September 29, 2017

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. ER17-______-000

Filing to Extend Temporary Measures to Address Limited Operability of Aliso Canyon Facility and to Make Permanent and Modify Other Measures to Address Potential Gas Limitations

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits a tariff amendment[1] that contains two sets of changes to address the effects of natural gas system limitations on the CAISO's system and market operations. The two sets of tariff changes will continue the effectiveness, with some modifications to the second set, of existing interim tariff provisions that address gas system limitations related to the limited operability of the Aliso Canyon gas storage facility (Aliso Canyon) and that will otherwise expire on November 30, 2017.[2]

The CAISO requests that the Commission accept both sets of tariff changes contained in this filing effective November 30, 2017. To ensure that the CAISO and market participants are prepared to transition effectively from the existing rules to the proposed tariff changes on November 30, the CAISO respectfully requests that the Commission issue an order accepting the tariff changes by November 28, 2017. Because this filing will impact how market participants participate in the CAISO markets, this will provide the CAISO and market participants sufficient time to consider any Commission directives in this

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

[2] *See Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,151, at P 25 (2016) (Aliso Phase 2 Order) (accepting, subject to compliance filing, CAISO tariff revisions on a temporary basis to address risks posed by limited operability of Aliso Canyon). As explained below, there have been three Commission proceedings on CAISO tariff amendments to address Aliso Canyon-related issues: the Aliso Phase 1 and Aliso Phase 2 proceedings, which are completed, and the Aliso Phase 3 proceeding initiated by this filing.

proceeding and to transition to the new measures November 30.

The first set of tariff revisions merely extend, with no modifications, certain existing temporary measures that the Commission approved in the Aliso Phase 2 proceeding for an additional 12 months, *i.e.*, until November 30, 2018. Continuing these measures will continue to provide greater bidding flexibility to reflect higher incremental and start-up and minimum load costs due to gas constraints.[3] These include:

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

2) Adjustments to commitment cost caps and default energy bids: This measure enables the CAISO to increase or decrease the gas commodity price index used to calculate commitment costs and default energy bids (DEBs) for resources in the Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E) gas regions by applying commodity price scalars, for purposes of distinguishing resources affected by the gas limitations from resources in the rest of the CAISO market areas. The CAISO applies the scalars to the next-day gas index published the morning of the day-ahead market run to calculate cost estimates.

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

The CAISO proposes to retain the existing temporary measures reflected in the first set of tariff changes only for an additional 12 months because it expects to file a tariff amendment with the Commission in 2018, pursuant to a separate, ongoing stakeholder initiative, that will contain more permanent solutions to provide market participants greater flexibility to reflect their gas-related costs in the CAISO markets. However, if the CAISO is unable to implement the permanent solutions by November 30, 2018, it will make any necessary filings with the Commission seeking necessary appropriate relief prior to that time.

[3] For all tariff changes in this filing that include no proposed modifications, the tariff changes do not include proposed revisions to the text of the tariff language but instead consist solely of the new requested effective date of November 30, 2017, which will prevent the tariff language from reverting on November 30, 2017 to how it read before that scheduled expiration date.

The second set of tariff revisions also reflect measures the Commission approved in the Aliso Phase 2 proceeding on a temporary basis to address the limited use of Aliso Canyon. The CAISO now proposes to adopt these measures on a permanent basis with some modifications and apply them to its entire market footprint. These include:

1) Maximum gas constraint: This measure enables the CAISO to enforce a constraint, which the CAISO now proposes to apply in all parts of the CAISO market footprint, that limits the maximum gas burn in affected areas in order to (a) better ensure that market dispatches are consistent with observed gas system limitations, (b) reflect these restrictions on market clearing prices, and (c) avoid further stressing the gas system, which could in turn adversely affect electric grid reliability. The gas constraints are a better tool for limiting the gas burn when the gas systems are experiencing constraints than manual exceptional dispatches, which the CAISO and other balancing authorities in the western energy imbalance market (EIM) would otherwise have to rely on, absent the ability to use such a constraint.

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 employ its market power mitigation tools in constrained areas to avoid the exercise of market power.

3) Virtual bidding: When and where 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.

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

In preparing these two sets of tariff changes, the CAISO took into account the input provided in the stakeholder process, including input given by the CAISO Department of Market Monitoring (DMM).

Experience over the past year and a half provides valuable information to the CAISO as to what the markets need to reflect better gas system limitations in electric system operations. For example, the maximum gas constraint has proven to be a useful and discrete tool that balancing authority areas can use to reflect the interactions of gas limitations in the electric market optimization. Therefore, the CAISO proposes to adopt that measure on a permanent basis and throughout its entire system. Further, the CAISO is in the process of developing permanent bidding rules to address the limitations it is temporarily addressing using the first set of tariff changes. Given the limitations of the current market rules and the expectation that access to Aliso Canyon will continue to have limited operability, the measures proposed herein are just and reasonable to address gas system limitations the CAISO expects to experience after November 30, 2017.[4]

I. Background and Need for Filing

A. Applicable CAISO Market Provisions and Existing Tariff Authority

1. Overview of CAISO Market Structure and Operation

The CAISO administers both day-ahead and real-time wholesale electricity markets. A primary objective of these interrelated markets is to ensure there is a sufficient supply of electricity to satisfy demand in the region while maintaining the reliability of the transmission system the CAISO operates (*i.e.*, the CAISO controlled grid). These markets simultaneously optimize the procurement of energy and ancillary services and allocate transmission capacity on the CAISO controlled grid based on locational marginal prices (LMPs) at both internal nodes (*i.e.*, locations within the CAISO balancing authority area) and the interties (*i.e.*, locations for imports to and exports from the CAISO balancing authority area).[5] The tariff sets forth rules for the submission of bids and self-

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

5 Existing tariff section 27, *et seq.* For the sake of clarity, this transmittal letter distinguishes among existing tariff provisions (*i.e.*, provisions in the current CAISO tariff that apply absent the effectiveness of the temporary measures approved in the Aliso Phase 1 and Phase 2 proceedings), proposed tariff provisions (*i.e.*, new provisions that the CAISO proposes to add to the tariff in this filing, which, except as explained below, are all either identical or very similar to proposed tariff provisions approved in the Aliso Phase 1 and Phase 2 proceedings), revised tariff provisions (*i.e.*, existing tariff provisions that the CAISO proposes to revise in this filing, which are all either identical or very similar to revised tariff provisions approved in the Aliso Phase 1 and Phase 2 proceedings), and deleted tariff provisions (*i.e.*, existing tariff provisions that the CAISO

schedules for all the CAISO markets.[6]

The CAISO operates its markets using a market software system that utilizes various information. This information includes transmission constraints that the CAISO enforces consistent with good utility practice to ensure, to the extent possible, that the market model used in each CAISO market reflects all the factors that contribute to actual real-time flows on the CAISO controlled grid and that the CAISO market results align better with actual physical conditions on that grid.[7] 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.[8] The CAISO has the authority to suspend or limit virtual bidding activities that can detrimentally affect system reliability or grid operations.[9]

The existing tariff includes local market power mitigation procedures to enable the CAISO to mitigate the market effects of any conduct that would substantially distort competitive outcomes in the CAISO markets.[10] The local market power mitigation procedures include calculating default energy bids and running an automated process for determining whether transmission constraints are competitive or non-competitive.[11]

2. Commitment and Compensation of Generating Resources

Pursuant to its tariff, the CAISO optimizes economic commitment and dispatch of generating resources in the markets it operates based on resources' market bids and commitment costs, default energy bids, and generated bids. The tariff also guarantees recovery of commitment costs and default energy bid costs for CAISO-committed resources through the bid cost recovery mechanism.

a. Commitment Costs

In the day-ahead market, (*i.e.*, the integrated forward market (IFM) and the residual unit commitment (RUC) process), the CAISO commits long-start units

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proposes to delete in this filing)., which are the same tariff provisions whose deletion the Commission also approved in the Aliso Phase 1 and Phase 2 proceedings).

6 Existing tariff section 30, *et seq.*

7 Existing tariff section 27.5.6.

8 Existing tariff section 30.9.

9 Existing tariff section 7.9.

10 Existing tariff section 39, *et seq.*

11 Existing tariff section 39.7, *et seq.* The calculation of default energy bids is further discussed below in section I.A(2)(b) of this transmittal letter.

through the IFM and RUC and publishes a financially binding day-ahead schedule for IFM awards. The costs the market considers when making commitment decisions consist of the costs of starting up resources (start-up costs), the costs of running resources at their minimum operating levels (minimum load costs),[12] and transition costs for resources that can operate in different configurations.[13]

To the extent resources do not recover their start-up costs, minimum load costs, and transition costs through the market, resources recover them through the bid cost recovery process based on the sum of cost components specified in the tariff that reflect the resources' unit-specific performance parameters relative to their market revenues for those cost components.[14] For natural gas-fired resources, one of these cost components is a formulaic value adjusted for fuel-cost variation on a daily basis using a natural gas price calculated as discussed below.[15] Gas-fired and non-gas-fired resources can also submit daily bids for their start-up costs, minimum load costs, and transition costs that are between zero and a cap of 125 percent of the calculated proxy cost (the bid cap).[16]

The CAISO normally uses a natural gas price index to estimate the formulaic natural gas cost values for a gas-fired resource subject to the proxy cost methodology.[17] Absent the effectiveness of tariff revisions accepted on a temporary basis in the Aliso Phase 1 and Phase 2 proceedings as discussed below, the CAISO calculates the gas price index between 7:00 p.m. and 10:00 p.m. Pacific time using up to four (but at least two) natural gas commodity prices published that day from the following sources: Natural Gas Intelligence (NGI), SNL Energy/BTU's Daily Gas Wire (SNL), Platt's Gas Daily, and the Intercontinental Exchange (ICE).[18] The CAISO uses this gas price index in the day-ahead market run for the following trading day. The same gas price index forms the basis of the commitment costs used in the next day's real-time market.

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[12] *See* existing tariff section 31.3; tariff appendix A, existing definitions of "Start-Up Cost" and "Minimum Load Costs".

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

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

[15] Existing tariff section 30.4.1.1.1(a).

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

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

[18] All times listed in this transmittal letter are Pacific time.

In market situations involving a spike in gas commodity prices, however, the CAISO uses a more recent gas price. Specifically, if a daily gas price reported by ICE on the morning of the day-ahead market run exceeds 125 percent of the gas price index calculated for the day-ahead market between 7:00 p.m. and 10:00 p.m. on the preceding day, the CAISO will utilize the daily gas price reported by ICE on the morning that the day-ahead market is running in all CAISO cost formulas and market processes for the day-ahead market running that day.[19] The CAISO adopted this procedure based in part on the fact that prior to this spring, ICE usually published gas commodity prices by 10:00 a.m., which is the time when the CAISO's day-ahead market closes. Effective April 1, 2016, however, ICE changed its publication time to 11:30 a.m., *i.e.*, after the CAISO day-ahead market closes.

b. Default Energy Bids under the Variable Cost Option

The CAISO uses default energy bids to mitigate bids of resources subject to local market power mitigation.[20] When a resource's bid is mitigated, the CAISO systems substitute the default energy bid for the resource's bid in the market clearing process and use the default energy bid to determine the resource's bid cost recovery compensation.[21] Default energy bids also factor into the settlement of residual imbalance energy and exceptional dispatches in some circumstances.[22] The default energy bid allows the resource to recover its marginal cost of producing energy.[23]

Each scheduling coordinator can choose one of the following three options as its preferred option for calculating default energy bids: (1) the variable cost option; (2) the negotiated rate option; or (3) the locational marginal price option.[24] For a gas-fired resource subject to the variable cost option, that option calculates the default energy bid based on incremental fuel costs, which are determined using the same tariff provisions that are used to determine the gas price under the proxy cost methodology as described above. All default energy bids under the variable cost option include an adder of 10 percent to the CAISO's calculation

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

[20] *See* existing tariff section 39.7.1, *et seq.*

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

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

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

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

of costs based on the gas price indices.[25]

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

c. Generated Bids

The CAISO generates cost-based bids when a scheduling coordinator does not submit a bid for a resource that is subject to a must-offer requirement, such as a resource adequacy resource, or pursuant to the generally applicable scheduling and infrastructure bidding rules as set forth in the CAISO tariff and the business practice manual.[26] As with start-up costs, minimum load costs, transition costs, and default energy bids under the variable cost option, the CAISO determines gas costs for generated bids of gas-fired resources using the gas pricing provisions described above. Like default energy bids under the variable cost option, generated bids include an adder of 10 percent.

d. Bid Cost Recovery Process

The CAISO guarantees recovery of start-up costs, minimum load costs, transition costs, and energy bid costs for resources committed by the CAISO through the bid cost recovery mechanism set forth in its tariff.[27] To the extent a resource's market revenues based on locational marginal prices are insufficient for the resource to recover such costs, the CAISO will pay the resource uplift to ensure that it recovers its costs.

B. Natural Gas Leak at Aliso Canyon

Please refer to section I of attachment C to this filing for background information regarding the natural gas leak at Aliso Canyon and the implications thereof, including the risk posed to the reliability of electric service.

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

The CAISO filed two successive tariff amendments, in the Phase 1 Aliso proceeding and later the Phase 2 Aliso proceeding, to incorporate interim measures to address reliability issues that could arise due to the limited

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

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

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

operability of Aliso Canyon.[28] The Commission approved the first set interim measures in the Aliso Phase 1 proceeding for a period of approximately five months (*i.e.*, until November 30, 2016)[29] and the second set, which was largely the same as the first, in the Aliso Phase 2 proceeding for an additional 12 months (*i.e.*, until November 30, 2017).[30] Please refer to attachment C to this filing for background information, in addition to the information provided below, regarding the Aliso Phase 1 and 2 proceedings. The discussion below describes the seven measures approved in the Aliso Phase 1 and 2 proceedings that the CAISO proposes to maintain, on either a temporary or a permanent basis and with some modifications, in this filing.

1. Aliso Phase 1 Proceeding

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

1) <u>Day-ahead market gas index</u>: The Commission found the CAISO's proposed tariff revisions to implement an enhanced gas price index used to calculate commitment costs, default energy bids, and generated bids in the day-ahead market to be "just and reasonable because they constitute appropriate improvements upon CAISO's current tariff provisions that should enable CAISO to address limitations in the natural gas delivery system in southern California and facilitate fuel cost recovery by generators."[31]

2) <u>Adjustments to commitment cost caps and default energy bids</u>: The Commission accepted the CAISO's proposed tariff provisions to increase (or decrease) as needed the gas price that is used to calculate commitment costs and generated and default energy bids

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

[29] *See Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,224 (2016) (Aliso Phase 1 Order); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,135 (2016) (accepting filing submitted by CAISO to comply with directives in Aliso Phase 1 Order and granting CAISO motion for clarification regarding that Order); *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,093 (2016) (granting CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions accepted in Aliso Phase 1 Order); *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,029 (2016) (granting subsequent CAISO petition for limited tariff waiver to modify effective date of certain tariff revisions accepted in Aliso Phase 1 Order); Commission Letter Order, *Cal. Indep. Sys. Operator Corp.*, Docket No. ER16-1649-006 (Feb. 24, 2017) (accepting eTariff changes to reflect actual effective date of certain tariff revisions accepted in Aliso Phase 1 Order).

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

[31] Aliso Phase 1 Order at P 12 & n.13.

for gas-fired resources served by the SoCalGas and SDG&E gas systems. The Commission found that the "CAISO has devised a system to increase or decrease the price of gas a generator may include as part of its bid as a means to allow these resources to manage gas balancing requirements under the tightened balancing tolerance bands," and that "the proposed reform should improve a generator's ability to recover fuel costs during this interim period of potential volatility."[32]

3) After-the-fact cost recovery: The Commission accepted the CAISO's proposed procedures for filings seeking after-the-fact recovery of incremental fuel costs associated with default energy bids under the variable cost option and with generated bids. The Commission found that "because of the uncertainty and potential price volatility introduced into the market due to the limited operability of Aliso Canyon, there remains the possibility that fuel costs may exceed the amounts recoverable under CAISO's normal cost recovery provisions."[33] Although the Commission noted that "after-the-fact cost recovery cannot be a substitute for properly functioning markets," the Commission explained that "given the situation facing CAISO and the need to ensure reliable operation of the grid at just and reasonable rates, we find reasonable the interim solution to improving a scheduling coordinator's ability to recover fuel costs."[34]

4) Maximum gas constraint: The Commission conditionally accepted the CAISO's proposal to institute a maximum natural gas constraint in its market solution to reflect gas limitations under certain conditions. The Commission found that this proposal "is a reasonable measure to ensure the reliable operation of the electric grid within the bounds necessarily imposed on it by the operation of the natural gas system, which is outside of CAISO's control."[35] The Commission "agree[d] with CAISO that these measures are necessary because electric reliability could be compromised if market inputs do not accurately reflect gas system constraints," and found that the CAISO's "proposed method of using generator

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32 *Id.* at P 29.

33 *Id.* at P 91.

34 *Id.* at P 92. *See also id.* at P 104. As discussed below in this section of the transmittal letter, the Commission also accepted procedures proposed by the CAISO that allow filings seeking after-the-fact recovery of fuel-related commitment costs.

35 *Id.* at P 48. The Commission also accepted the CAISO's proposal to implement a minimum natural gas constraint (*see id.*), but the CAISO eliminated the minimum gas constraint in the Aliso Phase 2 proceeding.

nomograms with a penalty factor is an appropriate interim means to achieve this goal."[36]

5) Competitive path assessment: In conjunction with the CAISO's proposal to enforce the gas constraint, the Commission also accepted the CAISO's proposed tariff provisions allowing it to designate a transmission constraint as non-competitive when necessary based on actual system conditions. The Commission found that "CAISO has provided sufficient justification for this measure because, as CAISO explains, actual electric supply conditions may be non-competitive when the natural gas constraint is enforced due to anticipated electric supply conditions in the SoCalGas and SDG&E gas regions."[37] In this regard, the Commission agreed with DMM's analysis finding that "the impact of the natural gas constraint on the assessment of competitive paths can only be assessed based on actual system conditions once the constraint is in place."[38]

6) Virtual bidding: The Commission accepted the CAISO's proposed tariff provisions authorizing the CAISO to suspend virtual bidding when and if it determines that such trading runs counter to market economic efficiency. The Commission found that "during the interim period, with the limited operability of Aliso Canyon and the operational steps that CAISO may undertake to address electric and gas reliability, there may be times when promoting price convergence may run contrary to the efficient economic solution of the market."[39] The Commission also stated that there may be "sustained differences in prices between locations and between day-ahead and real-time markets that could be exploited by virtual bidders without yielding any market benefits."[40] Further, the Commission explained that "[g]iven the uncertainty surrounding the extent to which CAISO may have to use internal transfer capability or enforce the gas constraint to address threats to reliability, or the impact that these actions will have on market outcomes, we find that CAISO has demonstrated a potential need for limited intervention in market outcomes to ensure these measures achieve their stated objectives."[41]

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[36] *Id.*

[37] *Id.* at P 52.

[38] *Id.*

[39] *Id.* at P 80.

[40] *Id.*

[41] *Id.* at P 83.

7) Pre-day-ahead information: The Commission accepted the CAISO's proposal to provide scheduling coordinators with advisory day-ahead commitment schedules produced in the residual unit commitment process on a two-day-ahead basis. The Commission found this advisory information "can help scheduling coordinators make more informed gas procurement decisions and more closely match their gas procurement with their potential gas consumption by nominating an amount of gas to match their expected generation output for each hour."[42] The Commission stated that the information can thereby "help reduce gas and electric reliability risks associated with imbalances between the amount of gas that electric generators nominate and the amount of gas that they burn."[43] The Commission concluded that the CAISO's proposal was "just and reasonable and not unduly discriminatory in the interim period when there is uncertainty about the operation of Aliso Canyon and the associated impact on gas and electric system reliability."[44]

2. Aliso Phase 2 Proceeding

In the Aliso Phase 2 proceeding, the CAISO proposed to extend for 12 additional months, with some modifications, the previously approved measures listed above.[45] The Commission accepted the CAISO's proposal and explained that "continuation of the interim measures for an additional year should improve scheduling coordinators' ability to manage their gas procurement and enhance their ability to recover gas procurement costs, while also providing CAISO with flexible tools to maintain reliability and avoid adverse market outcomes related to

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42 *Id.* at P 16.

43 *Id.*

44 *Id.* In addition to the tariff revisions to implement the seven measures listed above, the Commission accepted in the Aliso Phase 1 proceeding tariff revisions to reserve internal transmission transfer capability based upon anticipated conditions on the natural gas delivery system and to impose associated limitations on congestion revenue rights (*id.* at P 63), but the CAISO eliminated those measures in the Aliso Phase 2 proceeding. In the Aliso Phase 1 proceeding, the Commission also accepted tariff revisions to: (1) allow scheduling coordinators to seek after-the-fact recovery of unrecovered commitment costs that exceed the commitment cost bid cap as a result of actual marginal fuel procurement costs pursuant to an FPA section 205 filing submitted to the Commission; (2) allow resources to rebid commitment costs in the real-time market if they were not committed in the day-ahead market; and (3) ensure the short-term unit commitment process does not commit resources that did not submit bids into the real-time market unless they were scheduled or committed in the day-ahead or had a real-time must-offer obligation. *See id.* at PP 12, 91 & n.13. The CAISO later filed and the Commission accepted tariff revisions to make those three sets of tariff revisions effective on a permanent basis. *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,138 (2016).

45 The footnotes in the discussion above address the measures the CAISO did not propose to maintain in the Aliso Phase 2 proceeding.

the limited operability of Aliso Canyon."[46] The Commission also stated that it expected the CAISO to honor a commitment it had made in the proceeding to "consider other types of longer-term market enhancements" in its stakeholder process.[47]

D. Assessment of the Need to Address Continuing Concerns Related to the Limited Operability of Aliso Canyon

The limited operability of Aliso Canyon, which prompted the measures proposed and accepted in the Aliso Phase 1 and Phase 2 proceedings, still presents challenges today and will continue to do so into the foreseeable future. The Aliso Canyon Technical Assessment Group, whose member include technical experts from the California Public Utilities Commission (CPUC), California Energy Commission, CAISO, and Los Angeles Department of Water and Power (LADWP), has been periodically assessing Aliso Canyon's role in electric reliability in the greater Los Angeles area, resulting in the Technical Assessment Group's issuance of a number of Assessment Reports since the limited operability of Aliso Canyon began. The details of the report most relevant to this filing – the 2017 Risk Assessment Report – are described in section I.B of attachment C hereto.

To summarize the discussion in attachment C, the 2017 Risk Assessment Report calculated the system capacity of the SoCalGas/SDG&E gas transmission system, based on peak hour(s) supportable demand, and determined the ability for the electric balancing authorities to maintain power system reliability during a 1-in-10-year peak summer electric load. The 2017 Risk Assessment Report found that the CAISO and the LADWP's ability to meet the 1-in-10-year peak summer electric load was dependent on the amount of SoCalGas/SDG&E's system receipt point utilization and withdrawal capability from storage facilities other than Aliso Canyon.

Based on the gas system capacity of 3.373 billion cubic feet per day (Bcfd), 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 and CAISO joint 2017 power-flow study found that there was sufficient gas to meet the minimum electric reliability requirement. However, this assumed there is sufficient energy supply outside Southern California and sufficient electric transmission import capability into Southern California. LADWP and the CAISO further concluded that, as with the summer of

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[46] Aliso Phase 2 Order at P 26. The Commission also found that the "CAISO's proposal to augment its after-the-fact cost recovery tariff provisions [in the Aliso Phase 2 proceeding] is just and reasonable as a backstop cost recovery measure given the uncertainty and potential price volatility introduced into the market by the limited operability of Aliso Canyon." *Id.*

[47] *Id.* at P 29.

2016, during peak summer load conditions and historical electric transmission utilization patterns, incremental gas-fired generation could have been required to meet electric reliability. If gas supply was insufficient to meet the increased gas demand and there was no access to replacement energy, Southern California might require emergency assistance from neighboring balancing authorities, and the balancing authorities may have to shed load in the Southern California region.

The analysis assessed the minimum generation needed to maintain reliability and minimize gas burns. However, the solution did not reflect the least-cost dispatch for meeting 1-in-10-year peak summer load. In that regard, the CAISO maintains electric reliability based on least-cost generation resources to meet forecasted load for that day. Economic operation of the generation assets could 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.

Moreover, if transmission import capability decreases or demand response resources are limited, the electricity system needs more gas to avoid service interruptions. If storage withdrawal or flowing gas supplies also drop, the electricity system will be at risk.

E. Stakeholder Process Culminating in this Aliso Phase 3 Proceeding

Based on the findings in the 2017 Risk Assessment Report and the expectation that Aliso Canyon will not be fully operational for an undetermined amount of time, the CAISO determined that it must retain the seven measures listed above in order to continue to provide its market sufficient flexibility to avoid exacerbating gas and electric system reliability risks after November 30, 2017. Therefore, the CAISO established the stakeholder process that culminated in the submittal of this filing to initiate the Aliso Phase 3 proceeding.[48]

As detailed in the next section of this transmittal letter, the CAISO and stakeholders concluded that some of the measures should be extended on a temporary basis for an additional 12 months and that the balance of the measures should be made permanent with some modifications. The measures to be extended temporarily will later be superseded on a permanent basis by changes being developed in the CAISO's separate Commitment Cost and Default Energy Bid Enhancements (CCDEBE) initiative, whose purpose is to

[48] Details regarding the stakeholder process are provided in section III of attachment C to this filing. The materials coming out of the stakeholder process included a Draft Final Proposal and a memorandum to the CAISO Board of Governors (Board Memorandum), which are provided in attachments D and E, respectively, to this filing.

evaluate long-term market solutions for bid cost modeling of gas-fired resources, market mechanisms to improve market efficiency and support sufficient cost recovery, and coordination between the electric and gas markets.[49] The CCDEBE enhancements are currently planned to go into effect as of fall 2018, *i.e.*, before the 12-month temporary extension period ends.

Stakeholders generally agreed with the proposals, as developed in the stakeholder process, for extending some of the measures temporarily and making the balance of the measures permanent. Specific issues raised by stakeholders and the CAISO's responses are discussed below.

II. Proposed Tariff Revisions

As discussed below, the CAISO's proposes to maintain on a temporary basis three of the seven measures approved in the Aliso Phase 1 and Phase 2 proceedings and to make permanent the other four measures with some modifications. Doing so will ensure the CAISO can continue to manage its system reliably when faced with gas constraints such as those imposed by the limited operability of Aliso Canyon.

Specifically, the CAISO proposes two sets of tariff changes. The first set consists of measures the CAISO proposes to extend for an additional 12 months that provide market participants greater flexibility to reflect the higher incremental and start-up and minimum load costs due to gas constraints. The CAISO only requires the continued effectiveness of these provisions temporarily until the CAISO implements more permanent measures that arise from the CAISO's separate CCDEBE stakeholder initiative. The CAISO believes that the CCDEBE initiative is the appropriate forum for proposing more permanent solutions to enhance its cost-based framework to reflect the need to balance gas-electric system requirements in a manner that supports system reliability. The CAISO plans to file a tariff amendment in 2018 to implement the CCDEBE enhancements in fall 2018. Consequently, the CAISO proposes to extend the specified temporary measures until it implements the permanent CCDEBE solutions.

The second set of tariff revisions the CAISO proposes make permanent, with some modifications, measures that allow the CAISO to operate the system reliability when faced with natural gas system constraints anywhere in its markets. Perhaps most significantly, the CAISO proposes to make permanent the authority to adopt a market constraint limiting the maximum gas burn of a group of generators in any part of the CAISO and EIM entity balancing authority

49 Materials related to the CCDEBE stakeholder initiative are available at http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts_DefaultEnergyBidEnhancements.aspx.

areas. The CAISO's experience over the past year has shown that prudent use of this tool in its current form has proven particularly effective in avoiding negative impacts on electric reliability.

The CAISO discusses the reasons for extending some of the measures temporarily and implementing the balance of the measures on a permanent basis in detail below.

A. Extend Existing Interim Market Measures for an Additional 12 Months

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

The CAISO proposes to maintain for another 12 months existing interim tariff provisions that the Commission accepted in the Aliso Phase 2 proceeding to improve the accuracy of the gas commodity price indices the CAISO uses to calculate commitment cost proxy costs, generated bids, and default energy bids used by the day-ahead market, by reflecting the most recent gas commodity price information. Using information that more accurately reflects prevailing gas commodity costs enhances the day-ahead market's ability to dispatch resources efficiently. This provision also ensures that resources cleared in the day-ahead market will be compensated based on fuel prices that reflect better their actual costs of procurement.[50] Maintaining the interim tariff provisions will particularly help reflecting constrained gas conditions that result from the limited operability of Aliso Canyon. However, consistent with the existing interim tariff provisions, these provisions will continue to apply to all resources in the CAISO balancing authority area so the day-ahead market uses consistent and more accurate gas prices system-wide.

Specifically, the CAISO proposes to maintain the tariff provisions stating that, for the day-ahead market, the CAISO will use a volume-weighted average price reported between 8:00 a.m. and 9:00 a.m. that ICE calculates based on trades transacted on ICE during its next-day trading window, *i.e.*, on the morning of the CAISO's day-ahead market.[51] If, for any reason, the volume-weighted average price is not available from ICE during this period, the CAISO will use the

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

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

most recently calculated price indices.[52] For example, if the CAISO cannot obtain price data on a particular day, it will use the prior evening's price index.

The Commission previously found that this procedure constituted a just and reasonable improvement upon the CAISO's existing tariff provisions that should enable the CAISO to address limitations in the natural gas delivery system in Southern California and to facilitate fuel cost recovery by generators.[53] Maintaining the tariff provisions will allow them to continue serving these purposes.

The Commission previously accepted "CAISO's proposal to use an ICE-generated index" in implementing its proposed tariff revisions to improve the accuracy of the natural gas price index the CAISO uses to calculate commitment costs, generated bids, and default energy bids in the day-ahead market.[54] This filing permits the CAISO to continue calculating these amounts using a volume-weighted average gas price that is reported by ICE between 8:00 a.m. and 9:00 a.m., *i.e.*, prior to the running of the CAISO's day-ahead market.

The procedure set forth in the proposed tariff provisions revises and replaces the CAISO's day-ahead procedure that would apply in the absence of the procedure approved in the Aliso Phase 1 and Phase 2 proceedings that the CAISO now proposes to extend. The former (*i.e.*, pre-Aliso Phase 1 and Phase 2) procedure would require the CAISO to calculate its day-ahead gas price index two days prior to the applicable trading day using at least two or more of the following publications: NGI, SNL, Platt's Gas Daily, and ICE.[55] The market data from the summer of 2016 shown in Figure 1 below supports continuing to use the revised procedure, which improves upon the former procedure. In Figure 1, the CAISO calculated the premium needed to reflect the highest traded price relative to the next-day index used by the day-ahead market and by the real-time

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

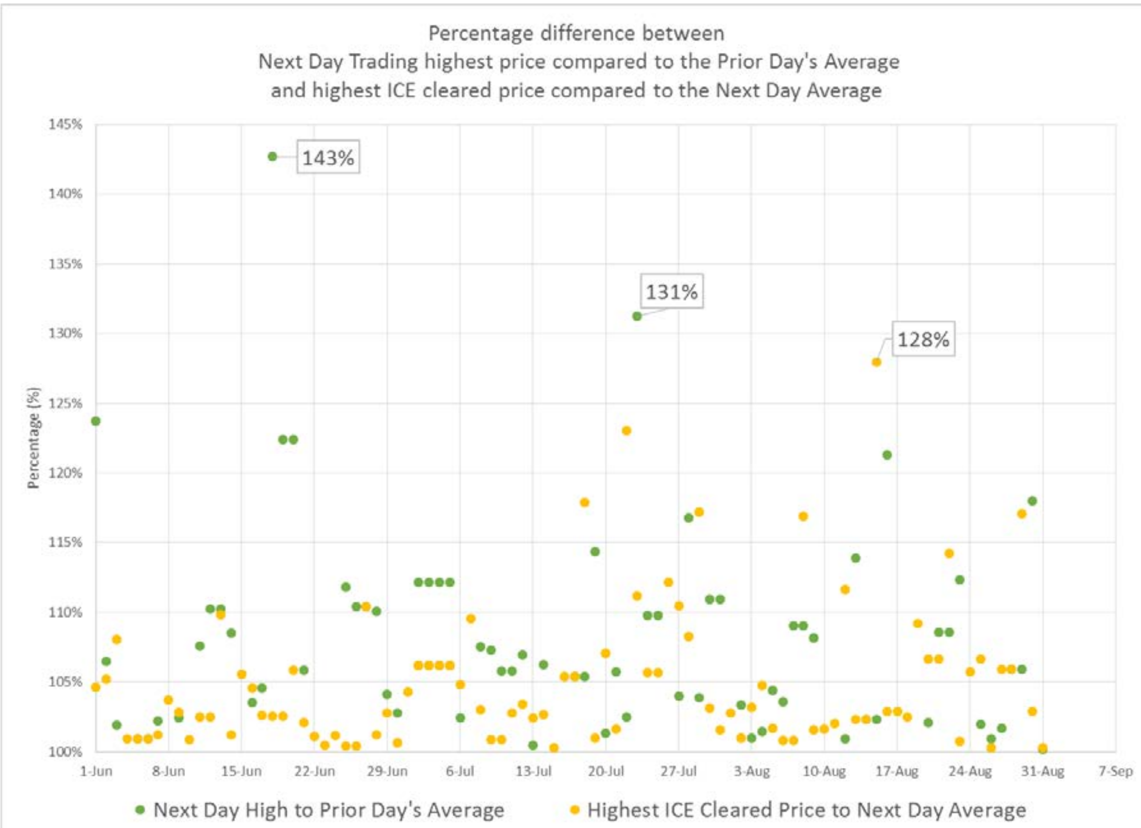
[53] Aliso Phase 1 Order at P 12 & n.13.

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

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

market.[56] For the day-ahead market, the CAISO calculated the percent difference between (i) the highest prices for trades on or reported by NGI, SNL, or ICE and (ii) ICE's next-day gas price index published for the following day (depicted as green circles). For the real-time market, the CAISO calculated the percent difference between (i) the highest prices traded on ICE and (ii) ICE's next-day gas index published on the morning of the day-ahead market (depicted as yellow dots).

Figure 1



As shown in Figure 1, of the 92 days from June through August of 2016, there were 19 days where the highest traded gas price was more than 110 percent higher than the next-day gas index price published the day prior to the CAISO's day-ahead market. If the proposed revised procedure had been in effect, such price increases would have occurred on only 12 of the days. Using the revised procedure will substantially improve resources' ability to reflect their actual costs in default energy bids under the variable cost option and generated bids, which equal 110 percent of such costs (including the 10-percent adder set

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

forth in the tariff).[57] Also, from June through August, there were two days (June 18 and July 23) on which the highest traded price was more than 125 percent higher than the next-day gas index price published the day prior to the day-ahead market. This means the CAISO's commitment cost cap (equal to 125 percent of calculated costs) would not have accounted for the highest traded price without the CAISO's manual gas price spike procedure. If the proposed revised procedure had been in effect, however, the CAISO's 125 percent commitment cost cap would have accounted for the highest traded price in all days during this time period.

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

DMM's comments submitted to the Aliso Phase 2 stakeholder process supported this change and recommended that the CAISO permanently include in its tariff a feature to eliminate the current one-day lag in gas prices used in the day-ahead market. Although the CAISO agrees that this change is an improvement over the CAISO existing process, in this filing, the CAISO proposes to include such a measure in the tariff only for the next 12 months. The CAISO expects to develop various means of determining the gas costs used in the day-ahead market as part of the ongoing CCDEBE stakeholder initiative. The CAISO will consider whether this measure is still necessary beyond November 30, 2018, in conjunction with the additional measures to be considered in the CCDEBE stakeholder process, and will propose any further tariff changes at the conclusion of that process.

As was previously the case, continuing to use the interim procedure will also obviate the need for the CAISO to retain the manual gas price spike procedure it employed under the former procedure, which authorizes the CAISO, when a gas price spike occurred, to calculate gas price indices for gas-fired resources manually using a daily gas price reported by ICE on the morning of the day-ahead market run.[58] The CAISO adopted this procedure based, in part, because ICE's morning publication time (almost always 10:00 a.m.) coincided with the timing of the CAISO's day-ahead market, which normally closes at 10:00

[57] See sections I.A(2)(b)-I.A(2)(c) of this transmittal letter.

[58] *See* tariff section 39.7.1.1.1.3(b) as deleted in the Aliso Phase 2 proceeding and in this filing.

a.m. and issues its results by 1:00 p.m.[59]

As of April 1, 2016, however, ICE began publishing its gas commodity prices at 11:30 a.m., *i.e.*, after the day-ahead market closes. Waiting for 11:30 a.m. to calculate the day-ahead gas price indices would require the CAISO to re-open bidding in the day-ahead market after 11:30 a.m., close the day-ahead market until about 12:45 p.m., and publish the day-ahead market results potentially by about 3:45 p.m. Changing the day-ahead market timeline in this manner would not be ideal because it would delay the ability of gas-fired resources to prudently procure and nominate gas to meet CAISO dispatch instructions. For this additional reason, it is best to maintain the procedure the Commission previously approved on an interim basis to allow it to continue to calculate day-ahead gas price indices based on price information released on the morning of the day-ahead market run.[60]

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

The CAISO proposes to maintain for an additional 12 months the interim tariff provisions approved in the Aliso Phase 2 proceeding that allow the CAISO to use an increased (or decreased) gas price calculate commitment costs for gas-fired resources subject to the proxy cost methodology,[61] generated bids for resource adequacy resources, and default energy bids under the variable cost option used for mitigation. The existing interim tariff provisions permit such an increase or decrease by an amount necessary to ensure the real-time market appropriately recognizes the increased constraints of resources in the Southern California region. As the Commission previously found, these tariff provisions allow resources to manage gas balancing requirements under the tightened balancing tolerance bands and to better recover fuel costs during the current interim period of potential volatility.[62]

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

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

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

[62] Aliso Phase 1 Order at P 29.

For the real-time market, the CAISO uses a gas price index based on at least two gas commodity prices from two or more gas price publications, plus the gas base transportation rate, plus other inputs. Commitment cost bids are capped at 125 percent of the cost calculated by the CAISO. Default energy bids under the variable cost option and generated bids include an adder of 10 percent to the CAISO's calculation of costs based on the gas price indices.[63] The CAISO proposes to continue using the increased gas price component of these formulas in the real-time market to reflect the constraints on the Southern California gas system arising from the continued limited operability of Aliso Canyon.

While Aliso Canyon operations may increase in the future, at this time the CAISO anticipates that (1) Aliso Canyon will have only limited operability, (2) intra-day (*i.e.*, real-time) gas availability will likely decrease, and (3) tightened gas balancing requirements will apply. The CAISO expects that the current commitment costs, generated bids, and default energy bids likely will not fully account for these conditions. Because the CAISO's current calculation of the gas commodity price is based on trading for next-day delivery, it does not include information from the intra-day gas commodity markets regarding gas prices or risk of noncompliance with gas balancing rules. Therefore, absent retaining these tariff provisions, the resulting commitment costs, generated bids, and default energy bids may not allow resources to manage gas-balancing requirements within tightened tolerance bands, and the calculated gas price may not fully capture real-time gas commodity prices on all days.

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

[63] See sections I.A(2)(a)-I.A(2)(c) of this transmittal letter.

resources only for local electrical needs.

The commitment cost costs, generated bids, and default energy bids resulting from the gas price index that the real-time market, which is how that price would be determined for the real-time market under the prior tariff provisions (*i.e.*, the tariff provisions that would apply in the absence of the provisions the CAISO proposes to maintain in this filing),uses may be insufficient to allow generators on the affected gas systems to manage their gas balancing requirements under tightened balancing tolerance bands. This can occur even if the CAISO enforces the maximum natural gas constraint that it proposes to make permanent pursuant to this filing, limiting the incremental dispatch of generators in a particular area to a maximum or minimum gas usage. Even when the CAISO enforces the maximum gas constraint, it is preferable for the CAISO to differentiate between generators that are at risk of violating balancing rules and those that have gas available to respond to dispatch. This allows the market dispatches and prices to reflect the resource's expected costs.

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

To address these problems and reflect expectations regarding real-time commodity prices, the CAISO proposes to maintain the effectiveness of the interim tariff provisions to increase the gas commodity price for resources connected to either the SoCalGas or the SDG&E system for purposes of determining the CAISO's real-time gas price indices.[64] Specifically, for the real-time market, if conditions warrant, the CAISO will increase or decrease the calculated gas price for resources receiving gas service from SoCalGas and SDG&E by an amount that it determines is necessary to: (1) improve the dispatch of these resources so they are more likely to be dispatched to address local needs rather than system needs; (2) better account for systematic differences between day-ahead and same-day natural gas prices; and (3) improve the ability to manage the generators' gas usage within applicable gas

[64] Proposed tariff section 39.7.1.1.1.3(d). The proposed tariff section in this filing is identical to the same new section approved in the Aliso Phase 2 Order. Additional detail regarding the application of the proposed tariff section is provided on pages 37-38 of the Draft Final Proposal.

balancing rules. Maintaining these tariff provisions will enable the real-time market clearing process to continue to avoid dispatching these resources for system needs and increase its ability to dispatch the resources only to address local needs. If conditions warrant, the increased amount should also be sufficient to continue allowing resources to account more effectively for systematic differences between day-ahead and same-day gas commodity prices in their bids. Further, the increased amount will continue to provide additional headroom to reflect costs of generators operating within the applicable gas balancing rules.

To achieve these goals, for resources connected to the SoCalGas or SDG&E systems for the real-time market, the CAISO will maintain its existing initial increase of the gas commodity price used for determining commitment costs by 75 percent, *i.e.*, the gas commodity price will remain 75 percent higher than it would have been absent the maintained increase. The CAISO will also retain the ability to increase or decrease the gas commodity price based on the CAISO's evaluation of whether the current increase is successfully accomplishing the three criteria described above, or whether a greater or lesser increase is necessary. However, any increase in the commitment cost gas price will remain capped at $2.50 per therm, plus two times the next-day gas index price. The CAISO will continue to use this same procedure to determine default energy bids under the variable cost option, except that the initial increase will remain 25 percent, and any increase in the generated or default energy bid gas commodity price will be capped at 100 percent.[65]

In the stakeholder process for this proceeding, DMM presented an analysis of gas market outcomes in 2017 that, in DMM's view, does not support the need for real-time gas price scalars at or near the current level. DMM requested an assessment of that the CAISO assess whether the current level of the gas price scalars for resources supplied by the Aliso Canyon gas system are appropriate or should be reduced or set to zero. DMM noted that its support for continuing the authority to use the gas price scalars is dependent on the conclusion of this process.[66]

In response to DMM's comments, the CAISO reevaluated the setting of the scalars. Starting in May 2016, the CAISO applied a gas price index in the commitment cost proxy cost calculation scaled at 175 percent of the gas commodity price and a gas price index in the default energy bid calculation

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

[66] *See* DMM Comments on Straw Proposal at 2, available at http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationPhase3StrawProposal.pdf; DMM Comments on Draft Final Proposal at 3-4, available at http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationPhase3DraftFinalProposal.pdf .

scaled at 125 percent of the gas commodity price. The CAISO recently determined, however, that these increased scalars were not needed given conditions experienced on the system at the time. Pursuant to its authority to increase or decrease the scalars as needed based on the three factors set forth in the tariff provisions, the CAISO lowered the gas price scalars effective trade date August 1, 2017 as applied to the gas commodity price for both the commitment cost and default energy bid calculations to 100 percent (*i.e.*, an additional percentage of zero, rather than the previous additional 75 percent for the commitment cost calculation and 25 percent for the default energy bid calculation), until such time as the CAISO performed another reevaluation pursuant to the tariff provisions.[67]

The CAISO continued to monitor gas and electric system conditions and to adjust the scalars when necessary. On August 3, 2017, because of gas curtailments in the Southern California area due to an unplanned pipeline outage, the CAISO again adjusted the scalars to 175 percent and 125 percent for commitment cost and default energy bid calculations effective August 4, 2017.[68] On August 7, 2017, because the CAISO no longer expected curtailments in the near future and based on the level of loads in the CAISO system, the CAISO lowered the scalars to 100 percent (additional percentage of zero) for the commitment cost and default energy bid calculations effective August 8, 2017.[69]

As demonstrated by these CAISO actions, the CAISO agrees with DMM that when conditions do not warrant higher scalars, the CAISO should lower and increase them based on need. To facilitate this more dynamic process, the CAISO has developed procedures that enable it to increase or decrease the scalars expeditiously.

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

[67] *See* Market Notice, Adjustment of Gas Price Index Scaling Factors (July 31, 2017.), available at http://www.caiso.com/Documents/Adjustment_GasPriceIndexScalingFactors.html.

[68] *See* Market Notice, Adjustment of Gas Price Index Scaling Factors August (Aug. 3, 2017.), available at http://www.caiso.com/Documents/Adjustment_GasPriceIndexScalingFactors080317.html.

[69] *See* Market Notice, Adjustment of Gas Price Index Scaling Factors August (Aug. 7, 2017.), available at http://www.caiso.com/Documents/Adjustment-GasPriceIndexScalingFactorsEffective080817.html.

The CAISO agrees with DMM that it is important to monitor the performance of these two allowable increases and commits to continue evaluating the market to determine whether they remain effective in achieving the three goals expressly stated in the tariff provisions or whether either or both of the amounts should be adjusted to achieve those objectives. The CAISO would discuss any such changes with DMM. In addition, pursuant to the proposed tariff provisions, upon determining that a change in the gas commodity price is necessary, the CAISO would issue a market notice specifying the amount of any price increase or decrease.[70]

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

The CAISO proposes to maintain for 12 months the tariff provisions that permit scheduling coordinators to seek after-the-fact recovery of fuel-related incremental fuel costs associated with default energy bids and with generated bids by submitting an FPA section 205 filing to the Commission.[71]

As the Commission has recognized, the tariff provisions permitting such FPA section 205 filings address the possibility that fuel costs may exceed the amounts recoverable under the CAISO's normal cost recovery provisions due to the uncertainty and potential price volatility introduced into the market by the limited operability of Aliso Canyon.[72] The Commission has also found that permitting such FPA section 205 filings is a reasonable interim solution given the situation facing the CAISO and the need to ensure reliable operation of the grid at just and reasonable rates.[73]

Given the likelihood that Aliso Canyon will not be fully functional in the next 12 months, these same considerations will remain equally valid for a significant amount of time after November 30, 2017. The CAISO anticipates that scheduling coordinators will, in almost all circumstances, be able to recover their fuel-related costs pursuant to the normal tariff provisions allowing cost recovery and thus will not need to submit FPA section 205 filings.

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[70] *See* proposed tariff section 39.7.1.1.1.3(d).

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

[72] Aliso Phase 1 Order at P 91; Aliso Phase 2 Order at P 26.

[73] Aliso Phase 1 Order at P 92.

The CAISO and stakeholders are considering additional measures to improve resources' cost recovery, including fuel cost recovery, in the ongoing CCDEBE stakeholder initiative. The CAISO anticipates that it will complete this initiative by the first quarter of 2018 and implement any long-term solutions prior to the expiration of the temporary measures it requests in this tariff amendment. Therefore, the tariff provisions the CAISO proposes to maintain temporarily will serve as an appropriate backstop measure if a scheduling coordinator cannot recover its fuel-related costs associated with default energy bids or generated bids through the normal tariff mechanisms until the permanent solutions are implemented.

B. Permanent Measures to Ensure Reliability System Operations

1. Make Permanent and Expand the Geographic Scope of the Existing Interim Tariff Provisions Allowing the CAISO to Implement a Maximum Natural Gas Constraint to Better Ensure that Dispatches Are Consistent with Gas System Limitations

a. Overview of CAISO Proposal and Need for the Expansion

The CAISO proposes to make permanent and expand the geographic scope of its existing interim tariff authority to implement a gas constraint that limits the maximum amount of natural gas that can be burned by natural gas-fired resources. Although this permanent authority will permit implementation of the same type of maximum gas constraint previously approved by the Commission,[74] it differs from the existing tariff authority in two ways. First, the proposed tariff authority would apply to all areas in which the CAISO operates a market: including the CAISO balancing authority area as well as the balancing authority areas of the EIM entities.[75] Second, the CAISO requests that the Commission

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[74] *See* Aliso Phase 1 Order at P 48; Aliso Phase 2 Order at PP 9, 25-26.

[75] Proposed tariff sections 27.11 and 29.27(c), and revised tariff section 6.2.1.3. Proposed tariff section 29.11 in this filing is identical to the same new section approved in the Aliso Phase 2 proceeding, except that: (1) the section in this filing states that its geographic scope is the entire CAISO balancing authority area, rather than only the SoCalGas and SDG&E gas regions as was the case with the section approved in the Aliso Phase 2 proceeding; and (2) to provide greater clarity, the section in this filing is broken out into discrete subsections, whereas the section approved in the Aliso Phase 2 proceeding contained no subsections. This filing also includes proposed tariff section 29.27(c) to state how the maximum natural gas constraint will apply in the balancing authority areas of the EIM entities; the CAISO proposed no such tariff provisions in either the Aliso Phase 1 or the Aliso Phase 2 proceeding, because the geographic scope of the tariff provisions filed in those proceedings was smaller. Revised tariff section 6.2.1.3 in this filing is identical to the same revised section approved in the Aliso Phase 2 proceeding, except that the section in this filing adds a cross-reference to tariff section 29.27(c), which is being introduced in this filing.

make this authority permanent and not interim as it is currently. Lessons the CAISO has learned by applying the maximum gas constraint in the SoCalGas and SDG&E gas regions of the CAISO balancing authority area has shown that this tool can and should be applied in other areas in which the CAISO operates markets, to ensure the market systems produce a dispatch solution that considers the gas system constraints and does not aggravate them or cause a system reliability issue.

As balancing authorities, the CAISO and the EIM entities already have the authority under the CAISO tariff to manually dispatch resources to account for gas constraints in order to prevent or address an electric system reliability issue.[76] However, using a maximum gas constraint is superior to using manual dispatch to account for gas system limitations, because the prices and dispatch solution reflect the impacts of maximum gas constraints but not of manual dispatches.

Although the other bidding rules and measures specified in this filing provide an opportunity for better visibility of the impacts of the constrained gas system on the electric system, additional tools are necessary to ensure that CAISO operators can maintain the system reliably to address known gas constraints and challenges posed by the limited operability of Aliso Canyon. Making the maximum natural gas constraint permanent 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.[77] The constraints will also limit CAISO market dispatch of the affected generators in the real-time market to a maximum gas usage if there is a limitation that relates to differences between gas scheduled with the gas company and gas consumed during the operating day due to gas system imbalance limitations. The tariff provisions are a reasonable and necessary measure to ensure the reliable operation of the electric grid within the bounds imposed on the CAISO by the operation of the natural gas system.[78]

It is prudent to expand the geographic scope of the maximum natural gas constraint beyond the Southern California gas regions, because similar gas system constraints likely will develop 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

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[76] *See* existing tariff sections 7 and 29.7.

[77] The CAISO will inform the affected generators that they are subject to the constraint or constraints.

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

augmented requirements on gas storage facilities in response to the Aliso Canyon incident (September 2016),[79] and new California Air Resource Board (CARB) rules aimed at combatting emissions from methane leaks (March 2017).[80]

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."[81] Both SB 887 and the CARB rules on methane leaks will likely result in potential significant changes to gas storage operations throughout the state – specifically, increased risk of system storage capability and availability limitations on the systems of both Southern California Edison Company and Pacific Gas and Electric Company.

Further, SB 887 established new safety standards for underground gas storage facilities and more stringent mechanical testing regions.[82] 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. The upcoming requirements will affect all state-regulated storage facilities in 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 CAISO balancing authority area.

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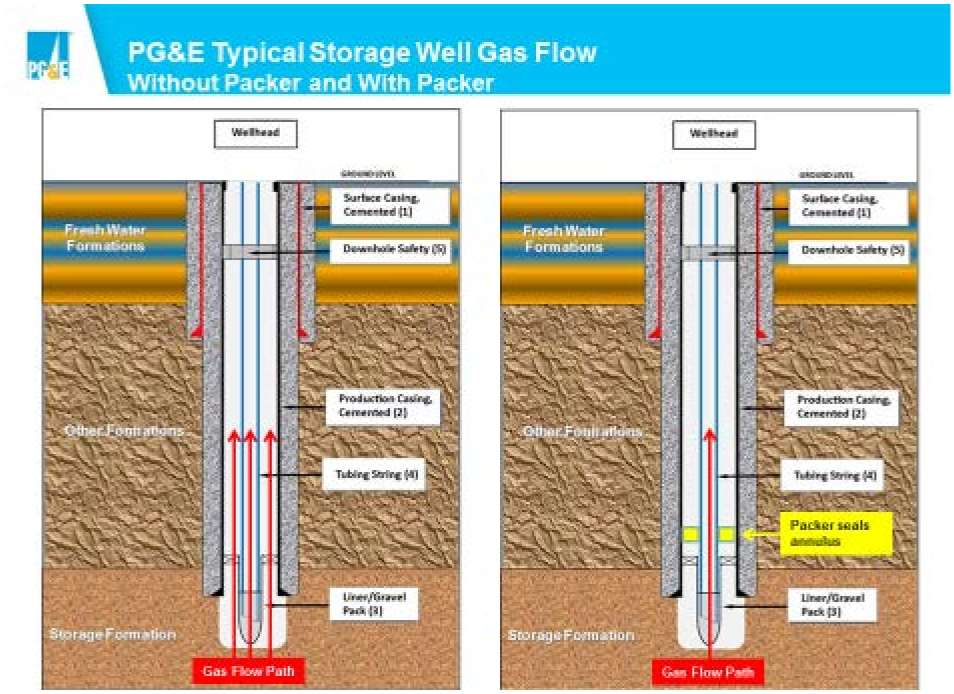
79 SB 887 is available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB887.

80 *See* https://www.arb.ca.gov/newsrel/newsrelease.php?id=907.

81 SB 887, section 1(i).

82 *See* https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB887.



The CAISO understands from EIM stakeholders that similar constraints exist in portions of the EIM footprint. Therefore, the CAISO also seeks authority to enforce a maximum gas constraint in EIM entity balancing authority areas based on the EIM entity's determination that a maximum gas constraint should be enforced. EIM entities already have similar authority to use manual dispatch at their discretion, but the maximum gas constraint will provide a more efficient means to managing gas usage. The existing design for a maximum gas constraint with options to apply either a gas system capacity limitation or a gas system imbalance limitation will effectively respond to the EIM entities' gas limitations. The EIM entity's use of the gas constraint will follow the existing maximum gas constraint policy, under which the use of the gas constraint is limited to managing anticipated physical gas limitations. All generators within the gas constraint will have to be EIM participating resources. EIM entity gas limitations include:

- **Gas capacity reduction limitation:** The CAISO has been informed that a number of EIM resources have limited pipeline capacity that their gas burns cannot exceed. In addition, select gas pipeline companies have not offered to sell interruptible transmission over the past several years, and gas storage is limited for portions of the EIM. Because of limited storage capacity, on high-demand days, the ability to draft from the pipeline can become limited and therefore, in combination with limited pipeline capacity and little to no interruptible pipeline capacity available, gas burn levels can be constrained in real-time.

- **Gas system imbalance limitation:** The CAISO has been informed that a number of EIM resources are within gas service areas that face operational issues similar to those in Southern California. Under constrained gas system conditions where pipeline pressure is imbalanced and could potentially lead to reliability issues, the gas pipeline company will issue instructions to limit the gas burn to within a tolerance band of the scheduled levels so that gas system reliability is not adversely impacted.

Given the risk of similar gas limitations arising across the CAISO footprint, which affect both CAISO and EIM entity balancing authority areas, it is prudent to have authority to enforce maximum gas constraints if such limitations arise so the CAISO in order to manage joint dispatch effectively in real-time.

b. Enforcement of the Maximum Gas Constraints in the CAISO and EIM Entity Balancing Authority Areas

The CAISO will apply a maximum gas constraint in its markets anywhere in its balancing authority area or an EIM entity balancing authority area in the same manner it does today in the Southern California region under its interim tariff authority to apply the constraint. As is the case today, for the CAISO balancing authority area, the CAISO will the apply a constraint for the day-ahead market, the real-time market, or both; if the CAISO applies a constraint to an EIM balancing authority area, the CAISO will enforce it in the real-time market only. The CAISO will enforce the constraint based on its assessment of gas and electric conditions, but will coordinate with the gas companies in the CAISO balancing authority area to the maximum extent possible to ensure the limitations imposed by the constraint in the market are consistent with the limitations observed on the gas system. The CAISO will also apply the constraint in coordination with the EIM entity in whose balancing authority area it is applying the constraint and expects that the EIM entity will coordinate with the gas company in its balancing authority area for purposes of defining the constraint and determining when it should be enforced.

For example, the CAISO would apply a maximum gas constraint as follows. After developing a constraint for a particular area of the CAISO balancing authority area, the CAISO may enforce the constraint in both the day-ahead and the real-time markets to ensure the CAISO market does not dispatch or commit resources that exceed the maximum gas burn in the specified region. If an unplanned gas outage occurs after the day-ahead market or a gas curtailment is issued during the real-time market, the CAISO may enforce the constraint in the real-time market run. Similarly, the CAISO may enforce the constraint if it anticipates that large imbalances between gas schedules and gas consumed could compromise gas reliability or electric system reliability. As it does today, the CAISO will retain the flexibility to modify the level of the constraint, or to remove the constraint, if the CAISO determines that the constraint is leading to adverse market impacts.

Similarly, after the CAISO has developed such a constraint for the EIM entity balancing authority area, if the EIM entity requests the CAISO to enforce such constraint based on information of a particular gas system outage in the EIM, the CAISO will enforce the constraint in the real-time market, which includes the affected area.

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

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

c. The Effect of Enforcing Maximum Gas Constraints in the CAISO Balancing Authority Area and EIM Entity Balancing Authority Areas

When binding, the maximum gas constraint ensures that generation in the day-ahead or real-time market is dispatched taking into consideration gas system limitations. Because the CAISO cannot predict at this time exactly how and when the gas system will be constrained, it seeks continued authority to reflect any such limitations through market constraints based on its and the EIM entity's observations of gas system limitations and how those limitations could impact electric reliability if not appropriately reflected in the CAISO markets.[83]

The CAISO will continue to implement the maximum gas constraint using generation nomograms that include the generators within the affected areas.[84] The nomogram will affect the congestion component of the relevant generators' locational marginal prices and have a relaxation parameter value (*i.e.*, a "penalty price") associated with relaxing the gas constraint. The CAISO will continue to 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.[85] Continued use of the constraint parameter in this manner is consistent with the finding in the Aliso Phase 1 Order that using generator nomograms with a penalty factor is an appropriate means of employing the gas constraint to ensure electric reliability.[86]

Pursuant to the permanent tariff provisions proposed in this filing, and as is true today under the existing interim tariff provisions, 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.[87] The shadow price of the constraint will not be reflected in the marginal cost of congestion component of

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[83] The CAISO provides a detailed mathematical description of the constraint on pages 22-26 of the Draft Final Proposal.

[84] A nomogram is a set of operating or scheduling rules that are used to ensure that simultaneous operating limits are respected. Tariff appendix A, existing definitions of "Nomogram" and "Contingency". Detailed mathematical information regarding nomograms is provided on pages 29-34 of the Draft Final Proposal.

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

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

[87] Proposed tariff sections 27.11.2 and 29.27(c)(2).

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.[88] The CAISO will continue to implement this approach by applying the constraint only to the resource-specific price at the network connectivity node (CNode)[89] used to dispatch affected generators but not to the bus location reflecting the point of delivery or receipt on the CAISO controlled grid.[90] It is just and reasonable to apply the shadow price of the constraint only to the resource-specific locational marginal price for generators connected to the affected gas systems because they are the only market participants subject to the gas limitations.

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

Figures 2 and 3 below illustrate the locations at which the CAISO will set prices when it enforces a gas constraint. The grey circle represents a generator's (G1)'s physical topological connection to a network node, the CNode. In this example, there is only one piece of equipment connected to a CNode. Therefore, the CNode and bus pricing node (PNode) are unique. Figure 2 also shows the connection between the CNode and the PNode, which represents the point at which the injection is received into the CAISO controlled grid for supply, or withdrawal is delivered out of the CAISO controlled grid for demand. Generally, the PNode of a generating unit will coincide with the CNode and is where the relevant revenue quality meter is connected or compensated, and reflects the point at which the generating unit is connected to the CAISO balancing authority area. This location is referred to as the "point of receipt" (POR) and is considered to be a PNode. However, the PNode and CNode can differ in the CAISO's network model.

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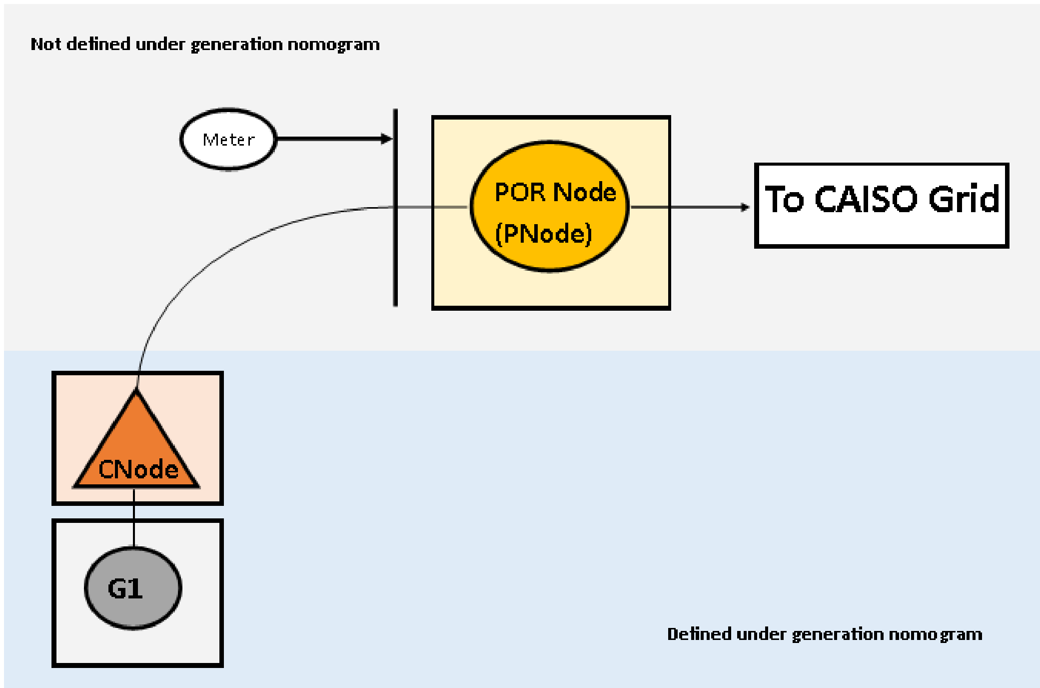
[88] The tariff provisions also specify how the CAISO will allocate any non-zero amounts attributable to the price differential between the marginal cost of congestion used for settling a generating unit's scheduled or dispatched amounts at their location and the marginal cost of congestion used for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

[89] 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 business practice manuals.

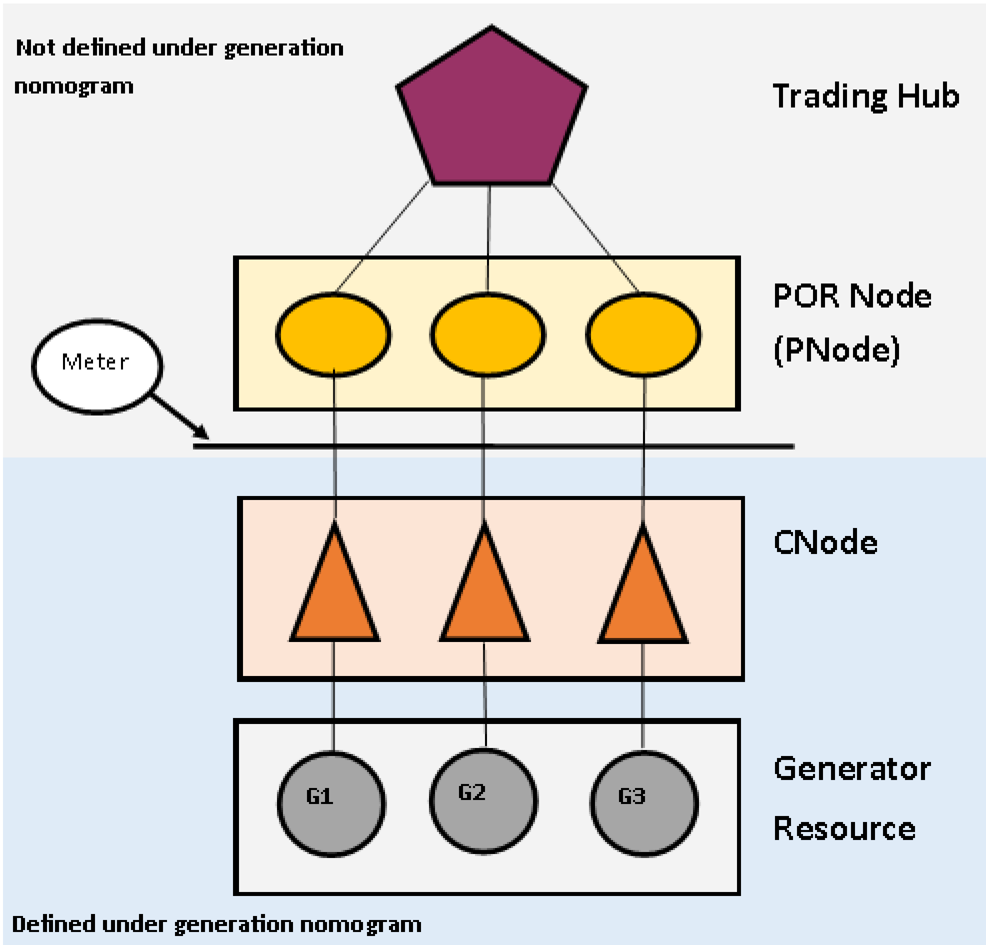
[90] The full network model is composed of CNodes interconnected with network branches. A CNode represents a connection point used to define the physical topological connectivity of the network and only one load or generation device can be connected to a CNode. Each piece of equipment has a CNode associated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

Figure 2



With respect to aggregated locations such as trading hubs, the settlement of transactions using these locations would be based on price information from the PNodes that are aggregated into the aggregated pricing node (APNode), and do not use price information from the CNode(s). Figure 3 below shows the relationship between the generators (represented by grey circles), CNodes (represented by orange triangles), and PNodes that are aggregated into the Trading Hub's APNode. Figure 3 illustrates that the PNode contributes to the pricing of the trading hub price represented by the purple pentagon and not the CNode.

Figure 3



The CAISO proposes to make permanent the tariff language authorizing it to settle injections into the CAISO controlled grid in all of its footprint and in EIM gas regions at prices influenced by the maximum gas constraint. The CAISO will accomplish this by pricing such resources based on the resource-specific locational marginal prices at the CNode rather than the PNode prices shown in Figures 2 and 3. For all other transactions, the CAISO will continue using the PNode-related prices. Consequently, only prices for generators on the affected gas systems at the specific resource location will reflect the cost of honoring the constraint.

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

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

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

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

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

d. Issues Raised by Stakeholders

The CAISO determined that it needs permanent authority to enforce a maximum gas constraint throughout its entire market footprint. Stakeholders, including DMM, did not oppose using the gas burn constraint in other areas of the system but requested greater detail and visibility into how the CAISO would determine and enforce these constraints.

DMM did not oppose using constraints in principle, but requested additional assurances before supporting the concept. First, DMM questioned the need for expanding the authority to other areas before seeing more specific evidence of gas limitations on the gas system.[91] As discussed above, given the increased safety measures adopted by the State of California, it is prudent for the CAISO to prepare to deal proactively with restrictions on the gas system that will affect other parts of the CAISO electric system. It would be neither necessary nor prudent to wait until these restrictions actually materialize and problems occur to seek authority to adopt similar gas constraints in other parts of the CAISO markets. The CAISO merely requests appropriate permanent authority based on an expanded geographic scope so it is prepared to address all such constraints, if and when they may arise, in a judicious manner.

DMM also did not support extending use of the gas nomogram into the EIM entity balancing authority areas until the CAISO develops more detail on how the EIM entity can decide to create and enforce the new gas nomogram.[92] After the CAISO Board of Governors approved the CAISO proposal and in response to the CAISO's request for comments on the draft tariff language, DMM recommended that the "CAISO should include language clarifying the requirement that gas limitations which are managed through the use of a gas constraint are physical limitations on the gas system that are not the result of a procurement or business decision on the part of any electricity market participant or gas market participant."[93]

To address that DMM recommendation, the CAISO proposes to specify in the tariff provisions that the CAISO may enforce gas constraints in the EIM entity's balancing authority area based on physical limitations in applicable gas regions anticipated by the EIM entity during specific hours.[94] The CAISO also specifies in the tariff provisions that prior to establishing the natural gas

[91] DMM Comments on Draft Final Proposal at 3. http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationPhase3DraftFinalProposal.pdf.

[92] *Id.*; DMM Comments on Draft Tariff Language at 2, available at http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.aspx.

[93] *See* DMM Comments on Draft Tariff Language at 1.

[94] Proposed tariff section 29.27(c).

constraint, the EIM entity must notify the CAISO of the need for the constraint and provide the CAISO with sufficient information for the CAISO to evaluate, develop, and test the performance of the constraint.[95] Further, the CAISO proposes to require that the EIM entity submit to the CAISO information sufficient to verify the physical limitations it asserts may materialize on the natural gas pipeline systems that serve generating facilities in its balancing authority area. The CAISO may deny the creation of such a gas constraint if the CAISO finds, based on the information submitted by the EIM entity or any other available information, that the physical limitations on the natural gas system that are asserted by the EIM entity are unlikely to materialize.[96] These tariff provisions adopt DMM's recommendation.

DMM also recommended that the tariff should specify the role of the relevant gas company in developing and enforcing the constraints.[97] The CAISO agrees that, as specified in its memorandum to the EIM Governing Body, "EIM entities will work with the [CA]ISO and the applicable gas system operator to define the gas burn constraints in advance."[98] The CAISO affirms this expectation but did not include it in the proposed tariff provisions because the CAISO does not have authority over, or a relationship with, the gas companies that affect the EIM entity balancing authority area. The CAISO instead added the aforementioned tariff language requiring the EIM entity to provide the necessary information in support of the legitimate use of the constraint and enough information to evaluate, develop, and test the performance of the constraint. To provide such information, the EIM entity will have had to coordinate with the gas company. The CAISO believes this tariff language provides sufficient notice and requirements on the EIM entity, with which the CAISO does coordinate closely pursuant to its tariff.

DMM also recommended that the tariff language include "details about how stakeholders will be notified of, and allowed to review, each potential new gas constraint before it is enforced in production. In the EIM governing body meeting, the [CA]ISO stated that development of each new constraint will be subject to a public process that will include time for review by participants."[99] The CAISO had always intended to provide stakeholders adequate notice regarding adoption of a new constraint in the CAISO's market, including the EIM. The CAISO agreed to include specific language that states the CAISO will provide all stakeholders the technical details of the new gas constraint prior to its

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95 Proposed tariff section 29.27(c)(1).

96 *Id.*

97 DMM Comments on Draft Tariff Language at 1.

98 See page 2 of the memorandum available at http://www.caiso.com/Documents/DecisiononEnergyImbalanceMarketMaximumNaturalGasBurnConstraint-Memo-Jul2017.pdf.

99 DMM Comments on Draft Tariff Language at 2.

adoption and an opportunity to comment on such details.[100] This will apply to gas constraints developed for the CAISO balancing authority area as well as the EIM entity balancing authority areas. The CAISO also proposes to make permanent the existing tariff language stating, to the extent feasible, in advance of the deadline for submitting bids for the relevant CAISO market, the CAISO will issue a notice through its market notification system indicating its or the EIM entity's intent to enforce a natural gas constraint, along with an indication of the affected areas, the magnitude, and the expected duration of the natural gas constraint.[101]

Some stakeholders asked the CAISO to document the detailed process for using the maximum gas constraint in additional areas beyond the SoCalGas and SDG&E systems. In response, the CAISO explained that it is appropriate to develop these implementation-level details with stakeholders through its business practice manual change management process. This includes developing EIM-specific procedures that will be documented in the business practice manual for the EIM.

3. Make Permanent the Existing Interim Tariff Provisions to Address Market Issues Related to the Enforcement of the Maximum Gas Constraint

a. CAISO Proposals

To address potential market issues, the CAISO also proposes to make permanent the existing interim tariff provisions regarding two measures related to use of the maximum gas constraint. First, the CAISO proposes to implement on a permanent basis 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.[102] The separate criteria provide that, notwithstanding application of the dynamic competitive path assessment, when the CAISO enforces the maximum natural gas constraint 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

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[100] Proposed tariff sections 27.11.3(a) and 29.27(c)(3)(a).

[101] Proposed tariff sections 27.11.3(b) and 29.27(c)(3)(b).

[102] Revised tariff section 39.7.2.2(A). The tariff section as revised in this filing is identical to the same revised tariff section approved in the Aliso Phase 2 proceeding, except that the revised tariff section in this filing: (1) adds a cross-reference to tariff section 29.27(c), which is being introduced in this filing; and (2) states that the provisions in the section address anticipated electric supply conditions in the CAISO balancing authority area or the EIM entity balancing authority area gas regions, rather than anticipated electric supply conditions in the SoCalGas and SDG&E gas regions as is the case under the Aliso Phase 2 tariff language, consistent with the expanded geographic scope of the maximum natural gas constraint proposed in this filing.

supply conditions. Maintaining this authority is consistent with the Commission's finding in the Aliso Phase 1 Order that such provisions are a reasonable measure to address actual electric supply conditions that are found to be non-competitive when the constraint is enforced due to anticipated electric supply conditions in gas regions.[103]

Second, consistent with the Aliso Phase 1 Order,[104] to ensure that virtual bidding cannot detrimentally affect the CAISO markets, the CAISO proposes to make permanent make permanent the existing interim tariff provisions allowing 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.[105] Making these tariff provisions permanent is 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.[106] Further, as the Commission recognized in the Aliso Phase 1 Order, with the limited operability of a gas region and the measures that CAISO may have to undertake to address electric and gas reliability, there may be times when promoting price convergence may run contrary to the efficient economic solution of the market. There may also be sustained differences in prices between locations and between day-ahead and real-time markets that could be exploited by virtual bidders without yielding any market benefits.[107] Making the tariff provisions permanent will allow the CAISO to address these issues in perpetuity.

As is the case today, if the CAISO suspends or limits virtual bidding pursuant to the tariff provisions, the CAISO will file an informational report with the Commission explaining why it took such action. The CAISO has included detail regarding this tariff authority in the business practice manual.

b. Issues Raised by Stakeholders

Stakeholders generally supported or did not oppose making these measures permanent. DMM recommended that the CAISO work out the details of the policy for inclusion of the impacts in the dynamic competitive path assessment in an automated fashion. At this time, the assessment is done manually and DMM has recommended that the CAISO adopt automated procedures for this purpose. The CAISO agreed to work on automation, which it

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103 *See* Aliso Phase 1 Order at P 52.

104 *See id.* at PP 80, 83.

105 Proposed tariff section 7.9.2(d). The tariff section as revised in this filing is identical to the same revised section approved in the Aliso Phase 2 proceeding.

106 *See* existing tariff section 7.9.2.

107 Aliso Phase 1 Order at P 80.

intends to implement by the end of 2018. DMM also commented that further tariff changes in the tariff are required to account for the changes made through the automation.[108] Because the CAISO is not automating this feature until later in 2018, the CAISO is not at this time proposing any changes to the tariff language that could be related to the automation. Rather, as the CAISO develops the details of the automation, the CAISO will consider with DMM and stakeholders what changes are required and will make any necessary tariff amendments with the Commission then.

In the meantime, when the CAISO enforces the maximum gas constraint in other parts of the CAISO and EIM entity balancing authority areas, the CAISO will deploy a manual process. Delaying this authority until the CAISO can automate the process would not be just and reasonable, because it would force the CAISO market to forgo the benefits the maximum gas constraint offers and unnecessarily increase risks to system reliability.

4. Make Permanent the Effectiveness of the Existing Interim Tariff Provisions the CAISO Uses to Give Generators Advisory Information Regarding Their Potential Day-Ahead Commitments Prior to the Day-Ahead Market Run

The CAISO proposes to make permanent the existing interim tariff provisions accepted in the Aliso Phase 2 Order, under which the CAISO helps scheduling coordinators make more informed gas procurement decisions by providing them with advisory information regarding their resources' potential commitment in the day-ahead market that the CAISO produces through its existing two-day-ahead process.[109] This involves the CAISO running the commitment process based on available bids and estimates of system conditions at that time. As the CAISO currently does, the CAISO will continue to provide this information to scheduling coordinators only to advise them of their potential commitments; the information will not be binding. The CAISO will continue to conduct its actual day-ahead market runs the day prior to the operating day to produce financially and physically binding commitments and dispatches.

The advisory information provided to scheduling coordinators will continue to come in the form of the MWh advisory schedule produced by the residual unit commitment process conducted as part of the typical day-ahead market. The CAISO communicates the advisory resource-specific RUC schedule to each scheduling coordinator for its resources through the CAISO's secure

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[108] DMM Comments on Draft Tariff Language at 2.

[109] Proposed tariff section 6.5.2.2.3. The proposed tariff section in this filing is identical to the same new section approved in the Aliso Phase 2 proceeding.

communication system and does not include pricing information.[110] Although the precise constraints operations personnel use may change between market runs until the final set of constraints for the real-time market is determined, the CAISO and stakeholders believed that providing scheduling coordinators with the two-day-ahead residual unit commitment process results will improve their ability to plan for gas procurement. The Commission reached the same conclusion in approving this mechanism in the Aliso Phase 1 Order, finding that this information will help reduce gas and electric reliability risks.[111] Those same reasons support retaining this tool permanently.

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

The CAISO will continue to provide advisory information only to the responsible scheduling coordinator for resources bidding into the day-ahead market and not to all market participants. The information reflects confidential schedules, which the CAISO tariff restricts the CAISO from sharing with other market participants. This restriction is reasonable because the scheduling coordinators for these resources are the entities that must ensure they have procured and nominated sufficient gas to perform consistent with expected CAISO dispatches. The Commission found in the Aliso Phase 1 Order that it is just and reasonable to provide the information only to the responsible scheduling coordinator.[112] The same reasoning continues to apply.

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

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

112 Aliso Phase 1 Order at P 17.

III. Effective Date

The CAISO respectfully requests that the Commission accept both the first set of tariff changes contained in this filing (*i.e.*, the changes to go into effect on a temporary basis for an additional 12 months) and the second set of tariff changes contained in the filing (*i.e.*, the changes to go into effect on a permanent basis) effective November 30, 2017. Granting the requested effective date for the two sets of tariff changes will permit the measures approved in the Aliso Phase 2 proceeding, which would otherwise automatically expire on November 30, 2017, to remain in effect (as modified in this filing) beyond November 30 without interruption on a temporary basis and a permanent basis, respectively. This uninterrupted effectiveness of the tariff provisions will ensure that the CAISO continues to have the necessary procedures and flexibility in place to timely address the risks posed by the limited operability of Aliso Canyon during this winter and beyond.

The outcome of this proceeding may affect market participants' bid submissions and may require that the CAISO adjust its market systems to comply with the Commission's order. For example, were the Commission to deny this tariff amendment, the CAISO might have to remove any gas constraints it would have otherwise thought it could implement at that time. Similarly, were the Commission to deny this amendment, the CAISO might have to remove any scalars in effect at that time and market participants would therefore be required to adjust their bids accordingly. To provide the CAISO and market participants with sufficient time to consider any Commission directives in this proceeding and to ready its systems to make the two sets of tariff changes effective November 30, the CAISO respectfully requests that the Commission issue an order accepting this filing by November 28, 2017.

IV. Temporary Effectiveness of the First Set of Tariff Changes Until November 30, 2018 to the Extent the Commission Does Not Permit Them to Remain in Effect Beyond that Date Pursuant to a Subsequent CAISO Filing

For these reasons discussed in this filing, the CAISO requests that the Commission permit the first set of tariff changes to remain in place for an additional 12 months, *i.e.*, until November 30, 2018. Further, the Commission and market participants will have transparency regarding the effects that the tariff revisions have had on the CAISO markets pursuant to the quarterly Reports on Market Issues and Performance that DMM issues.[113]

[113] These quarterly reports are available on the CAISO website at http://caiso.com/market/Pages/MarketMonitoring/MarketIssuesPerfomanceReports/Default.aspx.

To implement this temporary approach, the CAISO is submitting two groups of tariff records regarding the first set of tariff changes – one group that contains the proposed tariff revisions reflected in those changes and shows the November 30, 2017 effective date discussed above, and a second group that contains the tariff sections revised by the first set of tariff changes as they read in the existing tariff (*i.e.*, omitting the first set of tariff changes) and shows an effective date of November 30, 2017.[114] Pursuant to this approach, to the extent the Commission accepts the first set of tariff changes and does not later take action to continue their effectiveness beyond November 30, 2018, on that date the first group of tariff records described above will automatically be superseded by the second group of tariff records, and thus the tariff sections revised by the first set of tariff changes will revert to how they read before the CAISO submitted this filing (and before the corresponding tariff revisions accepted in the Aliso Phase 1 and Phase 2 proceedings went into effect). In addition, the CAISO is submitting a third group of tariff records to implement the second set of tariff changes on a permanent basis.[115]

V. Communications

Correspondence and other communications regarding this filing should be directed to:

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[114] The clean tariff sheets and red-lined document provided in attachments A and B to this filing reflect only the first pair of tariff records described above, and the clean tariff sheets and red-lined document provided in attachments C and D to this filing reflect only the second pair of tariff records described above. In addition, attachments E and F to this filing contain clean tariff sheets and a red-lined document that reflect only the tariff changes the CAISO proposes to implement on a permanent basis.

[115] All of the tariff revisions reflected in the three groups of tariff records are shown in clean format in attachment A to this filing and in red-line format in attachment B to this filing, with bracketed notes in the attachment B document to indicate which of the tariff revisions will go into effect on a temporary basis until November 30, 2018 and which tariff revisions will go into effect permanently.

VI. Service

The CAISO has served copies of this filing on the California Public Utilities Commission, the California Energy Commission, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

VII. Contents of Filing

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

Attachment A	Clean CAISO tariff sheets for this tariff amendment
Attachment B	Red-lined document showing the revisions contained in this tariff amendment
Attachment C	Additional background and rules information
Attachment D	Draft Final Proposal
Attachment E	Board Memorandum

VIII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission issue an order by November 28, 2017 that accepts the tariff changes contained in this filing effective November 30, 2017.

Respectfully submitted,

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Attachment A – Clean Tariff Records

Aliso Canyon Phase 3 Tariff Amendment

California Independent System Operator Corporation

6.2.1 Scheduling Coordinators

* * * *

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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 and Section 29.27(c) 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.

* * * *

6.5.2 Communications Prior To The Day-Ahead Market

* * * *

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

6.5.2.2.3 Advisory Day-Ahead Market Results

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

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

6.5.2.3.4 Greenhouse Gas Price Indices

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

* * * *

6.5.4 RTM Communications Before The Trading Hour

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT BEYOND NOVEMBER 30, 2018 AND OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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.

*** * * ***

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

27.11 Natural Gas Constraint

27.11.1 Natural Gas Constraint in the CAISO Balancing Authority Area

The CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the CAISO Balancing Authority Area, based on limitations in applicable gas regions anticipated by the CAISO during specific hours.

27.11.2 Effect of Enforcement of Constraint

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 in the applicable natural gas region of the CAISO Balancing Authority Area. 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 to 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.

27.11.3 Notification

(a) Stakeholder process for Creating the Gas Constraint and Technical Details

The CAISO will publish the technical details of a gas constraint adopted in the CAISO Balancing Authority Area, and will provide Market Participants an opportunity to review and comment on those details prior to the adoption of such constraints. The CAISO will subsequently publish the final technical details, and terms that govern its application of the gas constraint, in its Business Practice Manuals and applicable Operating Procedures.

(b) Notice of Application of Gas Constraint

(1) Prior to Enforcement. 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.

(2) Protected Communications. 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.

* * * *

29.27 CAISO Markets And Processes.

* * * *

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

(c) Natural Gas Constraint in the Energy Imbalance Market.

At the request of the EIM Entity Balancing Authority Area and in coordination with the relevant EIM Entity Balancing Authority Area, the CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in that EIM Entity's Balancing Authority Area, based on physical limitations in applicable gas regions anticipated by the EIM Entity during specific hours.

(1) Creation of the Natural Gas Constraint in an EIM Entity Balancing Authority Area.

Prior to establishing the natural gas constraint, the EIM Entity must notify the CAISO of the need for the constraint and provide the CAISO with sufficient information for the CAISO to evaluate, develop, and test the performance of the constraint. The EIM Entity shall submit to the CAISO information sufficient to verify the physical limitations it asserts may materialize on the natural gas pipeline systems that serve generating facilities in its Balancing Authority Area. The CAISO may deny the creation of such a gas constraint if the CAISO finds, based on the information submitted by the EIM Entity or any other available information, that the physical limitations on the natural gas system that are asserted by the EIM Entity are unlikely to materialize.

(2) Effect of Enforcement of the Natural Gas Constraint.

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. The same Marginal Cost of Congestion used for settling Demand 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 pursuant to Section 11.5.4.

(3) Notification.

(i) Stakeholder Process for Creating the Gas Constraint and Technical Details

The CAISO will publish the technical details of a gas constraint adopted in any EIM Entity's Balancing Authority Area, and will provide Market Participants an opportunity to review and comment on those details prior to the adoption of such constraints. The CAISO will subsequently publish the final technical details and terms that govern its application of the gas constraint in its Business Practice Manuals and applicable Operating Procedures.

(ii) Notice of Application of Gas Constraint

After the gas constraint has been vetted pursuant to Section 29.27(c)(3)(i), to the extent feasible in advance of the deadline for submitting Bids for the Real-Time Market, the CAISO will issue a notice through its market notification system indicating the EIM Entity is intending to enforce a natural gas constraint along with the affected areas and the magnitude, and the expected duration of the natural gas constraint.

*** * * ***

30.4.1 Start-Up and Minimum Load Costs

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

30.4.1.2 Registered Cost Methodology

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

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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

30.12.1 Applicability

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

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

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

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

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

30.12.2 Notice and Process

The Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator must notify the CAISO within thirty (30) Business Days after the Operating Day on which the resource incurred the unrecovered costs, and must submit the filing to FERC within ninety (90) Business Days after that Operating Day. Within sixty (60) Business Days after the Operating Day for which the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator provides notice to the CAISO per this

Section, the CAISO will provide the Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator with a written explanation of any effect that events or circumstances in the CAISO Markets and fuel market conditions may have had on the resource's inability to recover the costs on the Trading Day.

30.12.3 Documentation Required for FERC Filing

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

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

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

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

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

30.12.4 Payment and Allocation of Costs Recovered Pursuant to a FERC Order

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

*** * * ***

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

31.6.1 Criteria For Temporary Waiver Of Timing Requirements

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

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

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

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

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

*** * * ***

39.7.1 Calculation Of Default Energy Bids

* * * *

[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

39.7.1.1.1.3 Calculation of Natural Gas Price

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

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

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

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

*** * * ***

39.7.1.7 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

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

*** * * ***

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

39.7.2 Competitive Path Designation

39.7.2.1 Timing of Assessments

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

39.7.2.2 Criteria

(A) Notwithstanding the provisions in Section 39.7.2.2(B), when the CAISO enforces the natural gas constraint pursuant to Sections 27.11and 29.27(c), 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 CAISO Balancing Authority Area or in the EIM Entity Balancing Authority Area 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 FMM, 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.

* * * *

40.6.8 Use Of Generated Bids

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

40.6.8.1.6 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

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

Attachment B – Marked Tariff Records

Aliso Canyon Phase 3 Tariff Amendment

California Independent System Operator Corporation

6.2.1 Scheduling Coordinators

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[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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 and Section 29.27(c) for individual Scheduling Coordinators). Other CAISO data that is not confidential (such as CAISO Demand Forecasts) will be published on the public access reporting system of the CAISO Website and be available to anyone.

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6.5.2 Communications Prior To The Day-Ahead Market

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[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

6.5.2.2.3 Advisory Day-Ahead Market Results

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

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

6.5.2.3.4 Greenhouse Gas Price Indices

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

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6.5.4 RTM Communications Before The Trading Hour

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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

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[NOTE – THESE CHANGES WOULD BE IN EFFECT BEYOND NOVEMBER 30, 2018 AND OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

7.9.2 Reasons for Suspension or Limitation

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

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

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

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

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

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[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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

27.11.1 Natural Gas Constraint in the CAISO Balancing Authority Area

The CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the CAISO Balancing Authority Area, based on limitations in applicable gas regions anticipated by the CAISO during specific hours.

27.11.2 Effect of Enforcement of Constraint

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 in the applicable natural gas region of the CAISO Balancing Authority Area. 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 to 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.

27.11.3 Notification

(a) Stakeholder process for Creating the Gas Constraint and Technical Details

The CAISO will publish the technical details of a gas constraint adopted in the CAISO Balancing Authority Area, and will provide Market Participants an opportunity to review and comment on those details prior to the adoption of such constraints. The CAISO will subsequently publish the final technical details, and terms that govern its application of the gas constraint, in its Business Practice Manuals and applicable Operating Procedures.

(b) Notice of Application of Gas Constraint

(1) Prior to Enforcement. 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.

(2) Protected Communications. 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.

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29.27 CAISO Markets And Processes.

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[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

(c) Natural Gas Constraint in the Energy Imbalance Market.

At the request of the EIM Entity Balancing Authority Area and in coordination with the relevant EIM Entity Balancing Authority Area, the CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in that EIM Entity's Balancing Authority Area, based on physical limitations in applicable gas regions anticipated by the EIM Entity during specific hours.

(1) Creation of the Natural Gas Constraint in an EIM Entity Balancing Authority Area.

Prior to establishing the natural gas constraint, the EIM Entity must notify the CAISO of the need for the constraint and provide the CAISO with sufficient information for the CAISO to evaluate, develop, and test the performance of the constraint. The EIM Entity shall submit to the CAISO information sufficient to verify the physical limitations it asserts may materialize on the natural gas pipeline systems that serve generating facilities in its Balancing Authority Area. The CAISO may deny the creation of such a gas constraint if the CAISO finds, based on the information submitted by the EIM Entity or any other available information, that the physical limitations on the natural gas system that are asserted by the EIM Entity are unlikely to materialize.

(2) Effect of Enforcement of the Natural Gas Constraint.

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. The same Marginal Cost of Congestion used for settling Demand 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 pursuant to Section 11.5.4.

(3) Notification.

(i) Stakeholder Process for Creating the Gas Constraint and Technical Details

The CAISO will publish the technical details of a gas constraint adopted in any EIM Entity's Balancing Authority Area, and will provide Market Participants an opportunity to review and comment on those details prior to the adoption of such constraints. The CAISO will subsequently publish the final technical details and terms that govern its application of the gas constraint in its Business Practice Manuals and applicable Operating Procedures.

(ii) Notice of Application of Gas Constraint

After the gas constraint has been vetted pursuant to Section 29.27(c)(3)(i), to the extent feasible in advance of the deadline for submitting Bids for the Real-Time Market, the CAISO will issue a notice through its market notification system indicating the EIM Entity is intending to enforce a natural gas constraint along with the affected areas and the magnitude, and the expected duration of the natural gas constraint.

* * * *

30.4.1 Start-Up and Minimum Load Costs

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

30.4.1.2 Registered Cost Methodology

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

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

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

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

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

30.12.1 Applicability ~~[Not Used]~~

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

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

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

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

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

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

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

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

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

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

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

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

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

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

To the extent that FERC authorizes the Scheduling Coordinator or EIM Participating Resource

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

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

31.6.1 Criteria For Temporary Waiver Of Timing Requirements

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

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

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

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

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

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

* * * *

39.7.1 Calculation Of Default Energy Bids

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

39.7.1.1.1.3 Calculation of Natural Gas Price

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

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

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

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

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

* * * *

39.7.1.7 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

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

* * * *

[NOTE – THESE CHANGES WOULD BE PERMANENT, IN EFFECT BEYOND NOVEMBER 30, 2018 UNTIL OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

39.7.2 Competitive Path Designation

39.7.2.1 Timing of Assessments

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

39.7.2.2 Criteria

(A) Notwithstanding the provisions in Section 39.7.2.2(B), when the CAISO enforces the natural gas constraint pursuant to Sections 27.11and 29.27(c), 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 CAISO Balancing Authority Area or in the EIM Entity Balancing Authority Area 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 FMM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of sixty (60) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval of the FMM. In determining whether to designate a Transmission Constraint as non-competitive for the RTM, counter-flow supply to the Transmission Constraint that can be withheld also reflects the PMin of each Short Start Unit with a Start-Up Time of fifteen (15) minutes or less that was off-line in the immediately preceding fifteen (15) minute interval.

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

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

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

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

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40.6.8 Use Of Generated Bids

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[NOTE – THESE CHANGES WOULD BE IN EFFECT UNTIL NOVEMBER 30, 2018 OR OTHERWISE MODIFIED UNDER SECTION 205 OF THE FPA.]

40.6.8.1.6 Filings with FERC to Recover Actual Marginal Fuel Procurement Costs

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

Attachment C – Additional Background and Rules Information

Aliso Canyon Phase 3 Tariff Amendment

California Independent System Operator Corporation

ATTACHMENT C

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

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

A. The Aliso Canyon Facility

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

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

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

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[1] Aliso Canyon Risk Assessment Technical Report Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, and Southern California Gas Company, 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.

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

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

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

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

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[5] 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

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

The limited operability of Aliso Canyon caused gas-balancing conditions in 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 operations, the CAISO provides two-day-ahead and one-day-ahead gas burn

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nominated flows or increase their demand.

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

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

schedules to the gas companies, holds daily calls with them regarding the gas burn schedules, and notifies the gas companies if real-time gas burns are higher than the gas burn schedules. When peak operations are necessary during a day, the CAISO issues flex alerts or imposes restricted maintenance operations, holds peak-day reliability calls that include the gas companies, the Peak Reliability Coordinator (Peak RC),[10] participating transmission owners, and neighboring balancing authorities, and holds peak-day market calls with all market participants.

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

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

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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 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. There also remained some risk of electric service interruption due to reliability

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[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.

rules that require balancing authorities such as the CAISO and LADWP to maintain operating reserve margins. Gas-fired resources are normally used to maintain these operating reserves because they can respond rapidly to operating instructions. Even if the CAISO and LADWP can serve all electricity demand without using gas-fired resources, they need some gas to serve resources providing the operating reserves. If the CAISO and LADWP have no natural gas because of a gas curtailment, they could be required to shed load, thus resulting in the curtailment of electricity service to meet the operating reserve requirement.[16]

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

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

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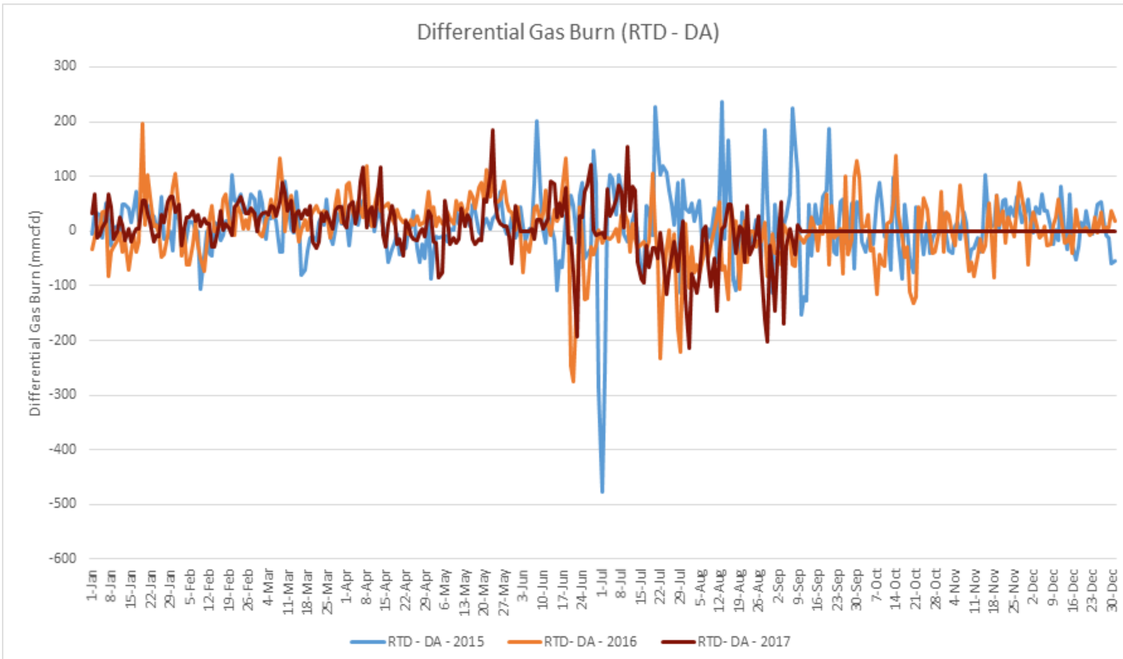
17 2016 Winter Action Plan at 5, 20-25.

18 *Id.* at 24.

19 See section III of this attachment.

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 orders discussed in section III of this attachment, 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, with input from SoCalGas, continued to assess the risks to electric reliability in the greater Los Angeles and Southern California area during the summer months due to the limited operability of Aliso Canyon. The group issued a report on May 19, 2017.[20] The 2017 Risk Assessment Report calculated the system capacity of

[20] Aliso Canyon Risk Assessment Technical Report Summer 2017 Assessment Prepared by the Staff of the California Public Utilities Commission, California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, with Input from Southern California Gas Company (May 19, 2017) (2017 Risk Assessment Report). The 2017 Risk Assessment Report is available at http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN217639_20170519T104800_Aliso_Canyon_Risk_Assessment_Technical_Report_Summer_2017_Asses.pdf.

the SoCalGas/SDG&E gas transmission system, based on peak hour(s) supportable demand, and determined the ability for the electric balancing authorities to maintain power system reliability during a 1-in-10-year peak summer electric load.

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

Based on these findings, the CAISO expects limited operability of Aliso Canyon in the remaining months of 2017, and continuing in 2018, that could have similar impacts on the electric system.

II. Commitment Cost and Default Energy Bid Scalar Settings[27]

The CAISO, with stakeholder and DMM input, previously found that the cap on the amount by which the gas commodity price is increased for use in determining commitment costs using the proxy cost methodology ($2.50 per therm plus two times the next-day gas index price) was effective because this cap level equals the price that a generator would have paid for gas if it violated an OFO based on the current SoCalGas and SDG&E gas tariffs.[28] This is likely the highest real-time gas price that resources in Southern California can be exposed to in managing their applicable gas balancing rules. The adjustment to the gas commodity price will ensure that commitment costs remain within the

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[24] *Id.*

[25] *Id.*

[26] *Id.* at 5-6.

[27] The discussion in this section II supplements the discussion provided in section II.A(2) of the transmittal letter for this filing.

[28] The next-day gas index price approximates the price a generator would have to pay to replace the gas it used to avoid weekly or monthly imbalance charges. A generator would additionally pay the OFO charge, which for SoCalGas is the next-day gas index price plus $2.50. Thus, the total cost a generator would pay for violating an OFO is the $2.50 plus the two times the next-day gas index price.

zone of reasonableness.[29] Also, the bid cap of 125 percent on the CAISO calculation of all commitment costs under the proxy cost methodology, including gas costs, will remain unchanged. Therefore, resources will remain free to submit commitment cost bids so long as they do not exceed the 125-percent bid cap.[30]

Similarly, if the CAISO increases the default energy bid scalar, it will generally increase it to the initial level of 125 percent amount. As DMM explained in previous stakeholder comments, it is appropriate that the initial increase in the gas commodity price for use in determining the default energy bid be set at a lower level than the initial increase in the gas commodity price for use in determining the commitment cost proxy costs. Although generators can submit commitment cost bids up to 125 percent of their proxy costs, generators can submit energy bids up to a bid cap of $1,000/MWh.[31] These energy bids are only subject to mitigation if that congestion occurs and the CAISO deems the supply that can relieve the congestion uncompetitive pursuant to the CAISO's local market power mitigation procedures. If subject to mitigation, energy bids are capped by the higher of a competitive market clearing price or the default energy bid. Thus, unlike commitment costs, energy bids are subject to mitigation, and the bidding resources can only be dispatched based on their mitigated bids, when the energy produced by the resources is necessary to meet a local need within an uncompetitive area. In addition, energy bids set the market price for the entire market, while commitment costs do not. For these reasons, DMM stated that "the gas index used in calculating Default Energy Bids in the SoCal gas area would need to be inflated by a much lower amount than the gas index used in calculating commitment costs."[32]

It is also sufficiently effective to use a smaller increase in the gas commodity price for determining the default energy bids as compared to commitment costs because, even though it provides less ability for generators to

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[29] The Commission has explained that "the courts and this Commission have recognized that there is not a single just and reasonable rate. Instead, we evaluate [proposals submitted under section 205 of the Federal Power Act] to determine whether they fall into a zone of reasonableness. So long as the end result is just and reasonable, the [proposal] will satisfy the statutory standard." *Calpine Corp. v. Cal. Indep. Sys. Operator Corp.*, 128 FERC ¶ 61,271, at P 41 (2009) (citations omitted). *See also New England Power Co.*, 52 FERC ¶ 61,090, at 61,336 (1990), *aff'd sub nom. Town of Norwood v. FERC*, 962 F.2d 20 (D.C. Cir. 1992), citing *City of Bethany v. FERC*, 727 F.2d 1131, 1136 (D.C. Cir. 1984) (rate design proposed need not be perfect, it merely needs to be just and reasonable).

[30] The same scalars that apply to commitment costs will continue to apply to the CAISO's calculation of the generated bids for resource adequacy resources that are under a must-offer requirement but fail to submit a bid in the real-time market. The CAISO's current market systems utilize the same fuel index for the generated bid calculation as they use for the commitment cost calculation.

[31] Existing tariff section 39.6.1.1.

[32] See pages 4-5 of the DMM comments provided in attachment F to the Aliso Phase 1 Tariff Amendment.

manage gas imbalances, it balances the impact a resource's default energy bid price has on its ability to manage imbalances with the impact it has on system-wide locational marginal prices. Default energy bids only come into play when a resource's bid is mitigated as part of local market power mitigation. Thus, the default energy bid price has a smaller impact on a resource's ability to manage its gas imbalances than do commitment costs. In contrast, because the price established pursuant to this mechanism to account for potential gas commodity price volatility may be greater than actual gas commodity prices on any specific day, this higher default energy bid price could set system-wide marginal energy costs at a level that is not just and reasonable.[33] Further, for the same reasons outlined above with respect to balancing the impact that a resource's default energy bid price has on its ability to manage imbalances with the impact it has on system-wide locational marginal prices, capping at 100 percent any subsequent increases to gas prices used for determining default energy bids is just and reasonable. The CAISO sees no evidence that DMM's initial analysis of the 25 percent increase is no longer valid.

III. CAISO Stakeholder Initiatives and Resulting Filings

To date, the CAISO's Aliso Canyon stakeholder initiative has had three phases.[34] The purpose of the instant tariff amendment is to the implement Phase 3 of the initiative. An overview of all three phases is provided below.

A. Phase 1

On March 16, 2016, the CAISO established Phase 1 of the initiative on an expedited basis to address the risks posed by the limited operability of Aliso Canyon. Following a series of working group and stakeholder meetings to develop the Phase 1 proposals, as reflected in successive papers issued by the CAISO, the CAISO Governing Board (Board) authorized the filing of a tariff amendment to implement Phase 1 at its May 4, 2016 meeting.[35]

The CAISO filed the Aliso Phase 1 Tariff Amendment on May 9, 2016, requesting that the Commission accept the Phase 1 tariff revisions on an interim basis until November 30, 2016. On June 1, 2016, the Commission issued an order conditionally accepting the tariff amendment, subject to the CAISO submitting a compliance filing within 30 days. The Commission also ordered a technical conference to be held several months after the CAISO implemented the

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[33] *See id.* at pages 5-6.

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

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

tariff revisions to discuss lessons learned and potential longer-term solutions.[36] The Commission later issued an order accepting the compliance filing the CAISO submitted and granting a motion for clarification the CAISO filed regarding the Aliso Phase 1 Order.[37] The tariff revisions went into effect as of the dates initially proposed by the CAISO and subsequently modified.[38]

On August 19, 2016, the CAISO filed a tariff amendment to maintain on a permanent basis, after November 30, 2017, a subset of the tariff revisions accepted on an interim basis in the Aliso Phase 1 Order.[39] The Commission issued an order accepting those permanent tariff revisions effective November 30, 2016.[40]

B. Phase 2

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

On October, 14, 2016, the CAISO filed the Phase 2 tariff amendment to maintain the tariff revisions in effect until November 30, 2017. The Commission issued an order accepting the tariff revisions on November 28, 2016, subject to the CAISO's submittal of a compliance filing within 30 days.[41]

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

[37] *Cal. Indep. Sys. Operator Corp.*, 156 FERC ¶ 61,135 (2016).

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

[39] Specifically, the CAISO proposed to make permanent the Commission-approved tariff revisions to: (1) allow scheduling coordinators to seek after-the-fact cost recovery of unrecovered commitment costs that exceed the commitment cost bid cap as a result of actual marginal fuel procurement costs pursuant to a filing submitted under section 205 of the Federal Power Act; (2) allow resources to rebid commitment costs in the CAISO real-time market if they were not committed in the day-ahead market; and (3) ensure the CAISO short-term unit commitment process does not commit resources that did not submit bids into the real-time market unless they were scheduled or committed in the day-ahead or had a real-time must-offer obligation.

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

[41] *Cal. Indep. Sys. Operator Corp.*, 157 FERC ¶ 61,151 (2016). The Commission subsequently accepted the CAISO's compliance filing by letter order issued in Docket No. ER17-

C. Phase 3

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

On June 2, 2017, the CAISO issued a market notice to announce the start of Phase 3, schedule a conference call with stakeholders for June 7 to discuss the Straw Proposal the CAISO had prepared, provide an electronic link to the Straw Proposal, and request that stakeholders submit any written comments on the Straw Proposal by June 14.

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

At its July 13, 2017 meeting, the Energy Imbalance Market (EIM) Governing Body issued motions to: (1) approve the Phase 3 proposal to extend the use of the maximum natural gas burn constraint to the EIM; and (2) provide verbal advisory input to the Board to support Phase 3.[42] The Board authorized the CAISO to file a tariff amendment to implement Phase 3 at its July 26 meeting.

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

110-001 on March 24, 2017.

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

Attachment D – Draft Final Proposal

Aliso Canyon Phase 3 Tariff Amendment

California Independent System Operator Corporation

California ISO

Aliso Canyon Gas-Electric Coordination

Phase 3

Draft Final Proposal

June 22, 2017

Table of Contents

Introduction

The purpose of this initiative is to mitigate continued risks to electric reliability due to constrained natural gas systems. Under the previous Aliso Canyon Gas-Electric Coordination Initiatives conducted in spring and fall 2016, the ISO identified there was a need to enhance its market and operational tools to increase gas-electric coordination to address reliability risks caused by the limited operability of the Aliso Canyon natural gas storage facility. The market and operational tools introduced to the ISO market on a temporary basis will expire on November 30, 2017.

Because the Aliso Canyon natural gas storage facility is expected to have limited operability for an extended period of time, the ISO (ISO) is proposing to extend the temporary market and operational tools currently in-place so that they remain in-effect beyond November 30. The ISO proposes to make market constraint limiting the maximum gas burn of a group of generators a permanent operational tool that can be used throughout the ISO and Energy Imbalance Market balancing areas. Experience over the past year has shown that the ISO has prudently used this tool and it has proven particularly effective when used. In combination with the natural gas constraint, the ISO proposes to make permanent its authority to deem transmission constraints uncompetitive when the natural gas constraint is enforced and to suspend convergence bidding when the constraint adversely impacts market efficiencies. The ISO also proposes to make the provisions to publish D+2 results permanent provisions. Finally, the ISO proposes to further temporarily extend other temporary market measures.

ISO proposes to temporarily extend the other temporary market measures because the long-term solutions to the need to balance gas-electric coordination issues through enhanced bidding rules addressed by these features are being evaluated under an existing stakeholder process, *Commitment Costs and Default Energy Bid Enhancements (CCDEBE)*[1]. The ISO believes that initiative is the appropriate format for proposing to enhance its cost based framework to reflect need to balance gas-electric system in a manner that supports system reliability. The CCDEBE enhancements are currently planned to be effective as of fall 2018. Consequently, the ISO proposes to extend these temporary measures until it implements these long-term changes.

This document describes the ISO's straw proposal for this third phase of the Aliso Canyon Gas-Electric Coordination policy initiative. The discussion in this paper is organized into the following sections:

- Background and Issue Discussion: Background discussion summarizing previous phases of this initiative including the source of concerns with gas-electric coordination and a procedural history of the Aliso Canyon stakeholder processes and filings.

- Proposal: Discussion of ISO's straw proposal to extend temporary market measures and to make the publication of D+2 advisory results and the maximum gas burn constraint and its accompanying measures a permanent operational tool. The section will first

[1] Stakeholder process documents available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts_DefaultEnergyBidEnhancements.aspx.

discuss the proposal for operational and D+2 publication to be made permanent and then discuss the proposal for the other market measures to be extended temporarily.

- <u>Plan for Stakeholder Engagement and Next Steps:</u> Reviews ISO's plan for the stakeholder initiative targeting the July 2017 EIM Governing Body and ISO Board of Governors meetings. This section also includes a request for stakeholder comments on this straw proposal.

Summary of Stakeholder Comments

On gas constraints

ISO understood from stakeholder comments that there is general support for its proposal to make permanent the maximum gas burn constraint and extend authority to areas outside of Southern California. ISO understands that Portland General Electric (PGE), NV Energy (NVE), Puget Sound Energy (PSE), Pacific Gas & Electric (PG&E), and Southern California Edison (SCE), and the Department of Market Monitoring (DMM) support the ISO's straw proposal. These views were tempered by practical concerns. ISO understands that Western Power Trading Forum and NRG Energy oppose the proposal primarily for the following reasons (1) opposes extension until ISO completes comprehensive re-evaluation of bidding rules, (2) develops detailed, transparent guidelines for the gas constraint's associated measures, and (3) provide stronger support for extending measured beyond Southern California.

The ISO appreciated stakeholders tempering this support based on whether the ISO would continue to pursue long-term market enhancements to the bidding flexibility under *Commitment Costs and Default Energy Bid Enhancements*.

Portland General Electric (PGE) while conceptually supportive of ISO seeking this expanded, permanent authority, stated in their comments that the maximum gas burn constraint under this initiative is not going to solve more pressing problems not addressed here. PGE stated, "PGE's primary concern with this initiative is its potential to delay the work being done in the Commitment Costs and Default Energy Bid Enhancements (CCDEBE) initiative…the importance of this initiative should not be underestimated."

This sentiment was echoed by NRG Energy, Inc., Environmental Defense Fund, and Western Power Trading Forum. WPTF stressed that the maximum gas burn constraint is not a substitute for needing bidding rule changes, stating "ISO has not established that there is not a market based solution to their (assumed) reliability needs across the footprint…Adequate bidding rules should be a priority for the ISO and not be delayed because of this initiative." EDF characterized the need for long-term changes " a pressing need".

Further demonstrating general consensus among the stakeholder community, NRG Energy stated in their comments, "Given how little progress has been made with regards to consideration of changes to bidding rules, NRG opposes the CAISO making any of the temporary Aliso Canyon mitigation measures permanent until the CAISO completes the CC-DEBE process."

While the ISO stakeholders would like the CCDEBE initiative to proceed more rapidly, evaluating long-term market design changes such as those CCDEE is considering require careful collaboration with stakeholders. Given the complexity of policy development on bidding flexibility and cost recovery issues, the ISO believes that the existing schedule for the initiative to refine the design details with the stakeholders is reasonable.

CCDEBE's schedule was not significantly impacted by launching this final phase of Aliso Canyon and the ISO commits to continuing to prioritize its resources to the CCDEBE effort. The ISO is in part bringing the Aliso Canyon Gas-electric Coordination Phase 3 to the July board so that it can resolve the final phase of this effort and allow resources to primarily focus on CCDEBE and its November board for fall 2018 implementation.

Environmental Defense Fund (EDF) expressed concerns with tying the sunset date for the temporary market measures to the implementation of CCDEBE's measures due to the uncertainty around the CCDEBE timeline. EDF states, "This will create the impetus for reconsideration of the need for, and efficacy of, temporary Aliso measures, considering the then prevailing context." Given the ISO's commitment to allocating resources to the CCDEBE effort and bringing a proposal to the November Board of Governor's meeting and has a target date already reserved in the fall 2018 release, the ISO is confident that the CCDEBE features will be implementable in the near future. The ISO believes tying the sunset date to CCDEBE's implementation will allow for better planning and ensuring the measures retire as the long-term solutions become effective.

The ISO appreciated stakeholders communicating which areas of the proposal would benefit from more information and has endeavored to enhance the proposal sections accordingly.

Environmental Defense Fund, Western Power Trading Forum, expressed in their comments that insufficient justification was provided for the need to seek permanent authority to enforce a maximum gas burn constraint across the ISO footprint, including CAISO and EIM BAAs. The ISO has addressed these concerns in the Section titled, Make permanent gas constraint authority, and believes the explanations have provided greater transparency into the potential issues faced by ISO Operations balanced against need to maintain confidentiality with specific stakeholder business needs. Specifically to the request from EDF to provide "a detailed consideration of the results of the summer 2017 joint agency technical study", the ISO does not intend to elaborate on the findings it in collaboration with other agencies reached in the technical study. The fuller consideration can be found in those documents[2].

The ISO has addressed the DMM, NV Energy, PGE, and PG&E's requests for additional information on the design of the maximum gas burn constraint and the process for determining it would be enforced through enhancing the paper to include a background section on the ISO's gas-electric coordination including use of gas constraint, noting in the proposal section that the gas-electric coordination efforts described would be leveraged, and including a technical

[2] Mitigation measures document includes a fuller consideration of needs driving maintaining authority, available at http://www.energy.ca.gov/2017_energypolicy/documents/2017-05-22_workshop/2017-05-22_documents.php.

appendix with the details for the constraint. These details include the formulation, modelling approach used by the generation group nomogram technology for the purpose of reflecting maximum burn limits, guidelines for use, and how the gas resource will be settled.

For EIM specific questions posed by NV Energy and DMM, the ISO explains that it has assessed the impact on sufficiency, balancing and capacity tests in EIM and the role of EIM base schedules. The ISO explains these in the proposal and technical appendix sections. The ISO believes these additions are responsive to stakeholder requests and would accordingly enhance its business practice manuals to include these details.

On capturing gas constraint impact on mitigation

ISO understood from comments that PG&E, SCE, DMM, NV Energy, PSE, and PGE support the ISO proposal to permanently maintain its authority to ensure its mitigation measures reflect expected impacts to competition when maximum gas burn constraint is enforced. DMM requests the ISO fully automate the dynamic competitive path assessment as a more sustainable alternative to the existing manual process. PG&E supports DMM's suggestions for these enhancements.

SCE commented that it supports the notion proposed by the Department of Market Monitoring's comments that there is a need for appropriate mitigation related to incremental exceptional dispatches in its Phase 2 comments. The ISO after further discussion realized that the Department of Market Monitoring was not aware that the ISO had previously determined the authority to deem select transmission constraints uncompetitive should apply to the mitigation of incremental exceptional dispatches under its existing exceptional dispatch policy which says the dynamic competitive path assessment results (including overrides is implied) is used to determine . Consequently, the ISO included the detailed language in both its straw and draft final proposal that the override applies to both the dynamic and default assessments. The default assessment is used for exceptional dispatch mitigation. The ISO believes there has not been a "gap" on incremental exceptional dispatch since the authority has been in effect.

The Department of Market Monitoring submitted comments that the current manual approach for assessing whether a transmission constraint should be deemed uncompetitive is not sustainable in the long-term. DMM states, "the ISO needs to ensure that the automated calculations of supply of counterflow include impacts of gas nomograms." The ISO agrees that the manual process is not sustainable in the long-term. The ISO revised its proposal to propose automating the dynamic competitive path assessment to consider the maximum gas burn constraint as the full technology solution and will maintain the authority to override the current method to bridge to the full solution. The ISO will need to evaluate the workload associated with using the manual override while enforcing gas constraints in additional areas and may need to phase in implementing these constraints.

On transparency commitments

WPTF, EDF, PGE, PG&E, NV Energy, and DMM all seek greater levels of transparency. Some stakeholders are seeking the ISO affirm its commitment to continue providing sufficient levels of transparency for the maximum gas burn constraint and its accompanying measures.

The ISO commits to providing additional transparency around the authority to override the dynamic or default competitive path assessment or to suspend virtual bidding. The ISO commits to continuing to provide transparency around enforcing the maximum gas burn constraint and if it deems transmission paths uncompetitive at that time. The ISO releases a notification if a maximum gas burn constraint is enforced. If a manual override were to be issued, the ISO would notify the market at the time it enforced the constraint. Further, the ISO maintains its previous commitment to issue a technical bulletin with justifications for a general suspension or limitation of Virtual Bids if suspended using this authority.

On real-time gas commodity price scalars

DMM support continued use of real-time gas commodity price scalars when appropriate caveating that they “stress the need to lower levels when there is no evidence of a tight market.” SCE’s comments were supportive of these statements by the DMM stating, “the CAISO should be prepared to adjust the cost scalar adders as appropriately needed.” The ISO agrees with both stakeholders that it is a critical component of the design that the ISO be able to raise or lower these scalars, which is why this flexibility is contained in the Tariff.

The ISO does not believe the specific level of the scalars is a policy discussion. There exists an internal business process for determining whether there is a need to adjust the scalars. The ISO will adjust the scalers if analysis shows it is appropriate and would issue a market notification communicating this decision.

Background and Issue Discussion

Procedural History

Under the *Aliso Canyon Gas Electric Coordination Measures* initiative Phase 1, the ISO launched an expedited stakeholder process to address operational concerns due to reliability risks identified in an inter-agency task force’s technical report and action plan.[3] The ISO together with stakeholders designed eleven temporary measures which the ISO filed with the Federal Energy Regulatory Commission (FERC) for approval on May 9, 2016[4], to be effective through November 30, 2016. See the original Revised Draft Final Proposal for Aliso Canyon Gas-Electric Coordination for Phase 1 for background information and a description of each approved temporary measure[5]. FERC subsequently approved this filing effective June 1, 2016 through November 30, 2016[6].

Of the 11 measures filed under the Phase 1 filing, three measures were previously vetted and developed with stakeholders under the Bidding Rules Enhancements initiative as permanent

[3] All the inter-agency materials are accessible through stakeholder webpage, http://www.caiso.com/informed/Pages/StakeholderProcesses/AlisoCanyonGasElectricCoordination.aspx
[4] http://www.caiso.com/Documents/May9_2016_TariffAmendment_EnhanceGas-ElectricCoordination_LimitedOperation_AlisoCanyonNaturalGasStorageFacility_ER16-1649.pdf
[5] http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf
[6] http://www.caiso.com/Documents/Jun1_2016_OrderAcceptingTariffRevisions_Establishing_TechnicalConference_AlisoCanyon_ER16-1649.pdf

market features. Consistent with the Board of Governors' approval of these measures, the ISO filed for approval to revise its tariff and make those bidding rules permanent on August 19, 2016.[7] FERC approved the three measures on November 21, 2016.

Under Phase 2, the ISO evaluated whether the eight remaining temporary measures enhancing gas-electric coordination should be extended in light of concerns with continued operational risks. The concerns were based on a revised reliability assessment for winter 2016/2017 from the same interagency task force, the Winter Action Plan and Winter Risk Technical Report, and whether the revised assessment warrants continuing the ISO's authority to utilize the eleven temporary measures designed to address operational concerns due to reliability risks.

The ISO did not propose to introduce new measures as the three new permanent provisions and the eight temporary measures previously approved were effective at managing natural gas system capacity limitations in addition to imbalance limitations.[8] The ISO determined two of the eight measures were not necessary to extend as the portfolio of measures without them was sufficiently robust. See the original Revised Draft Final Proposal for Aliso Canyon Gas-Electric Coordination for Phase 2[9] for background information and a description of each approved temporary measure. On October 14, 2016, the ISO filed to temporarily extend six measures to November 30, 2017. FERC approved the requested extension on November 28, 2016.

The inter-agency task force recently released the Aliso Canyon Risk Assessment Technical Report Summer 2017 Assessment.[10] The assessment states risks to electrical system reliability due to Aliso Canyon's limited operability are likely to continue. Consequently, the ISO is issuing this straw proposal to enable it to maintain the operational and market tools until the risks on the constrained gas system due to the limited operability of Aliso Canyon storage facility no longer pose a risk to reliable electric system operation.

Gas-electric coordination including use of gas constraint

ISO Operations is actively engaged in communicating with gas operations to coordinate operations supporting both systems. If through this coordination, the ISO identifies concerns that adverse operating condition may arise due to the upstream gas system it could select from a portfolio of operating tools to enforce a gas constraint.

The maximum gas burn constraint is one of the tools available to ISO operations to reflect anticipated limitations on the gas system so the market results will account for this limitation to avoid triggering reliability event (e.g. gas curtailments). ISO establishes guidelines and process

[7] Bidding Rules and Commitment Costs Enhancements (ER16-2445) filing, available at http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=1AA66AC3-C157-44C8-9B7C-384FD77C06D5.
[8] The Department of Market Monitoring has raised that there might be a need to mitigate exceptional dispatches related to the gas constraints under certain circumstances. The ISO and the Department of Market Monitoring continue to evaluate this issue and may later propose additional measures.
[9] Aliso Canyon Gas-electric Coordination Draft Final Proposal, available at http://www.caiso.com/Documents/DraftFinalProposal-AlisoCanyonGasElectricCoordinationPhase2.pdf.
[10] http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN217639_20170519T104800_Aliso_Canyon_Risk_Assessment_Technical_Report_Summer_2017_Asses.pdf

used to determine whether the operator should enforce a natural gas constraint. These processes are established with the gas company and documented in operating procedures.

Currently these procedures include addressing gas service area limitations or outages in Southern California and gas transmission pipeline derates or outages in the remainder of the ISO balancing authority area[11]. Through its coordination efforts, the ISO may identify the need to trigger one of these procedures to respond and appropriately operate the electric system while under adverse operating conditions.

The various coordination efforts span from advanced planning of pipeline or storage facility derates or outages through managing for anticipations of adverse conditions, specifically:

- Outage planning through bi-weekly calls with planners
- Under normal operations the ISO:
  - Provides D+2 and D+1 gas burn schedules
  - Holds daily calls on D+2 and D+1 gas burn schedules
  - Notifies if RT burns are higher than gas burn schedules
- Under peak day operations the ISO:
  - Issues flex alert or restricted maintenance operations
  - Holds peak day reliability call including gas companies, Peak RC, PTOs, and neighboring BAAs
  - Holds peak day market calls (all market participants)
- Under adverse operating conditions due to gas service area limitations the ISO:
  - Receives curtailment watch notification, where ISO can manage system using either gas constraints or exceptional dispatches
  - Receives curtailment instructions (i.e. transmission pipeline derates or outages) where ISO can manage system using either gas curtailment tool or exceptional dispatches
  - ISO will issue market notifications when action is taken

The procedure that could result in enforcing natural gas constraint in Southern California is found under the adverse operating conditions under its emergency operations procedures (Operating Procedure 4120c[12]). The procedure includes guidelines for addressing these adverse conditions such as:

- Scenarios under which the constraint could be enforced and actions by ISO, Scheduling Coordinator, or Gas Company etc.
- Relative timing of the coordination efforts
- Notifications associated with triggering the tool

Once Operations determines a need to enforce the constraint, the maximum gas burn constraint constrains the maximum amount of natural gas that can be burned by natural gas-fired

[11] Operating procedures 4120 and 4120c, available at http://www.caiso.com/Documents/4120.pdf and , http://www.caiso.com/Documents/4120C.pdf.
[12] Operating procedure available at, http://www.caiso.com/Documents/4120C.pdf.

resources, based on limitations, in applicable gas operating zones anticipated by the ISO[13]. The natural gas constraint permits ISO operators to enforce in the day-ahead and real-time markets a constraint(s) 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. The constraint(s) also limit the ISO 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 constraint lowers the resource-specific locational marginal prices of gas generators subject to the constraint to ensure the necessary supply reduction occurs[14].

Although individual generators can manage their gas burn to comply with gas system constraints to a large extent through their ISO market bids, these bids from individual resources cannot completely ensure that the gas burn resulting from the ISO's overall dispatch in an area does not exceed the capacity of the gas system in that area especially under the existing bidding rules and cost estimate design. In some emergencies or situations that can lead to emergencies, the ISO may be required to take action to avoid burning gas in gas operating zones and cannot rely on bidding behavior alone to ensure reliable operations of the electric system.

Based on its experience using the gas burn constraint in southern California over the past year, the ISO has found this operational tool to be an important mechanism to avoid excessive impacts on the gas system under constrained gas system conditions to help keep the gas system within operational limits and avoid impacts to electric system reliability. Although the ISO has had to use the constraint sparingly, the ISO found the constraint to be a valuable operational tool to keep electrical generation gas usage within system constraints when it was used.

Specifically, the maximum gas burn constraint has proven to be effective for recognizing constraints on natural gas systems, when they arise, so that the ISO's dispatch solution does not exceed the system limits; system limits if not addressed through manual dispatch could undermine electrical reliability. The ISO has enforced the gas constraints (two of them, one for San Diego Gas and Electric system and one for the larger Southern California Gas Company system area) in the market for only four days, from January 23 through January 26, 2001. In two of these days (January 24 and 25), the gas system was constrained to such an extent that Southern California Gas Company withdrew gas from Aliso Canyon. The ISO's use of the constraint on these days kept the gas burn of the generators subject to the constraint within the specified limit.

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[13] *Aliso Canyon Gas-Electric Coordination* Revised Draft Final Proposal includes the details for the zonal nature and rules for the gas constraint under Phase 1, available at: http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf. Under Phase 2, the ISO revised select details of the initial design, available at http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf.

[14] See section 6.1.3 of the Revised Draft Final Proposal under Phase 1 for pricing impacts, available at http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf.

Proposal

The following table summarizes the current temporary measures intended to increase gas-electric coordination to address reliability risks caused by the inoperability of the Aliso Canyon natural gas storage facility. For each of these measures, it lists whether the ISO proposes to temporarily extend the measure beyond November 2017, or whether the ISO proposes to make the measure a permanent tariff provision, along with any proposed modifications to the measures.

Temporary Measures	Proposal	Modifications
Maximum Gas Burn Constraint: Ability to enforce gas constraints for either capacity or imbalance limitations and proposes to make refinements to the original constraints design	File permanent revision	Extend authority to entire footprint when conditions warrant in day-ahead and real-time (note: real-time market footprint includes multiple BAAs)
Competitive Path Assessment: Allow the ISO to manually override the dynamic and default competitive path assessment to determine transmission paths should be deemed uncompetitive if the gas constraint is enforced based on a forward competitive path assessment and automate dynamic competitive path assessment to include gas constraint	File permanent revision	Extend authority to entire footprint when conditions warrant in day-ahead and real-time
Virtual Bidding: Ability to suspend virtual bidding in the event the ISO identifies market inefficiencies as result of enforcing the maximum gas burn constraint is only applicable at times the maximum gas burn constraint is enforced	File permanent revision	Extend authority to entire footprint when conditions warrant
D+2 Information: Increase access to information prior to day-ahead by reporting scheduling coordinators' D+2 residual unit commitment results directly to the scheduling coordinator	File permanent revision	No
Day-Ahead Market Gas Index: Increase ability of suppliers to reflect cost expectations in day-ahead bids by using an approximation of the next day gas index published morning of the day-ahead market run to calculate cost estimates	File for temporary extension	No
Adjustments to DEBs and Commitment Cost Caps: Increase the gas commodity price index used to calculate default energy bids (DEBs) and commitment cost for resources in the Southern California Gas and SDG&E gas regions by introducing a commodity price scalar, for purposes of	File for temporary extension	No

distinguishing resources affected by the gas limitations from the rest of the ISO market areas. The percent scalar is applied to the next day gas index published the morning of the day-ahead market run to calculate cost estimates.		

Make permanent gas constraint authority

ISO proposes to make the maximum gas burn constraint a permanent operational tool for use throughout the entire ISO and EIM footprint, as part of their balancing authority role when conditions warrant. The ISO arrived to this proposal primarily based on the following drivers:

- Aliso Canyon is likely to be out for the foreseeable future and the gas constraint has proven useful to mitigate reliability concerns in Southern California in a more transparent manner than use of exceptional dispatches.
- Similar constraints are likely developing in other areas of ISO balancing authority area outside of the Southern California area due to Senate Bill 887 increasing requirements on storage facilities and new CARB rules on storage facility methane leaks.
- Similar constraints exist in portions of the EIM footprint due to gas availability limitations where gas burn levels are not able to exceed limited pipeline capacity, exacerbated by limited levels of storage facilities to mitigate this risk, and the risk of gas system limitations indicated by curtailment watch or operational flow orders.

First, Aliso Canyon is likely to be out for the foreseeable future and the gas constraint has proven useful to mitigate reliability concerns in Southern California in a more transparent manner than use of exceptional dispatches. The gas constraint is a useful tool that can be used in the event of gas system problems to better coordinate with gas system operations and help keep the gas system within operational limits and avoid impacts to electric system reliability. It is preferable to manual dispatches taken by operators because the impact of the gas system constraints are reflected in the ISO market solution (both in locational marginal prices and dispatches) through the use of the gas constraint in the ISO market. Therefore, the constraint reduces the need for manual interventions and uplift on the ISO system.

Second, similar constraints are likely developing in other areas of the ISO balancing authority area outside of the Southern California area such that it finds it prudent to be prepared to manage limitations if needed through gas constraint. ISO believes gas system limitations may develop in other areas within its balancing authority area in the future as a result of higher levels of awareness of adverse impacts if gas storage facilities are unsafely operated. The ISO is concerned potential limitations may develop elsewhere due to potential impacts on gas systems to comply with both the approved Senate Bill initially launched in response to the Aliso Canyon incident that increased requirements on storage facilities (September 2016) and new California Air Resource Board rules aimed at combatting emissions from methane leaks (March 2017)[15].

[15] California Air Resources Board News Release, https://www.arb.ca.gov/newsrel/newsrelease.php?id=907.

The California Legislature declared in its California Senate Bill 887 (SB 887) that, "The 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.[16]" As a result of this approved bill, Legislature directed the Division of Oil, Gas, and Geothermal Resources to impose additional regulations on gas storage operations among other amendments[17]. Both SB 887 and CARB rules on methane leaks will likely result in potential significant changes to gas storage operations throughout the state – specifically increase risk of system storage capability and availability limitations in both Southern California Gas & Electric and Pacific Gas & Electric systems.

Finally, ISO understands from EIM stakeholders that similar constraints exist in portions of the EIM footprint and as such proposes to seek authority to enforce gas constraints in EIM balancing areas based on the EIM Entity's determination that a gas constraint should be enforced. EIM Entity's already have similar authority to use manual dispatch at their discretion and the gas constraint would provide a more efficient means to managing gas usage. The ISO agrees with Puget Sound Energy (PSE)'s comments on the Aliso Canyon Gas-Electric Coordination Phase 3 straw proposal comments stating, "This tool provides greater flexibility than manually applying outages on select units.[18]"

Based on its understanding of the concerns in EIM Entity balancing authority areas, the ISO believes the existing design for a maximum gas burn constraint with options to apply the either a gas system capacity limitation or a gas system imbalance limitation will effectively respond to the EIM Entities' gas limitations. EIM Entity's use of the gas constraint will follow the existing maximum gas burn constraint policy in which the use of the gas constraint would be limited to managing anticipated physical gas limitations. All generators within the gas constraint would have to be EIM participating resources. The ISO understands EIM Entity gas limitation include:

- Gas capacity reduction limitation: A number of EIM resources have limited pipeline capacity and their gas burn cannot exceed that limited pipeline capacity. In addition, ISO understands that select gas pipeline companies have not offered to sell interruptible transmission over the past several years as well as gas storage is fairly limited for portions of the EIM.[19] Because of this limited storage capacity, on high demand days the ability to draft from the pipeline can become limited and therefore, in combination with limited pipeline capacity and little to no interruptible pipeline capacity available, gas burn levels can be constrained to within gas availability in real-time.

- Gas system imbalance limitation: A number of EIM resources are within gas service areas that are faced with similar operational issues as those originally described in Southern California. Under constrained gas system conditions where pipeline pressure

[16] Section 1(i), https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201520160SB887.

[18] Puget Sound Energy (PSE) straw proposal comments, Page 1, http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=0203E012-3701-45BF-952D-757E2AD4011E.
[19] http://www.westernenergyboard.org/ngei/documents/reference/other/06-12APPIgs.pdf

> is imbalanced and could potentially lead to reliability issues, the gas pipeline company will issue instructions to limit the gas burn to within a tolerance band of the scheduled levels so that gas system reliability is not adversely impact.

Given the risk of similar gas limitations arising across the ISO footprint which affects both ISO and EIM balancing authority areas, the ISO believes it prudent to seek authority to enforce maximum gas burn constraints if such limitations arise so that it can manage joint dispatch effectively in real-time. ISO proposes to extend the use of the constraint consistent with the existing design and functionality as described in the Revised Draft Final Proposal from Phase 1 including revisions made under the second phase described in the Draft Final Proposal from Phase 2.[20] Appendix A: Technical appendix on gas constraint in this document includes details on the maximum gas burn constraint design as it would be applied regardless of whether enforced within the ISO or an EIM BAA. ISO notes that each defined generation group nomogram i.e. maximum gas burn constraint is a different constraint but all created similarly using the same principles.

ISO understood from NV Energy and Portland General Electric's comments that the EIM Entity's are seeking more information on the process for using the maximum gas burn constraint, including requirements, notification requirements, or timing of actions needed and how the differences in managing gas-electric coordination outside of the ISO balancing authority area would be captured in those processes[21]. The ISO agrees that establishing the process is a critical piece of the implementation effort needed to support a gas constraint. As described in the background section, the ISO has these procedures – established with the gas company – for the Southern California Gas & Electric area detailing the scenarios under which the constraint could be enforced and actions by ISO, Scheduling Coordinator, or Gas Company; relative timing of the coordination efforts; and notifications associated with triggering the tool.

If authority is approved to use gas constraint in other areas, the ISO will establish guidelines for use of maximum gas burn constraint elsewhere in its operating procedures for addressing adverse operating conditions for gas-electric coordination. Operation procedures are the appropriate location for greater levels of detail beyond the design since the procedures need to be established in coordination with the gas system operator of the affected gas service area if within the CISO balancing authority area or with the energy imbalance market affected service area if within an EIM balancing authority area. The ISO believes the differentiations needed between rules or procedures for ISO balancing authority area versus EIM balancing authority areas s are should be established in coordination with the applicable EIM Entity as the balancing authority area instead of the gas pipeline company would be responsible for (1) establishing operating procedure between the EIM entity and ISO Operations and (2) communicating the EIM entity balancing authority area's need to enforce the constraint to ISO

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[20] Available at:
http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf,
http://www.caiso.com/Documents/DraftFinalProposal-AlisoCanyonGasElectricCoordinationPhase2.pdf.

[21] NV Energy comments,
http://www.caiso.com/Documents/NVEnergyComments_AlisoCanyonGas_ElectricCoordinationPhase3StrawProposal.pdf; Portland General Electric comments,
http://www.caiso.com/Documents/PGEComments_AlisoCanyonGas_ElectricCoordinationPhase3StrawProposal.pdf.

Operations, and (3) would designate all generators' within the maximum gas burn constraint as EIM participating resources at the time the constraint is enforced.

NV Energy sought information on how enforcing a maximum gas burn constraint. The ISO confirmed that the sufficiency test does not consider the deliverability of that capacity as a requirement for the test today. Enforcing the maximum gas burn constraint will not impact the test to maintain consistency with the current policy around the test where transmission constraints are also not considered.

ISO notes that the maximum gas burn constraint has always been planned to be implemented in two phases where phase 1 hardcoded the $\propto_i$ so that it is the average heat rate for a resource that is programmed into the nomogram as hardcoded shift factors instead of the unit factor (shift factor of 1) for every resource and phase 2 will incorporate the heat rate specific to the bid segment curve output by the market process as described in the equation so that the shift factors will return to unity as designed. As a part of making this functionality a permanent feature, the ISO will fully implement the maximum gas burn constraint and complete phase 2.

Automate dynamic competitive path assessment to include gas constraint

The ISO proposes to automate the inclusion of the natural gas constraint into the dynamic competitive path assessment as the full technology solution to the mitigation concerns. To resolve these concerns today when the ISO enforces the maximum gas burn constraint, the ISO has the authority to override both its dynamic and default competitive path assessments when the gas constraint is enforced based on actual system conditions.

As part of each market power mitigation run, a dynamic competitive path assessment (DCPA) is performed to determine whether a transmission constraint is uncompetitive. A transmission constraint will be competitive by default unless the transmission constraint is determined to be uncompetitive by the DCPA. This will occur when the maximum available supply of counter-flow to the transmission constraint from all portfolios of suppliers (not identified as potentially pivotal) is less than the demand for counter-flow. If, for some reason, the DCPA is unable to function or for the purpose of mitigating incremental exceptional dispatches that could have relieved the transmission constraint, the market power mitigation will rely on a default competitive path list which is compiled based on historical analysis of congestion and previous DCPA results on each transmission constraint.

At times when gas-usage nomograms may be enforced, the simultaneous impact of enforcing both the maximum gas burn constraint and the transmission constraint is not included in the DCPA methodology.

To address this gap, the ISO performs a manual procedure the forward competitive path assessment to determine whether there is a need to manually declare transmission constraints uncompetitive based on its determination that actual electric supply conditions may be uncompetitive due to anticipated electric supply conditions in the affected gas regions. As a part of the forward competitive path assessment, the ISO first will identify the set of transmission constraints that can be relieved by counter-flow from potentially gas-limited resources. Then, the

ISO will estimate changes to the residual supply index (RSI) for each of those constraints resulting from the imposition of different values of the gas usage nomograms for each day. Estimation of the RSI will involve identical calculations to the ones used in the market, but will include an estimate of the capacity that is operationally available after the imposition of the gas-usage nomograms. The ISO will be able to declare a set of constraints uncompetitive where the RSI is predicted to be uncompetitive with the inclusion of the maximum gas burn constraint nomogram. Finally, Operations will be provided with a table that lists the relevant potentially uncompetitive transmission constraints based on maximum gas burn constraint levels enforced. For each constraint and maximum gas burn constraint combination, a limit or limits will be listed. If the maximum gas burn constraint(s) is binding with a limit at or below the one listed, it will be appropriate to declare the listed constraints uncompetitive if identified as uncompetitive based on the forward competitive path assessment.

Given its belief that the manual override mitigates risks to market power concerns when the maximum gas burn constraint is enforced, the proposal is to maintain authority to override the dynamic or default competitive path assessment until the full solution is effective. In this way, the existing process can be used to bridge to a full solution allowing authority to enforce gas constraint across footprint if conditions warrant while ensuring the potential impact of the constraint is incorporated in market power mitigation processes. The ISO will need to evaluate the workload associated with using the manual override while enforcing gas constraints in additional areas and may need to phase in implementing these constraints.

The ISO commits to providing additional transparency around the competitive path assessment. If a manual override were to be issued, the ISO would notify the market at the time it enforced the constraint.

Make permanent virtual bidding suspension authority

Along with making the gas constraint a permanent operational tool, the ISO proposes to also make permanent authority to suspend virtual bidding in the event virtual bids are introducing adverse market outcomes in conjunction with the use of the gas constraint (this would not be applicable to EIM areas as there is no virtual bidding at those locations). As explained in the previous Aliso Canyon Gas-Electric Coordination proposals, this is an important measure to mitigate adverse market outcomes in conjunction with the use of the gas constraint.

The ISO commits to providing additional transparency around the authority to suspend virtual bidding. The ISO maintains its previous commitment to issue a technical bulletin with justifications for a general suspension or limitation of Virtual Bids if suspended using this authority.

Make permanent publishing the D+2 Information

This measure increases access to information prior to day-ahead by reporting scheduling coordinators' D+2 residual unit commitment results directly to the scheduling coordinator. The ISO proposes to make these permanent tariff provisions because it believes this will continue to be useful information to suppliers to incorporate into their gas procurement conducted in the morning before the ISO publishes day-ahead market results at 1 pm. The majority of gas trading occurs before the ISO publishes day-ahead market results and suppliers have stated that although the D+2 results are not complete predictors of day-ahead market results, they are a useful data point in making their gas procurement decisions.

ISO will continue to pursue enhancements to increase access to information to scheduling coordinators and the gas companies to support gas-electric coordination below. Since the ISO does not need to make additional tariff revisions to increase transparency into gas-electric needs, ISO commits to continue to improve this transparency where practical through either providing:

- More than 24 hours of gas burn data so the gas company can see operating expectations across its operating day from 7AM-7AM Pacific,
- Real-time gas burn information, or
- Unit-level RUC gas burn amounts to both gas company and scheduling coordinators[22] for each gas burn amount reported to the gas company.

Extend temporarily market measures

As described in the table above, the ISO proposes to further extend some of the current temporary market measures designed to increase gas-electric coordination in light of the limited operability of the Aliso Canyon natural gas storage facility. As described below, these measures will likely no longer be needed once the ISO implements market design changes being developed under the ISO's current *Commitment Cost and Default Energy Bid Enhancements* policy initiative. The CCDEBE enhancements are currently planned to be effective as of fall 2018. Consequently, the ISO proposes to extend these temporary measures until it implements these long-term changes.

The following discuss the temporary measures the ISO proposes to further temporarily extend:

Day-Ahead Market Gas Index: This measure increases the ability of suppliers to reflect cost expectations in day-ahead bids by using an approximation of the next day gas index published the morning of the day-ahead market run to calculate cost estimates used for default energy bids, generated bids, and commitment cost bid caps (cost estimates). The ISO proposes to extend it to continue to estimate suppliers' costs at cost estimates that more accurately reflect current gas market prices.

The ISO is proposing to temporarily extend this measure, instead of making it permanent, because it is considering bidding rule and cost estimates changes in the ongoing Commitment Cost and Default Energy Bid policy initiative that will also increase the accuracy of cost estimates used by the day-ahead market.

Adjustments to DEBs and Commitment Cost Caps: These measures increase the gas commodity price index used to calculate cost estimates for resources in the Southern California

[22] Scheduling Coordinator would only receive its assets gas burn information.

Gas and SDG&E gas regions by introducing a commodity price scalar, for purposes of distinguishing resources affected by the gas limitations from the rest of the ISO market areas. The percent scalar is applied to the next day gas index published the morning of the day-ahead market run to calculate cost estimates. The ISO proposes to extend these three temporary measures that made adjustments to its cost estimates to improve commodity price information or to include additional short-run marginal costs associated with generator's managing their balancing requirements.

Based on the recent summer 2017 assessment, and as was the case over both summer 2016 and winter 2016/2017, the ISO anticipates that (1) Aliso Canyon will have only limited operability, (2) intra-day (i.e., real-time) gas availability will likely decrease, and (3) there will be tightened gas balancing requirements. This means a lack of nearby gas storage to respond to electric ramping needs and, when there is a deterioration of gas pipeline pressures, limited ability for SoCalGas and SDG&E to support large increases of gas receipts onto their systems relative to their scheduled capacity or deliver the increased amounts of gas in real-time to generators. ISO expects that the current commitment costs, generated bids, and default energy bids likely will not fully accommodate these conditions. Because the ISO's current calculation of the gas commodity price is based on trading for next-day delivery, it does not include information from the intra-day gas commodity markets regarding gas prices or risk of noncompliance with gas balancing rules. Therefore, absent the tariff provisions that the ISO proposes to maintain in this filing, the resulting commitment costs, generated bids, and default energy bids may not allow resources to manage gas-balancing requirements within tightened tolerance bands, and the calculated gas price may not fully capture real-time gas commodity prices on all days. When generators on the affected gas system are under tightened gas balancing requirements, they will presumably reflect these tightened balancing requirements in their bids, which will likely achieve the desired result of the real-time market dispatching these resources only for local electrical needs.

Under the existing policy effort CCDEBE, the ISO is evaluating with stakeholders bidding rule changes should be made to more accurately reflect gas costs in cost estimates when the gas system is adversely affected by constrained conditions so as to continue to differentiate between generators that are at risk of violating balancing rules and those that have gas available to respond to dispatch. The ISO is developing a straw proposal to propose long-term solution that will continue to allow market dispatches and prices to reflect resources' expected costs even under constrained gas system conditions.

Plan for Stakeholder Engagement and Next Steps

The current schedule for this initiative is shown below. Stakeholder comments will be due June 14, 2017. In comments, the ISO asks stakeholders to provide input on the ISO's straw proposal. The ISO will present its proposal to its Board of Governors and the EIM Governing Body during their July 2017 meetings.

> In this draft final proposal the CAISO has revised its plan for obtaining approval from the EIM Governing Body and CAISO Board. In the straw proposal, the CAISO had stated

the entire initiative would involve the EIM Governing Body's advisory role. The CAISO now plans to divide the initiative into two separate parts for decisional purposes. It would seek approval under the EIM Governing Body's primary authority for the element of this initiative that proposes to allow an EIM Entity to implement a gas constraint in its balancing area. The remainder of the initiative will involve the EIM Governing Body's advisory role to the Board of Governors.

The CAISO made this change after recognizing that the use of gas constraints in EIM areas is separable from the rest in the sense that, even if this particular component were not approved at this time, Management would plan to file the remainder of the proposal if it were approved because it relates to the distinct issue of Aliso Canyon. This approach is consistent with the guidance in section II.B. of the *Guidance for Handling Policy Initiatives within the Decisional Authority or Advisory Role of the EIM Governing Body.*[23] This section addresses when an initiative contains a severable component that CAISO management would plan to file for approval whether or not another components or components are approved. In such a case, it states that "…any severable EIM-specific element should be separated after the conclusion of stakeholder review and directed to the EIM Governing Body for decision. The severable EIMs specific element (alone) should be directed to the EIM Governing Body as part of primary authority. The remainder of the initiative should be classified according to the applicable rules."

Milestone	Date
Issue and Straw Proposal Posted	06/02/2017
Stakeholder Call	06/07/2017
Stakeholder Written Comments Due	06/14/2017
Draft Final Proposal Posted	06/22/2017
Stakeholder Call	06/23/2017
Stakeholder Written Comments Due	06/30/2017
EIM Governing Body Meeting	6/13/2017
July Board Meeting	07/26/2016

[23] http://www.caiso.com/Documents/GuidanceforHandlingPolicyInitiatives-EIMGoverningBody.pdf

Appendix A: Technical appendix on gas constraint

Enforce generation group nomogram to constrain burn levels

Problem statement

The ISO understands the two primary factors that can adversely impact the gas system reliability, and consequently electric system reliability, are:

1. Capacity reduction limitations from storage outages, pipeline outages, or curtailments: Whether planned or unplanned, outages or curtailments will restrict the availability of gas to affected generators. A plant level limitation reflecting an agreed upon maximum allowable gas burn could be reflected in ISO markets so the ISO can more efficiently dispatch the generators under the limitation.

2. System imbalance limitation where large imbalances between gas nominations and actual gas burn could compromise gas reliability: Electric operations can affect gas reliability if electric market outcomes result in instructing affected generators to increase or decrease their gas imbalances to respond to ISO instructions. For example, a significant change in the dispatch of generators in the SoCalGas and SDG&E gas system between the real-time dispatch and day-ahead market schedules could exacerbate the decline (for low operating pressure condition) or the increase (for high operating pressure condition) of operating pressure if generators are not able to adjust either their nominations or their gas burn to a level more supportive of gas system conditions. The technical assessment concluded that daily gas imbalances greater than 150 MMcf[24] in either direction significantly increase risk of gas curtailments that could result in electric service interruptions.

Discussion on (1) capacity reduction limitations

Current ISO policy in the event of a reduction in gas system capacity or deliverability capability is to allow generators to manage their output so that it reflects the reduction from gas outages and/or curtailments.

For outages, the ISO's policy is that once these outages are made public by the gas company, the generators are responsible for submitting its plant level limitation through the outage management system using the appropriate nature of work. The ISO's current policy places the responsibility on the generator to ensure it submits an outage card to the ISO's outage management system reflecting a limitation it might expect unless timing precludes the outage card from being reflected in the market. While an outage may be public, it may be unclear to generators exactly what their plant level limitation will be until the curtailment or their inability to procure gas occurs. While it would improve electric market outcomes if generators submitted outage cards reflecting their share of the gas limitation as result of outage, generators might not be able to translate the outage information to a plant level limitation. Further once a notification

[24] The ISO will continue to explore with SoCalGas its understanding of the exact constraint and in the meantime uses 150 MMcf for the purpose of describing the proposed priced constraint.

is issued for curtailments, the ISO is evaluating whether operations could be improved through using the gas constraint to reflect curtailments instead of issuing exceptional dispatches when timing does not allow outage cards to be reflected in the current market run.

For curtailments, operating procedure 4120 and 4120c detail the communication and actions taken to ensure curtailments are reflected to support gas and electric reliability. ISO policy for addressing curtailments is that if time allows, the gas company is responsible for communicating plant level limitations and the generator is responsible for submitting these plant level limitations to the ISO outage management system with a nature of work ‘ambient not due to temperature’. If an outage card is submitted later than 37.5 minutes prior to the real-time market interval, the real-time market run for that interval will not reflect the limitation. In this instance, the ISO will issue exceptional dispatches so the plant level limitations are consistent with what gas curtailment notifications would have been received by the generator are reflected in the market.

If determined the ISO has more latitude to allocate curtailment amount across its electric generator’s based on more refined criteria rather than a pro rata curtailment, the ISO could enforce a gas constraint to reflect the capacity reduction limitation in its markets where the constraint would limit the maximum allowable gas burn for the affected area in each market run based on an hourly limit provided to it by either the affected gas company or EIM entity BAA. For example, SoCalGas might notify the ISO of curtailment notification such that they would specify the gas operating zone(s) affected, the hours the curtailment will be in place (e.g. HE15 – HE18), and the maximum allowable burn for the hours which could vary across hours (e.g. 1 BCF for HE15, 1 BCF for HE16, 1 .5 BCF for HE17, and 1.5 BCF for HE18).

Discussion on (2) system imbalance limitations

According to the technical assessment report, the constraint on the gas system is not a flexible constraint once certain conditions are present and in those instances the range should not exceed the identified range that can be supported by the gas company. The conservative range noted in the report was 150 MMcf/d which is the amount the gas system can support on days with high demand usage relative to its overall system capacity. Gas operations with its day-ahead demand forecast can inform the extent to which this range can widen to support more imbalances.

If the gas reliability concern likely to impact electric service is anticipated to be a daily concern the ISO would default to enforcing a limit on gas burn in real-time until gas market structural changes are made to increase the ability of the gas system to support larger demands or imbalances over a day. On the other hand, if the risk to reliability imposed by large demands or imbalances is only present on days when certain fundamental factors are present the enforcement of this constraint would be triggered based on the fundamental factor(s). The ISO commits to coordinate with the affected gas company or EIM entity BAA and would apply maximum gas burn constraint in the market based on anticipated or observed needs.

To increase the affected generators ability to respond to electric service needs in real-time based on electric system needs, the ISO will allocate any daily range across hours based on the expected load shape.

Constraint details

The ISO proposes to implement a constraint in its day-ahead or real-time market, or both, that would limit the affected area gas burn to a gas burn limitation reflecting gas system limitations for either capacity reduction limitations or system imbalance limitations. If ISO operations determined additional generation from the affected generators is needed beyond the limits of the constraint enforced, the additional generation could only be dispatched through exceptional dispatches or EIM manual dispatches based on coordination with gas system operator or EIM entity BAA.

Defining affected generators under gas constraint(s)

This gas constraint will be implemented using generation nomograms where the generation nomogram is defined by a set of generators each with a unity shift factor (dfax=1) to the transmission paths within the area so the nomogram limits the area's generators to a maximum gas burn level. In the following section on Modeling the generation group nomogram, the nomogram functionality is described in detail where the nomogram variable type used for this constraint is V_3.

The affected area, or the set of generators included under the gas constraint(s), will be the gas fired generation within the gas operating zone(s) identified by gas company or EIM entity BAA as under the maximum gas burn limitation. If the entire system is affected, the constraint would encompass the entire gas company's service area or the entire EIM entity BAA. Depending on which gas operating zones are under restricted system limitations, the affected area could be one gas operating zones, a selection of gas operating zones, or the entire gas system. If gas system limitation is anticipated or identified that would impact more than one gas operating zone but not inclusive of the system-wide generation nomogram, the ISO will allocate the multi-zone limitation to the individual gas operating zones.

The ISO and gas company or EIM entity BAA will collaborate to identify generator groups likely to need to be constrained to manage a capacity or imbalance limitation. The generation group nomograms will be defined to include those resources.

Since the constraint will need to be able to move resources dispatch levels relative to the base schedule, the ISO will require the EIM entity to designate all generators defined within the nomogram as participating resources for the market runs where the constraint is enforced.

General constraint formulation

Equation 1: Gas Constraint(s)

$$\sum_{i \in S} \alpha_i \left(G_{i,t}\right) \leq RHS_t$$

S	Set of generators in affected area (1 or more gas operating zones)

G	Power output (MW)
$\propto_i$	Energy (MW) to million cubic feet (MMcf) gas conversion factor (Masterfile heat rate value at given MW output * unit conversion factor)
RHS_t	Right hand side limit enforcing upper bound constraint (different limit formulation for capacity versus imbalance limitations)

The criteria for enforcing the limits would differ depending on whether (1) it's a total gas burn limitation (absolute value MMcfd) versus incremental gas burn limitation (relative MMcfd amount relative to baseline), (2) daily or hourly limitation, and (3) limit provided by the gas company or default value.

<u>Total gas burn limitation due to reduction in capacity or deliverability</u>

Equation 2 defines the constraint limits for a maximum allowable total gas burn due to reductions in system capacity or deliverability. The upper bound limit defines the maximum allowable total gas burn communicated to the ISO from the gas company or the EIM entity BAA. When this maximum limit is enforced and ISO operations determines additional generation from the affected generators is needed above this limit for electric reliability, the additional generation would only be dispatched through exceptional dispatches or EIM manual dispatches once coordinated with the gas system operator or EIM entity BAA.

The upper bound constraint used to reflect gas system limitations due to outages or curtailments could either reflect a gas system limitation daily or hourly depending on the type of capacity reduction. A system capacity reduction from outages could tend to last for several days and appear as a daily limitation where a system capacity reduction from curtailments or emergency flow orders issued to respond to deteriorating system conditions generally occur for specific hours at hourly amounts.

The ISO would distribute the daily limitation across the hours based on a ratio of hourly load forecast to daily load forecast to support greater electric flexibility, if provided an hourly burn limit the value would be input individually for each hour. To further enhance the flexibility of this constraint, the ISO proposes to have the flexibility to recapture portions of the allocated range unused for earlier intervals if necessary. For example, if 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. ISO Operators or EIM entity BAAs will be provided flexibility to input allowance distribution coefficients that they believe would better support electric operations than the default method. For example if the gas constraint was enforced for all 24 hours but Operators felt that an equal distribution across the hours would better support gas-electric operations, the Operators or EIM entity BAA could override the default through inputting ~4% as the distribution factor for each hour.

Equation 2: Gas Capacity Reduction Limitation

$$Where\ limit\ is\ set\ as\ follows:$$

$$RHS_t = \gamma_t\, R_h$$

$$\sum_{1}^{N} \gamma_t = 1$$

$\boldsymbol{R_h}$	Amount of generation expressed in MMcf/d that the ISO determines or that the EIM entity BAA has communicated to the ISO is necessary to manage gas limitations and operate the electric system reliably
γ_t	Allowance distribution coefficients associated with upper bound limit that distributes a MMcf/d amount over the intervals of a trading day based on ratio of hourly load forecast to daily load forecast, if provided an hourly burn limit and not a daily limitation this value will be 1

When notified of a gas limitation requiring the enforcement of the gas constraint, the ISO requests to be notified of the following details: (1) affected area, (2) affected hours, and (3) maximum allowable gas burn for each hour. For example, if the gas company notifies the ISO it will have an outage on its pipelines reducing the availability of fuel in a defined zone to an expected maximum amount prior to the day-ahead market close, the constraint would be enforced in both day-ahead and real-time. If an unplanned outage occurs after day-ahead or curtailment is issued during real-time, the constraint could be enforced in real-time market run.

<u>Incremental gas burn limitation</u>

Equation 3 defines the constraint limits for a maximum allowable incremental gas burn due to concerns about deteriorating pipeline pressure on the gas system. The upper bound limit defines the maximum allowable incremental gas burn the gas system can support and maintain reliable operations, generally communicated to the ISO from the gas company or EIM entity BAA. When this maximum incremental limit is enforced and ISO operations determines or EIM entity BAA communicates that additional generation from the affected generators is needed above this limit for electric reliability, the additional generation would only be dispatched through exceptional dispatches or EIM manual dispatches once coordinated with the gas system operator or EIM entity BAA.

A significant change in the ISO's dispatch from day-ahead to real-time if generators are not successful in adjusting nominations to compensate for change can lead to compromising the gas operating pressures. This constraint, since it is relative to the day-ahead schedule or EIM base schedules, would be enforced in real-time as a daily limitation representing the incremental amount (MMcf/day) the real-time dispatch can deviate from the day-ahead schedule or EIM base schedules.

The ISO would distribute the daily limitation across the hours based on a ratio of hourly load forecast to daily load forecast to support greater electric flexibility. To further enhance the flexibility of this constraint, the ISO proposes to have the flexibility to recapture portions of the allocated range unused for earlier intervals if necessary. For example, if 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. ISO Operators or EIM entity BAAs will be provided flexibility to input allowance distribution coefficients that they believe would better support electric operations than the default method. For example if the gas constraint was enforced for all 24 hours but Operators felt that an equal distribution across the hours would better support gas-electric operations, the Operators or EIM entity BAA could override the default through inputting ~4% as the distribution factor for each hour.

Equation 3: Gas System Imbalance Limitation

$$Where\ limits\ are\ set\ as\ follows:$$

$$RHS_t = \gamma_t \left[R_h + \sum_{i \in S} \alpha_i \left(\bar{G}_{i,t} \right) \right]$$

$$\sum_{1}^{N} \gamma_t = 1$$

S	Set of generators in affected area
$\bar{G}$	Day-ahead market schedule or EIM base schedules
$\propto_i$	Energy (MW) to million cubic feet (MMcf/day) gas conversion factor (Masterfile heat rate value at given MW output * unit conversion factor)
R_h	Daily upper bound deviation allowance relative to day-ahead market schedule, this value can only be greater than or equal to 0[25]**.**
γ_t	Allowance distribution coefficients associated with upper bound limit that distributes a MMcf/day amount over the intervals of a trading day based on ratio of hourly load forecast to daily load forecast

The ISO would enforce this constraint for:

- Real-time hours once the gas company or EIM entity BAA has issued or anticipates issuing a low operational flow order or curtailment warning or watch notifications. The

[25] Adding clarity that the incremental constraint is incremental to day-ahead residual unit commitment schedules so must be greater than or equal to zero.

ISO would enforce the side of the constraint of the OFO. The MMCF/day amount of the R_h representing incremental burn the gas system can support would be dynamic if provided by the gas company or EIM entity BAA. If not provided but ISO anticipates reliability concerns within its BAA, the ISO would be able to enforce maximum gas burn constraints within the ISO BAA at a default amount of 105% of the aggregate burn amount from the day-ahead RUC schedules.

- For days where the ISO anticipates its load forecast may have a large error resulting in significant re-dispatches in the real-time market. The magnitude of such re-dispatch especially if day-ahead gas demand forecast is high implying a smaller imbalance tolerance, the ISO needs the authority to limit the re-dispatch in real-time as a preventive measure. By limiting the re-dispatch the ISO would not be issuing real-time dispatch instructions that could compromise the gas system reliability. Used in such a manner, the electric operator would be enforcing the constraint to avoid gas system conditions that could result in curtailments. The MMCF/day amount of the R_h representing incremental burn the gas system can support would be dynamic if provided by the gas company or EIM entity BAA. If not provided but ISO anticipates reliability concerns within its BAA, the ISO would be able to enforce maximum gas burn constraints within the ISO BAA at a default amount of 105% of the aggregate burn amount from the day-ahead RUC schedules.

Pricing impacts

The nomogram segment would have a shadow price associated with it reflective of a penalty price associated with relaxing the constraint. If the market cannot come to a feasible solution without violating the constraint, then the LMP for generators subject to the constraint will reflect the constraint penalty price. The ISO will establish this penalty price to function appropriately relative to the other penalty prices used by the market.

The constraint parameter establishing the penalty price for the gas constraint is a "penalty factor," which is associated with constraints on the optimization and which govern the conditions under which constraints may be relaxed and the setting of market prices when any constraints are relaxed. Importantly, the magnitude of the penalty factor values for each constraint for each market reflects the hierarchical priority order in which the associated constraint may be relaxed in that market by the market software relative to other constraints. A negative penalty price is used to reflect the need to reduce supply, a positive price is used to reflect the need for demand reduction, and for some constraints either a negative and positive price could be used.

The ISO believes the gas constraint should ideally have a lower priority than the electric transmission constraints. Table 1 below shows the ideal relative priority of the gas constraint to the other constraints market parameters described in the Market Operations BPM[26]. Currently, the ISO will relax the gas constraint consistent with electric generation group nomograms seen

[26] Market Operations BPM on Pages 179 – 186, available at: https://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/Market%20Operations%20BPM%20Version%20%2045_clean.doc.

in lines describing “Transmission constraints: Intertie scheduling, branch, corridor, **nomogram** (base case and contingency analysis).”

Table 1: Relative priority of relaxation of gas constraint

Market	Penalty Price Description	Scheduling Run Value	Pricing Run Value	Comment
IFM	Transmission constraints: Intertie scheduling, branch, corridor, nomogram (base case and contingency analysis)	5000	1000	Intertie scheduling constraints limit the total amount of energy and ancillary service capacity that can be scheduled at each scheduling point. In the scheduling run, the market optimization enforces transmission constraints up to a point where the cost of enforcement (the “shadow price” of the constraint) reaches the parameter value, at which point the constraint is relaxed. Ideally electric transmission constraints would have higher priority than the gas burn transmission constraint.
	Transmission constraints: gas burn nomogram			
	Ancillary Service Region Regulation-up and Regulation-down Minimum Requirements	2500	250	In the event of bid insufficiency, AS minimum requirements will be met in preference to serving generic Self-Scheduled demand, but not at the cost of overloading transmission into AS regions.
RUC	Transmission constraints: branch, corridor, nomogram (base case and contingency analysis)	1250	250	These constraints affect the final dispatch in the Real-Time Market, when conditions may differ from Day-Ahead.
	Transmission constraints: gas burn nomogram			
	Limit on quick-start capacity scheduled in RUC	250	0	Limits the amount of quick-start capacity (resources that can be started up and on-line within 5 hours) that can be scheduled in RUC. For MRTU launch the limit will be set to 75%.

RTM	Transmission constraints: branch, corridor, nomogram (base case and contingency analysis)	1500	1000	Scheduling run penalty price will enforce internal transmission constraints up to a re-dispatch cost of $ of congestion relief in $1500 per MWh. Energy bid cap as pricing run parameter consistent with the value for energy balance relaxation under a global energy supply shortage.
	Transmission constraints: gas burn nomogram			
	Ancillary Service Region Maximum Limit on Upward Services	1500	250	Scheduling run penalty price is lower than those for minimum requirements to avoid otherwise system-wide shortage by allowing sub-regional relaxation of the maximum requirement. AS market bid cap as pricing run to reflect the otherwise system-wide shortage.

Enhancements may be needed and would be taken under the business practice manual revision process to ensure the goal of reflecting a lower priority than the electric transmission constraints is observed in the market.

Due to the ISO's market design and the functionality of a generation group nomogram, the constraint will affect the resource specific price at the connectivity node (CNode) used to dispatch affected generators. The affected generators will settle off of the resource specific price at the CNode where the penalty price reflected in the CNode LMP when relaxed will ensure the generation under the nomogram will not be dispatched higher or lower than the constraints' limits. When relaxed:

- For a maximum gas burn limit, the CNode LMP will be lowered to ensure the necessary supply reduction occurs.
- For a minimum gas burn limit, the CNode LMP will be increased to ensure the necessary supply increase occurs.

All generators under a maximum gas burn constraint will not be able to be settled off of their Point of Delivery (POD) LMP, the POD is the same FNM node as the POR Pnode. All other market participants will be settled off of the pricing node locational marginal prices. What does this mean? This means that the nomogram segment shadow price is not included in the pricing node locational marginal prices used for settling:

- Injections received into the ISO Controlled Grid for Supply **for generators outside of maximum gas burn constraint areas**
- Withdrawals delivered out of the ISO Controlled Grid for Demand,
- Virtual bids or congestion revenue rights for those injection and withdrawal locations, and (CRR).

In short, the nomogram constrains only the specific resources it applies to; it does not apply to any other injection at the same location, thus its shadow price is not reflected in the PNode LMP, but only in the CNode. As discussed in detail in the following section, this is because for nomogram variables with aggregate generating resource output (i.e. V_3) the shift factor is set to 0 and will not be included in the locational marginal price at the PNode. This is similar to the difference between the SP-TIE price for an intertie schedule and the SP LMP for load at that location. The SP-TIE LMP includes contributions from constraints that apply only to the intertie schedule, but not the load.

Modeling the generation group nomogram

Introduction

A nomogram is a set of piece-wise linear inequality constraints relating transmission corridor MW flows and MW generation. (Note that if one wanted to use the MW flow on a single branch as part of a nomogram definition then a single branch transmission corridor would need to be defined.) Resource statuses cannot be part of the nomogram model. The constraints must be piecewise linear defining a convex set. **Nomograms can consist of a family of piecewise linear constraint curves. The constraint curve that is active for a given Trading Hour (or set of Trading Hours) is manually selected by the user prior to the optimization.**

An individual nomogram variable can be one of the following:

a) A transmission corridor MW flow value.

b) A Nomogram Generation Group MW output value. This is the sum of the MW output of the individual market generating resources or aggregate market generating resources that make up the nomogram generation group.

The following are examples of typical nomogram variable combinations:

a) Transmission Corridor MW Flow vs. Transmission Corridor MW Flow.

b) Transmission Corridor MW Flow vs. Area MW Generation.

The nomogram constraint presents a family of piecewise linear curves relating one or more nomogram variables. The Nomogram constraints relating variables $V_n\,;\ \ where,\ n = 1, 2, ..., N$ imposed by $k = 1, 2, ..., K$ linear segments of an active piecewise linear nomogram curve can be expressed as follows:

$$a_1^k \cdot V_1 + a_2^k \cdot V_2 + ... + a_n^k \cdot V_n + ... + a_N^k \cdot V_N \le b^k; \quad k = 1,2,...,K$$

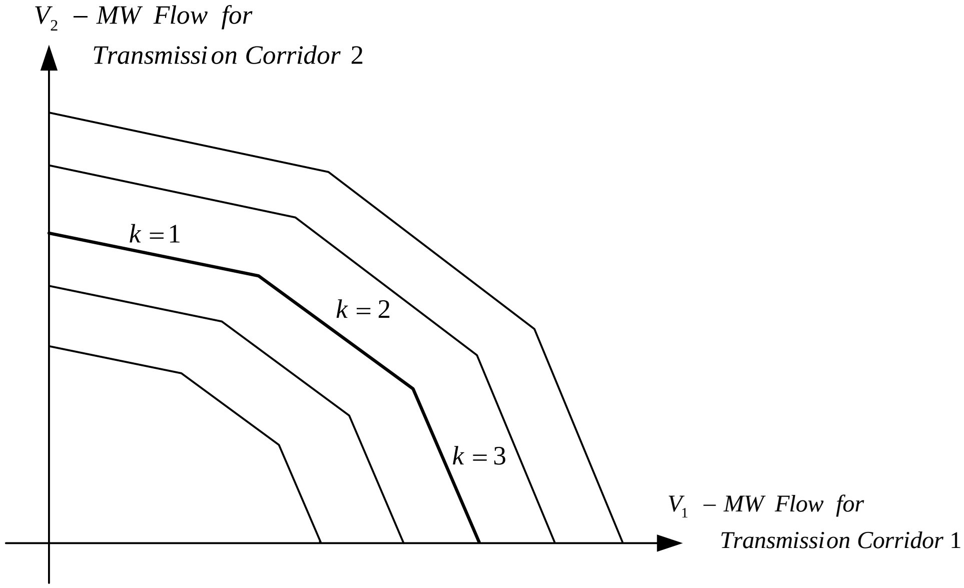


Figure 1. A Typical Nomogram Constraint

For example, the nomogram shown on above diagram relates a transmission corridor (corridor 1) MW Flow variable:

$$V_1 = Flow_{corr1}^{base,t} + \Delta Flow_{corr1}^{t} = Flow_{corr1}^{base,t} + \sum_{node \in corr1} SF_{corr1}^{node} \cdot \left(P_{node}^{t} - P_{node}^{base,t}\right)$$

To another transmission corridor (corridor 2) MW Flow variable:

$$V_2 = Flow_{corr2}^{base,t} + \Delta Flow_{corr2}^{t} = Flow_{corr2}^{base,t} + \sum_{node \in corr2} SF_{corr2}^{node} \cdot \left(P_{node}^{t} - P_{node}^{base,t}\right)$$

For a selected nomogram constraint curve the following three segments are specified:

$$a_1^1 \cdot V_1 + a_2^1 \cdot V_2 \le b^1$$ for segment k = 1,

$$a_1^2 \cdot V_1 + a_2^2 \cdot V_2 \le b^2$$ for segment k = 2,

$$a_1^3 \cdot V_1 + a_2^3 \cdot V_2 \le b^3$$ for segment k = 3.

The active nomogram constraint curve is manually selected by the user prior to the optimization process from a pre-specified set of piecewise linear curves.

Other nomogram variables can be the energy generation of some group of generating units:

$$V_3 = \sum_{unit \in G} En_{unit}^{t}$$

No other types of variables are supported.

Notation

The notation used for these equations is the same as used in the IFM DDS with the following extensions for nomograms:

t	time interval index
$node$	node index
$unit$	generating unit or import system resource index
$load$	dispatchable load or export system resource index
$line$	network branch (line or corridor) constraint index
nm	is a subscript referring to a particular nomogram
nv	is a subscript referring to a particular nomogram variable for a particular nomogram
nc	is a subscript referring to the active curve for a particular nomogram at time t. For every nomogram there may be multiple curves defined but only one of them can be active in a given Trading Hour.
ns	is a subscript referring to a particular nomogram segment for a particular active nomogram curve for a particular nomogram
ntc	is a subscript referring to a particular transmission corridor that is associated with a nomogram variable
$a_{nv}^{nm,nc,ns}$	is the coefficient of segment ns of the active curve nc of nomogram nm that corresponds to the nomogram variable nv
$b^{nm,nc,ns}$	is the right hand side value of segment ns of the active curve nc of nomogram nm
$SF_{nm,nv}^{node}$	is a shift factor indicating how the nomogram variable nv of nomogram nm changes due to an incremental injection into the system at the pnode location $node$.
$SF_{nm,nc,ns}^{node}$	is a shift factor indicating how the left hand side value of segment ns of the active curve nc of nomogram nm changes due to an incremental injection into the system at the pnode location $node$.
$NSCP_{nm,nc,ns}^{t}$	is the nomogram segment clearing price (i.e., shadow price) for the nomogram segment ns of the active curve nc of nomogram nm at time t
$\overline{P}_{nm,nc,ns}^{viol;t}$	is the violation or infeasibility slack variable for segment ns of the active curve nc for nomogram nm at time t
$C(\overline{P}_{nm,nc,ns}^{viol;t})$	is the contribution to the objective function for the infeasibility slack variable for segment ns of the active curve nc for nomogram nm at time t
p_{NM}^{viol}	is the infeasibility slack variable penalty price for nomograms
GG	refers to the set of generation resources that make up a specific generation group
NN	refers to the set of nodes.
T	refers to the time horizon
G	refers to the set of generating units or import system resources
L	refers to the set of dispatchable loads or export system resources
LL	refers to the set of network branch (line or corridor) constraints
NM	refers to the set of all nomograms
NMV_{nm}	refers to the set of nomogram variables associated with nomogram nm
$NMS_{nm,nc}$	refers to the set of nomogram segments associated with active curve nc of nomogram nm
P_{node}	is the energy injection at node $node$
En	is the energy schedule of a given resource

$V_{nm,nv}^{t}$	is the value of the nomogram variable corresponding to nomogram *nm* and variable *nv* for time *t*
MCP	is the shadow price of the power balance constraint
pf_{node}	is the loss penalty factor at node *node*
TCP	is the shadow price of a network constraint on a transmission branch or corridor

Generation Group Nomogram Variable Equation

This section provides the formulation details for generation groups that are defined as a nomogram variable. Basically this nomogram variable consists of the sum of the MW outputs of a subset of generation resources within the system. There are some key observations to make regarding this definition. The first relates to which generation resources are part of the subset. The following restrictions should be made on the subset:

- Permitted values within a generation group
    - Individual generation resources
    - Aggregate generation resources. If an aggregate generation resource is defined as part of a generation group then all of the members of the aggregate resource will be part of the generation group.

  System Resources (import/exports) will not participate in nomograms, but transmission corridors defined for inter-ties can be defined as nomogram variables.

- Values not permitted within a generation group
    - Only a subset of the units in an aggregate generation resource. Either the entire aggregate generation resource should be included within a generation group or none if it should be.

The equation for a generation group nomogram variable can be written as follows:

$$V_{nm,nv}^{t} = \sum_{unit \in GG} En_{unit}^{t}; \quad nm \in NM; nv \in NMV_{nm}; t \in T$$

We want to know how the variable associated with a nomogram changes due to an increment of load at each pnode. For a generation group nomogram variable this can be written as follows:

$$SF_{nm,nv}^{node} = \frac{\Delta V_{nm,nv}^{t}}{\Delta P_{node}} = 0$$

There is a subtlety to note here. The subtlety is that an incremental injection at this pnode is not assumed to come from the portion of a generation group that may reside at this pnode. Since the nomogram variable depends only on the generation group resources and not on a general injection at the pnode then the nomogram variable does not change. In particular, if the incremental change in injection at the pnode was actually an increment in load at the pnode the generation group nomogram variable would not change and therefore the shift factor term is zero.

Nomogram Segment Equation

For every segment of the active curve for each nomogram for each time period an equation should be added to the model. This section will discuss the form of the equation to be added.

$$a_1^{nm,nc,ns} \cdot V_{nm,1}^t + a_2^{nm,nc,ns} \cdot V_{nm,2}^t + ... + a_n^{nm,nc,ns} \cdot V_{nm,n}^t \le b^{nm,nc,ns}; \quad nm \in NM; ns \in NMS_{nm,nc}; t \in T$$

This can be written in a more compact notation as follows:

$$\sum_{nv \in NMV_{nm}} a_{nv}^{nm,nc,ns} \cdot V_{nm,nv}^t \le b^{nm,nc,ns}; \quad nm \in NM; ns = \in NMS_{nm,nc}; t \in T$$

There are several observations to be made here. First, according to the table definitions, the equation can be one of the following relationships: $\le, =, \ge$. The equation above used $\le$ for convenience sake. Second the number of equations being described here should not be missed. The form shown above looks pretty simple however the total number of equations represented is given by

$$NumEqs = T \cdot \sum_{nm \in NM} NMS_{nm,nc}$$

An infeasibility slack variable should be included in the nomogram segment inequality constraint. This is similar to the slack variable processing that is done for other constraints. In particular this has the following form:

$$\sum_{nv \in NMV_{nm}} a_{nv}^{nm,nc,ns} \cdot V_{nm,nv}^t \le b^{nm,nc,ns} + \overline{P}_{nm,nc,ns}^{viol,t}; \quad nm \in NM; ns = \in NMS_{nm,nc}; t \in T$$

The infeasibility slack variable should be a non-negative value, i.e.,

$$\overline{P}_{nm,nc,ns}^{viol,t} \ge 0; \quad nm \in NM; ns \in NMS_{nm,nc}; t \in T$$

There is a penalty function associated with the infeasibility slack variable. This penalty function needs to be included as part of the objective function.

$$C(\overline{P}_{nm,nc,ns}^{viol;t}) = p_{NM}^{viol} \cdot \overline{P}_{nm,nc,ns}^{viol;t}; \quad p_{NM}^{viol} >> 1$$

It should be remembered that the nomogram segment constraint be any one of the types $\le, =, \ge$. The exact form of the infeasibility slack variable term will depend on the specific form being used.

Following the solution, the nomogram segments that are binding will provide a contribution to the congestion component of the LMP for every price node. Let us consider this contribution in more detail here. First let us consider the equation for LMP values without any contribution from nomograms, namely:

$$LMP_{node}^{En;t} = MCP^{En;t} / pf_{node}^t + \sum_{line \in LL} SF_{line}^{node} \cdot TCP_{line}^t$$

Where the index *node* refers to every price node. If we extend this to include the effect of nomograms we can write

$$LMP_{node}^{En;t} = MCP^{En;t} / pf_{node}^t + \sum_{line \in LL} SF_{line}^{node} \cdot TCP_{line}^t + \sum_{nm \in NM} \sum_{ns \in NMS_{nm,nc}} SF_{nm,nc,ns}^{node} \cdot NSCP_{nm,nc,ns}^t$$

The nomogram segment shadow price $NSCP_{nm,nc,ns}^t$ will be a byproduct of the optimization. Let us turn our attention to how to determine the term $SF_{nm,nc,ns}^{node}$. This can be written as follows:

$$SF_{nm,nc,ns}^{node} = \sum_{nv \in NMV_{nm}} a_{nv}^{nm,nc,ns} \cdot SF_{nm,nv}^{node}$$

Where as described in the previous section:

$$SF_{nm,nv}^{node} = \begin{cases} SF_{ntc}^{node} & \text{if } nv \text{ is transmission corridor } ntc \text{ flow} \\ 0 & \text{if } nv \text{ is an aggregate generating resource output} \end{cases}$$

Specifically for Aggregate Generating Resources that are variables in a given nomogram, an additional marginal congestion component contribution exists because of the restriction that that particular nomogram imposes on the Aggregate Generating Resource:

$$LMP_{V_{nm,nv}}^{En;t} = MCP^{En;t} / pf_{node}^{t} + \sum_{line \in LL} SF_{line}^{node} \cdot TCP_{line}^{t} + \sum_{ns \in NMS_{nm,nc}} a_{nv}^{nm,nc,ns} \cdot NSCP_{nm,nc,ns}^{t}$$

Where the node is the aggregate node (ANode) of the aggregate generating resource and the shift factor is the aggregate shift factor that corresponds to that aggregate node.

Note that this additional marginal congestion component applies only to the Aggregate Generating Resources that are variables in a nomogram; it does not apply to other resources, even if connected to the same node(s).

Impact on nodal prices

As stated in the ISO's Managing Full Network Model (FNM) Business Practice Manual[27], "The operation of the ISO's Markets, which includes the determination and mitigation of transmission congestion and the calculation of LMPs, requires a network model [Full Network Model] that provides a detailed and accurate representation of the power system included in the ISO Markets."

The FNM is composed of network connectivity Nodes[28] (CNodes) interconnected with network branches. A CNode represents a connection point used to define the physical topological connectivity of the network where only one load or generation device can be connected to a CNode. Each terminal of equipment is connected to a CNode. Each piece of equipment has a CNode associated with it and roles up into a bus which represents all the topological nodes associated with a generating resource. Below in Figure 1, the grey circle represents generator 1 (G1)'s physical topological connection point of the terminal of the equipment to a network node, the connectivity node (CNode). In this example, there is only one piece of equipment which is connected to a CNode so the CNode and bus are the same.

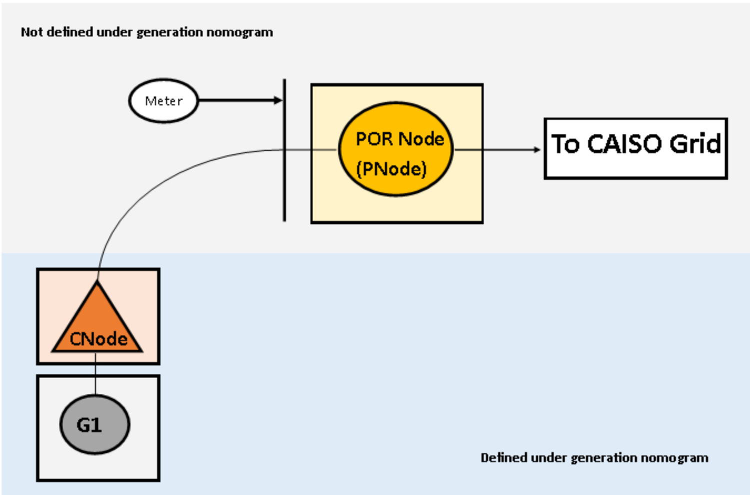
Figure 1 further shows the connection between the CNode to the Pricing Node (PNode), which represents the point at which the injection is received into the ISO Controlled Grid for Supply, or withdrawal is delivered out of the ISO Controlled Grid for Demand. Generally, the PNode of a generating unit will coincide with the CNode where the relevant revenue quality meter is connected or compensated, to reflect the point at which the Generating Units are connected to

[27] Available on Page 11 at https://bpmcm.caiso.com/BPM%20Document%20Library/Managing%20Full%20Network%20Model/Managing%20Full%20Network%20Model%20BPM%20Version%208_clean.docx.

[28] The ISO BPMs have adopted "Connectivity Node" or CNode as an alternative expression of "Node".

the ISO Balancing Authority Area. This Location is referred to as the "Point Of Receipt" (POR) and is considered to be a PNode. However, the PNode and CNode can differ in the FNM.

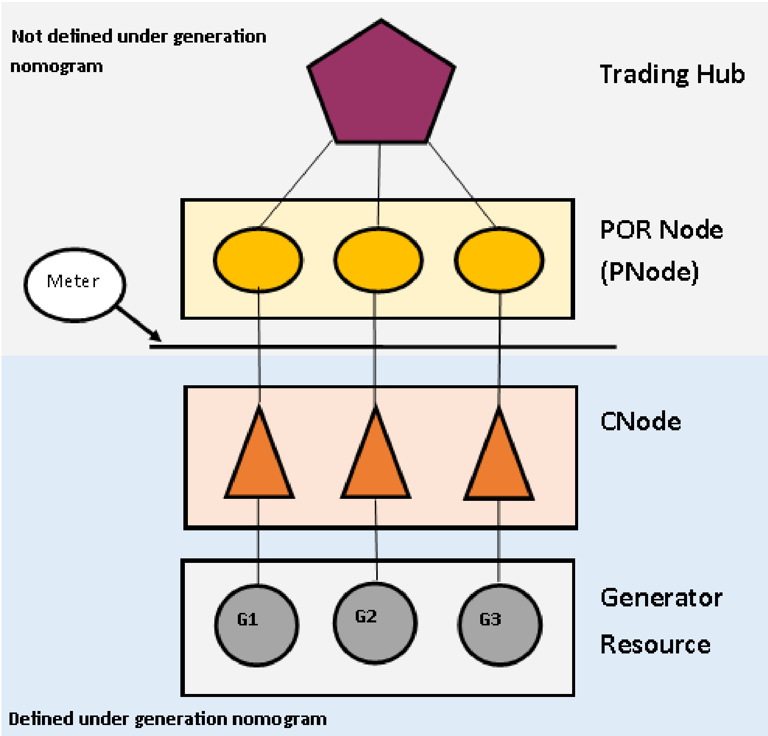
Figure 1: Simple generating unit with one CNode and Pnode



The diagram shows the pieces of the FNM that would be variables under the generation group nomogram where the nodes in the blue box would be defined as variable and the nodes in the grey box would not be defined as variable under the generation group nomogram. While the nomogram segment shadow price is a natural byproduct of the optimization, the shift factor indicating how the nomogram variable nv of nomogram nm changes due to an incremental injection into the system at the PNode location node ($SF_{nm,nv}^{node}$) is 0 so that the PNode LMP does not contain the nomogram segment shadow price. Whereas, the shift factor indicating how the nomogram variable nv of nomogram nm changes due to an incremental injection into the system at the CNode location node ($SF_{nm,nv}^{node}$) is 1 so that the CNode LMP associated with each element of the nomogram does contain the nomogram segment shadow price.

As another example, any transactions settling off of a trading hub would contain the price information from the Pnodes that are aggregated into the aggregated pricing node (APNode) also called Trading Hub. Figure 2 shows the relationship between the generators (grey circles), CNodes (orange triangles) to the PNodes that are aggregated into the Trading Hub's APNode.

Figure 2: Relationship of nodes to aggregate pricing nodes



The diagram shows the pieces of the FNM that would be variables under the generation group nomogram where the nodes in the blue box would be defined as variable and the nodes in the grey box would not be defined as variable under the generation group nomogram. As shown in Figure 2 only the CNodes are variables under the generation group nomogram so that only the impact of the nomogram segment shadow price is reflected in the CNode LMP whereby the shift factor to the PNodes, shown in the grey box, is 0 and the shadow price is not captured in these prices. Because the shadow price is not captured in the PNode LMPs, the impact of the shadow price does not get reflected in the APNodes either since they are based on PNode LMPs.

Appendix B: Technical appendix on market measures

The GPI formulation just for the SCE and SDGE fuel regions[29]. There will be scalars applied to the commodity price (relevant next day gas index) to get to a different GPI for energy versus commitment cost estimates. Every other fuel region will remain unaffected and the gas price indices are the same for commitment costs and default energy bid calculation (i.e. $GPI_{Commitment} = GPI_{Energy}$). These scalars would be used to formulate the two different GPIs for the SoCalGas and SDG&E fuel regions every day. If adjusted up or down there would be a market notice specifying the new scalars.

Equation 4: GPI Formulation

$$GPI_{Commitment} = (Commodity\ Price * \text{Scalar}_{Commitment}) + Transportation\ Rate$$

$$GPI_{Energy} = (Commodity\ Price * \text{Scalar}_{DEB}) + Transportation\ Rate$$

Where:

$\text{Scalar}_{Commitment} = 1.75$, Fuel Region is eligible for scalar

$\text{Scalar}_{DEB} = 1.25$, Fuel Region is eligible for scalar

In the following cost estimate equations, the ISO highlights the portion of the calculations affected and clarifies which GPI is used for which cost estimate.[30]

Equation 5: Proxy Start-Up Costs

Start-up Cost

$$= \begin{cases} \text{Start-up Fuel Cost} + \text{Start-up Energy Cost} + \text{GMC Adder},\ GHG_{COMPLIANCE} =' N' and\ MMA = 0 \\ \text{Start-up Fuel Cost} + \text{Start-up Energy Cost} + \text{GMC Adder} + \text{GHG Cost},\ GHG_{COMPLIANCE} =' Y' and\ MMA = 0 \\ \text{Start-up Fuel Cost} + \text{Start-up Energy Cost} + \text{GMC Adder} + \text{GHG Cost} + MMA,\ GHG_{COMPLIANCE} =' Y' and\ MMA \neq 0 \end{cases}$$

Where:

$\text{Start-up Fuel Cost} = STRT\_STARTUP\_FUEL * GPI_{Commitment}$
$\text{Start-up Energy Cost} = STRT\_STARTUP\_AUX * EPI$

$$\text{GMC Adder} = Pmin * (STARTUP\_RAMP\_TIME/60min) * \frac{GMC}{2}$$

$\text{GHG Cost} = STRT\_STARTUP\_FUEL * \text{Emissions Rate} * \text{GHG Allowance Rate}$

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29 This scope item could be applied in future fuel region's GPI formulation only if the pipeline transport company is defined as Southern California Gas & Electric.
30 The equation for transition costs is not included but the $GPI_{Commitment}$ would be used to determine the proxy transition cost estimate. Further, the $GPI_{Commitment}$

Equation 6: Proxy Minimum Load Costs

Minimum Load Cost

$$= \begin{cases} \text{Minimum Load Fuel Cost} + \text{VOM} + \text{GMC Adder}\,, & GHG_{COMPLIANCE} =' N' and\ MMA = 0 \\ \text{Minimum Load Fuel Cost} + \text{VOM} + \text{GMC Adder} + \text{GHG Cost}\,, & GHG_{COMPLIANCE} =' Y' and\ MMA = 0 \\ \text{Minimum Load Fuel Cost} + \text{VOM} + \text{GMC Adder} + \text{GHG Cost} + MMA\,, & GHG_{COMPLIANCE} =' Y' and\ MMA \neq 0 \end{cases}$$

Where:

$$\text{Minimum Load Fuel Cost} = Unit\ Conversion * \text{Heat\_Rate} * Pmin * GPI_{Commitment}$$

$$\text{VOM} = \text{VOM} * \text{Pmin}$$
$$\text{GMC Adder} = Pmin * GMC$$

$$\text{GHG Cost} = Unit\ Conversion * \text{Heat\_Rate} * Pmin * \text{Emissions Rate} * \text{GHG Allowance Rate}$$

Equation 7: Default Energy Bid Costs

Default Energy Bid Cost

$$= \begin{cases} (\text{Segment's Fuel Cost} + \text{VOM} + \text{GMC Adder}) * Scalar, & GHG_{COMPLIANCE} =' N' and\ DEBA = 0 \\ (\text{Segment's Fuel Cost} + \text{VOM} + \text{GMC Adder} + \text{GHG Cost}\,) * Scalar, & GHG_{COMPLIANCE} =' Y' and\ DEBA = 0 \\ (\text{Segment's Fuel Cost} + \text{VOM} + \text{GMC Adder} + \text{GHG Cost} + DEBA) * Scalar\,, & GHG_{COMPLIANCE} =' Y' and\ DEBA \neq 0 \end{cases}$$

Where:

$$\text{Individual Segment's Fuel Cost} = Unit\ Conversion * \text{Heat\_Rate} * GPI_{Energy}$$

$$\text{GHG Cost} = Unit\ Conversion * \text{Heat\_Rate} * \text{Emissions Rate} * \text{GHG Allowance Rate}$$

$$\text{Scalar} = 1.1$$

Attachment E – Board Memorandum

Aliso Canyon Phase 3 Tariff Amendment

California Independent System Operator Corporation

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 scalers. 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 scalers 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.