

October 31, 2019

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. ER20-_____-000**

Southern California Maximum Gas Constraint Amendment

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this tariff amendment¹ to address the effects of limitations on the natural gas system in Southern California on the CAISO ability to operate the electric grid reliably and its markets, by permanently extending three tariff provisions previously approved by the Commission on a temporary basis -- the maximum gas constraint and related tariff provisions regarding the designation of other transmission constraints as uncompetitive and the suspension of virtual bidding.²

The CAISO requests that the Commission accept the proposed tariff provisions to provide a permanent, effective tool to address the impact of these limitations with an effective date of December 31, 2019. If the Commission declines to approve these provisions on a permanent basis, the CAISO respectfully requests the Commission extend them another year, until December 31, 2020. If the Commission accepts the proposed tariff amendment on a

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.*, 165 FERC ¶ 61,161 (2018), Order in Docket No. ER18-2520. The maximum gas constraint and two related tariff provisions currently in effect on a temporary basis will otherwise automatically expire on December 31, 2019. *Id.* As explained below, there have been five Commission proceedings on CAISO tariff amendments to address Aliso Canyon-related issues: the proceedings in Docket Nos. ER16-1649-000, ER17-110-000, ER17-2568-000, ER18-375-000, and ER18-2520-000, which are completed, and the Maximum Gas Constraint implementation proceeding initiated by this filing. CAISO Governing Board approval was not required for the temporary extension of the tariff provisions.

permanent basis, the CAISO commits to report annually to the Commission the impact of the maximum gas constraint on the CAISO energy markets when it is enforced.

Retaining these tariff provisions will provide the CAISO the authority it needs to manage effectively electric reliability issues caused by limitations on the use of natural gas in the Southern California Gas Company (SoCalGas) and San Diego Gas and Electric (SDGE) natural gas systems (*i.e.*, Southern California gas system). As the CAISO explained to the Commission in its comments in Docket No. AD18-7, the permanent adoption of the maximum gas constraint is “an important mechanism to promote grid reliability and resilience.”³

Although the Aliso Canyon storage facility (Aliso Canyon) became more operational in the past year, it is operating only at approximately 40 percent capacity and, based on the results of recent proceedings, there is no expectation its operability will increase in future years. Assessments of the Southern California natural gas system indicate that while Aliso Canyon remains at less than full capability, the system will remain constrained in the future. As reported by SoCalGas⁴ and the staff of the California Public Utility Commission (CPUC),⁵ the Southern California gas system will face reliability challenges this coming winter caused by the combination of continuing limitations on critical transmission pipelines and restricted operations at Aliso Canyon. These same concerns are reflected in the Commission staff 2019-2020 Winter Energy Market Assessment presented to the Commission on October 17, 2019.⁶ The recent return to service of certain outages has caused the CPUC to be more optimistic regarding the potential gas limitations. However, their report still highlights that SoCalGas’s ability to provide reliable service to core and non-core customers depends highly on the ability to withdraw gas from Aliso Canyon and on no further outages on main gas transmission facilities. The CAISO expects these limitations to remain a constant fixture over the long-term; they are not merely short-term challenges. Accordingly, the CAISO seeks authority to implement the existing maximum gas constraint on a permanent basis.

It is just and reasonable to grant the CAISO permanent authority to

³ Comments of the CAISO in Response to the Commission’s Request for Comments about System Resiliency and Threats to Resilience, Docket No. AD18-7, pp. 171-73, March 9, 2018.

⁴ SoCalGas Winter Technical Assessment (SoCalGas Winter Assessment), https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/SOCALGAS%20WINTER%202019-20%20TECHNICAL%20ASSESSMENT.pdf.

⁵ Winter 2019-20 Southern California Reliability Assessment, by California Public Utilities Commission Staff, October 24, 2019, (CPUC Reliability Assessment), available at <https://www.cpuc.ca.gov/alisoassessments/>.

⁶ FERC staff report. <https://www.ferc.gov/market-assessments/reports-analyses/mkt-views/2019/10-17-19-A-3.pdf>

enforce the maximum gas constraint because the limitations on the Southern California gas system are expected to remain in the future. CAISO operators have been able to proactively manage the limitations of the gas system, and reliably and efficiently operate the CAISO grid, because of the maximum gas constraint. The maximum gas constraint has been and continues to be a useful and discrete market tool because it reflects the interactions of gas limitations in the CAISO market optimization.

If the Commission were to decline to grant the CAISO the authority to employ the constraint, given the limitations on the gas system, the CAISO will still have to manage the gas usage proactively to avoid further stressing the gas system and avoid reliability issues. This is inevitable because if a gas-fired electric resource is dispatched and it is unable to perform, either because gas is unavailable or because following the CAISO's dispatch instruction would cause reliability issues on the gas system, the CAISO must take action to ensure the CAISO can continue to serve its load reliably. This is done through the redispatch of other resources that do not face the gas constraints, and dispatch down of those that do. CAISO operators work closely with the gas companies to ensure both systems are reliable. Being able to enforce the maximum gas constraint provides the CAISO an effective tool to accomplish the necessary redispatch limiting the gas usage on the electric system when the CAISO needs to avoid further stressing the already constrained gas system while continuing to serve CAISO load reliably and efficiently. Absent the maximum gas constraint, the CAISO grid operators are forced to resort to manual dispatches, which impose additional costs on the system and are not as efficient as the maximum gas constraint in managing gas usage limitations. There is no harm providing the CAISO this authority. The CAISO has demonstrated that lacking information from the natural gas company that justifies limiting gas usage by the electric system, the CAISO will not use the constraint.

The proposed tariff amendment includes the exact same provisions the Commission previously approved.

- 1) Maximum gas constraint: This measure enables the CAISO to enforce a constraint that limits its market dispatch of resources to remain within a maximum gas usage amount 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.
- 2) 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.

- 3) 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.

I. Background

A. Overview of CAISO Market Structure

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, flexible ramping capability, and ancillary services. The market also allocates 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 in the real-time market) and the interties (*i.e.*, locations for imports to and exports from the CAISO balancing authority area).⁷ The tariff sets forth rules for the submission of bids and self-schedules for all of the CAISO markets.⁸ The tariff also provides for communications between the CAISO and scheduling coordinators, including communications prior to the day-ahead market.⁹

The CAISO market optimization utilizes various information, including transmission constraints the CAISO enforces, to ensure, to the extent possible, that the market model used in the CAISO market reflects all factors that contribute to actual real-time flows on the CAISO controlled grid, and that market

⁷ 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 ER16-1649-000, ER17-110-000, ER17-2568-000, ER18-375-000, and ER18-2520-000 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 ER17-2568-000, ER18-375-000, and ER18-2520-000 proceedings).

⁸ Existing tariff section 30, *et seq.*

⁹ Existing tariff section 6, *et seq.*

results align better with actual physical conditions on the CAISO controlled grid.¹⁰ 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.¹¹ The CAISO is authorized to suspend or limit virtual bidding activities that can detrimentally affect system reliability or grid operations.¹²

The existing tariff includes local market power mitigation procedures to enable the CAISO market to mitigate the effects of any conduct that would substantially distort competitive outcomes in the CAISO markets.¹³ The local market power mitigation procedures include calculating default energy bids and competitive locational marginal prices as well as 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.¹⁴

Under 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, ancillary service bid costs, and energy bid costs for CAISO-committed resources through a bid cost recovery mechanism.¹⁵

B. Continued Limitations on the Gas System in Southern California

The limited operability of the Southern California gas system continues to present challenges today and will continue to do so in the future. There has been little change in the Southern California gas system since the Commission accepted the CAISO's ER18-2520 filing. The Aliso Canyon facility continues to experience limited operability. Even under the best-case scenario, with all lines

¹⁰ Existing tariff section 27.5.6.

¹¹ Existing tariff section 30.9.

¹² Existing tariff section 7.9. In addition to its temporary authority to suspend virtual bidding when the CAISO determines that enforcing the maximum gas constraint causes market inefficiencies, the CAISO has authority to suspend virtual bidding if virtual bids create a substantial risk that the CAISO will be unable to (1) obtain sufficient energy and ancillary services to meet real-time demand and ancillary service requirements in the CAISO balancing authority area, (2) render the CAISO day-ahead market software unable to process submitted bids submitted, and (3) render the CAISO unable to achieve an alternating current (AC) solution in the day-ahead market for an extended period of time.

¹³ Existing tariff section 39, *et seq.*

¹⁴ Existing tariff section 39.7, *et seq.*

¹⁵ See existing tariff section 11.8, *et seq.*

previously on outage restored to full service, SoCalGas reports it will have challenges meeting its non-core customers' load, which includes electricity generators.¹⁶ Additionally, the CPUC identified declines in inventory at non-Aliso Canyon storage fields, which affects Aliso's withdrawal capacity.¹⁷ Collectively, these limitations on the Southern California gas system are likely to require that CAISO take actions to ensure it can operate the electricity grid reliably and efficiently without causing further challenges to the gas system.

On October 8, 2019, SoCalGas issued its Winter 2019-20 Technical Assessment (SoCalGas Winter Assessment) providing a forecast for gas system reliability for the winter season (November 2, 2019 through March 31, 2020). The SoCalGas Winter Assessment found that "[e]ven with the use of the Aliso Canyon storage field, SoCalGas has insufficient capacity to meet the 1-in-10 year cold day design standard" given the expected withdrawal capacity of all active storage fields and the transmission pipeline outages forecasted to occur during the peak demand months (December and January).¹⁸ The SoCalGas Winter Assessment is based on updated forecast data, the projected SoCalGas capacity to receive pipeline supplies, and an estimate of storage field inventory levels on November 1, 2019. Based on this data, SoCalGas found that noncore curtailment may be required under cold temperature conditions throughout the winter, regardless of facility outage scenarios.

The SoCalGas/SDGE gas transmission system is nominally designed to receive up to 3.775 BCFD of firm supply. However, supply delivered to the SoCalGas system does not reach maximum receipt levels for a variety of reasons, including: (1) customers may choose to use SoCalGas's balancing service rather than deliver supplies; (2) California natural gas production has declined over time; (3) system demand does not require maximum delivery of supply; and (4) supply may not be available because of weather patterns or maintenance impacting the interstate pipelines.

As a result, the SoCalGas Winter Assessment determined ranges of flowing pipeline supplies by analyzing "best case" and "worst case" scenarios. SoCalGas's "best case" scenario assumes that lines that are currently limited or out of service—specifically, Line 235-2 and Line 4000¹⁹—are in service, though at reduced pressures. It also assumes that supply is delivered to SoCalGas' Southern System at Otay Mesa in quantities in excess of historical experience. In contrast, the "worst case" scenario assumes that Line 4000 and Line 235-2 are removed from service through March 2020 and that additional supply to Southern

¹⁶ SoCalGas Winter Assessment, at 1-2.

¹⁷ Aliso Canyon Withdrawal Protocol, at p. 1.

¹⁸ SoCalGas Winter Assessment, p. 1.

¹⁹ Line 235-2 was returned to service on October 15, 2019.

System is unavailable. SoCalGas notes that neither scenario takes into account potential unexpected outages on the gas transmission system, such as those resulting from third-party damage and safety related conditions, which may still occur throughout the winter season, further reducing receipt capacity beyond the levels projected in even the “worst case” scenario.

The SoCalGas Winter Assessment concludes that “SoCalGas expects that it will have insufficient supplies to meet the 1-in-10-year cold day demand forecast” in the “best case” scenario. The SoCalGas Winter Assessment goes on to state that “in a 1-in-10-year cold day scenario, some level of noncore curtailment may be required, either voluntary or involuntary, *beginning with [electric generation] demand* in accordance with the Commission-approved procedure.”²⁰

The SoCalGas Winter Assessment is consistent with the CAISO’s experience with the natural gas system in Southern California since the initial Aliso Canyon outage. In particular, it shows that the Southern California Gas system, given the current limitations on the gas transmission and storage system, is insufficient to maintain natural gas reliability to electric generation customers during high demand periods. These system level challenges are exacerbated by the requirement that the gas companies must maintain reliable service to core customers before serving non-core customers. The CAISO will be required to coordinate closely with SoCalGas to ensure that electric generation resources are dispatched appropriately to maintain both gas and electric system reliability.

On October 24, 2019, the CPUC issued its Winter 2019-20 Southern California Reliability Assessment (CPUC Reliability Assessment) that concluded “Southern California faced considerable uncertainty about the prospects for gas system reliability during the coming winter.”²¹ The CPUC Reliability Assessment also noted that the SoCalGas system will enter winter 2019 with less total gas storage than 2018. It noted that “total storage inventory as of October 1, 2019, was 73.6 billion cubic feet (Bcf), compared to 80.7 Bcf on October 1, 2018.”²² The CPUC attributed the lower storage inventories to (1) gas transmission outages on the SoCalGas system, (2) heavy use of non-Aliso Canyon storage fields during the 2018-19 winters season, and (3) Aliso Canyon reaching its maximum allowable inventory capacity of 34 Bcf on June 19, 2019.²³

²⁰ SoCalGas Winter Assessment, p. 6. (emphasis added)

²¹ CPUC Reliability Assessment, p. 3.

²² *Id.*

²³ *Id.* at p. 3.

The CPUC Reliability Assessment conducted analysis based on a range of scenarios. In the best case scenario, with all gas transmission pipelines remaining in service and a relatively mild winter season, the CPUC found that reliability could be maintained with little need to use Aliso Canyon storage. However, if a 1-in-10 peak day occurs this winter, withdrawals from Aliso Canyon would be necessary even in the best case scenario. In the worst case scenario, with Line 235-2 and Line 4000 out of service, the CPUC found that Aliso Canyon's current capacity would not be enough to meet demand and that a 1-in-10 peak demand day would "likely lead to the curtailment of noncore customers" including electric generators.²⁴

The availability of Aliso Canyon continues to be an important factor in the ability to serve gas customers reliably. The Aliso Canyon storage facility remains limited, despite the fact the CPUC provided additional flexibility for withdrawals in 2019. There are no expected plans to return the facility to its pre-leak storage capacity. The CAISO refers the Commission to attachment C to this filing for background information regarding the natural gas leak at Aliso Canyon. Prior to the discovery of the natural gas leak, the Aliso Canyon storage facility was SoCalGas's largest natural gas storage facility. At full capacity, Aliso Canyon can store 86.2 Bcf of natural gas providing a maximum withdrawal capacity of 1,860 MMcfd.²⁵ Currently, the CPUC caps total storage at Aliso Canyon at 34 Bcf, or approximately 40 percent of its prior capacity. At this level, the maximum daily withdrawal from Aliso Canyon is limited to 1,350 MMcfd.²⁶ In July 2019, the CPUC modified the withdrawal protocols for Aliso Canyon, providing more access to the storage facility if there is an "imminent and identifiable risk of gas curtailments created by an emergency condition that would impact public health and safety or result in curtailments of electric load."²⁷ Although the new withdrawal protocol enhanced SoCalGas's flexibility in using Aliso Canyon, it did not increase the actual storage capacity or daily withdrawal limits from the facility.

Separately, the CPUC is considering the long-term fate of the Aliso Canyon facility. The CPUC has opened an investigation—pursuant to state statute—to determine the feasibility of minimizing or eliminating the use of Aliso

²⁴ *Id.* at p. 4.

²⁵ Aliso Canyon Risk Assessment Technical Report, April 4, 2016. Appendix to https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/Preliminary%20Report%20-%20Section%20715%20of%20the%20Public%20Utilities%20Code.pdf at p. 6.

²⁶ SoCalGas Winter Assessment, p. 5.

²⁷ Aliso Canyon Withdrawal Protocol, July 23, 2019, p. 1. https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/UpdatedWithdrawalProtocol_2019-07-23%20-%20v2.pdf.

Canyon.²⁸ The CPUC is currently still conducting production cost modeling to inform its investigation. In its production cost modeling, CPUC is using CAISO power flow analysis to maintain local electric capacity requirements. However, because the CPUC's statutory mandate is to "minimize or eliminate the use of Aliso Canyon while still maintaining electric and energy reliability,"²⁹ it is possible that the CPUC could further limit the use of Aliso Canyon in the future.

C. Prior Proceedings to Address the Impact on the CAISO Balancing Authority Area of Gas Limitations in Southern California

The CAISO filed two successive tariff amendments, in the ER16-1649-000 and ER17-110-000 proceedings, to incorporate interim measures to address reliability issues that could arise due to the limited operability of Aliso Canyon. The Commission approved the first set of interim measures in the ER16-1649 proceeding for a period of approximately five months (*i.e.*, until November 30, 2016)³⁰ and the second set, which was largely the same as the first, in the ER17-110 proceeding for an additional 12 months (*i.e.*, until November 30, 2017).³¹ In the ER17-2568 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. 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.³²

²⁸ CPUC Investigation 17-02-002, Order Instituting Investigation , Jan. 4, 2019: <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M254/K771/254771612.PDF>

²⁹ *Id.*, p. 3.

³⁰ See *Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,224 (2016) (ER 16-1649 Order); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,135 (2016) (accepting filing submitted by CAISO to comply with directives in ER16-1649 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 ER16-1649 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 ER16-1649 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 ER16-1649 Order).

³¹ See *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,151 (2016) (ER17-110 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 ER17-110 Order).

³² *Cal. Indep. Sys. Operator Corp.*, 161 FERC ¶ 61,232 (2017) (ER17-2568 Order) at PP 25-26, 53-63.

In the ER18-375 proceeding, the CAISO 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. The Commission accepted the expedited filing effective December 16, 2017, to expire on December 16, 2018.³³

On September 28, 2018, in Docket No. ER18-2520, the CAISO submitted, for temporary approval, seven previously approved tariff amendments that would otherwise automatically expire on November 30, 2018 and December 16, 2018. The Commission rejected one of the proposed tariff amendments (*i.e.*, use of gas price scalars) and approved the six of the measures on a temporary basis to expire on December 31, 2019.³⁴

D. Analysis of the Use and Impact of the Maximum Gas Constraint in 2019

The CAISO employed the maximum gas constraint in the day-ahead and real-time markets on 9 days in 2019 to manage actual and anticipated gas curtailments. In the first quarter of 2019, the CAISO enforced the maximum gas burn constraint in either the day-ahead or real-time markets on two occasions: February 6 through February 8 and again on February 20. In the day-ahead market, the constraint was binding in about 10 percent of hours during which it was enforced. The constraint was not binding when enforced in the real-time market. The CAISO determined it was necessary to employ the gas constraint after SoCal Gas informed it of concerns with the gas supply in Southern California due to cold weather, gas pipeline limitations and storage availability.

The CAISO recently enforced the constraint again in mid-October due to a planned outage in the San Diego Gas & Electric gas system. The CAISO enforced the maximum gas constraint in the day-ahead market from October 14 through October 18 and in the real-time market from October 14 through October 17. The maximum gas constraint was not binding except for a single hour in the day-ahead market on October 18.

Figure 1 below shows the number of days the maximum gas constraint was used since 2016. Although the use of the maximum gas constraint has decreased since 2016, the CAISO enforced it for 9 days this year, and it may be required to use it again before the year is done given the state of the gas system in Southern California.

³³ See Commission Letter Order, Docket No. ER18-375-000 (Dec. 15, 2017) (ER18-375 Order).

³⁴ See ER18-2520 Order, P 47 and FN 62.

Figure 1: Number of Days the CAISO Enforced the Maximum Gas Constraint in each Market

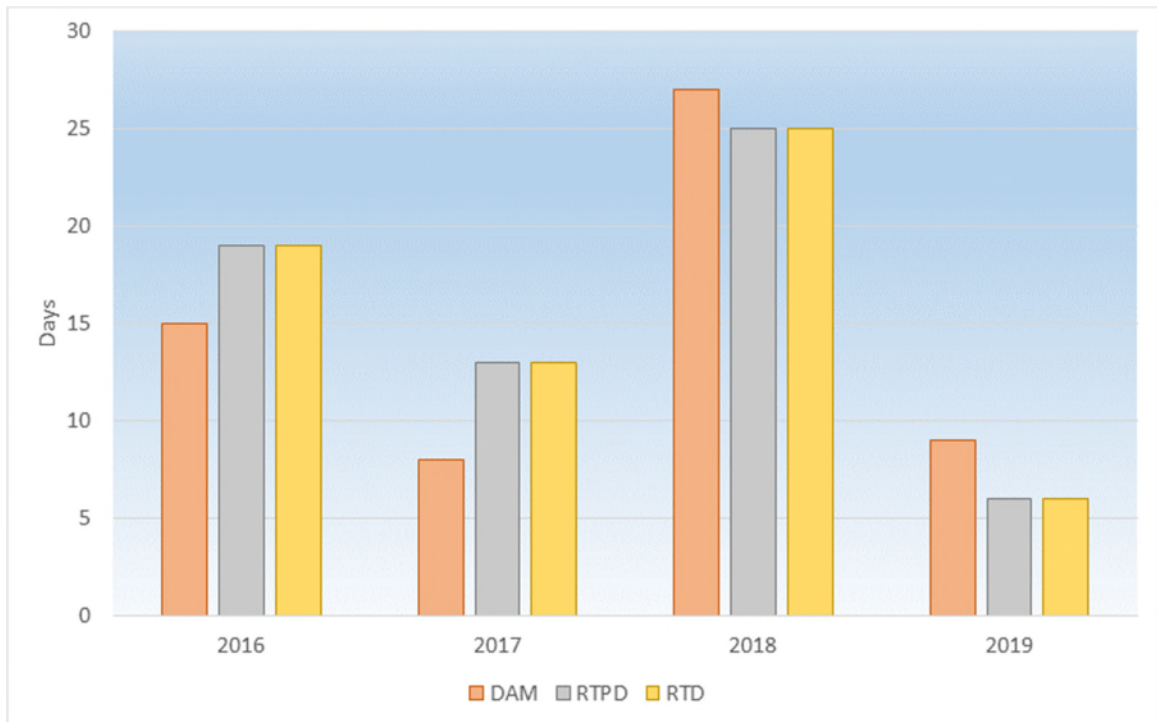
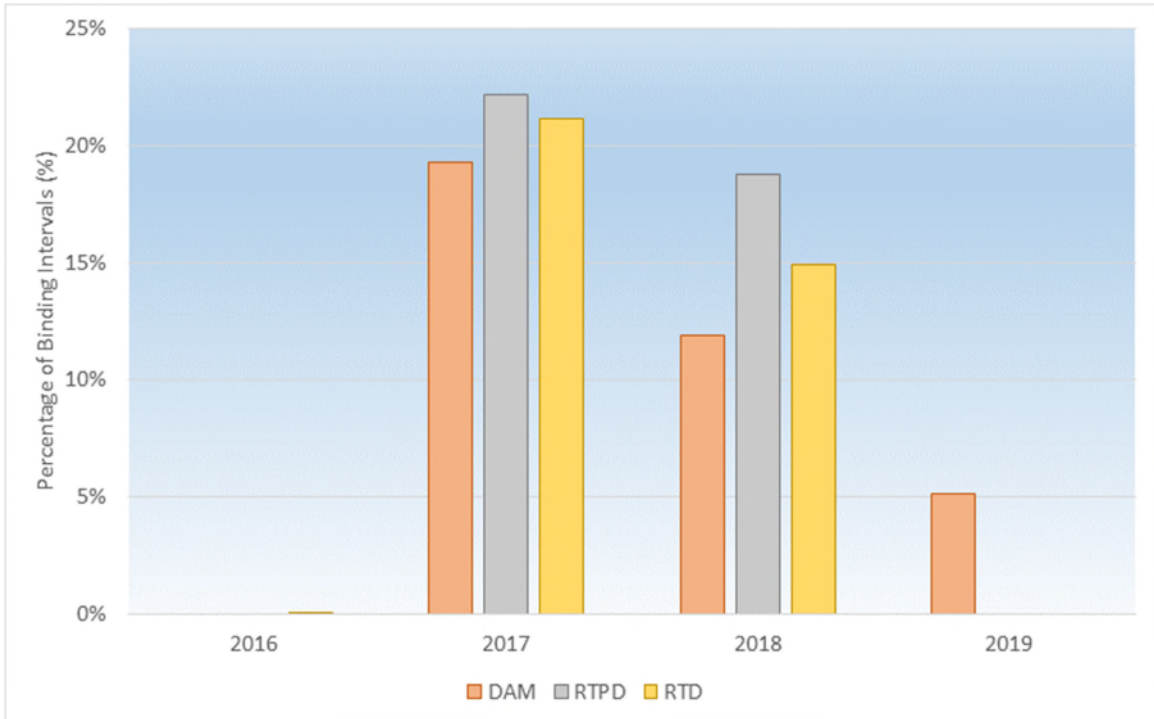


Figure 2 below compares how frequently the maximum gas constraint has been binding since the CAISO first started using the constraint in 2016. As shown in the Figure 2, the constraint was binding more frequently in prior years than it was in 2019. In 2016, the constraint was barely binding, which led to the enhancements to the constraint described below.³⁵ As a result of those changes the constraint became more effective and was binding more frequently.

³⁵ See fn 49.

Figure 2: Intervals in which The Maximum Gas Constraint was Binding as a Percentage of the Intervals in which the Maximum Gas Constraint was Enforced

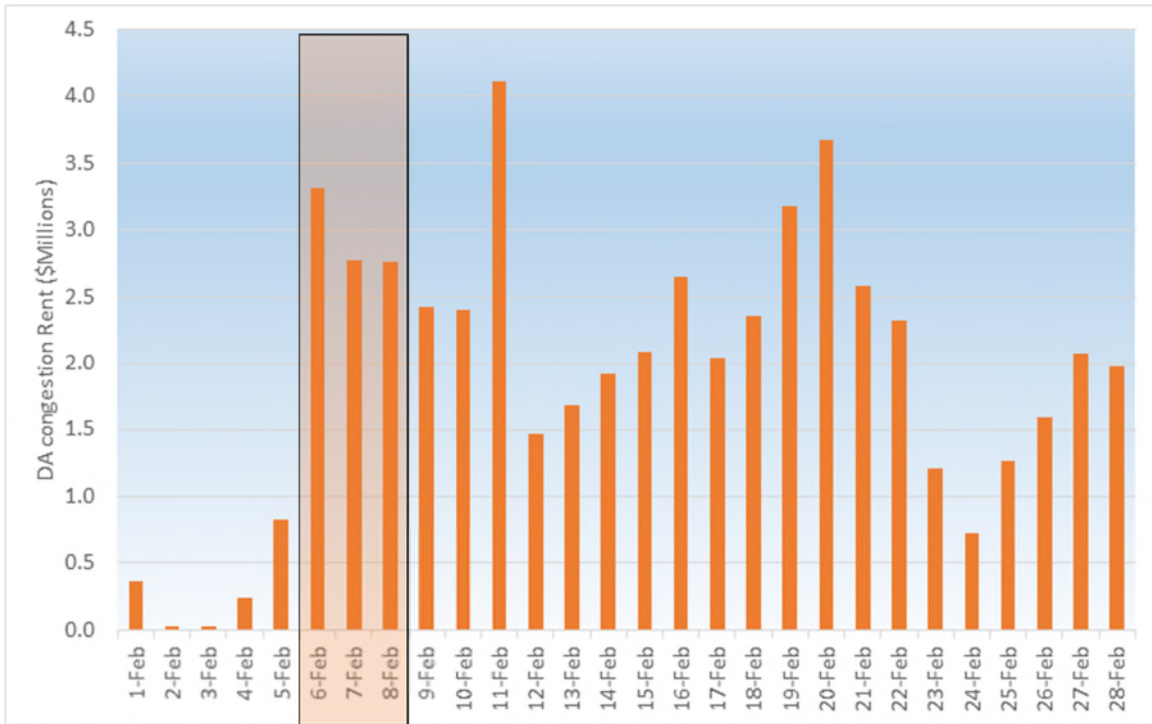


The CAISO conducted an analysis of the performance of the February 2019 gas constraint enforcement and its impact on the markets. This analysis was presented and discussed with participants at the February 2019 Market Performance and Planning Forum meeting. As indicated above, the constraint was not binding in real-time and therefore did not impact real-time energy or real-time congestion offset costs.³⁶ Figure 3, below, illustrates that day-ahead congestion rents experienced when the constraint was binding. The days with the constraint binding are highlighted. The trend over the month shows that there was no obvious impact of the gas constraint on transmission constraints.³⁷

³⁶ The CAISO has not yet completed its analysis of the impact the use of the constraint had on the CAISO markets in October. The CAISO will present its analysis at the upcoming Market Performance and Planning meeting scheduled for December 11, 2019.

³⁷ Attachment D to this Transmittal Letter provides an analysis of the constraints performance in 2018 submitted to the Commission in the CAISO's Transmittal Letter in Docket No. ER18-2520.

Figure 3: Day-Ahead Congestion Rents



E. Stakeholder Process in Support of Tariff Amendment

The CAISO discussed the proposed tariff revisions on a tariff stakeholder call held on October 7, 2019. Prior to the stakeholder call, the CAISO posted the proposed tariff language on September 26, 2019 and requested comments by October 3, 2019. The CAISO did not receive any written comments on the proposed tariff revisions. Also, on October 3, the CAISO posted a presentation detailing the history and continued need for the maximum gas constraint tool.³⁸ The presentation was discussed during the stakeholder call and verbal comments were requested. Two stakeholders asked questions during the call. One stakeholder raised a question about Aliso Canyon’s storage capacity. The other stakeholder questioned the process timeline for the proposed tariff

³⁸ See attachment F.
<http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.a.spx>.

revisions. After the stakeholder call, two stakeholders submitted written comments. This transmittal letter addresses the substance of each key issue and stakeholder concerns that were not resolved through the stakeholder process.

One stakeholder submitted comments that the CAISO has not undergone a stakeholder process prior to making these tariff provisions permanent. Specifically, the stakeholder points to language from the CAISO's prior filings that the CAISO would conduct a stakeholder process prior to making this tariff amendment. The CAISO did not conduct a lengthy stakeholder process because the CAISO Governing Body approval of the proposed tariff extensions was not required. The Governing Body previously approved the proposed permanent tariff revisions through the ER17-2568 proceeding. Moreover, the CAISO provided stakeholders with an analysis of the impact of the maximum gas constraint throughout the past year in multiple forums as discussed above.

II. Proposed Tariff Revisions

The CAISO proposes to permanently implement three measures approved by the Commission in prior proceedings, which are set to automatically expire on December 31, 2019.³⁹ Permanently implementing these three measures will ensure the CAISO can continue to manage its system reliably when faced with gas constraints posed by the limited operability of, and known outages on, the Southern California gas pipeline system.

The 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. The CAISO's experience over the past years has shown that prudent use of this tool has proven effective in avoiding negative impacts on electric reliability.

A. Permanently Implement Previously Approved Tariff Provisions Allowing the CAISO to Use a Maximum Natural Gas Constraint in the SoCalGas and SDG&E Gas Regions

The CAISO proposes permanent implementation of the same tariff provisions the Commission previously approved in the ER17-110, ER18-375, and ER18-2520 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

³⁹ This filing initiates the Maximum Gas Constraint implementation proceeding.

SoCalGas and SDG&E gas regions.⁴⁰ Permanently implementing 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 maximum amount of gas used.⁴¹ 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 continuous reliable operation of the electric grid within the bounds imposed on the CAISO by the operation of the natural gas system.⁴²

The affected tariff provisions are a vital component of the CAISO's effort to maintain grid reliability and resilience in the face of changing conditions on the CAISO system. In its comments in Docket No. AD18-7, where the Commission is examining the resilience of the bulk power system, the CAISO identified permanent adoption of the maximum gas constraint as "an important mechanism to promote grid reliability and resilience."⁴³ The CAISO stressed that gas constraints are a better tool for limiting gas burn when gas systems are managing gas constraints than manual exceptional dispatches, which the CAISO must rely on absent the ability to use such a constraint.⁴⁴ The CAISO stated that it considered "the maximum gas constraint to be a 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."⁴⁵ The Commission should grant the CAISO authority to employ this tool to manage gas usage constraints in Southern California as a permanent feature of the CAISO tariff to ensure the CAISO can maintain a reliable and resilient system.

1. Enforcing 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

⁴⁰ Proposed tariff section 27.11 and proposed tariff section 6.2.1.3, both of which are identical to the versions of those sections approved in the ER17-110 proceeding. ER17-110 Order at P 27; ER18-375 Order; ER18-2520 Order.

⁴¹ The CAISO will inform the affected generators that they are subject to the constraint(s).

⁴² See ER16-1649 Order at P 48.

⁴³ Comments of the CAISO in Response to the Commission's Request for Comments about System Resiliency and Threats to Resilience, Docket No. AD18-7, pp. 171-73, March 9, 2018.

⁴⁴ *Id.* at 171.

⁴⁵ *Id.* at 172.

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:

- Based on information provided by the affected gas company in Southern California, the CAISO develops and defines hourly limits to the gas burn by generators in the SoCalGas or SDG&E gas region.
- The CAISO coordinates with the affected gas company to ensure the hourly limits to the gas burn address the gas limitation and do not further aggravate the gas system constraint.
- The CAISO enforces the constraint in both the day-ahead and the real-time markets as needed 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 notification occurs after the day-ahead market, the CAISO may enforce the constraint in the real-time market run only. In addition, if the CAISO has enforced the nomogram in the day-ahead market and the gas company subsequently releases the limitation before completion of the real-time market for the trade date, the CAISO may remove the nomogram from all remaining real-time market intervals.
- Similarly, the CAISO may enforce the constraint if it anticipates 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 hourly limits to the gas burn, or to remove the constraint from the markets, if the CAISO determines that the constraint is leading to adverse market impacts.

2. The Effect of Enforcing the Maximum Gas Constraint

When binding, the maximum gas constraint ensures generation in the day-ahead or real-time markets is dispatched taking into consideration gas system limitations. Because it is known that the Southern California gas system will continue to be constrained even with relaxation of the use of Aliso Canyon, and because the CAISO cannot predict exactly how and when the gas system will be constrained, it seeks to make permanent the same maximum gas constraint

authority the Commission previously approved. The maximum gas constraint enforces gas usage limits that the CAISO formulates based on information made available to it by the gas company and its own observations of gas system limitations and how those limitations could affect electric reliability.⁴⁶

As the CAISO has done over the past four years, the CAISO will implement the maximum gas constraint using generation maximum gas constraints that are configured to limit the gas burn of generators within the affected areas. The maximum gas constraint 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.⁴⁷ Using the constraint parameter in this manner is consistent with the Commission's finding in the ER16-1649 Order that using generator maximum gas constraints with a penalty factor is an appropriate means of employing the gas constraint to ensure electric reliability.⁴⁸ Currently that price penalty parameter is set at the same value used for any other transmission constraint.⁴⁹ The BPM for Management of the Full Network Model currently describes, and will continue to describe, the maximum gas constraint.⁵⁰

⁴⁶ See *SoCalGas Service Area Limitations or Outages*, Operating Procedure 4120C available at <http://www.caiso.com/Documents/4120C.pdf>.

⁴⁷ 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.

⁴⁸ See ER16-1649 Order at P 48.

⁴⁹ The CAISO adjusted the parameters for the maximum gas constraint to ensure the constraint was effective in limiting the gas burn as intended. See PRR 1091 available at: <https://bpmcm.caiso.com/Pages/default.aspx>. Based on the analysis of the performance of the gas constraint from previous events, the CAISO worked through the BPM process to enhance the constraint formulation so that it could be similarly situated to other transmission constraints. 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.

⁵⁰ 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>. In response to DMM past concerns, the CAISO added details in BPM for Management of the Full Network Model that describes how both the left- and right-hand side of the equation that represents the gas constraint is multiplied by a constant of 100. The relevant Proposed Revision Request is PRR 1091. The CAISO 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

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.⁵¹ The CAISO will continue to implement its approach of applying the constraint only to the resource-specific price at the network connectivity node (CNode)⁵² used to dispatch affected generators, but not to the bus location reflecting the point of delivery or receipt on the CAISO controlled grid.⁵³ 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 elements of the electrical system subject to the gas limitations.

When the constraint is binding, the market will ensure generation subject to the constraint will not be dispatched higher 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 also reduce the amount of energy the CAISO market dispatches from an affected generator.

Figures 4 and 5 below illustrate the locations at which the CAISO will set prices when it enforces the maximum 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 separate.

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.

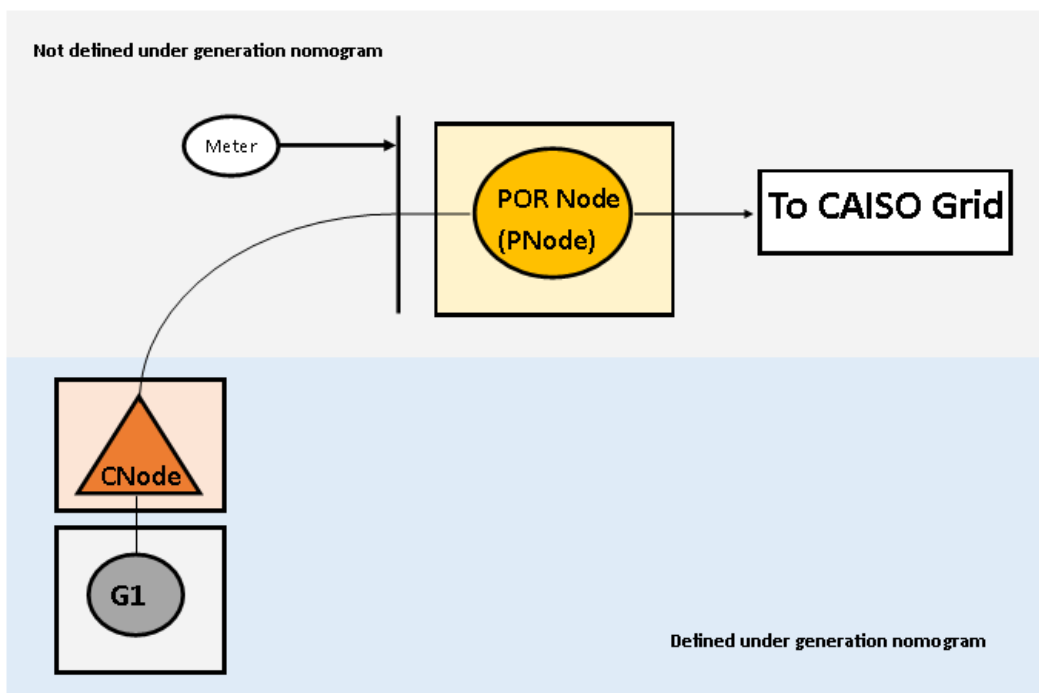
⁵¹ The tariff provisions also specify how the CAISO will allocate any non-zero amounts attributable to the price differential between the marginal cost of congestion used for settling a generating unit's scheduled or dispatched amounts at their location and the marginal cost of congestion used for settling demand, virtual bids, or congestion revenue rights. Proposed tariff section 27.11.

⁵² 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.

⁵³ 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.

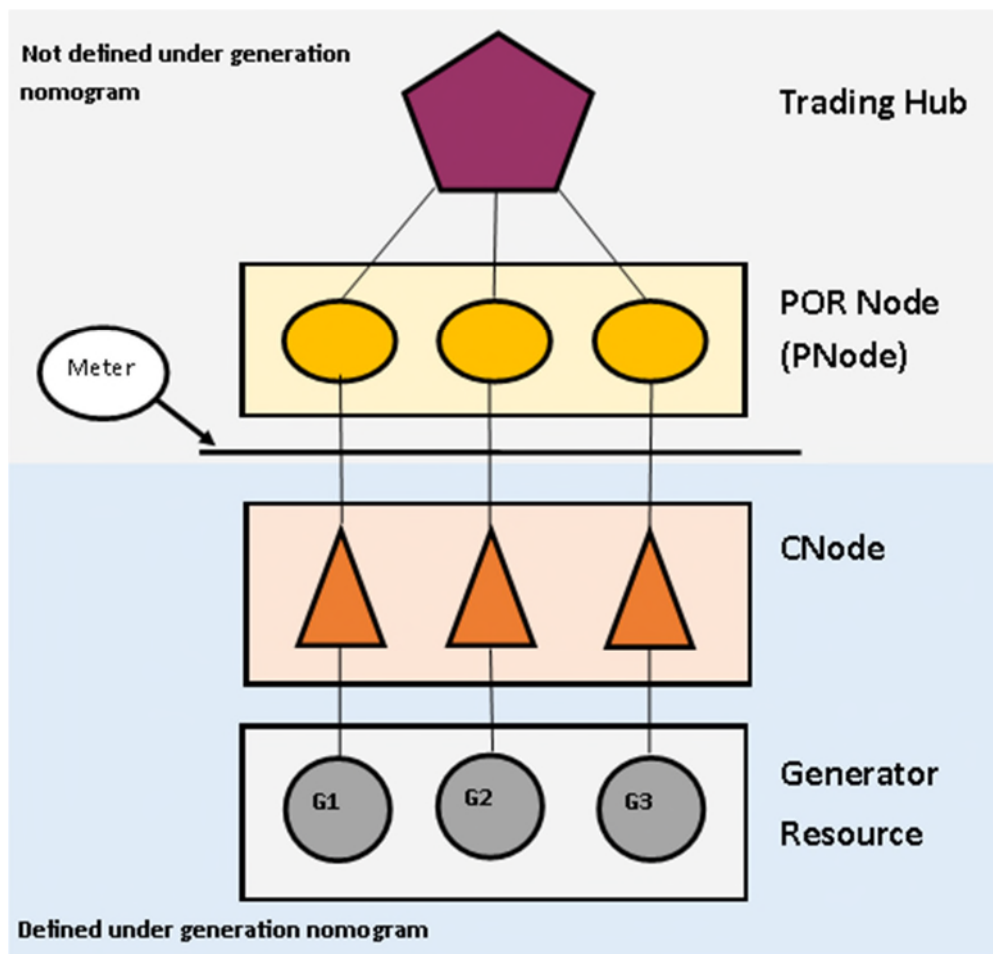
Figure 4 also shows the connection between the CNode and the PNode, which represents the point at which the injection is received into the CAISO controlled grid for supply, or withdrawal is delivered out of the CAISO controlled grid for demand. Generally, the PNode of a generating unit will coincide with a 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 PNode location is referred to as the “point of receipt” (POR).

Figure 4: CNode to PNode to CAISO Grid Relationship



Regarding aggregated locations such as trading hubs, the settlement of market transactions using these locations would be based on PNode prices that are aggregated into the aggregated pricing node (APNode), and they would not be based on CNode prices. Figure 5 below shows the relationship between generators (represented by grey circles), CNodes (represented by orange triangles), and PNodes, and also shows how PNode prices are aggregated into Trading Hub prices (represented by the purple pentagon). Figure 5 illustrates that the PNode prices determine the trading hub prices and not the CNode prices.

Figure 5: Generator Location Relative to CNodes and PNodes



The CAISO proposes to continue applying the tariff language authorizing it to settle generation on the SoCalGas and SDG&E gas systems at prices reflecting the effects of the maximum gas constraint. The CAISO will accomplish this by pricing this generation based on the locational marginal prices at each generator's CNode rather than at the PNode price. For all other transactions, the CAISO will continue using the PNode prices. Consequently, only prices for generators on the affected gas systems will reflect the cost of honoring the constraint.

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

Consistent with how the CAISO has enforced the maximum constraint in the past, the price for load, virtual bids, and congestion revenue rights will not reflect the shadow price of the maximum gas constraint. These will continue to be priced at POR locations and not CNode locations because load, virtual bids, and congestion revenue rights are not limited by the constraint. Therefore, the gas constraint only affects generator's prices, not the prices for load, virtual bids, and congestion revenue rights. As described above, only CNode locations reflect the shadow price of the maximum gas constraint.

Settling virtual bids and congestion revenue rights at locational marginal prices at the PNode that do not reflect the shadow price of the constraint also avoids potential adverse market outcomes in the CAISO market. 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 relevant transmission constraint, but not at a price reflecting the gas constraints' shadow price. Because the CAISO does not enforce the constraint in the congestion revenue rights auction, if congestion revenue rights were settled in the day-ahead market at a cost reflecting the shadow price of the constraint, then a market participant could purchase congestion revenue rights at a cost that does not reflect the cost of the constraint and then receive payments reflecting the cost of the constraint. This would be funded through payments that the CAISO would otherwise allocate to load serving entities.

A similar issue would exist if the CAISO settled virtual bids using the maximum gas constraint's shadow price and the CAISO enforced the maximum gas constraint in the real-time market but not in the day-ahead market. A market participant could submit 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. This could result in a market participant purchasing offsetting virtual supply and demand that would profit off the constraint enforcement and not have energy price 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. All of this is avoided with pricing the affected resources at the CNode.

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.⁵⁴ Furthermore, if the Commission grants the CAISO authority to employ the maximum gas constraint in Southern California permanently, as necessary, the

⁵⁴ DMM's quarterly market performance reports are available on the CAISO website at <http://caiso.com/market/Pages/MarketMonitoring/MarketIssuesPerformanceReports/Default.aspx>.

CAISO will submit to the Commission annual reports that explain the impact of the maximum gas constraint on the CAISO markets.

3. It is Just and Reasonable to Enforce the Maximum Gas Constraint to Address Known Limitations on the Gas System Instead of Exceptional Dispatches.

CAISO operators believe that using the maximum gas constraint is far superior to conducting manual exceptional dispatches to address gas burn conditions. In the past, absent the maximum gas constraint, operators were required to take the gas burn values from the gas company and translate them into exceptional dispatches in an expedited manner. This unduly increased the burden on operators in circumstances where 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 they also dispatch any offline units with start-up times less than 4.5 hours. If the operators were only to exceptionally dispatch online units, without further instructions, the market may start-up offline units to replace the reduced energy. Without using the maximum gas constraint, the CAISO must 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. The exceptional dispatches must also be updated hourly to follow the electric load changes such as day-ahead awards, transmission constraints, and forced outages.

The CAISO sought to use the maximum gas constraint to alleviate a potential untenable situation for operators. Using the maximum gas constraint 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 maximum gas constraint 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 using the constraint, it is crucial to consider what costs the CAISO market incurs absent the constraint and with similar electric and gas system conditions. Aside from the risk of unduly burdening the grid operators, there are economic consequences associated with exceptional dispatches to consider. For example,

when the CAISO exceptionally dispatches resources to manage the gas constraint it may have to dispatch down resources whose bid prices are below the market clearing price (*i.e.*, the LMP), resulting in exceptional dispatch uplift associated with having to keep those generators whole. The gas constraint more effectively addresses this issue in two ways. First, because it is enforced in the market clearing process it considers that resources are behind a constraint and thus lowers their price to limit their dispatch and effectively manage the gas limitation. Second, because the maximum gas constraint is enforced in the market, it will produce least cost economic dispatches, thereby limiting the uplift payments the CAISO must make to generators.

Finally, although suppliers can reflect cost limitations in their economic energy bids, the CAISO cannot manage the gas limitations through resource' bids alone. Although a generator may know its own gas cost exposure, it cannot know the actual physical system limitations and overall gas limitations better than the gas companies can. In addition, the individual supplier may know its own gas limitations, but it does not and cannot know the other generator's limitations, nor can a generator know how to manage gas usage collectively to achieve reliable gas operations. In contrast, the CAISO can coordinate with the gas company, and establish a gas usage limitation that ensures the gas reliability and electric reliability is managed effectively. The maximum gas constraint provides the CAISO the ability to set gas usage limitations in its markets that effectively and efficiently manage the electric grid in light of the known gas limitations.

As discussed above, there are known and identifiable constraints on the Southern California gas system that will continue in the future. Although Aliso Canyon is more available than it was in prior years, the possibility of future outages when Aliso Canyon remains less than fully operational pose significant risks to reliable service for core and non-core gas customers. Even under the best-case scenario where all current outages are returned to service, SoCalGas faces significant challenges to serving its customers.

Given these known, persistent, and long-term issues facing the Southern California gas system, over-dispatching resources in gas-constrained regions could negatively affect pipeline conditions, exacerbating existing gas system limitations, and ultimately impacting electric reliability. This can also potentially 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 Southern California part of the CAISO controlled grid, but the CAISO market system is unable to capture those limitations through market constraints, the market could schedule or dispatch resources based on submitted bids and system conditions that do not account for gas system limitations. Such dispatches could aggravate already constrained gas system conditions, thereby compromising gas reliability and causing 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.

Permanently implementing the existing interim tariff provisions will allow the CAISO to respond to problematic expected future gas system conditions proactively as they develop, better ensuring that market dispatches reflect actual gas system conditions. It is critical for maintaining continuous reliability of both gas and electric systems that the CAISO have authority to proactively address such occurrences in advance to ensure the dispatch reflects the conditions on the natural gas system to the maximum extent possible.

Experience has shown that granting the CAISO authority to enforce the maximum gas constraint does not mean the CAISO will employ the constraint without good cause. As discussed above, experience clearly shows the CAISO has only used the constraint in a small number of occasions where it was informed of significant gas system limitations by the affected gas company. The CAISO coordinates its use of the constraint closely with the affected gas companies to ensure the constraint limits the gas burn necessary to maintain reliable services on both systems. The Commission has encouraged and required coordination between electricity and gas operators to ensure both systems are operated reliably.⁵⁵ The CAISO has complied with these requirements and avoided significant risks to electric reliability through its coordination and the use of the maximum gas constraint. As discussed further below, the costs of a restricted gas availability impacts electric prices, with or without the maximum gas constraint at play. Lacking the constraint, however, hampers the CAISO's ability to serve its load reliably during significant gas limitations. Given the persistent nature of the limitations on the Southern California gas system and their expected presence in the future, the CAISO likely will have to request authority to employ the maximum gas constraint year after year.

4. Stakeholder Comments on Using Constraint

In the stakeholder process preceding this tariff amendment, the DMM submitted comments stating that when the maximum constraint is binding, the gas usage limitations appear to have created energy imbalance offset costs and other

⁵⁵ See e.g., *Coordination of the Scheduling Processes of Interstate Natural Gas Pipelines and Public Utilities*, 151 FERC ¶ 61,049 (2015).

secondary impacts. The DMM recommends further refinements to the gas usage limitation and that any refinements be transparent to market participants.⁵⁶

The CAISO recognizes that limitations on the gas system will increase costs and affect the electricity reliability and markets. However, gas limitations exist regardless of whether or not the CAISO chooses to use the maximum gas constraint to manage these limitations. The alternative to using maximum gas limitations is using exceptional dispatches.⁵⁷ As discussed above, experience clearly shows that using the constraint is preferred to forcing CAISO operators to issue exceptional dispatches to manage gas limitations.

In contrast to exceptional dispatches, the maximum gas constraint is enforced in the CAISO market processes, which means the prices and schedules or dispatches produced by the market systems will internalize these constraints. Exceptional dispatches are conducted outside the market systems, which means LMPs and schedules issued by the market. This has several implications, the most important of which are the benefits the maximum gas constraint provides system operators in operating the grid during tight system conditions. Although there are still circumstances during which the use of the maximum gas constraint may not be ideal, the CAISO system operators have determined that the use of the constraint provides them with a more effective tool in limiting the gas burns in areas experiencing gas limitations. Because the constraint is enforced in the actual day-ahead or real-time market runs, using the maximum gas constraint provides the operators the ability to receive an automated market solution that honors the gas limitation while considering all the cost and bid inputs to the market as well as all the

⁵⁶ *Comments of the Department of Market Monitoring*, (DMM Comments)

<http://www.caiso.com/Documents/DMMComments-AlisoCanyonGas-ElectricCoordinationPhase5-DraftTariffLanguage.pdf>.

⁵⁷ As the CAISO has explained in the past, absent the availability of the constraint, CAISO system operators will have to resort to exceptional dispatches. See Aliso Filing October 12, 2016, pp 38-19. In addition to its concerns with the way in which the CAISO currently defines the gas limitations the CAISO must manage through its markets, the DMM recommends that when decremental exceptional dispatches are issued to some units while incremental exceptional dispatches are issued to other units, such exceptional dispatches are considered non-competitive and subject to exceptional dispatch market power mitigation. See DMM Comments at 6. The CAISO is not proposing any changes to the exceptional dispatch mitigation provisions in this tariff amendment. Therefore, the DMM's request is entirely outside the scope. The Commission has in the past specifically required the CAISO to demonstrate that suppliers are actually exercising market power or that there is the potential to exercise market power before the CAISO can mitigate a resource's economic bids. See *e.g.*, *California Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,150 at PP 71-72 (2009). The CAISO will be reviewing what additional mitigation is necessary to address any supplier's ability to exercise market power when the CAISO conducts exceptional dispatches. See "*Dispatch Enhancements*" initiative in CAISO Policy Roadmap, available at <http://www.caiso.com/Documents/2020DraftPolicyInitiativesRoadmap.pdf>. The Commission should encourage the DMM to participate in that stakeholder process and provide the CAISO and its stakeholders the ability to evaluate these important policy issues before requiring any such mitigation.

other physical constraints on the grid and available resources. CAISO system operators have the ability to review market results and adjust dispatches through exceptional dispatches if needed to address gas constraints that were not addressed by the market optimization. However, having the market solution provides system operators with significant benefits than starting from scratch and having to determine all the necessary exceptional dispatches that would be necessary to manage the gas limitations. The use of the constraint is also preferable to out-of-market actions that impose other uplifts and weaken actual price signals produced by the market. Although the Commission has granted the CAISO authority to use exceptional dispatches for reliable operations of the CAISO grid, the Commission has clearly articulated its preference for use of market tools to model constraints and allow the CAISO to operate its grid reliably through the CAISO markets.⁵⁸

a. Improvements to Methodology for Establishing Hourly Gas Limitations

The CAISO does not believe DMM is proposing to force the CAISO system operators to only use exceptional dispatches to deal with gas constraints, nor is it proposing that the market inefficiencies of exceptional dispatches are better to live with than those it believes are caused by the use of the constraint. Rather, the CAISO believes that the DMM is really more concerned with the way in which the CAISO formulates the gas limitations for each hour of each day. These gas limitations would have to be considered one way or another. DMM states that “the gas usage constraints should be reshaped to reflect hourly gas burn rather than ISO load.”⁵⁹ The DMM seems to recognize that how the maximum gas constraint is used is pivotal in setting the hourly “gas usage constraints.”

As reflected in the BPM for Managing the Full Network Model, the CAISO currently sets the “gas usage constraints” of the maximum gas constraint equation, as the daily limitation across the hours of a given day-ahead market based on the ratio of hourly load forecast to daily load forecast.⁶⁰ The CAISO calculates the gas usage constraint this way unless the CAISO has coordinated an alternative specific gas limitation with the gas company. In the real-time market, the CAISO will recapture portions of the unused allocated gas for earlier intervals if it can determine those amounts can be recaptured based on its communications with the gas company. For example, if the balancing range allocated to the first 4 hours of the day was unused, the gas burn associated with that allocation would be recaptured

⁵⁸ See e.g., *California Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,150 at P 33 (2009).

⁵⁹ DMM Comments at 2.

⁶⁰ See Business Practice Manual for Management of Full Network Model, at pp. 84-87. https://bpmcm.caiso.com/BPM%20Document%20Library/Managing%20Full%20Network%20Model/Managing%20Full%20Network%20Model%20BPM%20Version%2018_clean.docx.

and used to increase the allowable range for later periods consistent with expected load shape.

The DMM proposes to modify the maximum gas constraint to instead “reflect total hourly gas burn within the area subject to the gas constraint rather than CAISO load”⁶¹ Because DMM states it has found that “while during most hours, modeled gas usage was below the maximum limit set by the CAISO for each 15-minute interval, modeled gas usage hit or exceeded the set limit during peak evening ramping hours.”⁶² The DMM illustrates its concerns in figure 2 of its comments, which purportedly shows there is a “significant surplus of gas from non-peak hours” because the gas burn limit the CAISO used in the day-ahead market was significantly higher than the actual day-ahead schedule during the middle hours of the day. DMM believes “excess gas should have been available during the evening ramping hours when the need for fast ramping capacity from gas-fired units was most critical.”⁶³ DMM concludes that reshaping the constraint to reflect likely hourly gas burn rather than CAISO load would avoid unnecessarily tight limits on gas generation when the need is most critical. Further, DMM suggests the gas burn on a typical day can be easily calculated from past data and the two-day ahead runs of the market software that the ISO performs.

The CAISO does not disagree that the definition of the “gas usage constraint” should be enhanced over time to better reflect actual gas burn need and ensure the CAISO does not unnecessarily restrict the gas burn to the detriment of electricity market efficiency and reliability. However, DMM’s suggested approach is not the best way to achieve that result. In considering DMM’s recommendation, it is important that the Commission recognize that the CAISO does not set the maximum gas usage for use in the constraints unilaterally. The CAISO establishes the limits for the maximum gas constraint in close coordination with the gas companies to ensure it understands the gas limitations and that managing the gas burn on the electric system does not further compromise whatever gas system limitations are in effect.

The DMM maybe wrongly assuming, however, that the gas limitations come only in the form of daily limitations distributed hourly, and if gas is not used in one hour it can easily be used in the next hour. DMM seeks confirmation that gas usage limitation levels are not adjustable in either the day-ahead or real-time market. Instead, limitations may be enforced or unenforced in response to changes in real-time conditions. Today, the CAISO may adjust the limits set for the maximum gas constraint manually if it knows it can reliably release the limitations. The CAISO clarifies that the gas companies convey gas limitations to the CAISO not only in the

⁶¹ DMM Comments at 3.

⁶² *Id.*, at 2.

⁶³ *Id.*, at 3.

form of daily and hourly amounts, but also as limitations on the instantaneous draw on the gas system. The CAISO cannot simply assume it may unilaterally release the gas not used in earlier hours to meet its peak demand as suggested by the DMM. As noted above, the CAISO already acknowledges in its BPM for Full Network Model that if the “balancing range allocated to the first 4 hours of the day was unused, the gas burn associated with that allocation would be recaptured and used to increase the allowable range for later periods consistent with expected load shape.”⁶⁴ This release could be accomplished by modifying the constraint itself or through exceptional dispatches if the CAISO cannot modify the limits set in the maximum gas constraint in time. When the gas system is experiencing limitations, the CAISO operators are in close contact with the gas company operators. The gas company may inform the CAISO of additional available gas for the evening electric load pull. This would allow the CAISO to lift the limitations on the gas usage, which will allow the CAISO to access any unused available gas on the system.

Nevertheless, the CAISO believes it can improve the gas usage limits it uses in the maximum gas constraint by using a net load assessment rather than the gross load assessment it uses today for conditions of a daily limitation. The net load assessment would consider the total system load net of generation by solar and wind resources, which may more closely resemble the actual gas burn requirement. This approach will accurately account for changes that may happen from day to day since it will be based on forecasted production of wind and solar resources. This is superior to DMM’s proposal of using a historical reference of a gas burn because using a historical reference to set up the limitation for a day in advance will not consider changing conditions, such as the difference between a cloudy day versus a sunny day, or even the level of the system load.

The DMM agrees that the net load assessment would be an improvement, but still prefers that the CAISO shape the gas burn based on a typical day – which it claims can be easily calculated from past data, as well as two-day-ahead runs of the market the CAISO conducts.⁶⁵ DMM’s proposed details are beyond the scope of the CAISO’s filing because the CAISO does not propose to have the details of the settings in the equation for the maximum gas constraint be defined in the tariff. The CAISO currently provides these details in the BPM and has not proposed to change that approach. These details have never been included in the tariff because the CAISO needs flexibility to modify the gas constraint details over time and make refinements to address lessons learned in its application. In addition, regardless of its normal course of business in setting the gas limitations, there may be instances in which the gas company communicates specific restrictions as was the case the week of October 14 - 18, which the CAISO must honor to avoid further aggravating

⁶⁴ See Business Practice Manual for Management of Full Network Model, at p. 86.

⁶⁵ DMM Comments at 4.

gas conditions.⁶⁶ Requiring restrictive settings in the tariff would inappropriately deny the CAISO the flexibility it requires to effectively address these types of situations.

In changing the BPM, the CAISO will conduct its normal BPM change management process in which it collects comments from all stakeholders. The DMM like all other stakeholders will have an opportunity to explain why it believes its approach is superior to the CAISO's intention to start setting the limits based on the net load. The CAISO has been and will continue to be fully transparent on how it sets gas limitations. The CAISO has not concluded the net load approach is the best approach. The CAISO believes it should conduct the stakeholder process first to determine the best approach for setting the gas usage limits to be managed through the maximum gas constraint. The CAISO discusses the weaknesses of the DMM proposed approach in this proceeding to illustrate that their recommendation is not necessarily the only or ideal approach.

Figure 6 and 7 below illustrate how DMM's preferred option can be problematic and potentially creates electric and gas reliability issues. Using the same type of figure produced by the DMM in its comments to the CAISO, the CAISO plotted what the gas burn would look like using the net load methodology it is seeking to implement versus the typical gas burn day option DMM prefers based on February 8, 2019 data.

Figure 6 illustrates the comparison between the net load methodology and the current gross load methodology. The orange line illustrates the net load methodology. The black dotted line illustrates the current gross load methodology. The blue line illustrates the gas burn without any gas limitations. This figure shows that the net load approach would limit the gas burn less during the middle hours of the day than the current methodology. Additionally, during the evening hours when the electricity system peaks, the proposed net load approach releases the gas constraint at a rate that more closely reflects the actual gas burn during those hours.

Figure 7 illustrates the comparison of the CAISO's current gross load methodology and the DMM's proposed typical gas day methodology. The black dotted line illustrates the current gross load methodology. The blue line illustrates the gas burn without any gas limitations. There are various ways to calculate the DMM's typical gas day proposal. These different calculation possibilities are illustrated as follows: The orange line illustrates the gas constraint calculated using the previous week historical gas burn value of the same day. The yellow line illustrates the gas constraint calculated using the historical average based on the

⁶⁶ During the week of October 14, 2019, SoCalGas provided a gas limitation both as a daily and hourly limit and the hourly limit capped hourly burn volumes to a uniform value throughout all hours of each operating day.

previous week. The green line illustrates the gas constraint calculated using the previous two-week historical average.

Figure 7 shows that all the different typical day approaches fail to follow the actual gas burn better than the CAISO's net load approach. Additionally, all of the typical day approaches are not significantly different than the current methodology of using the gross load, except for the evening peak hours, or until the CAISO system experiences quickly changing conditions among days. In the peak hours, the gas limit using both of the historical average approaches would significantly exceed the gas burn without any constraint. Thus, indicating the DMM's proposed gas constraint would be irrelevant for those hours. Further, using the same day from the previous week approach would not remove the gas limitation during the peak hours as much as the net load approach would.

Figure 6: Gas Burn using Net Load versus Gross Load to set the Gas Burn Limit

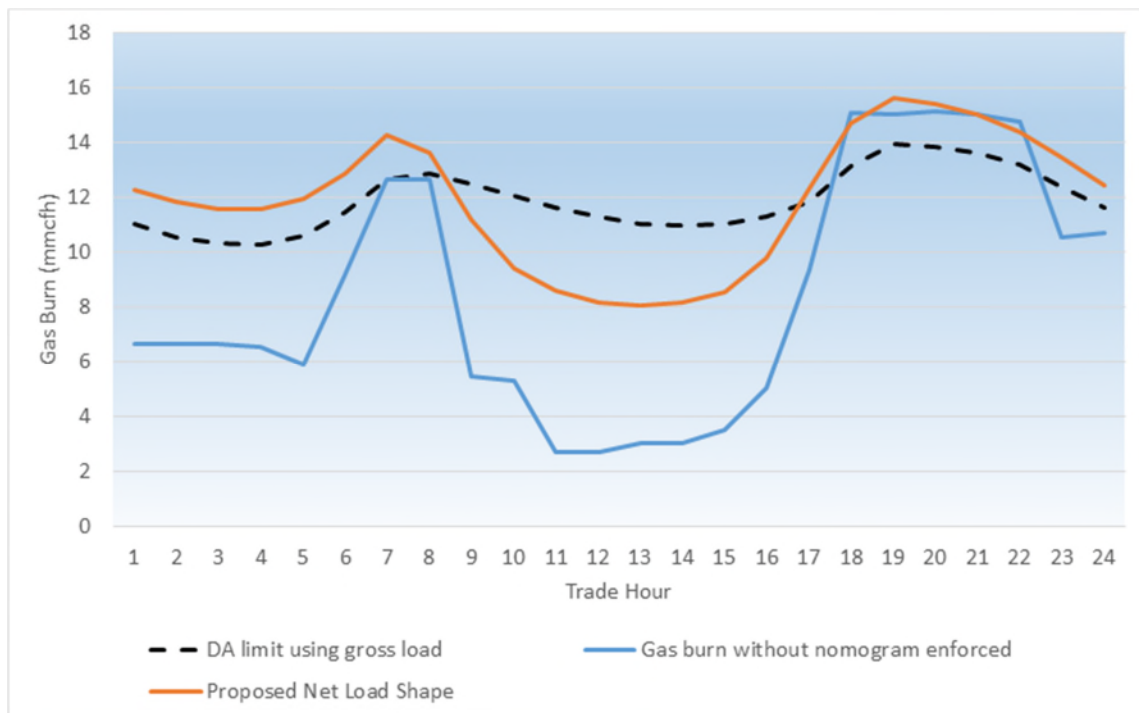
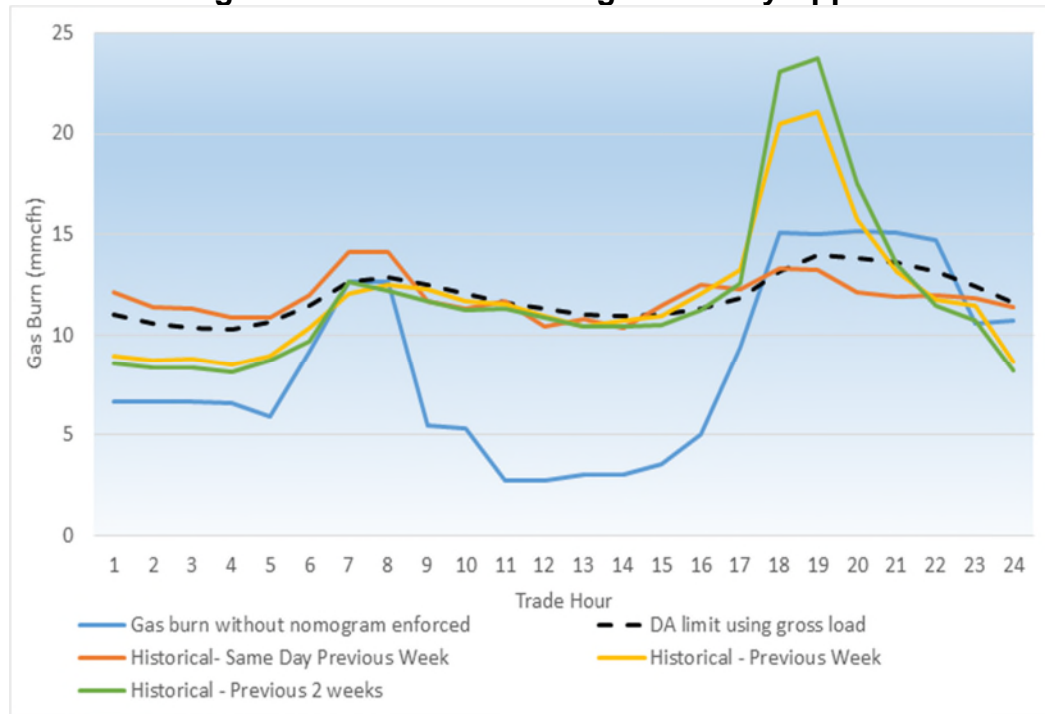


Figure 7: Gas Burn using Same-Day Approach



The CAISO's analysis illustrates DMM's approach has limitations and is not necessarily the best approach in setting the limits to be used in the maximum gas constraint. The CAISO will continue to work with its stakeholders, including DMM, and provide complete visibility into how it sets the limits in the business practice manuals, just as it has before. However, it is important to keep in mind that regardless of the methodology the CAISO uses to establish the hourly gas limits, it must manage the electric system and continue to closely coordinate with gas companies to ensure it does not violate any limitations on the instantaneous draw on the gas system. Therefore, even if there appears to be unused gas the CAISO could use during the peak hours on the electricity system, there is no guarantee that on any given day the CAISO can ramp up the gas system as suggested by DMM.

One stakeholder agrees with the DMM and argues the CAISO should resolve how it will shape the constraint prior to making the constraint permanent in the Southern part of the CAISO system.⁶⁷ The CAISO disagrees. The CAISO plans on making the improvements to how it sets the gas limits whether its authority to enforce the constraint is permanent or temporary. Moreover, regardless of whether the CAISO is able to enforce the constraint, it must

⁶⁷ See PG&E Comments – Aliso Canyon Gas-Electric Coordination Phase 5, available at http://www.caiso.com/Documents/PG_EComments-AlisoCanyonGas-ElectricCoordinationPhase5-DraftTariffLanguage.pdf.

manage gas limitations on the gas system and, therefore, the CAISO has to continue to find a way of managing the gas limitations. Unless the gas company provides specific hourly limitations, the CAISO must define what the hourly limitations are. Therefore, the CAISO will have procedures for limiting the gas burn one way or another. The Commission should grant the CAISO the authority to enforce the maximum gas constraint as it has done over the past 4 years and encourage the DMM and all stakeholders to participate in the BPM change management stakeholder process to determine any enhancements it may make in the definition of the maximum gas usage limits.

b. Impact of Maximum Gas Constraint on Real-Time Imbalance Energy Offset

The DMM cautions that “[u]se of the gas constraints can cause unnecessarily high real-time imbalance offset costs (RTIEO) the gas constraint is set too low and is not adjusted dynamically in real-time.” The DMM bases its arguments on an observation in February 2018 in which the use and binding of the constraint coincided with large real-time imbalance energy offset amounts.⁶⁸ Although limitations on the gas system may affect real-time imbalance energy offsets, the DMM errs in concluding that enforcing the constraint causes increases in the real-time imbalance energy offsets. DMM failed to describe exactly how enforcing the constraint or the constraining binding directly impacts the real-time imbalance energy offset.

The CAISO is a revenue-neutral, independent energy market operator. To facilitate sufficient and reliable electric service, the CAISO must balance energy supply and demand at all times. The CAISO maintains a detailed set of energy settlements charges and payments calculations. This ensures supply and demand are compensated or charged based on their respective injections and withdrawals from the CAISO energy market, which includes all the balancing authority areas participating in the CAISO’s real-time market. However, total payments and charges do not always net out. In those instances, the CAISO may have excess payments it must allocate or insufficient funds it must collect to fully fund energy procurement.

⁶⁸ DMM Comments. The CAISO reported this coincidence in its monthly market performance report for February posted on April 10, 2018. See CAISO Market Performance Report for February 2018 at p. 33, <http://www.caiso.com/Documents/MarketPerformanceReportforFebruary2018.pdf>. The CAISO also reported that the increase in the real-time imbalance energy offset coincided with a time when gas prices spiked to record high values. In May of 2019, the DMM released its annual report and reported that the CAISO’s enforcement of the gas constraints in the early parts of 2018 may have contributed to the higher real-time energy imbalance offset costs in February. See *2018 Annual Report on Market Issues and Performance, Department of Market Monitoring, May 2019*, p. 80. <http://www.caiso.com/Documents/2018AnnualReportonMarketIssuesandPerformance.pdf>

The need for offsets arises from the difference between market results and actual metered energy. This difference has numerous causes, but predominantly results from the tariffs and practices of the individual balancing authority areas, including the CAISO. These primarily include differences between the estimated tariff loss rate and the physical loss rate (*i.e.*, unaccounted for energy), deviations from dispatch not precisely matched by resources on automatic generation control, and metering granularity for load. The CAISO maintains the real-time imbalance energy account as a neutrality account that tracks imbalance energy settlement dollar values based on the various components of the LMP used to settle energy transactions. The CAISO then allocates out any excess revenues or insufficiencies to scheduling coordinators based on the measurements of their demand.⁶⁹

The CAISO accounts for amounts in the RTIEO based on the various contributing factors. The dollar amounts in the RTIEO are attributed to the sum of various measures of differences between market results and metered results: FMM instructed imbalance energy;⁷⁰ RTD instructed imbalance energy;⁷¹ uninstructed imbalance energy;⁷² EIM bid adders and the resulting GHG emission compliance costs;⁷³ and unaccounted for energy.⁷⁴

The key message here is that each and every component of the RTIEO is priced based on LMPs cleared in the CAISO markets. It is not surprising, therefore, that if the cost of fuel is high on a given day, the cost of the real-time offset will be high. It is also no surprise that gas prices are likely to be high on

⁶⁹ See existing tariff Section 11.5.4.1.

⁷⁰ “The accounted for energy resulting from the difference between a resource’s Day-Ahead Schedules or EIM Base Schedules and FMM Schedules determined pursuant to Section 11.5.1.1.” Appendix A to the CAISO tariff.

⁷¹ “The portion of accounted for energy resulting from difference between Dispatch Instructions and the Day-Ahead Schedules and EIM Base Schedules that have not already been accounted for as FMM Instructed Imbalance Energy determined pursuant to Section 11.5.1.2.” Appendix A to the CAISO tariff.

⁷² “The portion of RTD Imbalance Energy that is not RTD Instructed Imbalance Energy.” Appendix A to the CAISO tariff.

⁷³ “A Bid component composed of a MW quantity and price that provides EIM Participating Resources an opportunity to recover costs of compliance with California Air Resources Board greenhouse gas regulations.” Appendix A to the CAISO tariff.

⁷⁴ “The difference in Energy, for each utility Service Area and Settlement Period, between the net Energy delivered into the utility Service Area, adjusted for utility Service Area Transmission Losses, and the total Measured Demand within the utility Service Area adjusted for distribution losses using Distribution System loss factors approved by the Local Regulatory Authority. This difference is attributable to meter measurement errors, power flow modeling errors, energy theft, statistical Load profile errors, and distribution loss deviations. For EIM Market Participants, the CAISO will calculate Unaccounted For Energy based on the EIM Entity Balancing Authority Area instead of the utility Service Area.” Appendix A to the CAISO tariff.

days that the system is experiencing limitations. Therefore, the more likely explanation for the February 2018 high real-time imbalance offsets is that the gas system was constrained and gas prices were high. Therefore, the real-time imbalance energy offset was high. Although, the CAISO enforced the maximum gas constraint on some of those days, there is no evidence that enforcing the constraint alone caused the RTIEO to also increase.

Figure 8 below shows a direct correlation between the gas prices and prices in the CAISO's integrated forward market. During the months that the gas price in the gas system in Southern California was high, the LMPs in the CAISO markets were also high, even though the CAISO did not enforce the constraint. The diagram also shows that with relatively stable gas prices, the CAISO's LMPs are also relatively stable.

Figure 8: Gas Prices and LMPs in the CAISO Markets May-August 2018.

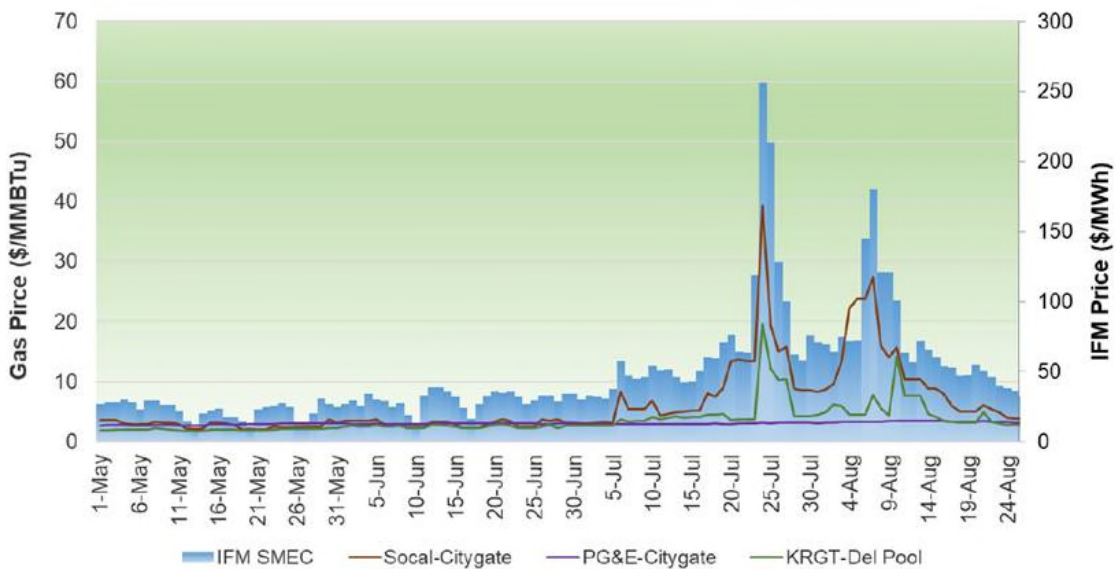
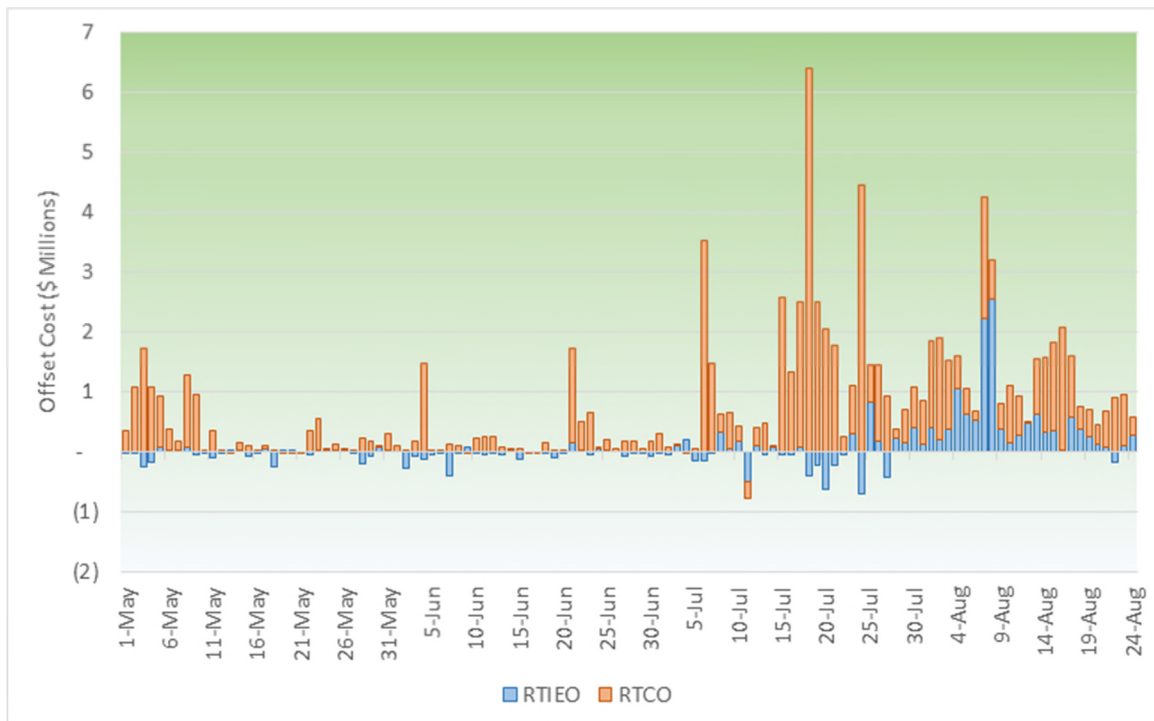


Figure 9 below shows that during the same time period in which the CAISO did not enforce the constraint, the offset costs increased as energy and gas prices increased. Again, this occurred even without the CAISO having enforced the maximum gas constraint.

Figure 9: Real-Time Offsets over May – August 2018



Furthermore, the CAISO has analyzed the correlation between gas prices and the RTIEO over periods of time when the constraint was enforced and when it was not. The data shows that there is a correlation between high gas prices and high RTIEO, regardless of whether the CAISO enforces the constraint. Figure 10 below shows that even on days the constraint was not enforced, on days in which the day-ahead LMPs increased because of high gas prices, the real-time offset costs were also high. For example, over July 23-25, gas prices were significantly high as were day-ahead prices. As shown in the blue and red bars the offset costs were also significantly higher than other days. As was the case in August 6-8. The CAISO is not presenting this data to suggest that the *only* reason the offset costs were high on those days is due to high gas prices. It is presenting them to illustrate that there are other forces at play in influencing the offsets. For example, on July 17-19, the gas prices were not particularly high, however there were other market conditions at play that caused electric prices to increase, which further impacted the cost of the offsets.

Figure 10: Real-time Offsets on Days In which the Maximum Gas Constraint was not Enforced

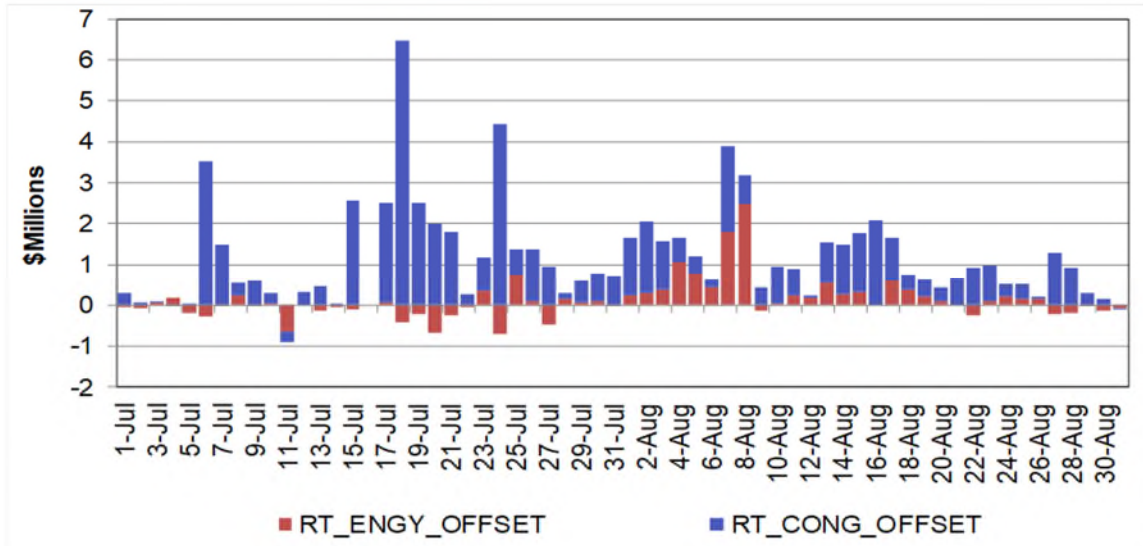
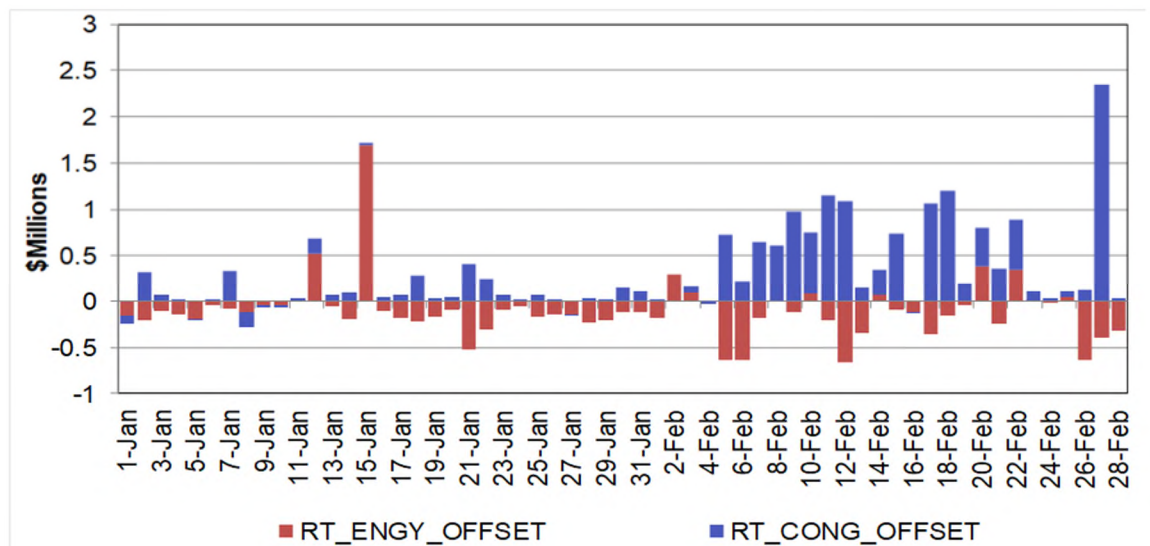


Figure 11 below shows that on the days the CAISO enforced the maximum gas constraint on February 6-8, the offset costs were not particularly higher than on the days it did not enforce the constraint. Although it is difficult to pinpoint exactly what drives the offset costs, these figures illustrate that the offset costs may be higher or lower, regardless of whether the CAISO enforces the maximum gas constraint. As such, the CAISO does not believe that the cost of the offsets alone should drive whether or not the CAISO should have the authority to use the constraint.

Figure 11: Offset Amounts on Days the Constraint was Enforced on February 6-8.



One stakeholder believes the CAISO should rely on exceptional dispatch rather than using the gas constraint to manage local gas shortage issues.⁷⁵ The stakeholder believes exceptional dispatch is preferable because the costs of exceptional dispatch are allocated to the participating transmission owners in the corresponding territory.⁷⁶ This is not accurate. The only exceptional dispatches that are allocated to the corresponding participating transmission owners are those that arise because of a transmission-related modeling limitation in the full network model.⁷⁷ Exceptional dispatches due to limitations on the gas system are not transmission-related limitations. Rather, when the CAISO issues exceptional dispatches to address limitations on the gas systems, the CAISO is doing so to avoid system emergencies on the CAISO system. Costs associated with these exceptional dispatches are allocated to all scheduling coordinators regardless of the geographic location of the gas constraint.⁷⁸ Moreover, exceptional dispatch uplift costs are uplift costs to CAISO load serving entities as are real-time imbalance energy offset costs.

Moreover, the use of the maximum gas constraint has the benefit of providing the CAISO and market participants with a least cost market solution for dispatch of resources when the gas system is constrained and it provides a more effective tool for managing the system reliably than exceptional dispatch. There is no reason to wait to consider a redesign of costs associated with the enforcement of the constraint.

The reality is that gas constraints on the system overall will cause higher gas prices, which will lead to higher wholesale electricity prices, which in turn will increase the cost of any uplift on the CAISO system. Forcing the CAISO to rely solely on exceptional dispatches to address gas system limitations imposes significant hardships on the CAISO operators that can result on increased system reliability risks. The CAISO has consistently demonstrated its ability to use the maximum gas constraint judiciously. Making this authority permanent will not cause the CAISO to enforce the constraint more frequently. As noted previously, although the CAISO believes it is appropriate to use the maximum gas constraint in the northern part of the system to address gas constraints unique to that area, the CAISO is not seeking authority to enforce the maximum gas constraint in the northern part of its system in this filing. If the need arises in the future, the CAISO can request authority to ensure it can manage the northern part of the system efficiently and reliably through its market systems. Finally, the CAISO is also considering enhancements to the RTIEO in an upcoming

⁷⁵ See PG&E Comments at 4.

⁷⁶ *Id.*

⁷⁷ See existing Section 11.5.6.2.5.1 of the CAISO tariff.

⁷⁸ See existing Section 11.5.6.2.5.2 of the CAISO tariff.

stakeholder process.⁷⁹ All stakeholders should direct their efforts to that process to suggest changes to the RTIEO.

Finally, in its comments submitted prior to this tariff amendment, the DMM recommended that the CAISO continue to publicly report on generation of real-time energy imbalance offset costs and other secondary impacts of imposing gas usage constraints and consider such impacts before imposing gas usage constraints in the market. Although the CAISO commits to continue publicly reporting on generation of real-time energy imbalance offset costs and other secondary impacts of imposing maximum gas constraint, it is not prudent to require CAISO operators to consider these cost impacts before deploying the maximum gas constraints in the market. The CAISO operators are required to deploy the constraint or perform exceptional dispatches to manage gas limitations for purposes of ensuring reliable electric service without aggravating the already constrained gas system. Furthermore, as discussed above, offset costs are likely to increase when there are high gas prices or gas constraints on the system, regardless of whether or not the CAISO operators deploy the maximum gas constraint. Therefore, there is no basis for requesting that the CAISO operators consider the costs of using the constraint when they deploy the constraint.

B. Permanently Implement Existing, Previously Approved Tariff Provisions to Address Market Issues Related to the Enforcing the Maximum Gas Constraint

To address potential market issues, the CAISO also proposes to permanently implement two other interim tariff provisions previously approved in the ER17-110, ER18-375, and ER18-2520 proceedings regarding two measures related to use of the maximum gas constraint.

1. Designation of Competitive or Non-Competitive Constraints in the Local Market Power Mitigation Process

The CAISO proposes to permanently implement 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.⁸⁰ The separate criteria provide 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. This determination is based on the CAISO's determination that actual electric supply

⁷⁹ See "Real-Time Settlement Review" Scheduled to begin in Q2 of 2020, <http://www.caiso.com/Documents/2020DraftPolicyInitiativesRoadmap.pdf>

⁸⁰ Proposed tariff section 39.7.2.2, which is identical to the same proposed tariff section approved in the ER17-110, ER18-375, and ER18-2520 proceedings.

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 previous filings to address the limited availability of Aliso Canyon, that such provisions are a reasonable measure to address actual electric supply conditions found to be non-competitive when the constraint is enforced due to anticipated electric supply conditions in gas regions.⁸¹

In rejecting this tariff provision in the ER17-2568 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."⁸² In the most recent stakeholder comments, the DMM commented that:

DMM continues to support the granting of authority to the ISO to manually deem constraints uncompetitive if necessary. If the ISO finds it necessary to use the manual override on a regular basis, DMM recommends adding gas usage constraints to the automated dynamic competitive path assessment.

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 will be necessary to use the manual override on a regular basis. The CAISO has not yet automated this feature because of competing technology upgrades required by other initiatives, and infrequent use of the constraint has not justified prioritizing automation of it over other needed enhancements. Nevertheless, it is important to retain the authority to manually override the competitive constraint designation. DMM has expressed in its comments that it "has been and will remain prepared to assess whether any transmission constraints should be deemed uncompetitive to account for the impact of these gas constraints."⁸³

The CAISO recognizes the importance of minimizing manual designations of transmission constraints as non-competitive and, even though the CAISO does not anticipate the need to enforce the constraint on a regular basis, it has already begun consulting with the DMM on requirements for the automation of the processes. Although the CAISO does not anticipate it will be able to automate the process by January 1, 2020, it is just and reasonable to enforce the constraint and continue to perform the constraint designation on a manual basis. Without this authority the market may be subject to LMPs that are the product of

⁸¹ See ER16-1649 Order at P 52; ER17-110 Order at P 27; ER18-375 Order; ER18-2520 Order.

⁸² See ER17-2568 Order at P 63.

⁸³ DMM Comments at 5.

uncompetitive conditions.

Based on its discussions with DMM on the requirements for automating the path designation process, the CAISO will determine the appropriate stakeholder process to implement the automation feature. If the automated process does not call for any additional changes, the CAISO will vet the process with its stakeholders through the BPM stakeholder process and memorialize any implementation details in the BPMs. If on the other hand automating this process triggers the need to modify the CAISO tariff, the CAISO will pursue a tariff amendment to implement the changes. The CAISO is unable to indicate the exact time it will be able to implement the automation. However, given the need to enforce the maximum gas constraint on a permanent basis, the CAISO is taking appropriate actions to determine how the automation would be accomplished.

Moreover, in this tariff amendment the CAISO seeks continued authority to enforce the maximum gas constraint in the Southern part of its system. Albeit infrequently, the CAISO, DMM and stakeholders have been able to observe the impact the enforcement of this constraint has had to the local areas in the Southern system. In addition to investigating and developing requirements for automating the DCPA designation, the CAISO will work with DMM to determine any process enhancements it can make to alleviate the risks associated with the manual process.

2. Possible Suspension of Virtual Bidding when Enforcing the Maximum Gas Constraint

Consistent with the ER16-1649 Order,⁸⁴ to ensure that virtual bidding cannot detrimentally affect the CAISO markets, the CAISO proposes to permanently implement the tariff provisions previously approved in the ER17-110, ER18-375, and ER18-2520 proceedings. These tariff provisions 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.⁸⁵ These tariff provisions continue to be 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.⁸⁶ Further, as the Commission recognized in the ER16-1649 Order, with the limited operability of a gas region and the measures that CAISO may have to undertake to address electric and

⁸⁴ See ER16-1649 Order at PP 80, 83.

⁸⁵ Proposed tariff section 7.9.2(d), which is identical to the same proposed tariff section approved in the ER17-110, ER18-375, and ER18-2520 proceedings.

⁸⁶ See existing tariff section 7.9.2.

gas reliability, there may be times when promoting price convergence may run contrary to the efficient economic solution of the market.⁸⁷ 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.⁸⁸ 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, 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 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.”⁸⁹ The CAISO does not intend to exercise this authority each and every time it enforces the constraint. While the CAISO has had this authority, it has never suspended virtual bidding because it has not observed market inefficiencies that warrant such suspension. However, it is just and reasonable for the CAISO to have the authority to suspend virtual bidding, if in the future such market inefficiencies actually occur. It would be unjust and unreasonable to force the market to be subject to market inefficiencies during the time the CAISO must enforce the constraint, while the CAISO pursues appropriate actions to address market inefficiencies.

III. Effective Date

For the reasons discussed in this filing, the CAISO requests that the Commission permit the proposed tariff revisions to be permanently implemented with an effective date of December 31, 2019.

IV. Communications

In accordance with the Commission’s regulations,⁹⁰ 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:

⁸⁷ ER16-1649 Order at P 80.

⁸⁸ *Id.*

⁸⁹ ER17-2568 Order at P 63.

⁹⁰ 18 C.F.R. § 385.203(b).

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V. 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.

VI. 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;
Attachment D	Impact of Use of the Maximum Gas Constraint in 2018;
Attachment E	Board of Governors Memorandum; and
Attachment F	Aliso Canyon Phase 5 – Maximum Gas Constraint – Presentation, October 7, 2019

VII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission issue an order by December 31, 2019, that accepts the tariff revisions contained in this filing effective December 31, 2019.

Respectfully submitted,

/s/ Anna McKenna

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Attachment A

Clean Tariff

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019

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.

* * * * *

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.

* * * * *

39.7.2 Competitive Path Designation

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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.

* * * * *

Attachment B

Marked Tariff

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019

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.

* * * * *

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~~[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.

* * * * *

39.7.2 Competitive Path Designation

* * * * *

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.

* * * * *

Attachment C

Additional Background Information Regarding Aliso Canyon

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019

ATTACHMENT C

ADDITIONAL BACKGROUND INFORMATION REGARDING ALISO CANYON

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 used normally year round. For summer operations, the SoCalGas Control department strives to fill completely 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

B. The Gas Leak at Aliso Canyon and Subsequent Events

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, at 5-7 (Apr. 5, 2016) (2016 Risk Assessment Report). The 2016 Risk Assessment Report 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 7. The other three gas storage fields are the Honor Rancho, La Goleta, and Playa del Rey facilities. *Id.*

³ *Id.* at 7-8.

⁴ *Id.* at 10.

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 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 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

⁵ Emergency Proclamation at ¶¶ 7, 10. The Emergency Proclamation is 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, at 20 (2016) (2016 Reliability Action Plan). The 2016 Reliability Action Plan is available on the same CAISO website page as the 2016 Risk Assessment Report.

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 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.

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.

C. Analyses of and Actions Taken to Address the Potential Consequences of Limited Operability of Aliso Canyon and Limitations on the Gas System in Southern California

1. Analyses and Actions for 2016-2017

The limited operability of Aliso Canyon caused gas-balancing conditions in southern California 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.

The CAISO also established an ongoing practice of holding biweekly calls with the gas companies regarding outage planning. In addition, during normal

⁸ The four phases of the Aliso Canyon stakeholder initiative are described further in section I.C of the transmittal letter for this filing.

⁹ Transmittal letter for Aliso Phase 1 tariff amendment at 2-5; attachment C to Aliso Phase 1 tariff amendment.

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

¹⁰ Peak RC is 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); 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), both available on the same CAISO website page as the other reports described above.

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 of 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

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.

¹⁴ 2016 Winter Risk Assessment Report at 30-40. This analysis assumed that multiple outages would not occur on the electric and gas system. *Id.* at 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 4-5, 17-18.

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

¹⁶ *Id.* at 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 6-7, 14-16; 2016 Winter Action Plan at 10-12, 17-20.

- 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

The various actions that the CAISO and other entities took were effective in addressing the risks presented by the limited operability of Aliso Canyon during summer 2017. With regard to the markets operated by the CAISO, the market results for June through August of 2017 indicated that suppliers scheduled in a more conservative manner than they had for those months in 2015 to bring sufficient gas on-line, and did not drive real-time imbalances causing more gas to be demanded in real-time than day-ahead.

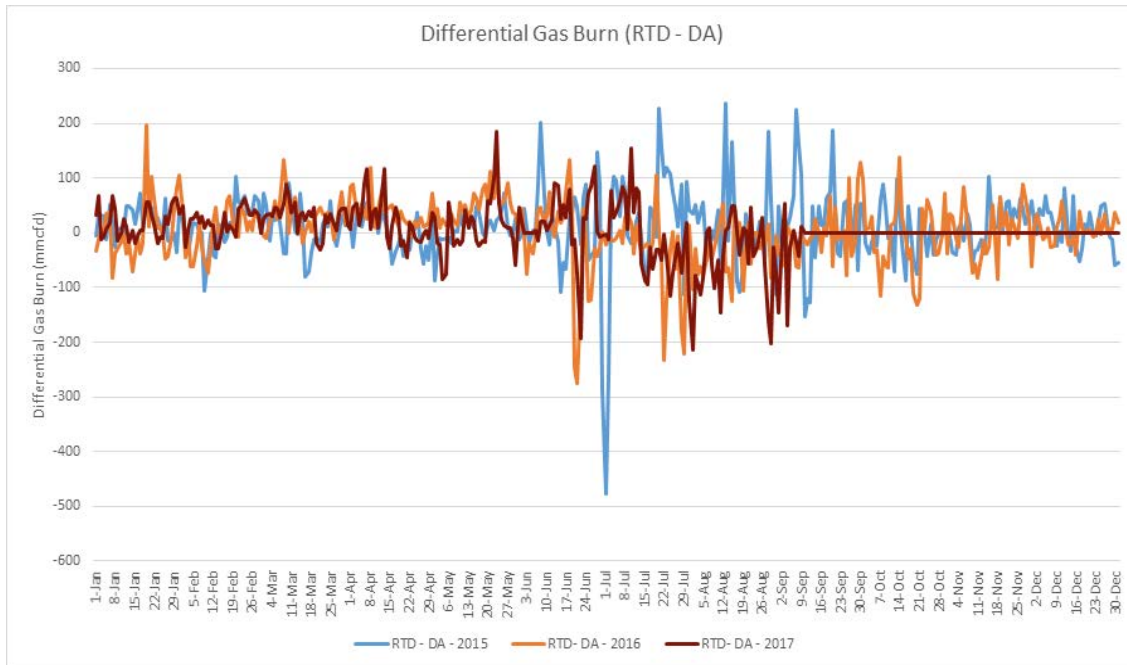
These market results are shown in Figure A below. In Figure A, the orange lines represent the difference (*i.e.*, imbalance) between the gas burn amounts on the SoCalGas system between the CAISO's five-minute real-time dispatch and residual unit commitment process schedules. When the orange line falls below zero for a given day, that day had a negative imbalance. A negative imbalance means that the CAISO scheduled greater amounts of power in the day-ahead market and that suppliers either (i) scheduled gas accordingly or (ii) were not able to schedule gas but did bid effectively to reduce their output consistent with their scheduled gas.

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

¹⁸ *Id.* at 24.

¹⁹ See section I.C of the transmittal letter for this filing.

Figure A



The CAISO believes that the exceptional gas-electric coordination and advanced electric planning, as well as the totality of the measures adopted by the CAISO pursuant to the Commission’s Aliso Phase 1 and Phase 2 orders discussed in section I.C of the transmittal letter for this filing, resulted in the limited number of days depicted in Figure A on which modest positive imbalances occurred from June through August. Overscheduling gas prior to real-time likely supported both gas and electric reliability risk, as the reliability risk was largely that there would be insufficient gas on the SoCalGas system when electric demand required gas to the fuel generating resources on that system.

In early 2017, the staffs of the CPUC, CEC, CAISO, and LADWP (collectively, the Aliso Canyon Technical Assessment Group or ACTAG), 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 ACTAG jointly issued a report on May 19, 2017.²⁰ The 2017 Risk Assessment Report calculated the system

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/Public Documents/17-IEPR-11/TN217639_20170519T104800_Aliso_Canyon_Risk_Assessment_Technical_Report_Summer_2017_Asses.pdf.

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 Summer Risk Assessment Report found that the CAISO and the LADWP's ability to meet the 1-in-10-year peak summer electric load is dependent on the amount of SoCalGas/SDG&E's system receipt point utilization and withdrawal capability from storage facilities other than Aliso Canyon.

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).²¹
- Any loss of flowing supply from 100 percent of the current receipt point utilization will reduce sendout capacity on a one-to-one basis.²²

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 assumes there is enough energy supply outside Southern California and sufficient electric transmission import capability into Southern California.²³
- As with last 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 is insufficient to meet the increased gas demand, access to replacement energy may require emergency assistance from

²¹ *Id.* at 5.

²² *Id.*

²³ *Id.*

neighboring balancing authorities, and electric load shed in the Southern California region may be necessary.²⁴

- This analysis assesses the minimum generation needed to maintain reliability and minimize gas burns. However, this dispatch does 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.²⁵
- If transmission import capability decreases or demand response resources are limited, the electricity system needs more gas to avoid service interruptions. Should storage withdrawal or flowing gas supplies also drop, the electricity system will not be able to get that gas and will be at risk.²⁶

2. Analyses and Actions for 2017-2018

Based on the analyses conducted previously and discussed above, the CAISO expected limited operability of Aliso Canyon in the remaining months of 2017, and continuing in 2018 that could adversely affect reliability of the electric system. Therefore, on September 29, 2017, the CAISO filed the tariff amendment in the Aliso Phase 3 proceeding discussed in section I.C of the transmittal letter for this filing. As discussed therein, in the Aliso Phase 3 Order issued on November 28, 2017, the Commission accepted the CAISO's proposal to maintain some of the tariff measures on a temporary basis until November 30, 2018 but rejected the CAISO's proposal to implement the balance of the tariff measures, as modified, on a permanent basis. The Commission also expressly invited the CAISO to submit a filing to make the previously approved versions of those latter measures effective on a temporary basis until November 30, 2018.

On November 28, 2017, the Aliso Canyon Technical Assessment Group (ACTAG), whose members include technical experts from the CPUC, CEC, CAISO, and LADWP, with input by SoCalGas, issued its most recent report to assess the reliability challenges of delivering energy to Southern California for the winter of 2017-18 and concluded that "the region faces new challenges and greater uncertainty compared to last winter."²⁷ The ACTAG's Winter 2017-2018

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.* at 5-6.

²⁷ Aliso Canyon Winter Risk Assessment Technical Report 2017-18 Supplement (Nov. 28, 2017) at 3 (Winter 2017-18 Supplement, or Supplement). The Winter 2017-18 Supplement is

Supplement articulates the risks the electric and gas systems face this coming winter and beyond. Although the Supplement recognizes that the availability of Aliso Canyon will likely be greater than it was last year, the Supplement highlights that, because of known (*i.e.*, existing or planned) and unplanned outages on other parts of the Southern California gas system, there is a significant risk of curtailments of non-core customers, which include gas-fired generation facilities.

The Winter 2017-18 Supplement provides a number of crucial findings that bear on the importance of this tariff amendment filing and the need for immediate Commission action to ensure the CAISO has the tools it needs to maintain reliability of the electric system:

- The primary challenge is that three SoCalGas natural gas transmission pipelines are out of operation. SoCalGas relies on these pipelines to serve core customers.
 - Line 235-2 ruptured on October 1, 2017, also damaging the nearby Line 4000. This outage reduces maximum system capacity by 800 million cubic feet per day (MMcfd).
 - Maintenance scheduled at the Playa del Ray gas storage field from November 7, 2017, through December 18, 2017 reduces maximum system capacity by 260 MMcfd.
 - The risk of additional unplanned outages could further reduce maximum capacity on the SoCalGas system.
 - SoCalGas has adopted mitigation measures to address these outages, which in part depend on deliveries on alternative pipelines.
- This winter's minimum generation requirement (*i.e.*, the gas needed by the electricity system operators to maintain electric system reliability) estimated by LADWP and the CAISO is higher than it was for 2016-17.
 - The increase is due to higher demand forecasts.
 - LADWP is postponing a planned transmission line outage until February 1, 2018 because of gas constraints. 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.

also provided in attachment D to this filing, along with a companion summary of the Supplement entitled Aliso Canyon Update Winter 2017-18 (Nov. 28, 2015) (Winter 2017-18 Update) and a notice of availability of the Supplement issued November 28, 2017. All of these documents are available on the CEC's website at http://www.energy.ca.gov/2017_energy_policy/documents/#05222017.

- Between now and February 1, 2018, 38 MMcfd is needed to meet the total minimum generation requirement for the CAISO and LADWP balancing authority areas. If the balancing authority areas experience a contingency event, 112 MMcfd is needed to meet electricity demand. After February 1, 2018, those numbers will increase to 219 MMcfd and 293 MMcfd.²⁸
- Absent the 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 non-core customers may occur in December to preserve inventory needed for core customers on cold days.
- Although the ACTAG considers mitigation measures in its assessment, it is not clear that these measures will suffice to avoid gas curtailments to non-core customers this winter.

To mitigate the identified risks to the extent feasible, the ACTAG proposed maintaining all of the previously implemented mitigation measures described above and instituting the following additional measures:

- Delaying transmission upgrade work by LADWP until February 2018;
- Using more gas from Aliso Canyon than last winter;
- Customers taking more conservation measures, such as turning thermostats down and deploying more smart thermostats;
- Implementing an emergency moratorium on new gas hookups in Los Angeles County;
- Having electricity generators more frequently shift generation to facilities located outside the SoCalGas system in order to preserve gas inventory;
- Slightly increasing the volume of gas that can be stored at Aliso Canyon pursuant to an update to Aliso Canyon's report under section 715 of the California Public Utilities Code;

²⁸ Last year, those numbers were at 22 MMcfd and 96 MMcfd.

- Acquiring liquefied natural gas for delivery to Otay Mesa if it turns out to be infeasible to deliver pipeline supply to Otay Mesa using the North Baja and Gasoducto Baja Norte pipelines; and
- Monitoring and communicating constantly, including to the public.²⁹

In sum, the gas system capacity and maximum supported demand will vary this winter depending on when the pipelines can return to operation during the winter and on system mitigation actions that may be taken.³⁰ But in any event, 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 non-core customers, including electric generators, even if the generators reduce their output to a minimum.³¹ The ACTAG warned:

While the ACTAG offers several mitigation measures in this assessment, including using gas at Aliso Canyon, it is not clear that they and the prior measures already in place will be sufficient to avoid gas service curtailments to noncore customers in Southern California this winter. Assuming no additional gas system or electric transmission system outages and that full supplies arrive at the pipeline receipt points, the need for curtailments depends entirely on the weather and by how much customers can decrease gas demand.³²

The Winter 2017-18 Supplement makes plain the increased risks to reliability this winter due to the continued limited operability of Aliso Canyon and outages on the gas pipelines in Southern California.

D. Constraints on the Gas System in the CAISO Balancing Authority Area

The gas constraints identified in the ATCAG's Winter 2017-2018 Supplement are likely to occur in other parts of the CAISO balancing authority area as a result of more stringent safety and reliability measures for all in-state natural gas storage facilities recently adopted by the State of California. These restrictions may develop over time due to potential impacts on gas systems to comply with California Senate Bill No. 887 (SB 887), which augmented requirements on gas storage facilities in response to the Aliso Canyon incident (September 2016), and new California Air Resource Board (CARB) rules aimed at combatting emissions from methane leaks (March 2017).

²⁹ Winter 2017-18 Supplement at 25-26, 29-30; Winter 2017-18 Update at 8.

³⁰ Winter 2017-18 Supplement at 3-5; Winter 2017-18 Update at 5.

³¹ Winter 2017-18 Supplement at 17-19; Winter 2017-18 Update at 6.

³² Winter 2017-18 Supplement at 27. See also Winter 2017-18 Update at 9.

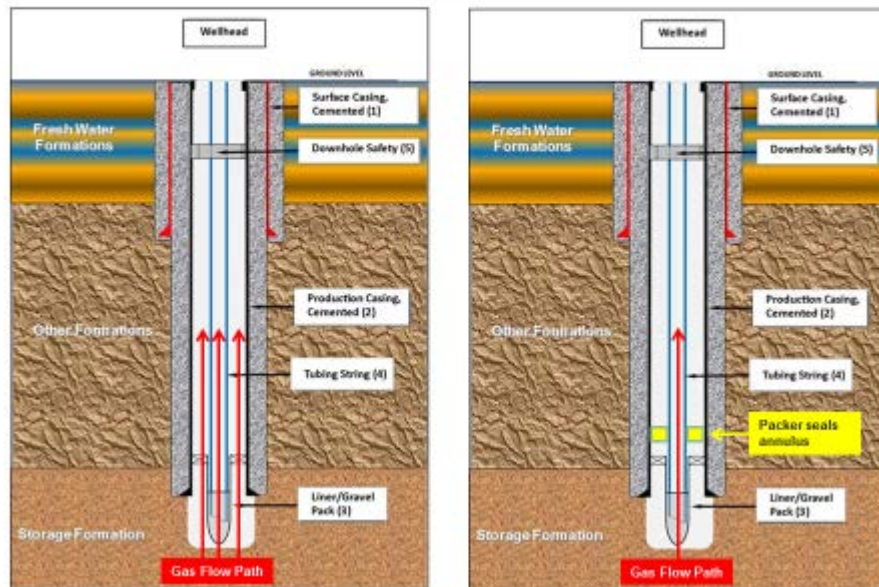
SB 887 stated that “[t]he standards for natural gas storage wells need to be improved in order to reflect 21st century technology, disclose and mitigate any risks associated with those wells, recognize that these facilities may be in locations near population centers, and ensure a disaster like the Aliso Canyon leak does not happen again.” Both SB 887 and the CARB rules on methane leaks will likely result in potential significant changes to gas storage operations in Southern California (and elsewhere in the state).

Further, SB 887 established new safety standards for underground gas storage facilities and more stringent mechanical testing regions. In promulgating regulations related to SB 887, the California Division of Oil, Gas & Geothermal Resources is required to consider enhanced design, construction, and maintenance measures that limit gas pipelines’ use of the outer casings of pipeline facilities for production (referred to as “Tubing and Packer”). This will change the way in which the California-regulated pipelines provide system storage capability and availability. This requirement is likely to have the most impact on gas availability because it restricts the usage of concrete outer casings for injection and withdrawals from storage facilities and requires that extractions be limited to using the inner tubing. It is prudent that the CAISO’s systems be prepared to deal with any limitations that arise from these known upcoming requirements.

The left-hand picture in the diagram below demonstrates capacity on extraction facilities with the concrete casing shown using the three red arrows, which in the right-hand picture is reduced to the tubing alone as demonstrated by the single red arrow.



PG&E Typical Storage Well Gas Flow Without Packer and With Packer



The upcoming requirements will affect all state-regulated storage facilities in California, including those located in Southern California, and are important safety measures to prevent leakages such as those experienced at Aliso Canyon, which will significantly affect gas availability for gas-fired resources in the state.

Attachment D

Analysis of the Use and Impact of the Maximum Gas Constraint in 2018

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019

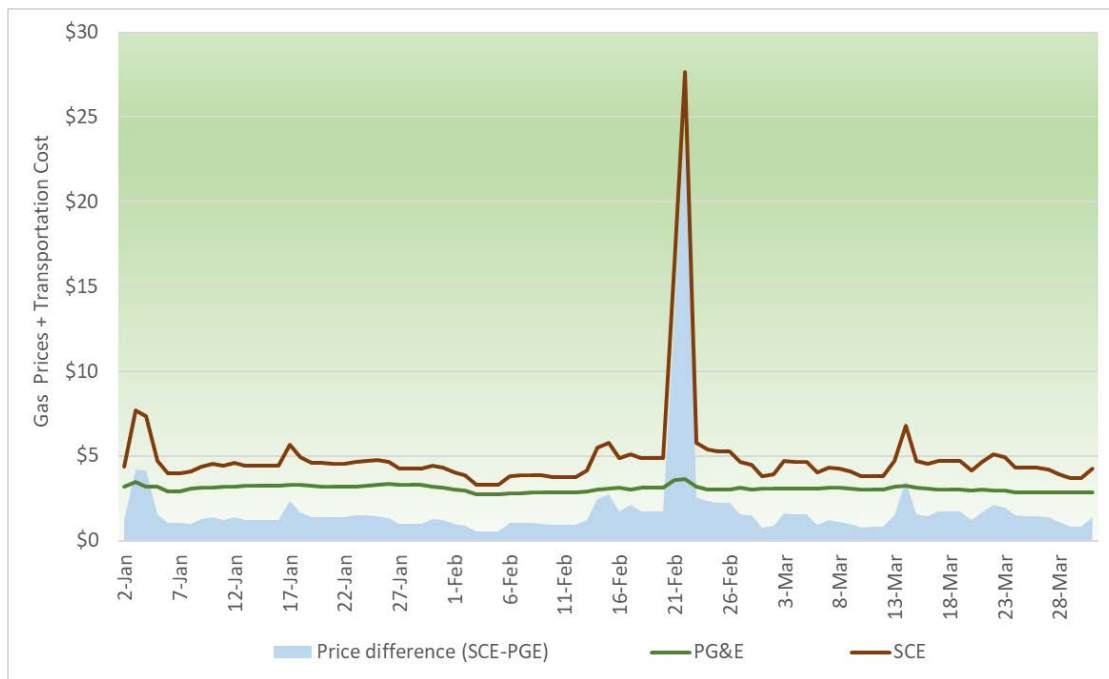
Attachment D

Analysis of the Use and Impact of the Maximum Gas 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, 2018.¹ 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 1 below shows the difference in prices between the northern and southern parts of the CAISO controlled grid.

Figure 1 Gas price trends in the CAISO system



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

¹ Prior to 2018, the gas nomograms were enforced on January 23 to 26, 2017 and August 3 and 4, 2017.

provided metrics on the overall gas conditions impact on day-ahead congestion rents, and the real-time energy and congestion offsets.² 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.

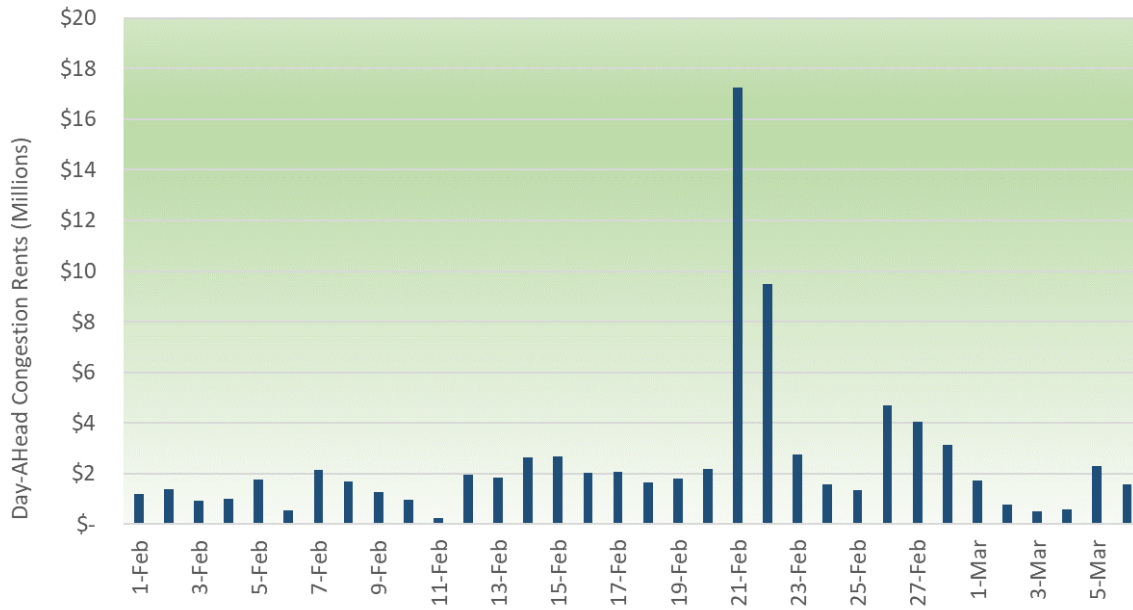
There are three separate factors that contributed to the higher costs. First, although it is not easy to isolate, the enforcement of the constraint will have an overall cost impact when the constraint is binding. Second, naturally higher gas prices, irrespective of whether or not the constraint is enforced 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.³

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

² 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.

³ CAISO *Market Performance Report – July 2018* (Sep. 19, 2018), available at: <http://www.caiso.com/Documents/MarketPerformanceReportforJuly2018.pdf>.

Figure 2 Day-Ahead Congestion Rents



Similarly, as shown in Figures 3 and 4 below, the real-time congestion offset and real-time energy offset fluctuated on those days, February 20 to March 4, 2018, significantly.

Figure 3: Real-Time Congestion Offset

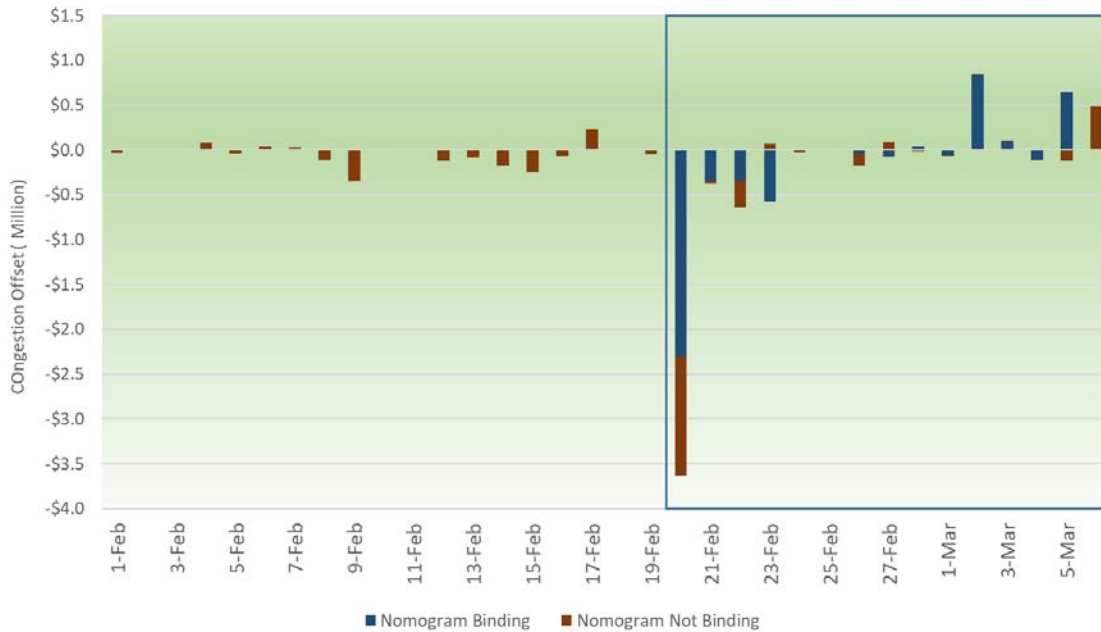
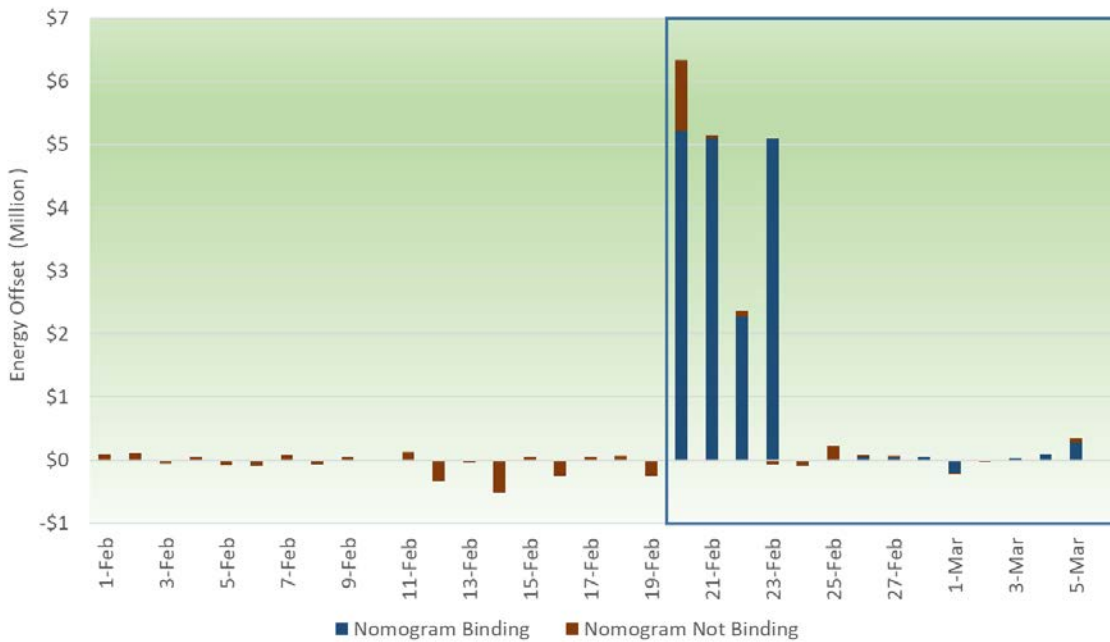


Figure 4: Real-time Energy Offset



Figures 3 and 4 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.⁴

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 the CAISO market incurs, absent the constraint and with similar electric and gas system conditions.

⁴ DMM Q1 2018 Report at p. 50.

Attachment E

Board Memorandum

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019



Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market & Infrastructure Development

Date: July 19, 2017

Re: **Decision on Aliso Canyon gas-electric coordination phase 3 proposal**

This memorandum requires Board action.

EXECUTIVE SUMMARY

As detailed in Management's May and September 2016 memorandums to the Board of Governors, the Aliso Canyon natural gas storage facility in southern California had a large natural gas leak that significantly affected many of the people that live and work in the area as well as the gas balancing tools available to gas system operators. Although the leak has been repaired, use of the storage facility continues to be restricted, greatly limiting the flexibility of the Southern California Gas Company and San Diego Gas and Electric Company systems to serve gas-fired electrical generators in the area. The storage facility is a significant part of the gas system serving customers in the Los Angeles Basin and San Diego, including gas-fired electric generation.

In September 2016, the Board approved extending a coordinated set of operational and market measures to address the continued risks to electrical reliability posed by the continued restrictions on the Aliso Canyon facility. The Board approved these measures that were later approved by the Federal Energy Regulatory Commission to be effective through November 30, 2017.

The loss of the Aliso Canyon storage facility is expected to continue to stress the gas system in southern California. In addition, physical gas limitations can exist throughout the ISO and western energy imbalance market balancing areas. Because of this, Management proposes to make one of these measures, the maximum natural gas burn constraint, a permanent operational tool that can be used throughout the ISO balancing area and balancing areas in the western energy imbalance market. It is a valuable operational tool that enhances electric system reliability by reflecting gas system limitations in the ISO market. Extending to balancing areas in the western energy imbalance market was approved by the EIM Governing Body at their July 13, 2017 meeting subject to approval on the Board's consent agenda.

Management also proposes to extend the other temporary market measures currently in place beyond their current November 30, 2017 expiration date. Management proposes to make permanent the provision to publish two-day-ahead market results. Management proposes that the other temporary measures be further extended and expire once the ISO implements more comprehensive bidding rule changes being developed as part of the ISO's *Commitment Costs and Default Energy Bid* policy initiative.

Moved, that the ISO Board of Governors approves the Aliso Canyon gas electric coordination phase 3 proposal, as described in the memorandum dated July 19, 2017; and

Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposed tariff change.

DISCUSSION AND ANALYSIS

Based on an inter-agency task force study completed this spring, the limitations resulting from the loss of the Aliso Canyon storage facility are expected to continue to stress the gas system in southern California. In addition, physical gas limitations can exist throughout the ISO and western energy imbalance market balancing areas.

Because of this, Management proposes to make the market constraint that limits the maximum gas burn of a group of generators a permanent operational tool that can be used throughout the ISO and EIM balancing areas. Experience over the past year has shown that the ISO's use of this tool has proved prudent and particularly effective.

Because the Aliso Canyon natural gas storage facility is expected to have limited operability for an extended period of time, Management proposes to extend the temporary market measures currently in-place so that they remain in-effect beyond November 30. Management proposes to make permanent the provision to publish two-day-ahead market results. Management proposes to extend the remainder of the temporary market measures until it implements more comprehensive bidding market rule changes it is developing with stakeholders through the *Commitment Costs and Default Energy Bid Enhancements* policy initiative. Management anticipates implementing these changes in fall 2018.

Maximum natural gas burn constraint

The maximum natural gas burn constraint limits the market's dispatch of a group of generators on a constrained part of the gas system so that these generators in aggregate burn no more than a specified gas burn rate. The gas burn constraint is a valuable operational tool used to ensure that electric system dispatches respect gas system operational limits which, if exceeded, could compromise electric system reliability. In coordination with gas system operators, ISO operators enforce the constraint during

conditions for which they are concerned that if gas system limitations are exceeded the electric system reliability could be compromised.

Because of the constraint's importance in ensuring reliability, and because physical gas system limitations may develop elsewhere, Management proposes to make the gas constraint a permanent feature for use throughout the ISO and balancing areas in the EIM. Management believes gas limitations may develop in the ISO balancing area outside of southern California because of California's more stringent requirements for operating gas storage facilities put in place in response to Aliso and new state rules aimed at combatting emissions from methane leaks. Gas limitations also exist in EIM areas because of limited pipeline capacity and limited storage. For example, one EIM Entity has explained to the ISO that it has a group of generators with only a limited share of the physical capacity of the pipeline they are connected to. It must limit its gas burn from this group of generators on days with high demand for gas because the pipeline reserves the capacity for its core non-electric customers.

The maximum natural gas burn constraint offers additional protections to manage gas limitations more efficiently than other tools that include energy bid prices, outages reported to the market systems, and exceptional dispatch in the ISO balancing area or manual dispatch in EIM balancing areas. It can efficiently manage a group of generators' overall dispatch and gas burn. The gas constraint, when binding, limits the dispatch of those generators and affects resource-specific prices used for dispatch and settlement purposes. However, it does not impact the locational marginal price used for other purposes such as settling load or non-gas resources.

The ISO will add additional natural gas burn constraints in coordination with the applicable gas system operator in its balancing area and as requested by EIM balancing area operators (i.e., EIM Entities). The ISO will enforce a natural gas burn when needed to address current or anticipated gas system limitations. The EIM balancing area operator will communicate the maximum gas burn to be enforced and the portion of the gas system it applies to. Acceptable use of the gas constraint will be limited to addressing physical gas system limitations. The EIM balancing authority areas already have the ability to use manual dispatch to manage the gas burn on their system should there be such a need. The maximum gas burn constraint automates and allows the market to optimize what otherwise would be managed by EIM Entities through their existing manual dispatch authority. In the EIM, only participating EIM generators in the affected area will be subject to the constraint. This aspect of the proposal was approved by the EIM Governing Body subject to approval on the Board's consent agenda.

Management also proposes to make permanent two related measures that protect the market when the ISO enforces the maximum gas burn constraint. These measures are the ISO's authority to deem transmission constraints uncompetitive when the gas burn constraint is enforced and to suspend convergence bidding if the constraint adversely impacts market efficiency.

ISO market measures

As discussed above, Management proposes further extending the temporary market measures currently in place that are set to expire on November 30, 2017. This will continue to ensure the ISO market produces prices that reflect gas system limitations so that the risk that ISO dispatch could adversely impact gas operators' efforts to manage reliability is mitigated.

The first of these market measures is to increase the gas cost estimate that is used to calculate the ISO real-time market commitment costs bid cap and default energy bids for generators on the SoCalGas and SDG&E systems. This market measure allows generators' real-time bid prices to better reflect gas system limitations and gas prices. This greater bidding flexibility increases the likelihood that the ISO market will only dispatch these generators for local needs and not for system energy that can be provided by generators not subject to gas limitations in other areas of the electric grid.

This market measure provides for the ISO to increase these gas cost estimates in the real-time market by an amount that is:

- Sufficient to enable the ISO market to dispatch generators on the SoCalGas and SDG&E systems only for local electricity needs and not system electricity needs;
- Accounts for systematic differences between actual day-ahead and same day gas prices that are likely to be more volatile for same day purchases on the constrained gas systems; and
- Needed to improve generators' ability to manage gas company requirements on the constrained systems to limit differences between individual generators' gas schedules and usage (*i.e.*, gas balancing requirements).

The ISO currently scales the gas commodity price used in its commitment cost proxy cost calculations for generators on the SoCalGas and SDG&E systems to 175 percent of the gas index price and scales the gas price used in the default energy bid calculations continues to 125 percent of the gas commodity price. The ISO scales the gas price used in its commitment cost proxy cost calculation more than the gas price used for default energy bid calculations to help avoid commitment of these generators for system needs.

This market measure also provides the ISO with the authority to adjust the scaling of the gas commodity price, up to specified maximum amounts, in the event it is too high or too low based on observed electric and gas market outcomes. The ISO is currently analyzing whether the current scaler levels are appropriate to meet the three objectives listed above and may adjust them based on this analysis.

The second market measure Management proposes to extend, applicable to all gas-fired generators, not just those in the affected area, is to create a gas price index for the day-

ahead market by drawing from the Intercontinental Commodity Exchange, which is an index published between 8:00 a.m. and 9:00 a.m. Pacific Time. This measure improves the gas price information used by the ISO day-ahead market to establish commitment costs bid caps and default energy bids for mitigated energy offers. Without this measure, the day-ahead market would use gas price information based on gas trading occurring the previous day that consequently may not align with gas trading for the majority of the operating day for which the ISO's day-ahead market is being run.

The third market measure Management proposes to extend is to permit market participants to file with Federal Energy Regulatory Commission to recover costs incurred that exceed that exceed a mitigated energy bid. This measure is in addition to a permanent provision that allows them to file to recover costs that exceed commitment cost bid caps.

Management proposes extending these three measures until the ISO implements more comprehensive bidding market rule changes being developed through its *Commitment Costs and Default Energy Bid Enhancements* policy initiative that it anticipates implementing in fall 2018.

Finally, Management proposes to make permanent the provision to make two-day-ahead advisory market results available to scheduling coordinators. Making this advisory information regarding estimates of resources' day-ahead market schedules available to market participants allows them to consider this information in purchasing gas in the next day gas trading, which primarily occurs before ISO day-ahead market results are available.

POSITIONS OF THE PARTIES

With the exception of the ISO Department of Market Monitoring, stakeholders generally support Management's proposal, though some expressed concerns or opposition to specific aspects of the proposal, as discussed below. Arizona Public Service and Puget Sound Energy note that extending the use of the maximum gas burn constraint to EIM balancing areas will be beneficial as it allows the market to recognize gas system constraints in their balancing areas.

The Department of Market Monitoring does not support the ISO continuing to scale the day-ahead gas commodity price used in its commitment cost proxy cost and default energy bid calculations for generators on the SoCalGas and SDG&E systems. The Department of Market Monitoring states it does not support continued scaling of the gas prices because their analysis shows same-day gas prices infrequently rise to levels above the day-ahead gas prices that would justify the current scaling amounts, 175 percent and 125 percent, respectively.

Management understands that the Department of Market Monitoring's opinion is primarily based on the fact that over the past year the system has not often experienced constraints that warrant the use of the scalars. Management does not believe that the lack of such experience should be the criteria for whether or not it continue to have the authority to apply the scalars if conditions so warrant. Because the potential for constrained gas system

operating conditions still exists, Management believes it is important to retain the authority to scale gas prices. This is necessary not only to reflect real-time gas prices, but to also help manage gas usage on the SoCalGas and SDG&E systems by allowing higher bids in those areas so that the market tends to dispatch generators in those areas only for local electricity needs and not system electricity needs.

Consequently, consistent with the criteria currently in effect for use of the scalers described earlier in this memorandum, Management is analyzing what scaling amounts continue to be needed. The analysis will determine whether there is a need to change the scalers going forward, up or down, consistent with this criteria. If warranted by the analysis, Management may lower the scalers to zero if it finds zero meets the criteria. Management has this authority today as reflected in the tariff approved by FERC. Management is only requesting that the Board approve its existing authority to apply and change the scalers beyond November 30, 2017, so that if needed in the future, Management may adjust the scalers up or down based on its analysis and as warranted by changes in gas system conditions. Management does not believe it is appropriate to remove this authority after November 30, 2017, given that the conditions on the gas system continue to be potentially constrained by the reduced usage of the Aliso gas storage facility.

Western Power Trading Forum states it will not support the proposal to extend the use of the maximum gas burn constraint to other areas if the ISO reduces the level of the scalers.

A number of stakeholders have asked the ISO to document the detailed process for using the gas burn constraint in additional areas beyond the SoCalGas and SDG&E systems, including detailing the acceptable limitations to be included in the constraint and the procedures for its implementation. The Department of Market Monitoring states it is concerned the criteria for using the constraint in EIM areas should be further defined and that it does not support extending the use of the maximum burn constraint beyond southern California until Management develops all the implementation details.

Management believes it is appropriate to develop these implementation-level details with stakeholders through its business practice manual change process. This includes developing EIM-specific procedures that will be documented in the EIM business practice manual. Management believes these procedures will be more transparent than other tools currently used to manage gas constraints, which include manual dispatch in EIM balancing areas. Management clarifies that the policy intent is for the constraint to be used for physical limitations consistent with the guidelines previously developed for its use in SoCalGas and SDG&E systems.

The Department of Market Monitoring also states that the ISO should conduct additional analysis of the penalty prices associated with the maximum gas burn constraint nomogram before it expands its use beyond the SoCalGas and SDG&E systems. Management clarifies it is in the process of doing this and will propose changes to these parameters through the business practice manual change process.

Portland General Electric and Environmental Defense Fund emphasized that the broader energy bidding rule changes Management is considering as part of the *Commitment Costs and Default Energy Bid Enhancements* policy initiative should be the priority. NRG opposes extending any of the measures until the ISO implements enhancements resulting from that initiative. Environmental Defense Fund wants the temporary measures to expire by a set date to provide incentive to implement broader bidding rule changes. Management clarifies extending the measures will not affect the planned fall 2018 implementation of the changes being developed in the *Commitment Costs and Default Energy Bid Enhancements* initiative.

Finally, the Department of Market Monitoring believes the ISO should alter the EIM resource sufficiency test to consider gas constraint limitations and to automate fully incorporating the gas constraint into the local market power mitigation process, which currently is a manual process. Management believes the electric supply limitations due to gas constraints are similar to transmission limitations, which are currently not considered by the sufficiency test. Management believes there may be merit to incorporating these types of constraints into the resource sufficiency tests. However, the use of the gas constraint is expected to be very infrequent and only used in times of severe gas system limitations. Management commits to continuing to monitor the impact of the gas constraint, as well as transmission constraints, on the efficacy of the EIM resource sufficiency test. Management will consider modifications to the resource sufficiency test if the impact warrants the additional cost and complexity required to include such constraints in the EIM resource sufficiency test. In addition, Management plans to automate the gas constraint into the local market power mitigation test in fall 2018. In the meantime, it will evaluate the workload associated with the manual process for implementing any new gas constraints and will adjust the implementation schedule accordingly.

CONCLUSION

Management requests Board approval of the proposal discussed above. The gas burn constraint is an important operational tool to ensure that electric system dispatches respect gas system operational limits. The market measures provide important functionality to mitigate the reliability impacts of the limited operability of the Aliso Canyon natural gas storage facility and other similar gas constraint issues.

Attachment F

Aliso Canyon Phase 5 – Maximum Gas Constraint – Presentation, October 7, 2019

Southern California Maximum Gas Constraint Amendment

California Independent System Operator Corporation

October 31, 2019



Aliso Canyon Phase 5

Maximum gas constraint

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October 7, 2019

History

- Summer 2016, ISO initiated stakeholder process to explore mechanisms or tools to support reliability concerns due to limited operability of Aliso Canyon
- Limited operability of Aliso Canyon amplified existing gas management challenges in southern California
 - Design of SoCal gas system
 - Increased net electrical load ramps result in higher instantaneous draw on gas system

Electric system reliability concerns due to limitations of the gas system in southern California

- During stressed conditions, SoCal Gas determines gas limitations or curtailments
 - Avoid further stress on gas system
 - Like the CAISO, SoCal Gas must service demand
- SoCal communicates gas system limitations to CAISO operators
 - If gas system limitations are not captured in the CAISO market, adverse impact to electric system reliability
 - Gas resources are needed for the morning and evening demand ramps

CAISO implemented the maximum gas constraint to manage generator gas consumption in southern California within bounds established by SoCal Gas

- CAISO usage of tool:

Year	#of Days	% of year	% intervals constraint binding
2016	19	5%	0.0%
2017	6	2%	0.5%
2018	14	4%	0.7%
2019**	4	3%	0.05%

- Authority for tool expires December 31, 2019

Propose to make the existing tariff provisions permanent

- Maximum gas constraint
 - Allows coordination between CAISO and SoCal Gas for periods when the gas system is constrained
 - Ensures reliable gas and electric system operations
- Competitive path assessment
 - Allows the CAISO to manually override the dynamic competitive path assessment to determine if transmission constraints are uncompetitive
 - Allows supply limitations to be reflected in market power mitigation process
- Virtual bidding
 - If the maximum gas constraint is causing market inefficiencies, CAISO may suspend virtual bidding

BPM enhancements to maximum gas constraint

- Change calculation of constraint to more accurately capture when electric gas-fired generation is needed
 - Shape constraint to allocate gas usage based on electrical system need

Next steps

- File tariff changes mid-October for January 1, 2020 effective date
- Comments or questions?