) announced the start of Phase 3, (2) scheduled a conference call with stakeholders for June 7 to discuss the Straw Proposal the CAISO had prepared, (3) provided an electronic link to the Straw Proposal, and (4) requested that stakeholders submit any written comments on the Straw Proposal by June 14.[52]

On June 22, 2017, the CAISO issued a Draft Final Proposal for Phase 3 and requested that stakeholders submit written comments on the Draft Final Proposal by June 30. The CAISO hosted a stakeholder conference call to discuss the Draft Final Proposal on June 23.[53]

At its July 13, 2017 meeting, the Energy Imbalance Market (EIM) Governing Body issued motions to: (1) approve the Phase 3 proposal to extend the use of the maximum natural gas burn constraint to the EIM; and (2) provide verbal advisory input to the Board to support Phase 3.[54] The Board authorized the CAISO to file a tariff amendment to implement Phase 3 at its July 26 meeting.

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51 Phase 2 Order at P 26.

52 *See* Market Notice *New Initiative: Aliso Canyon Gas-Electric Coordination Phase 3* (Jun. 2, 2017), available at: http://www.caiso.com/Documents/NewInitiativeAlisoCanyonGas-ElectricCoordinationPhase3Call060717.html.

53 *See* Market Notice *Aliso Canyon Gas-Electric Coordination Phase 3 Draft Final Proposal* (Jun. 21, 2017), available at: http://www.caiso.com/Documents/AlisoCanyonGas-ElectricCoordinationPhase3DraftFinalProposal_Call062317.html.

54 *See* https://www.westerneim.com/Pages/Governance/default.aspx (providing materials related to these actions of the EIM Governing Body).

On August 3, 2017, the CAISO issued and market notice posted draft tariff revisions to implement Phase 3 for stakeholder review, requested written stakeholder comments on the draft tariff revisions by August 9, and scheduled a stakeholder conference call for August 11.[55] On September 15, the CAISO issued a market notice to announce that it had posted a revised draft of the tariff revisions and that it planned to file the Phase 3 tariff amendment within the next two weeks.[56]

2. Substantive Proposals

In the Aliso Phase 3 proceeding, the CAISO proposed to extend for an additional 12 months (*i.e.*, until November 30, 2018), with no modifications, previously approved measures.[57] The CAISO also proposed to adopt on a permanent basis four previously approved measures, with some modifications. Specifically, the CAISO proposed to expand the geographic scope of the previously approved tariff provisions regarding the maximum gas constraint and competitive path assessment to apply them on a permanent basis to all areas in which the CAISO operates a market, including the CAISO balancing authority area as well as the balancing authority areas of the Energy Imbalance Market (EIM) entities. The CAISO proposed no modifications to the previously approved tariff provisions regarding virtual bidding and pre-day-ahead information, other than to make those provisions permanent.

In the Commission's November 28, 2017, Aliso Phase 3 Order, it accepted the CAISO's proposal to extend the interim measures but rejected the CAISO's proposal to modify and make the specified measures permanent.[58] The Commission explained that, although it "reject[ed] CAISO's permanent proposals because we find that CAISO's proposed extension of the use of maximum gas constraints to the EIM has not been shown to be just and reasonable and not unduly discriminatory," the Commission's "rejection of [CAISO's] permanent proposals here is without prejudice to CAISO refiling a permanent maximum gas constraint for its own balancing authority area that addresses the Commission's concerns."[59] The Commission also found that the other measures the CAISO

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55 *See* Market Notice *Aliso Canyon Gas-Electric Coordination Phase 3 Draft Tariff Language Posted* (Aug. 3, 2017), available at: http://www.caiso.com/Documents/AlisoCanyonGas-ElectricCoordinationPhase3DraftTariffLanguagePostedCall081117.html.

56 *See* Market Notice *Aliso Canyon Gas-Electric Coordination Phase 3 Revised Draft Tariff Language Filing* (Sep. 15, 2017), available at: http://www.caiso.com/Documents/AlisoCanyonGas-ElectricCoordinationPhase3RevisedDraftTariffLanguageFiling.html.

57 The Aliso Phase 3 proceeding was initiated with the Commission in Docket No. ER17-2568-000.

58 *Cal. Indep. Sys. Operator Corp.,* 161 FERC ¶ 61,232 (2017) (Aliso Phase 3 Order).

59 *Id.* at PP 55, 61.

proposed to make permanent "may be appropriate for an interim tariff provision to address an identified problem, such as Aliso Canyon's limited availability, but CAISO has not provided justification that they are appropriate or adequate in their current form as permanent features of CAISO's market."[60]

The Commission's rejection of the proposed permanent measures meant that the interim versions of those measures, which the Commission had approved in the Aliso Phase 2 proceeding, automatically expired on November 30, 2017. However, the Commission addressed that issue in the Aliso Phase 3 Order:

> We recognize that rejecting CAISO's permanent tariff revisions will leave CAISO without the maximum gas constraint and the two-day-ahead advisory schedules to address the ongoing limited operability of Aliso Canyon. Our rejection of these permanent tariff provisions does not foreclose CAISO from proposing an extension of these Aliso Canyon-specific tariff provisions for another year, as CAISO did with the three tariff provisions that we accept on a temporary basis in this order.[61]

Thus, the Commission recognized the importance of the function the measures serve in addressing the ongoing limited operability of Aliso Canyon, and expressly permitted the CAISO to submit a filing to extend for another year the interim versions of those measures.

D. December 1, 2017, Filing to Temporarily Re-Implement Previously Approved and Recently Expired Measures to Address Potential Gas Limitations

1. Procedural History

Pursuant to the Commission's Aliso Phase 3 Order, the CAISO filed a request to temporarily re-implement previously approved and recently expired measures to address potential gas limitations on December 1, 2017 (Aliso Phase 4 Filing).[62] The CAISO requested expedited consideration of its proposed amendment and a waiver of the 60-day notice requirement under section 35.11 of the Commission's regulations.

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60 *Id.* at P 60.

61 *Id.* at P 53.

62 The Aliso Phase 4 proceeding was initiated with the Commission in Docket No. ER18-375-000.

2. Substantive Proposals

In the Aliso Phase 4 proceeding, the CAISO proposed to temporarily re-implement, until December 16, 2018, the exact same four measures approved in the Aliso Phase 2 proceeding as discussed above, which automatically expired on November 30, 2017. The CAISO requested authority to re-implement the measures to ensure it could continue to manage its system reliably when faced with gas constraints such as those posed by the limited operability of Aliso Canyon and known outages on the Southern California gas pipeline system.

The Commission accepted CAISO's proposed interim tariff revisions on December 15, 2017, which are to sunset on December 16, 2018.[63]

E. Proposed Filing to Extend the Temporary Interim Provision Until December 31, 2019

On September 17, 2018, the CAISO issued a market notice informing market participants of its intent to extend the temporary provisions, posted draft tariff language, scheduled a call with stakeholders on September 25, 2018, and informing market participants that comments were due by close of business on September 21, 2018.[64] The CAISO is proposing to extend the interim provisions approved in the Aliso Phase 3 Order and Aliso Phase 4 Order until December 31, 2019. If the CAISO determines it will need these measures beyond December 31, 2019, the CAISO will seek appropriate relief before that date.

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63 Commission delegated letter order, Docket No. ER18-375-000 (Dec. 15, 2017) (Aliso Phase 4 Order).

64 *See* Market Notice *Aliso Canyon Gas-Electric Coordination Phase 4 Draft Tariff Language Posted* (Sep. 17, 2018), available at: http://www.caiso.com/Documents/AlisoCanyonGas-ElectricCoordinationPhase4DraftTariffLanguagePosted-Call092518.html.

Attachment D – Summer 2018 Supplemental Report

Aliso Canyon Gas-Electric Coordination Phase 4

California Independent System Operator Corporation

California Public Utilities Commission

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

Summer 2018 Supplemental Report

Public Utilities Code Section 715

July 6, 2018

Energy Division

Executive Summary

In the aftermath of the 2015 gas leak at the Aliso Canyon natural gas storage facility (Aliso), Senate Bill 380 added Section 715 to the Public Utilities Code, which requires the California Public Utilities Commission (CPUC) to determine the range of Aliso inventory necessary to ensure safety, reliability, and just and reasonable rates. In this update to the 715 Report,[1] Energy Division recommends that the maximum allowable Aliso inventory be increased from 24.6 to 34 billion cubic feet (Bcf). Energy Division deems this increase to be necessary due to 1) continuing pipeline outages on the Southern California Gas Company (SoCalGas) system; 2) consideration of the impact that declines in inventory at the non-Aliso storage fields have on their withdrawal capacity; 3) an examination of whether monthly 1-in-10 peak day demand can be met with forecasted storage inventory levels; and 4) limited injection capacity at the non-Aliso fields, which makes it difficult to inject gas into storage.

This update to the 715 Report focuses on whether SoCalGas can meet all system demand on a 1-in-10-year peak day. Previous versions of the report calculated what system demand would be if electric generators were curtailed to the minimum generation level sustainable without a disruption in electric service. Curtailing electric generators to minimum generation is an emergency measure. As such, it was appropriate to consider when no Aliso injection was possible. However, the CPUC's established standard is that the SoCalGas system should be designed to meet both core and noncore demand on a peak day that is expected to occur once every 10 years. Deviating from that standard in the absence of an emergency puts an undue burden on electric generators and ratepayers. Furthermore, the California Independent System Operator (California ISO) has indicated that it faces "a much higher potential for challenging summer operating conditions" than in previous summers.[2] Requiring its electric generators to run at minimum generation would exacerbate an already difficult situation.

Another change in this update compared to previous versions is that it looks beyond the coming season to both summer 2018 and winter 2018-19. This change in strategy was prompted by the results of the Aliso Canyon Risk Assessment Technical Report Summer 2018 (Summer 2018 Technical Assessment), which found that in addition to the risks to energy reliability expected for summer 2018, extensive pipeline outages on the SoCalGas system may make it difficult for the utility to fill its gas storage fields to a level sufficient to ensure energy reliability this winter.

In addition to Summer 2018 Technical Assessment, the analysis in this report is based on the findings of the Aliso Canyon Winter Risk Assessment Technical Report (Winter 2016-17 Technical Assessment); the Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement (Winter 2017-18 Technical Assessment); the experience of

[1] The last 715 Report was published on December 11, 2017. All previous versions of the 715 Report can be found at: http://www.cpuc.ca.gov/General.aspx?id=6442457392.

[2] California Independent System Operator's 2018 Summer Loads & Resources Assessment, p.3.

winter 2017-18; and confidential withdrawal curves for the four SoCalGas storage fields provided by the utility.[3]

In this update, Energy Division examines two possible pipeline capacity scenarios, as shown in the table below. Each pipeline scenario is shown under two sets of weather conditions in order to determine the amount of Aliso inventory that is required to meet 1-in-10-year peak day demand in every month of winter 2018-19.

Table ES-1: Scenarios Examined (MMcfd)

	Pipeline Capacity	Weather
A-average	2,696	Avg. summer/avg. winter
A-cold	2,696	Avg. summer/cold winter
B-average	3,296	Avg. summer/avg. winter
B-cold	3,296	Avg. summer/cold winter

The first pipeline capacity scenario assumes that current outages, as detailed in the Summer 2018 Technical Assessment, continue and that an additional 180 MMcfd of pipeline capacity is lost in September.[4] Under the "A" Scenarios, peak demand cannot be met without curtailments, even if Aliso were filled to the maximum inventory the Division of Oil, Gas, and Geothermal Resources (DOGGR) has deemed to be safe. The pipeline outages assumed in the A Scenarios also make it difficult to fill Aliso to a level that provides winter-long support for system reliability. In the Gas Balances produced for this analysis, the maximum achievable Aliso inventory under the A Scenarios was 31 Bcf. In contrast, under the "B" Scenarios, which assume that Line 4000 returns to full capacity in September and there are no additional pipeline outages, the need to use Aliso to meet peak demand is greatly reduced and the ability to fill storage is enhanced.

Further complicating matters is the fact that early summer — when demand is still relatively low— is the key time for injecting gas into storage under the reduced pipeline capacity scenario. Therefore, Energy Division cannot wait for more information about which pipeline scenario is more likely — a recommendation must be made early in the summer. In reaching its recommendation, Energy Division has weighed the risks to Southern California reliability in winter 2018-19 with the uncertainty regarding the pipeline system and the practical limitations on injecting gas into Aliso.

Finally, it is important to emphasize that the 715 Report is intended to provide analysis of what is required to manage Southern California gas reliability over the short term. The determination of whether the storage facility will be used over the long term is the subject of CPUC proceeding I.17-02-002.

[3] The Technical Assessments were created by the Aliso Canyon Technical Assessment Group, which consists of the CPUC, the California Energy Commission, the California ISO, and the Los Angeles Department of Water and Power. All previous Technical Assessments can be found at: http://cpuc.ca.gov/alisoassessments/.
[4] The loss of pipeline capacity is based on the assumptions SoCalGas used in Table 2 of its own Summer 2018 Technical Assessment, which can be found in Appendix B of Advice Letter 5275-A.

Background

A major gas leak was discovered at the Southern California Gas Company's Aliso Canyon natural gas storage facility on October 23, 2015. On January 6, 2016, the governor ordered SoCalGas to maximize withdrawals from Aliso Canyon to reduce the pressure in the facility. The California Public Utilities Commission subsequently required SoCalGas to leave 15 Bcf of working gas in the field that could be withdrawn in an emergency. On May 10, 2016, Senate Bill (SB) 380 was approved. Among other things, the bill:

1. Prohibited injection into Aliso until a safety review was completed and certified DOGGR with concurrence from the CPUC;
2. Ordered Aliso wells to be remediated so that gas flows only through the interior metal tubing and not through the annulus between the tubing and the well casing ("tubing-only flow");
3. Required DOGGR to set the maximum and minimum reservoir pressure; and
4. Charged the CPUC with determining the range of working gas necessary to ensure safety and reliability and just and reasonable rates; this statutory requirement may be found in Public Utilities Code Section 715.[5]

On July 19, 2017, DOGGR certified, and the Executive Director of the Commission concurred, that the required inspections and safety improvements had been completed and injections could resume. DOGGR found that the facility could be safely operated at pressures between a minimum of 1,080 pounds per square inch absolute (psia) and a maximum of 2,926 pounds psia.[6] These pressures translate into an inventory of working gas that ranges from 0 Bcf to approximately 68.6 Bcf.[7]

The CPUC has published four previous versions of this report — known informally as the "715 Report" — which determines the range of working gas needed to ensure safety, reliability, and reasonable rates as required by Section 715. The allowable range has changed with each iteration of the report due to changing system conditions and the CPUC's evolving understanding of the available information. 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;

[5] SB 380 added Section 715 to the Public Utilities Code. All statutory references in this report are to the Public Utilities Code unless otherwise noted.

[6] DOGGR Updated Comprehensive Safety Review Findings, Enclosure 1.

[7] This figure is based on an April 19, 2018, email from DOGGR to the CPUC.

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.

Items 3 and 4 have become less critical as more wells have satisfactorily completed required testing and remediation. Therefore, this report focuses primarily on Items 1 and 2: the range of working gas necessary (inventory) and the amount of natural gas production needed (withdrawal capacity). Nonetheless, a brief update on Items 3 and 4 is provided at the end of this report.

This update incorporates information acquired since the last 715 Report was published on December 11, 2017, as well as the results of previous analyses. It is based on the findings of the Winter 2016-17 Technical Assessment; the Winter 2017-18 Technical Assessment; the Summer 2018 Technical Assessment; the experience of winter 2017-18; and confidential withdrawal curves for the four SoCalGas storage fields.

The 715 Report is intended to provide analysis of what is required to manage Southern California gas reliability over the short term. The determination of whether the storage facility will be used over the long term is the subject of CPUC proceeding I.17-02-002.

Lessons from Winter 2017-18

Winter 2017-18 started off under challenging circumstances due to the October 1, 2017, rupture on Line 235-2. After the rupture, SoCalGas took the adjacent Line 4000 out of service for inspection and repair.[8] With little time to inject additional gas into storage before the official start of the winter season on November 1, the CPUC allowed a modest expansion of the range of working gas at Aliso, from 14.8-23.6 Bcf[9] to 0-24.6 Bcf.[10]

With pipeline capacity reduced by outages, the gas balance forecasts performed in November for the 2017-18 Winter Technical Assessment[11] showed that storage inventory would be insufficient to meet peak demand in an average winter and that it would be woefully inadequate for a cold winter. Fortunately, most of winter 2017-18 was exceptionally warm, and SoCalGas withdrew very little gas from storage until the region experienced a sustained cold snap beginning in mid-February. Even with the cold snap, there was nearly as much gas in the non-Aliso fields at the end of March as the average forecast predicted for December. However, even with much higher storage inventory levels than anticipated, electric generators were curtailed between February 20 and March 6, 2018.

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[8] These outages were in addition to an existing outage on Line 3000 and a reduction in capacity on Line 2000.

[9] July 19, 2017, 715 Report.

[10] December 11, 2017, 715 Report.

[11] 2017-18 Winter Technical Assessment, pp 22-23.

Table 1 below compares the forecasted month-end inventory at the non-Aliso fields from the November gas balances to actual month-end inventories in winter 2017-18.

Table 1: Forecasted vs. Actual Non-Aliso Month-End Inventory: Winter 2017-18 (Bcf)

	November	December	January	February	March
Average Winter	42	27	21	17	17
Cold Winter	36	21	5	1	1
Actual	46	41	35	29	26

Withdrawal capacity is directly related to storage inventory. At higher inventories, storage fields experience higher pressures, which allow the gas to be withdrawn at faster rates. Withdrawal rates decline rapidly as the amount of gas in inventory drops. Table 2 below calculates what the combined withdrawal rate for the non-Aliso fields would be at the inventory levels shown in Table 1. In all three scenarios, by March withdrawal capacity has fallen significantly. In the Cold Winter scenario, withdrawal capacity drops far below critical levels.

Table 2: Estimated Non-Aliso Withdrawal Capacity at Winter 2017-18 Forecasted and Actual Month-End Inventory Levels (MMcfd)[12,13]

	November	December	January	February	March
Average Winter	1,048	878	786	666	666
Cold Winter	1,033	806	487	225	225
Actual	1,065	1,060	1,021	809	762

These declines in withdrawal capacity have a significant impact on the SoCalGas system's ability to meet 1-in-10 peak day demand. However, previous versions of the 715 Report mentioned, but did not explicitly calculate, these impacts. In part this was because, prior to the pipeline outages, the drawdown in storage was not as extreme since a greater portion of daily demand could be met with flowing gas supplies. Similarly, both the Winter 2016-17 and the Winter 2017-18 Technical Assessments use a

[12] Withdrawal rates for individual fields are confidential. These estimates combine the differing withdrawal rates at the three non-Aliso fields at estimated levels of inventory and are for illustrative purposes only. Assumptions have been made about how inventory would be allocated between storage fields. Aggregate withdrawal capacity may differ at similar combined inventory levels because of different assumptions about how the inventory is allocated. For example, if more inventory is assumed to be at Honor Rancho in Estimate A compared to Estimate B, combined withdrawal capacity will be different, even if combined inventory is the same. The withdrawal rates used in the calculations underlying these estimates are based on confidential withdrawal curves provided by SoCalGas in fall 2017 for Honor Rancho and La Goleta. SoCalGas did not provide a withdrawal curve for Playa del Rey at that time, so the estimated withdrawal capacity for that field is based on weekly reliability reports provided to Energy Division by SoCalGas.

[13] Honor Rancho is limited to a maximum of 541 MMcfd of withdrawal capacity based on the hydraulic modeling found on page 19 of the 2016 Aliso Canyon Winter Risk Assessment Technical Report. Modeling found that Honor Rancho would operate at a higher withdrawal capacity on an hourly basis but that it wouldn't be used every hour of the day. This limitation only has an impact early in winter.

static number — 1,181 MMcfd — in their calculations of non-Aliso withdrawal capacity on a peak day.[14] Although the gas balances included in the Technical Assessments forecast how storage inventory declines throughout the season, the impact of the decline on withdrawal capacity is not explicitly calculated. This report seeks to make the connection between inventory and withdrawal capacity explicit and to consider whether drawdowns in storage inventory impact the system's ability to meet peak-day demand late in the winter.

Table 3: Ability to Meet 2017-18 Winter Monthly 1-in-10 Peak Day Forecast[15] with Estimated Month-End Non-Aliso Withdrawal Capacity (MMcfd)

	(a) 1-in-10 Peak Day Demand	(b) Total Pipeline Capacity	(c) Estimated Withdrawal Capacity	(d) Total System Capacity (d=b+c)	(e) Surplus/ Shortfall (e=d-a)
November					
Average Forecast	4,263	2,476	1,048	3,524	-739
Cold Forecast	4,263	2,476	1,033	3,509	-754
Actual	4,263	2,476	1,065	3,541	-722
December					
Average Forecast	4,955	2,736	878	3,614	-1,341
Cold Forecast	4,955	2,736	806	3,542	-1,413
Actual	4,955	2,736	1,142	3,878	-1,077
January					
Average Forecast	4,955	2,906	786	3,692	-1,263
Cold Forecast	4,955	2,906	487	3,393	-1,562
Actual	4,955	2,906	1,021	3,927	-1,028
February					
Average Forecast	4,639	2,906	666	3,572	-1,067
Cold Forecast	4,639	2,906	225	3,131	-1,508
Actual	4,639	2,906	809	3,715	-924
March					
Average Forecast	4,428	2,906	666	3,572	-856
Cold Forecast	4,428	2,906	225	3,131	-1,297
Actual	4,428	2,906	762	3,668	-760

Table 3 above shows in column (b) the pipeline capacity assumed in the Winter 2017-18 Technical Assessment[16] and then in column (c) substitutes the estimated withdrawal

[14] This estimate came out of the hydraulic modeling done for the Winter 2016 Technical Assessment (p. 19). The hydraulic modeling found that the withdrawal capacity of the fields was as follows: La Goleta: 340 MMcfd; Playa del Rey: 300 MMcfd; and Honor Rancho: 541 MMcfd.

[15] Winter 2017-18 peak day forecasts were created for the 2016 California Gas Report.

capacities from Table 2 above for the static number (1,181 MMcfd) used in the Winter 2016-17 and Winter 2017-18 Technical Assessments. As withdrawal capacity declines, it becomes more difficult to meet the 1-in-10-year peak day design standard. The shortfalls displayed in column (e) represent the amount of gas from Aliso and/or curtailments that would have been required if a peak day had occurred. Given the existing pipeline outages, the SoCalGas system could not have supported 1-in-10 peak demand in any month, under any scenario without using Aliso Canyon and/or resorting to curtailments. Furthermore, in some scenarios, 1-in-10 peak demand could not have been met even with the 869 MMcfd in withdrawal capacity available at Aliso Canyon at the 24.6 Bcfd inventory cap.[17] If electric generators were curtailed to minimum generation on peak days, these shortfalls could be reduced but not eliminated. Under the Cold Forecast assumptions, the shortfall would have been roughly 900 MMcfd in February, even with electric generators curtailed to minimum generation.

Given the precarious state of the SoCalGas system, Southern California was fortunate to have experienced extremely mild temperatures for most of winter 2017-18, with sustained cold weather hitting only late in the season. However, hoping for continued mild weather is not a prudent strategy for ensuring future energy reliability. Pipeline capacity has not improved appreciably since winter 2017-18, and there is a chance that it could deteriorate further. When Line 235-2 ruptured in October 2017, there was insufficient time to substantially increase storage inventory before the high-demand winter season began. However, there is time now to boost storage inventory in advance of the 2018-19 winter season. Doing so requires increasing the cap on Aliso inventory while there is still time to inject gas into storage.

Public Utilities Code Section 715 also requires the CPUC to consider the impact of Aliso inventory on rates. While the CPUC has not completed its planned analysis of winter 2017-18, it is clear that the combination of pipeline outages and limits on Aliso storage led to continuing pressure on SoCalGas citygate commodity prices. Natural gas prices spiked repeatedly on cold days in the SoCalGas service territory, while PG&E citygate prices remained flat *(see Figure 1, below)*.

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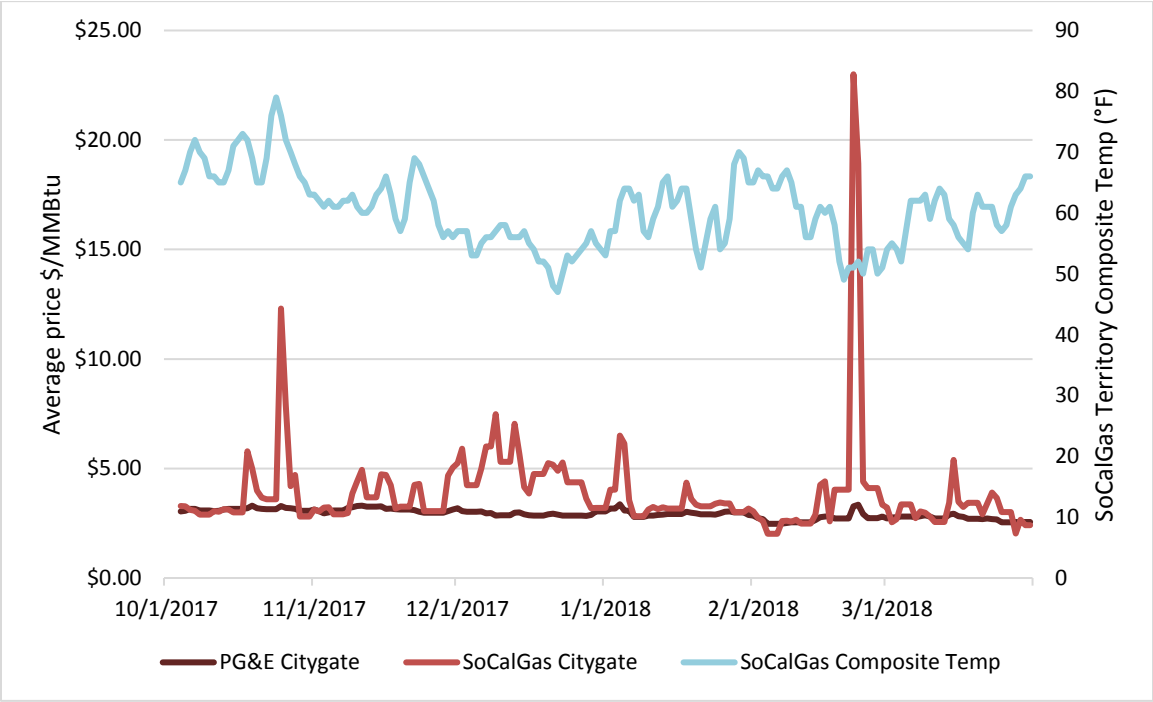
[16] The assumptions used in the Winter 2017-18Technical Assessment (Table 2, page 9) were based on hydraulic modeling done for the Winter 2016 Technical Assessment (Table 1, p. 19). The additional pipeline outages were subtracted from the total supported demand on a one-for-one basis. In Table 3, Total Pipeline Capacity for January-March was revised downward by 30 MMcfd compared to the 2017-18 Winter Technical Assessment due to events that occurred after the Technical Assessment was published. Line 4000 was expected to return to service at a capacity of 350 MMcfd. However, it actually returned to service at 270 MMcfd. That 80 MMcfd loss was somewhat offset by the resultant ability to bring in 50 MMcfd of interruptible supply at Kramer Junction.

[17] Advice Letter 5275-A (April 20, 2018) states that at 24.6 Bcf in inventory, Aliso Canyon has a projected withdrawal rate of 869 MMcfd.

Figure 1: Comparison of SoCalGas and PG&E Citygate Prices and SoCalGas Service Territory Composite Temperature: 10/3/17-3/31/18[18]



Findings

This report recommends that the maximum allowable working gas at the Aliso Canyon gas storage field should be increased to 34 Bcf. The minimum should remain 0 Bcf or the level that a prudent operator would maintain in order to preserve the integrity of the field. This minimum level is in keeping with the minimum established by DOGGR and the language of the previous version of the 715 Report.[19]

Several factors have led to the recommendation to increase the cap on Aliso inventory. First, significant pipeline outages have made it more difficult for customers to deliver enough gas to meet their demand, increasing reliance on storage. Second, experience this past winter caused Energy Division to explicitly consider the impact that declines in inventory at the non-Aliso storage fields have on their withdrawal capacity. Third, the experience of winter 2017-18 also caused Energy Division to examine whether the SoCalGas system has the ability to support monthly 1-in-10 peak day demand throughout the winter rather than determining the amount of Aliso inventory needed to meet one peak day. Finally, without Aliso, systemwide injection capacity is limited, which makes it difficult to inject gas into all the storage fields.

It is important to note that the pipeline outages currently in effect are not expected to be permanent. Additional mitigation measures proposed in the Summer 2018 Technical Assessment, such as deliveries of liquefied natural gas and changes to the gas tariffs,

[18] Based on weighted average spot prices reported by PointLogic; composite temperature data from Envoy.
[19] December 11, 2017, 715 Report, p. 2.

could also change the reliability equation in the future. However, the impact of the proposed additional mitigation measures is uncertain and will likely be insufficient to fully eliminate the identified shortfalls. Energy Division will revisit the recommendations of this report as the impact of these measures becomes more certain.

Pipeline Outages

Energy Division created four gas balances for this report to estimate inventory levels under different pipeline capacity and weather scenarios.[20] Gas balances look at average daily demand by month rather than peak demand and provide a means of forecasting how storage may be drawn down throughout the winter. Gas Balances A-average and A-cold assume that Line 4000 remains at its current reduced capacity all winter and that an additional 180 MMcfd of pipeline capacity is lost in September. In contrast, Gas Balances B-average and B-cold assume that Line 4000 returns to its maximum capacity of 740 MMcfd in September and there are no additional pipeline outages. Gas Balances A-average and B-average are based on demand assumptions for an average temperature year, while A-cold and B-cold assume an average summer and a cold winter.[21]

Table 4 below forecasts the amount of pipeline capacity that may be available this winter. It is modeled on Table 2 in the Winter 2017-18 Technical Assessment. It differs from that table in that it includes the 30 MMcfd of incremental pipeline capacity on Line 2000 that was lost in March 2018 due the expiration of a right-of-way agreement between SoCalGas and the Morongo Band of Mission Indians. It has also been modified to include the assumptions about pipeline capacity used in Gas Balances A and B.

Table 4: Forecasted Pipeline Capacity Under Scenarios A and B

(MMcfd)	Scenario A	Scenario B
Supported Gas Demand from Table 1 of the 2016 Winter Assessment (Includes both pipeline and withdrawal capacity)	4,567	4,567
Static Withdrawal Capacity	(1,181)	(1,181)
Combined Outages Lines 4000/235-2	(530)	(60)
Reductions at Ehrenberg (Lines 2000 and 5000)	(410)	(230)
Total Pipeline Capacity: No Mitigation	2,446	3,096
Mitigation 1: Otay Mesa	200	200
Mitigation 2: Kramer Junction (Interruptible)	50	0
Total Pipeline Capacity	2,696	3,296

[20] The gas balances and a summary of the assumptions used are provided in Appendix A.

[21] Demand assumptions are from SoCalGas' workpapers for the 2016 California Gas Report, pp. 12-13 and 25-26.

Impact of the Decline in Inventory on Withdrawal Capacity

The Gas Balances in Appendix A use the assumptions about pipeline capacity shown in Table 4 above to determine whether average monthly demand can be supported all winter long. They also provide a forecast of how much inventory will be left in the non-Aliso fields at the end of every month.[22] The resulting month-end inventory levels for the non-Aliso fields are used in Tables 5 and 6 below to provide a range of possible inventory and withdrawal capacity scenarios.

Table 5: Non-Aliso Month-End Inventory in 2018-19 Gas Balances (Bcf)

Gas Balance	November	December	January	February	March
A-average	37	29	20	15	13
A-cold	38	25	13	5	3
B-average	50	44	36	31	38
B-cold	50	38	29	25	26

Table 6: Estimated Non-Aliso Withdrawal Capacity at Month-End Inventory Levels in 2018-19 Gas Balances (MMcfd)[23]

	November	December	January	February	March
A-average	1,064	1,040	914	813	761
A-cold	1,064	996	803	584	532
B-average	1,113	1,097	1,064	1,048	1,080
B-cold	1,113	1,080	1,040	1,032	1,032

Table 5 shows that inventory at the non-Aliso fields declines precipitously in the A Scenarios, falling to 3 Bcf in March of the A-cold Scenario. Table 6 shows the impact that declining inventory has on withdrawal capacity. In the A Scenarios, there is little non-Aliso withdrawal capacity left in February and March, leaving the gas system very vulnerable to cold weather, outages, or any disruption in flowing supply.[24]

Ability to Support Monthly 1-in-10 Year Peak Day Demand throughout the Winter

Table 7 below combines the forecasted pipeline capacity from Table 4 with the estimated withdrawal capacities from Table 6 to evaluate whether monthly 1-in-10 peak day demand can be met under the different scenarios.

[22] See the row labeled "OTF Month-End Storage Inventory (Bcf)." OTF stands for "other three fields."

[23] The combined withdrawal capacities were calculated using estimated withdrawal curves as of June 1, 2018. The withdrawal curves were provided to Energy Division by SoCalGas on May 14, 2018.

[24] SoCalGas is unlikely to let inventories fall as low as shown in the A Scenarios. Noncore customers would likely experience preemptive curtailments long before inventories reached such low levels.

Table 7: Ability to Meet 2018-19 Winter Monthly 1-in-10 Peak Day Forecast[25] with Estimated Month-End Non-Aliso Withdrawal Capacity (MMcfd)

Gas Balance	(a) 1-in-10 Peak Day Demand	(b) Total Pipeline Capacity	(c) Estimated Withdrawal Capacity	(d) Total System Capacity (d=b+c)	(e) Surplus/ Shortfall (e=d-a)
November					
A-average	4,247	2,696	1,064	3,760	-487
A-cold	4,247	2,696	1,064	3,760	-487
B-average	4,247	3,296	1,113	4,409	162
B-cold	4,247	3,296	1,113	4,409	162
December					
A-average	4,936	2,696	1,040	3,736	-1,200
A-cold	4,936	2,696	996	3,692	-1,244
B-average	4,936	3,296	1,097	4,393	-543
B-cold	4,936	3,296	1,080	4,376	-560
January					
A-average	4,936	2,696	914	3,610	-1,326
A-cold	4,936	2,696	803	3,499	-1,437
B-average	4,936	3,296	1,064	4,360	-576
B-cold	4,936	3,296	1,040	4,336	-600
February					
A-average	4,622	2,696	813	3,509	-1,113
A-cold	4,622	2,696	584	3,280	-1,342
B-average	4,622	3,296	1,048	4,344	-278
B-cold	4,622	3,296	1,032	4,328	-294
March					
A-average	4,410	2,696	761	3,457	-953
A-cold	4,410	2,696	532	3,228	-1,182
B-average	4,410	3,296	1,080	4,376	-34
B-cold	4,410	3,296	1,032	4,328	-82

In Table 7, the shortfalls displayed in column (e) represent the amount of gas from Aliso and/or curtailments that would be required if a 1-in-10 day occurs and the pipeline capacity and weather scenarios assumed in the Gas Balances come to fruition. The need for Aliso's withdrawal capacity is greatest under Scenarios A-average and A-cold. The greatest shortfall is seen in January under Scenario A-cold, when an additional 1,437 MMcfd is required to meet peak demand. In this scenario, the potential for large

[25] Winter 2017-18 peak day forecasts were created for the 2016 California Gas Report. The 2018 California Gas Report is expected to be published in July and will include updated forecasts.

shortfalls continues through March, when an additional 1,182 MMcfd would be required on a 1-in-10 peak day. Aliso's maximum withdrawal capacity when filled to the maximum safe inventory of 68.6 Bcf determined by DOGGR is estimated to be 1,092 MMcfd.[26] Therefore, these shortfalls could not be met without curtailments at any authorized level of Aliso inventory. However, the depth of the curtailments could be reduced if Aliso inventory was higher than the 24.6 Bcf authorized in the December 11, 2017, version of the 715 Report.[27]

The situation is much less dire in Scenarios B-average and B-cold. The largest shortfall is seen in January in Scenario B-cold, when an additional 600 MMcfd is required. The shortfalls drop significantly in February and March — in Scenario B-cold the March shortfall is only 82 MMcfd.

To further complicate matters, it is very difficult to fill Aliso under the A Scenarios because of the critical lack of pipeline capacity. In Gas Balances A-average and A-cold, the maximum achievable Aliso inventory is 31 Bcf, a level of inventory that provides under 1,000 MMcfd of withdrawal capacity.[28] In short, under conditions when Aliso inventory would be most needed, it is least likely to be available.

Unfortunately, there is not time to wait and see which set of assumptions most closely matches reality because of the need to inject gas into storage early in the summer. In the A Gas Balances, the largest build in storage inventory takes place in early in summer, when demand is relatively low and there are no additional pipeline outages. Waiting until late summer to determine the maximum Aliso inventory would mean missing this window for injection.

In the A Scenarios, Aliso withdrawals would be needed over multiple months, reducing the field's inventory level and withdrawal capacity. In the A-average scenario, there is 10 Bcf left at Aliso in March; in A-cold there is only 1 Bcf. Confidentiality concerns preclude Energy Division from revealing Aliso withdrawal capacity at all the inventory levels of concern in this report. However, Table 8 includes information that SoCalGas has stated publicly to provide a rough idea of how declines in Aliso inventory impact withdrawal capacity.

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[26] This estimate is untested since the field has not been filled to 68.6 Bcf since the switch to tubing-only flow.
[27] The California ISO and LADWP have not yet calculated what their minimum generation requirements will be for winter 2018-19. Using their estimates for February 2018 as a proxy, peak day demand can be reduced by roughly 592 MMcfd if electric generators are curtailed to minimum generation. See Table 7 on p. 15 of the Winter 2017-18 Technical Assessment.
[28] SoCalGas has stated that withdrawal capacity for individual fields is market sensitive and therefore confidential. This report only includes specific withdrawal capacities that have been previously made public or that SoCalGas has agreed to disclose

Table 8: Estimated Aliso Withdrawal Capacity at Four Inventory Levels[29]

Inventory (Bcf)	Withdrawal Capacity (MMcfd)
12.3	574
21.9	815
24.6	869
68.6	1,092

Injection Capacity

With the Aliso Canyon Turbine Replacement Project fully operational, Aliso injection capacity is estimated to be 545 MMcfd. In contrast, non-Aliso injection capacity in mid-May was roughly 230 MMcfd.[30] The injection capacity at Aliso therefore represents over 70 percent of effectively available systemwide injection capacity.[31]

Injection capacity serves two important purposes, and the total available injection capacity must be divided between these two purposes. First, it provides firm injection rights that customers can purchase in order to inject gas into storage. Second, a portion of total injection capacity is set aside to help the gas system stay in balance. On days when customers schedule more gas onto the system than is burned, something must be done with the excess gas to keep the pipelines from exceeding their maximum allowable operating pressure. If injection capacity is available, the SoCalGas System Operator can balance the system by injecting the extra gas into storage. If there is not enough injection capacity available, the System Operator must either call a High Operational Flow Order (OFO)[32] or turn away gas at the border to avoid over-pressurization. Both of these measures increase customer costs and create disincentives for customers seeking to take advantage of unpredictable releases of injection capacity late in the day.

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[29] Estimates for the first three rows are taken from Table 2 of Advice Letter 5275-A and p. 7 of Attachment C to AL 5275-A. SoCalGas authorized the CPUC to disclose the withdrawal capacity at 68.6 Bcf in a June 6, 2018, email. All estimates are based on the number of wells expected to be in service at the beginning of summer 2018.

[30] On May 11, 2018, Envoy reported injection capacity of 236,000 dekatherms (Dth): https://scgenvoy.sempra.com/#nav=/Public/ViewExternalOFO.getOFO%3Frand%3D40. Using the conversion factor of 1027.348 Dth/MMcf provided by SoCalGas, that is equivalent to 229.7 MMcf (236,000 Dth/1,027.348 Dth/MMcf = 229.7 MMcf).

[31] In a May 15, 2018, announcement regarding the Aliso Canyon Turbine Replacement Project, SoCalGas states that it has 995 MMcfd in total injection capacity. The effectively available total is much lower, however, due to long-term reductions in injection capacity at Honor Rancho and La Goleta that are not expected to be remedied in the timeframe covered by this report.

[32] A High OFO is called when too much gas is scheduled onto the system and there is a danger that pipelines could exceed their maximum allowable operating pressure. On a High OFO day, gas customers face a financial penalty if they deliver more than 105 percent of their gas burn. The System Operator will not allow more gas onto the system than the pipelines are designed to handle. If there is still too much gas scheduled after a High OFO is called, the System Operator will simply refuse to accept additional gas from the interstate pipelines.

When Aliso reaches its maximum inventory, its injection capacity is no longer available. This leads to a significant drop in the injection capacity available for both firm injection rights and balancing. The end result of having less injection capacity for balancing services is that less gas will be scheduled into the system to fill the non-Aliso storage facilities since the injection capacity in those facilities may need to be held in reserve to mitigate overdeliveries. Limits on firm injection rights mean customers cannot enter into long-term contracts to purchase the extra gas they need to inject into storage. The reduction in storage set aside for balancing leads to an increase in OFOs and incidences of gas being turned away, which make customers wary of overscheduling. Therefore, one of the factors in the recommendation to increase the maximum Aliso inventory is the need to extend the period during which Aliso's injection capacity is available.

Recommendations

Given the uncertainty regarding the pipeline capacity that will be available this winter along with concerns about maintaining injection and withdrawal capacity, this report recommends a maximum Aliso inventory of 34 Bcf. While this level of inventory does not provide a substantially higher withdrawal capacity than the 31 Bcf that is shown as the maximum achievable inventory in the A Gas Balances, it does allow the system to maintain relatively high injection and withdrawal capacity over a longer period. This is important even if pipeline capacity increases to the level forecasted in the B Scenarios.

Aliso is not needed to meet average daily demand in Gas Balance B-average. However, in Gas Balance B-cold, 22 Bcf from Aliso is used.[33] Table 9 below compares how Aliso inventory would be impacted if the Aliso draw-down followed the pattern shown in Gas Balances A-cold and B-cold but Aliso was capped at either 24.6 or 34 Bcf.[34]

Table 9: Comparison of Aliso Draw-Down under Scenarios A-cold and B-cold at Caps of 24.6 and 34 Bcf

	November	December	January	February	March
A-cold					
24.6 Cap	24.6	12.6	0.6	0.0	0.0
34 Cap	34	22	10	4	4
B-cold					
24.6 Cap	24.6	19.6	11.6	2.6	2.6
34 Cap	34	29	21	12	12

At the 24.6 Bcf cap, there is not enough gas in Aliso to meet January peak demand under either the A-cold or the B-cold Scenario. With a cap of 34 Bcf, the January peak cannot be met in the A-cold Scenario, but it can be met under B-cold assumptions. Raising the cap

[33] Usage to meet average demand is in addition to the gas from Aliso needed to meet peak day demand.

[34] As noted in Appendix A, the Gas Balances do not impose a cap on Aliso inventory. Only physical constraints on storage injections were considered.

thus provides an additional margin of reliability should either the more pessimistic pipeline or weather scenarios come to pass.

If pipeline outages continue, it may not be possible to fill Aliso to 34 Bcf. However, under certain weather and pipeline conditions it may be achievable. Given the potential for reliability problems this winter, this report finds it prudent to recommend a maximum level that would bring Southern California closer to being able to meet 1-in-10 peak day demand over a longer period. It is important to emphasize, however, that even with 34 Bcf at Aliso, the SoCalGas system would not meet the 1-in-10 design standard with the pipeline outages assumed in the A Scenarios. Southern California would remain vulnerable to disruptions in energy supply that could lead to curtailments of noncore customers, including electric generators.

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.*

This report finds that 34 Bcf of inventory at the Aliso Canyon natural gas storage field is necessary to maintain reliability given forecasted demand and supply constraints and may be practically achievable before the start of the 2018-19 winter season. If Line 4000 returns to full capacity before winter and no additional outages are sustained, this level of inventory should be sufficient. If Line 4000 remains at reduced capacity and additional pipeline capacity is lost, Southern California will face risks to reliability even with the increased inventory at Aliso. Despite these risks, Energy Division does not recommend authorizing a higher level of Aliso inventory because it is unlikely that the storage field could be filled above 34 Bcf under the more pessimistic pipeline scenarios.

Minimum Aliso inventory remains at 0 Bcf or the level that a prudent operator would maintain in order to preserve the integrity of the field This minimum determination is in keeping with the minimum established by DOGGR and the language of the previous version of the 715 Report.

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

To meet peak day demand in a scenario where Line 4000 remains at reduced capacity and an additional 180 MMcfd of pipeline capacity is lost, 1,437 MMcfd of Aliso natural gas production is required. This is not achievable at any inventory with the number of wells that are expected to be in service by June 1, 2018.

To meet peak day demand in a scenario where Line 4000 returns to service and there are no additional pipeline outages, 600 MMcfd in Aliso withdrawal capacity is required.

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

As of May 31, 2018, 46 wells had completed all testing and remediation requirements and were operational. Up to eight more wells may be in service before the end of summer, which will provide a modest increase in Aliso's production capacity. These wells are sufficient to meet peak demand in the more optimistic pipeline capacity scenario but not in the more pessimistic scenario.

SoCalGas has provided a range of historical withdrawal capacities for the 22 wells that have not yet returned to service but are not slated to be plugged and abandoned. If all the wells were to perform at the minimum of the range, there still would not be enough withdrawal capacity to meet peak demand in the pessimistic pipeline scenario. If all the wells were to perform at the maximum of that range, it is possible that peak demand of 1,437 MMcfd could be met, depending on the pressure in the field. It should be noted that this finding is based on simple addition using historical data and does not take into account factors such as the switch to tubing-only flow. In the event that a significant number of new wells return to service, a new Aliso withdrawal curve should be created to better estimate maximum withdrawal capacity.

The Aliso Canyon Turbine Replacement project is currently being brought online and should soon be fully operational. When the new electric compressors are operating at full capacity, Aliso is expected to have a maximum injection capacity of 545 MMcfd. This represents over 70 percent of effectively available systemwide injection capacity.[35]

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

As of May 31, 2018, 46 wells had completed all testing and remediation requirements and were operational. Up to eight more wells may be in service before the end of summer, which will provide a modest increase in Aliso's production capacity.

[35] In a May 15, 2018, announcement regarding the Aliso Canyon Turbine Replacement Project, SoCalGas states that it has 995 MMcfd in total injection capacity. The effectively available total is much lower, however, due to long-term reductions in injection capacity at Honor Rancho and La Goleta that are not expected to be remedied in the timeframe covered by this report.

Comments and Responses

The Draft 715 Report was posted on the Commission's website on June 18, 2018. The Commission accepted informal comments on the draft through June 27, 2018. Below we describe the comments and our response to them.

SoCalGas

- Supports an increase in inventory at Aliso Canyon.
- Recommends modifying the Aliso Canyon Withdrawal Protocol to allow SoCalGas to withdraw gas from Aliso Canyon, without curtailing customers or requiring the balancing authorities to voluntarily reduce demand.
- Stresses the importance of injection capacity, noting that if Aliso reaches its inventory limit, it has other effects on the system, which tends to limit the overall injection capacity of the system.
- Agrees with the approach taken in this latest 715 Report to look beyond the summer season to winter, when demand for gas by the core customers is greatest.
- Asks that the Commission consider more than just costs and prices at the SoCalGas and PG&E citygates, but take a more holistic view of how restrictions on the use of Aliso Canyon gas storage affect the entire region, including not just Southern California, but all of California and neighboring states.

Energy Division Response to SoCalGas

- Energy Division is reviewing the Aliso Canyon Withdrawal Protocol. Any proposed changes to the Protocol would be circulated for comment at a later date.

Southern California Publically Owned Utilities (SCPOU)

- SCPOU supports changes in the 2018 Report over previous reports.
- Asks the Commission to investigate the reduction in capacity on Line 4000.
- Notes differences in the number of operational wells discussed in the 715 Report (46 wells tested and operational) and the DOGGR website (56 wells that have passed all tests).
- Seeks clarification if changes to the Aliso Canyon withdrawal protocol will be addressed.

Energy Division Response to SCPOU

- Energy Division shares SCPOU's concern about the reliability impacts of the reduction in capacity on Line 4000.

- SCPOU is correct that 56 wells have passed all DOGGR inspections. However, to date, not all of the wells that have passed inspections are operational.
- Energy Division is reviewing the Aliso Canyon Withdrawal Protocol. Any proposed changes to the Protocol would be circulated for comment at a later date.

Porter Ranch Neighborhood Council (PRNC)

- Opposes the inventory increase in the 715 Report because the proposed increase appears based on pipeline outages on the SoCalGas system. Contends SoCalGas should be held to its promise to fix pipeline outages by September, rather than pressuring the Commission to increase inventory.
- Disagrees with relying on use of storage to balance the system and suggests instead the potential curtailment of noncore customers.
- Maintains that increasing inventory levels at Aliso increases the risk of leakage, which has significant health and safety effects on the neighboring communities.
- Recalculates the gas balancing tables that are included in the Appendix to the 715 Report, and concludes that in the event that the pipelines are not fixed by September, the system can be balanced by curtailing up to 500 MMcf/day of deliveries to noncore, wholesale and/or international customers. In its analysis, PRNC also increased deliveries of California Producers to 100 MMcf/day from the 60 MMcf/day assumed by the 715 Report.
- Notes that 100 MMcf/day is what the ENVOY system shows as California Producers' deliveries since March of this year.
- Contends inventory levels at Aliso can be increased at a later date, such as the start of the fall season, which is a season of low demand like spring.

Energy Division Response to PRNC

- Energy Division shares PRNC's concern about the reliability impacts of outages on the SoCalGas system and continues to monitor the situation.
- Season-long curtailments of noncore customers are not a reasonable solution to the problem posed by SoCalGas' pipeline outages. This proposed solution would harm SoCalGas' customers more than SoCalGas itself. Noncore customers include electric generators, manufacturers, hospitals, and oil refineries. The extensive curtailments proposed by the Porter Ranch Neighborhood Council would likely decrease electric reliability, drive up costs for electric ratepayers, and harm the Southern California economy.
- PRNC is correct that 100 MMcfd has been delivered from California Producers in recent months. However, Energy Division is reluctant to count on continued deliveries at that level in its analysis because under the Pipeline Safety

Enhancement Plan enacted in the aftermath of San Bruno, Line 85 must either be pressure tested, replaced, or derated. It is therefore unclear how long Line 85 will continue to operate at its current capacity. Nevertheless, in response to PRNC's concerns, Energy Division re-ran the Gas Balances from the draft 715 Report for its own internal analysis, using 100 MMcfd from the California Producers. Increasing deliveries from the California Producers led to marginal improvements but did not significantly change the outcome of the analysis.

- PRNC is correct that fall is a shoulder season when storage injections can be made. However, it is a relatively short period since September is usually hot and November is the official start of the winter season. Furthermore, the Summer Technical Assessment warned that storage withdrawals may be needed to support electric demand this summer. If storage is depleted this summer and the pipelines remain out of service, waiting until fall could mean there is not enough time to bring storage inventories to a level to provide reliability over the winter of 2018-19.

<u>Porter Ranch residents</u>

- In addition to PRNC, eight individual residents of the Porter Ranch community commented on the 715 Report. The residents oppose an increase in the inventory of Aliso Canyon, expressing health concerns as well as questions about the monitoring and safety of the facility, including seismic concerns.
- Several express concern that SoCalGas is manipulating its pipeline outages to justify use of Aliso Canyon and state that the company has not worked diligently to repair its pipelines.
- They request the root-cause analysis of the leak be finalized.
- Several ask for increased conservation of natural gas rather than an increase in Aliso Canyon inventory levels.

<u>Energy Division Response to Community Members' Concerns</u>

- On July 19, 2017, Division of Oil, Gas, and Geothermal Resources (DOGGR) certified, and the Executive Director of the Commission concurred, that the required inspections and safety improvements had been completed and injections could resume. DOGGR has found that the facility can be safely operated up to an inventory of approximately 68.6 Bcf. The 715 Report proposes an inventory level of 34 Bcf, or roughly half that capacity.
- DOGGR is monitoring Aliso Canyon's wells, and the CPUC's Safety and Enforcement Division continues to coordinate with DOGGR consistent with our shared responsibility to ensure that the facility is operated safely.

- DOGGR approved SoCalGas' Storage Risk Management Plan on January 17, 2017, "conditioned upon further study as recommended by subject matter experts at Lawrence Berkeley, Lawrence Livermore, and Sandia National Laboratories." That seismic study is being conducted by a consortium of experts in conjunction with the National Laboratories to determine whether any additional safety measures should be put in place. It is scheduled to be released November 1, 2018.
- The Commission will continue to investigate the pipeline outages and to consider an appropriate regulatory response.
- The root-cause analysis is expected to be completed by November 20, 2018.[36]
- Although California and the CPUC are working diligently toward a low-carbon future, at this time, intermittent renewable electricity still needs to be backed up by fossil fuel generation. Winter heating demand is also still supplied in large part by natural gas. The Commission has authorized several mitigation measures to reduce gas usage including energy efficiency and demand response programs that provide rebates for smart thermostats. To date, energy efficiency and demand response programs have led to more significant demand reductions in the summer than the winter.[37]

BizFed

- Represents an alliance of over 170 business organizations and represents 390,000 employers with 3.5 million employees in L.A. County.
- Supports the inventory increase.
- Suggests changes are needed to the Withdrawal Protocol. Concerned with continuing curtailments of electric generators before withdrawals from Aliso Canyon are allowed.

Energy Division Response to BizFed

- Energy Division is reviewing the Aliso Canyon Withdrawal Protocol. Any proposed changes to the Protocol would be circulated for comment at a later date.

[36] Root-cause analysis schedule: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Safety/Natural_Gas_Pipeline/Blade%20RCA%202-15-18%20%20Estimated%20Timeline.pdf. For more information about the root-cause analysis, see: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Safety/Natural_Gas_Pipeline/Blade%20RCA%20SS-25%20Metallurgical%20Protocol%20-Phase%204%20RCA.pdf.

[37] For more information, see the May 2018 Update to the Aliso Canyon Mitigation Measures Impact Report.

RWE Supply and Trading (RWE)

- Supports the Commission's efforts to ask SoCalGas for a detailed update on the status of Lines 3000 and 235-2.
- Contends there is a lack of transparency and communication from SoCalGas, in contrast to other North American pipeline operators after similar incidents. In the two weeks after a June 7, 2018, explosion on Transcanada's Columbia gas pipeline, Columbia Gas Transmission posted six updates, created an FAQ page on the rupture, and gave an estimated date of "early July" for the line's return to service.

Energy Division Response to RWE

- The Commission shares RWE's concerns about pipeline outages and the transparency surrounding them and is working to obtain further information from SoCalGas about its pipeline outages.

Environmental Defense Fund (EDF)

- The Commission should perform a formal inquiry of SoCalGas' actions on pipeline repairs. Notes the response of Columbia Gas Transmission to a pipeline explosion on a 1.2 Bcf/day line in a "densely forested region away from easily accessible roads" where an 80 foot long rupture and fire affecting multiple pipeline joints has taken less than a month to restore partial service, while the rupture of Line 235-2 has taken eight months with still no date for return to service.
- Agrees with SCPOU that the Commission should include Line 4000 in its investigation.

Energy Division Response to EDF

- The Commission will continue to investigate the pipeline outages and to consider an appropriate regulatory response.

Protect Our Communities Foundation (POC)

- Opposes increasing inventory at Aliso Canyon. Contends that current storage levels are adequate.
- Asks for a more transparent and formal process before approval of inventory changes at Aliso Canyon. Asks that comments on the 715 Report be folded into the Administrative Record of I.17-02-002.
- States that a root-cause analysis must be completed before inventory is increased.
- Requests evidentiary hearings on the alleged lack of progress of pipeline repairs, particularly on Line 235-2, and on Aliso Canyon inventory levels. Contends that

SoCalGas should be required to turn over information regarding the pipeline outages.

Energy Division Response to POC

- Winter storage usage is largely dependent on the weather. Southern California was fortunate to have experienced mild weather for most of last winter. If the February cold snap had happened in December, there would have been very little gas left in storage to get through the rest of the winter.
- The 715 Report is focused on short-term reliability while I.17-02-002 will look at the long term.
- The Commission will continue to investigate the pipeline outages and to consider an appropriate regulatory response.

Food and Water Watch

- Opposes increasing inventory at Aliso Canyon and states that the Commission should demand faster response times on pipeline repairs.
- Concerned about reported 8.1 methane spikes from SoCalGas' fence-line monitors on June 21 and 22, 2018 and reports of over 500 health impacts from the Environmental Health Tracker app.

Energy Division Response to Food and Water Watch

- The Commission will continue to investigate the pipeline outages and to consider an appropriate regulatory response.
- Energy Division contacted SoCalGas regarding readings from fence-line methane monitors on June 21 and 22, 2018. SoCalGas stated that no injections had been made since the 715 Report was not final at that time. With regard to the heightened readings of methane, the following notification and explanation was posted on the SoCalGas Aliso Canyon Community Notifications Page: "Around 8:20 a.m., one of the Fence-Line methane monitoring points at Aliso Canyon registered a reading of 8.1 ppm. The reading was caused by fog and humidity. Following normal procedures, SoCalGas crews performed an infrared survey of the Aliso Canyon facility and did not find any elevated concentrations of methane. No other Fence-Line monitors recorded elevated methane levels at that time. There are no indications of elevated methane levels at the fence line."

County of Los Angeles

- Pipeline outages on Lines 3000 and 235-2 significantly contribute to energy reliability concerns in the L.A. Basin. SoCalGas "appears to be slow-walking repairs," which has had a dramatic effect on the price of natural gas. Urges thorough investigation of the pace of repairs and delays and consideration of other penalties in addition to removing unused pipeline capacity from rate-base.

- Requests results from internal investigation that the Commission said it was conducting as to the cause of the "unusual circumstances" surrounding withdrawals in January 2017.
- Concerned that a focus on 1-in-10 peak day gas demand, rather than gas demand after curtailing electric generators to minimum generation, avoids curtailments but ignores health and safety impacts to customers.
- Notes differing numbers of remediated wells in the 715 Report from those certified by DOGGR. Asks that SoCalGas provide a status update of its tests and conclusions as well as a timeline of when forthcoming tests of wells not yet remediated are expected to be concluded.

Energy Division Response to County of Los Angeles

- The Commission will continue to investigate the pipeline outages and to consider an appropriate regulatory response.
- The Commission's analyses of withdrawals from Aliso in winter 2017 and winter 2018 are still pending.
- As stated in the Technical Assessments, curtailing electric generators to minimum generation is an emergency response. Relying on minimum generation increases electricity costs and strains reliability. It is not reasonable to curtail electric generators to minimum generation on a regular basis or for an extended period. The Commission's established design standard is the ability to meet demand on a 1-in-10 year peak day.
- Regarding differences in well counts, not all wells certified by DOGGR have yet become operational.

Appendix A

Gas Balances

Energy Division created four gas balances for this report to estimate inventory levels under different weather and pipeline scenarios. These gas balances do not project what will actually happen but rather show what would happen if the supply, demand, and storage assumptions shown come to pass. These gas balances are similar to those created for the 2018 Summer Technical Assessment but contain some updates based on what has actually happened in April and May. For example, actual storage inventory at the end of April was lower than projected in the Technical Assessment, and low demand caused SoCalGas to reduce Southern System pipeline capacity to 700 MMcfd for most of May.

The four gas balances also combine some of the assumptions in the different gas balances created for the 2018 Summer Technical Assessment. In the case of Otay Mesa, 30 MMcfd is assumed through October, while 200 MMcfd is assumed throughout the November-March winter season. In all cases, no limits are put on Aliso inventory beyond the physical limits imposed by DOGGR and the existing constraints on injecting gas into storage. This was done in order to understand what is physically possible under different assumptions. However, withdrawals were made from the non-Aliso fields first where possible.

Gas Balances A-average and A-cold share the same pipeline assumptions but look at different weather scenarios. Gas Balance A-average estimates what would happen in an average temperature year, while Gas Balance A-cold assumes an average summer and a cold winter. Both gas balances assume that Line 4000 remains at its current capacity of 270 MMcfd all winter long and that Kramer Junction is able to deliver 600 MMcfd. They also assume that an additional 180 MMcfd of pipeline capacity is lost in September. In Gas Balance A-cold, by the end of the winter season there is insufficient gas in storage to maintain a positive deliverability balance, even on an average day. Furthermore, in both A Gas Balances, the maximum level of achievable Aliso inventory is 31 Bcf.

Gas Balances B-average and B-cold also look at an average temperature year and an average summer/cold winter year respectively. These gas balances assume that Line 4000 returns to full capacity of 740 MMcfd in September, which reduces Kramer Junction's capacity to 550 MMcfd. Both gas balances assume that there are no additional pipeline outages throughout the winter.

Ideally, a gas balance would result in a reserve margin of 15 percent. In these gas balances, a 15 percent reserve margin was only possible for a few months in the more optimistic B-average and B-cold scenarios.

Gas Balance A-average

SoCalGas Month-End Gas Balance, May 2018-March 2019: Average Temperature Year												
CGR Demand (MMcfd)		**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
Core		751	692	630	608	628	714	1,072	1,483	1,420	1,379	1,143
Noncore including EG		1,063	1,089	1,362	1,408	1,526	1,270	1,100	1,136	1,151	1,112	1,031
Wholesale & International		358	377	374	374	392	391	422	521	501	486	414
Co. Use and LUAF		27	27	30	30	32	30	33	40	39	38	33
Subtotal Demand		2,199	2,185	2,396	2,420	2,578	2,405	2,627	3,180	3,111	3,015	2,621
Storage Injection (Other Three Fields)		130	220	85	60	0	0	0	0	0	0	0
Storage Injection (Aliso)		0	140	85	60	0	0	0	0	0	0	0
Storage Injection Total		130	360	170	120	0	0	0	0	0	0	0
System Total Throughput		2,329	2,545	2,566	2,540	2,578	2,405	2,627	3,180	3,111	3,015	2,621
Supply (MMcfd)												
California Line 85 Zone		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
Blythe (Ehrenberg) into Southern Zone		700	980	980	980	800	800	800	800	800	800	800
Otay Mesa into Southern Zone		0	30	30	30	30	30	200	200	200	200	200
Kramer Junction into Northern Zone		600	600	600	600	600	600	600	600	600	600	600
North Needles into Northern Zone		270	270	270	270	270	270	270	270	270	270	270
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0
Sub Total Pipeline Receipts		2,395	2,705	2,705	2,705	2,525	2,525	2,695	2,695	2,695	2,695	2,695
Storage Withdrawal (Other Three Fields)		0	0	0	0	100	0	110	275	275	200	50
Storage Withdrawal (Aliso)		0	0	0	0	0	0	0	275	250	150	0
Total Supply		2,395	2,705	2,705	2,705	2,625	2,525	2,805	3,245	3,220	3,045	2,745
DELIVERABILITY BALANCE (MMcfd)		66	160	139	165	47	120	178	65	109	30	124
Reserve Margin		3%	6%	5%	6%	2%	5%	7%	2%	4%	1%	5%
OTF Month-End Storage Inventory (Bcf)	28.4	32	39	42	44	41	41	37	29	20	15	13
Aliso Month-End Storage Inventory (Bcf)	22.2	22	26	29	31	31	31	31	22	15	10	10
Total Storage Inventory	50.6	55	65	71	74	71	71	68	51	35	25	23

Gas Balance A-cold

SoCalGas Month-End Gas Balance, May 2018-March 2019: Average Summer / Cold Winter												
CGR Demand (MMcfd)		**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
Core		751	692	630	608	628	714	1,183	1,696	1,619	1,559	1,274
Noncore including EG		1,063	1,089	1,362	1,408	1,526	1,270	1,150	1,188	1,218	1,159	1,061
Wholesale & International		358	377	374	374	392	391	453	577	560	551	451
Co. Use and LUAF		27	27	30	30	32	30	35	44	43	41	35
Subtotal Demand		2,199	2,185	2,396	2,420	2,578	2,405	2,821	3,505	3,440	3,310	2,821
Storage Injection (Other Three Fields)		130	230	85	80	0	0	0	0	0	0	0
Storage Injection (Aliso)		0	150	85	70	0	0	0	0	0	0	0
Storage Injection Total		130	380	170	150	0	0	0	0	0	0	0
System Total Throughput		2,329	2,565	2,566	2,570	2,578	2,405	2,821	3,505	3,440	3,310	2,821
Supply (MMcfd)												
California Line 85 Zone		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
Blythe (Ehrenberg) into Southern Zone		700	980	980	980	800	800	800	800	800	800	800
Otay Mesa into Southern Zone		0	30	30	30	30	30	200	200	200	200	200
Kramer Junction into Northern Zone		600	600	600	600	600	600	600	600	600	600	600
North Needles into Northern Zone		270	270	270	270	270	270	270	270	270	270	270
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0
Sub Total Pipeline Receipts		2,395	2,705	2,705	2,705	2,525	2,525	2,695	2,695	2,695	2,695	2,695
Storage Withdrawal (Other Three Fields)		0	0	0	0	100	0	125	410	375	300	75
Storage Withdrawal (Aliso)		0	0	0	0	0	0	15	400	375	200	20
Total Supply		2,395	2,705	2,705	2,705	2,625	2,525	2,835	3,505	3,445	3,195	2,790
DELIVERABILITY BALANCE (MMcfd)		66	140	139	135	47	120	14	0	5	-115	-31
Reserve Margin		3%	5%	5%	5%	2%	5%	0%	0%	0%	-3%	-1%
OTF Month-End Storage Inventory (Bcf)	28.4	32	39	42	44	41	41	38	25	13	5	3
Aliso Month-End Storage Inventory (Bcf)	22.2	22	27	29	31	31	31	31	19	7	1	1
Total Storage Inventory	50.6	55	66	71	76	73	73	69	44	20	6	3

Gas Balance B-average

SoCalGas Month-End Gas Balance, May 2018-March 2019: Average Temperature Year												
CGR Demand (MMcfd)		**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
Core		751	692	630	608	628	714	1,072	1,483	1,420	1,379	1,143
Noncore including EG		1,063	1,089	1,362	1,408	1,526	1,270	1,100	1,136	1,151	1,112	1,031
Wholesale & International		358	377	374	374	392	391	422	521	501	486	414
Co. Use and LUAF		27	27	30	30	32	30	33	40	39	38	33
Subtotal Demand		2,199	2,185	2,396	2,420	2,578	2,405	2,627	3,180	3,111	3,015	2,621
Storage Injection (Other Three Fields)		130	220	85	60	150	75	0	0	0	0	230
Storage Injection (Aliso)		0	140	85	60	150	400	400	0	0	0	0
Storage Injection Total		130	360	170	120	300	475	400	0	0	0	230
System Total Throughput		2,329	2,545	2,566	2,540	2,878	2,880	3,027	3,180	3,111	3,015	2,851
Supply (MMcfd)												
California Line 85 Zone		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
Blythe (Ehrenberg) into Southern Zone		700	980	980	980	980	980	980	980	980	980	980
Otay Mesa into Southern Zone		0	30	30	30	30	30	200	200	200	200	200
Kramer Junction into Northern Zone		600	600	600	600	550	550	550	550	550	550	550
North Needles into Northern Zone		270	270	270	270	740	740	740	740	740	740	740
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0
Sub Total Pipeline Receipts		2,395	2,705	2,705	2,705	3,125	3,125	3,295	3,295	3,295	3,295	3,295
Storage Withdrawal (Other Three Fields)		0	0	0	0	0	0	0	200	275	175	0
Storage Withdrawal (Aliso)		0	0	0	0	0	0	0	0	0	0	0
Total Supply		2,395	2,705	2,705	2,705	3,125	3,125	3,295	3,495	3,570	3,470	3,295
DELIVERABILITY BALANCE (MMcfd)		66	160	139	165	247	245	268	315	459	455	444
Reserve Margin		3%	6%	5%	6%	9%	9%	9%	10%	15%	15%	16%
OTF Month-End Storage Inventory (Bcf)	28.4	32	39	42	44	48	50	50	44	36	31	38
Aliso Month-End Storage Inventory (Bcf)	22.2	22	26	29	31	35	48	60	60	60	60	60
Total Storage Inventory	50.6	55	65	71	74	83	98	110	104	95	90	98

Gas Balance B-cold

SoCalGas Month-End Gas Balance, May 2018-March 2019: Average Summer / Cold Winter												
CGR Demand (MMcfd)		**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
Core		751	692	630	608	628	714	1,183	1,696	1,619	1,559	1,274
Noncore including EG		1,063	1,089	1,362	1,408	1,526	1,270	1,150	1,188	1,218	1,159	1,061
Wholesale & International		358	377	374	374	392	391	453	577	560	551	451
Co. Use and LUAF		27	27	30	30	32	30	35	44	43	41	35
Subtotal Demand		2,199	2,185	2,396	2,420	2,578	2,405	2,821	3,505	3,440	3,310	2,821
Storage Injection (Other Three Fields)		130	230	85	80	160	40	0	0	0	0	50
Storage Injection (Aliso)		0	150	85	70	50	300	50	0	0	0	0
Storage Injection Total		130	380	170	150	210	340	50	0	0	0	50
System Total Throughput		2,329	2,565	2,566	2,570	2,788	2,745	2,871	3,505	3,440	3,310	2,871
Supply (MMcfd)												
California Line 85 Zone		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
Blythe (Ehrenberg) into Southern Zone		700	980	980	980	980	980	980	980	980	980	980
Otay Mesa into Southern Zone		0	30	30	30	30	30	200	200	200	200	200
Kramer Junction into Northern Zone		600	600	600	600	550	550	550	550	550	550	550
North Needles into Northern Zone		270	270	270	270	740	740	740	740	740	740	740
Topock into Northern Zone		0	0	0	0	0	0	0	0	0	0	0
Sub Total Pipeline Receipts		2,395	2,705	2,705	2,705	3,125	3,125	3,295	3,295	3,295	3,295	3,295
Storage Withdrawal (Other Three Fields)		0	0	0	0	0	0	0	400	300	150	0
Storage Withdrawal (Aliso)		0	0	0	0	0	0	0	150	250	350	0
Total Supply		2,395	2,705	2,705	2,705	3,125	3,125	3,295	3,845	3,845	3,795	3,295
DELIVERABILITY BALANCE (MMcfd)		66	140	139	135	337	380	424	340	405	485	424
Reserve Margin		3%	5%	5%	5%	12%	14%	15%	10%	12%	15%	15%
OTF Month-End Storage Inventory (Bcf)	28.4	32	39	42	44	49	50	50	38	29	25	26
Aliso Month-End Storage Inventory (Bcf)	22.2	22	27	29	31	33	42	44	39	31	22	22
Total Storage Inventory	50.6	55	66	71	76	82	93	94	77	60	46	48