Aliso Canyon Gas-Electric Coordination

Phase 2

Draft Final Proposal

September 23, 2016

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Introduction

This document describes the California ISO's draft final proposal for the second phase of its Aliso Canyon Gas-Electric Coordination initiative. In early September 2016, the California ISO (ISO) launched the second phase of this initiative to address retaining temporary measures approved under Phase 1 still needed in light of winter risks beyond their November 30, 2016 sunset date.

The following table summarizes the ISO's proposal to either extend, retire, or extend with refinements each of the Phase 1 temporary measures.

Temporary Measures	Proposal	Refinements
Allow resources to rebid commitment costs in the real-time market for hours without day-ahead schedules or hours it received residual unit commitment start-up instruction. Scheduling Coordinator may not resubmit bid in real-time once committed for the trading hours that span its minimum run time.	Removed from scope and filed to extend permanently on August 19	No
No longer replicate bids in the short-term unit commitment run for resources that do not submit bids into the real-time market that are not scheduled in the day-ahead market and that do not have a real-time market must offer obligation.	Removed from scope and filed to extend permanently on August 19	No
Provide an after-the-fact cost recovery filing right at Federal Energy Regulatory Commission under Section 205 of the Federal Power Act when actual fuel procurement costs led to commitment costs that exceed its bid cap or energy costs that exceed the mitigated price.	Commitment Cost recovery removed from scope and filed to extend permanently on August 19; Energy cost recovery remains in scope and extended temporarily	Clarify eligibility for energy cost recovery is for any mitigated energy offer
Increase access to information prior to day-ahead by reporting scheduling coordinators' D+2 residual unit commitment results directly to the scheduling coordinator	Extend	Continue to pursue coordination enhancements
Increase ability of suppliers to reflect cost expectations in day-ahead bids by using an approximation of the next day gas index published	Extend	No

morning of the day-ahead market run to calculate reference levels		
Increase the gas commodity price index used to calculate default energy bids and commitment cost for resources in the Southern California 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 reference levels.	Extend	No
Ability to enforce gas constraints for either capacity or imbalance limitations and proposes to make refinements to the original constraints design	Extend	Yes
Allow the ISO to manually override the dynamic competitive path assessment to determine transmission paths should be deemed uncompetitive if the gas constraint is enforced based on a forward competitive path assessment	Extend	Clarify determination method and use by operators
Ability to suspend virtual bidding in the event the CAISO identifies market inefficiencies	Extend	No
Ability to adjust internal transfer capability to ensure sufficient transfer capability in real-time to support reliable grid operations including meeting incremental energy needs in Southern California or assuring deliverability of contingency reserves	Retire	N/A
Ability to limit the amount of congestion revenue rights it releases in the monthly allocation and auction to be consistent with the reduced transfer capability	Retire	N/A

The discussion in this paper is organized into the following sections:

- Background: Background explanation for Phase 1 and Phase 2 of this initiative.
- Bidding Rules Enhancements Filing: Summary of temporary measures the ISO filed to extend permanently in its Tariff.

- <u>Proposals to Improve Suppliers' Ability to Manage Gas Units:</u> Discussion of ISO's proposal to extend these temporary measures.

- <u>Proposals to Improve ISO's Ability to Manage Operations:</u> Discussion of ISO's proposal to extend or retire temporary measures and description of refinements or clarifications.

- <u>Plan for Stakeholder Engagement and Next Steps:</u> Reviews ISO's plan for the stakeholder initiative targeting an October 3, 2016 board of governors meeting. This section also includes a request for stakeholder comments on the ISO's proposal.

Background

Under the *Aliso Canyon Gas Electric Coordination Measures* initiative Phase 1, the ISO launched an expedited process to address operational concerns raised due to reliability risks during summer raised in the inter-agency task force's technical report and action plan[1]. The ISO along with stakeholders designed 11 temporary measures which the ISO filed with the Federal Energy Regulatory Commission (FERC) for approval on May 9, 2016[2], to be effective through November 30, 2016. FERC subsequently approved this filing effective June 1, 2016 through November 30, 2016[3].

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[4]. For purposes of discussion, the ISO will refer to sections from the original Revised Draft Final Proposal throughout this draft final proposal for Phase 2.

The primary purpose of the second phase, Phase 2, is to evaluate a revised reliability assessment for winter 2016/2017 from the same inter-agency 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 11 temporary measures designed to address operational concerns due to reliability risks.

The ISO found the winter technical report showed continued reliability risks that merit extending its authority to use temporary measures. The winter assessment raised concerns that there might be capacity limitations on the gas system insufficient to meet gas demand given the magnitude of the demand during the gas winter peak. At this time, the ISO does not propose to

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

introduce new measures as the 11 measures previously approved are effective at managing capacity limitations in addition to imbalance limitations.[5]

Under Phase 2, the ISO evaluated whether reliability assessment warrants continued authority, which temporary measures are needed, and what refinements are needed. Further, the ISO considered where providing greater transparency would be appropriate.

Bidding Rules Enhancements Filing

This section includes a discussion of the temporary measures designed as a part of Phase 1 of *Aliso Canyon Gas-Electric Coordination* that the ISO has subsequently filed with FERC for consideration as permanent tariff amendments.

The ISO filed a tariff amendment on Friday, August 19, 2016[6] to extend the effectiveness of the three temporary measures included in the ISO's May 9, 2016[7] tariff amendment. These three measures were originally approved by the ISO Board on March 25, 2016 as part of the Board *Decision on Commitment Cost Bidding Improvements*[8] and were not intended to be temporary. The tariff amendment included the following measures:

- Allow resources to rebid commitment costs in the real-time market for hours without day-ahead schedules or hours it received residual unit commitment start-up instruction. Scheduling Coordinator may not resubmit bid in real-time once committed for the trading hours that span its minimum run time.

- No longer replicate bids in the short-term unit commitment run for resources that do not submit bids into the real-time market that are not scheduled in the day-ahead market and that do not have a real-time market must offer obligation.

- Provide an after-the-fact cost recovery filing right at Federal Energy Regulatory Commission under Section 205 of the Federal Power Act when actual fuel procurement costs led to commitment costs that exceed its bid cap and are unrecovered through market revenues.

Some stakeholder comments submitted on the ISO's Phase 2 straw proposal addressed these measures. Generally, the Environmental Defense Fund (EDF), Western Power Trading Forum (WPTF), Six Cities, SCE, PG&E NRG, and the Department of Market Monitoring (DMM) support the ISO's filing to permanently amend its tariff with these measures. However, DMM submitted

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[5] 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.

[6] http://www.caiso.com/Documents/Aug19_2016_TariffAmendment_BiddingRules_CommitmentCostsEnhancements_ER16-2445.pdf

[7] http://www.caiso.com/Documents/TariffAmendment-ExtendTariffMeasuresFiled-May9_2016-TemporaryMeasures.html

[8] Board of Governors Revised Motion, http://www.caiso.com/Documents/Decision_CommitmentCostBiddingImprovementsProposal-RevisedMotion-Mar2016.pdf

comments to FERC requesting that the ISO develop specific guidelines and details to the after-the-fact cost recovery provisions. As this is an open docket at FERC, the ISO will respond to these comments in its answer under the Bidding Rules and Commitment Cost Enhancements Previously Accepted on an Interim Basis filing (ER16-2445). Once filed, the ISO's answer will be available on the *Bidding Rules Enhancements* stakeholder initiative page.

Stakeholders commented to the ISO that these bidding flexibility improvements helped them manage their operational risk during summer 2016. As a result, in the event FERC does not issue a favorable order accepting the August 19 amendments in due time, the ISO will make necessary filings to extend these measures for the earlier of the term the Phase 2 measures are in place or until FERC accepts the measures on a permanent basis.

Stakeholder comments indicating that these measures have been helpful are supported by market results showing suppliers scheduling in a conservative manner to bring sufficient gas online and not driving real-time imbalances where more gas is demanded in real-time than day-ahead. The market results are shown in Figure 1 where the orange lines represent the difference between the gas burn amounts between the five-minute real-time dispatch and residual unit commitment process schedules (i.e. imbalance). When the orange line falls below zero that day had a negative imbalance. A negative imbalance means that the ISO scheduled greater amounts of power in the day-ahead market, suppliers scheduled gas accordingly, or if not able to schedule gas could bid effectively to reduce their output consistent with their scheduled gas.

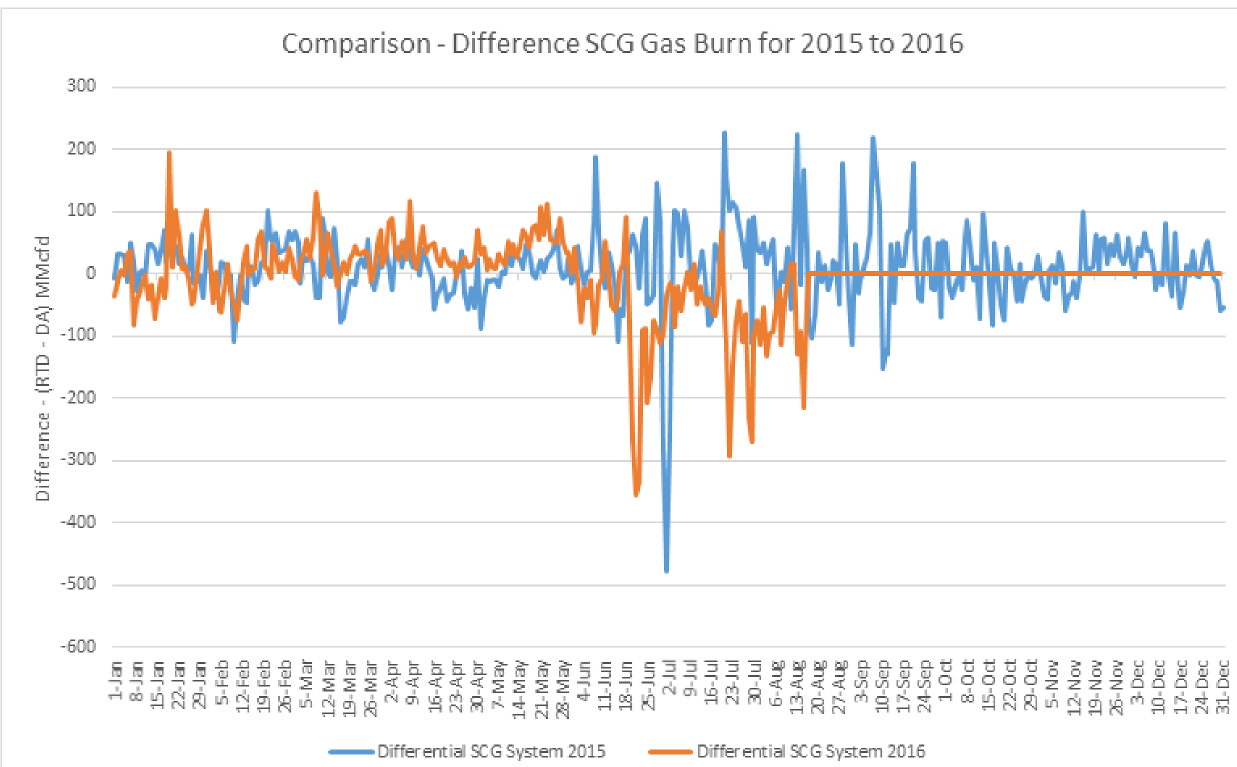

Figure 1: Comparison 2015 to 2016 - 5MM to DA RUC Gas Burn Amounts

In combination with good coordination and advanced electric planning, the more robust bidding flexibility is believed to have led to the limited days with modest positive imbalances and other days with negative imbalances during the summer months. Overscheduling gas prior to real-time likely supported both gas and electric reliability as the reliability risk was largely that there would be insufficient gas on Southern California Gas (SoCalGas) system when electric demand required gas to fuel their units.

ISO notes that the August 19, 2016 filing seeks permanent tariff amendments for an after-the-fact cost recovery filing right only for commitment costs in excess of the bid cap unrecovered through market revenues because this was the scope approved at the March Board of Governors session. To mitigate risks that energy costs could exceed an energy offers mitigated price, the ISO proposes to retain a temporary measure that provides an after-the-fact cost recovery filing right at FERC for incurred energy costs that exceed its mitigated price unrecovered through market revenues[9]. An energy offer is mitigated to its default energy bid price calculated differently depending on whether the scheduling coordinator selected the variable, negotiated or locational marginal price option (i.e. mitigated price). Regardless of the election, this filing right will be open to scheduling coordinators with energy costs that exceed the mitigated price unrecovered through the ISO's bid cost recovery mechanisms.

Proposals to Improve Suppliers' Ability to Manage Gas Units

The purpose of this section is to propose to extend, retire, or adjust the temporary measures to improve suppliers' ability to manage their gas-fired units beyond Phase 1's sunset date of November 30, 2016. The temporary measures in this section only apply to units in the SoCalGas system. The ISO identifies eligible units using a list that SoCalGas provided of electric generators within its system[10]. For additional details on the original design, see the original Revised Draft Final Proposal for Phase 1[11].

The ISO proposes to extend all three temporary measures improving suppliers' ability to manage their gas-fired units with only minor refinements to the first measure. The measures would remain effective beyond November 30th through Phase 2's sunset date.

The three temporary measures provided the ISO the authority to:

(1) Increase access to information prior to day-ahead by reporting scheduling coordinators' D+2 residual unit commitment results directly to the scheduling coordinator (Phase 1 Revised Draft Final Proposal, Section 7.1),

(2) 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

[9] This temporary measure would apply to units across the footprint for that market.
[10] The list of Electric Generators from SoCalGas, which defines the group of eligible resources, does not include combined heat and power (CHP) resources. CHP resources are not classified as Electric Generation under the SoCalGas tariff.
[11] http://www.caiso.com/Documents/RevisedDraftFinalProposal_AlisoCanyonGas_ElectricCoordination.pdf

to calculate reference levels (Phase 1 Revised Draft Final Proposal, Section 7.3),

(3) Increase ability of suppliers to reflect the impact of gas system constraints in the commitment costs and default energy bids of resources in the SoCalGas and SDG&E gas regions by adding a commodity price scalar in the form of a percent multiplier on the next day gas index published the morning of the day-ahead market run to calculate reference levels (Phase 1 Revised Draft Final Proposal, Section 7.2).

The following information will be discussed below:

- Minor refinements to increased access to information: Description of the ISO's proposal to continue to pursue enhancements to increase access to information to scheduling coordinators and the gas companies to support gas-electric coordination below.

- No revisions to the suppliers ability to reflect impact of gas constraints in affected areas in day-ahead or real-time commitment costs or default energy bids: Description of support for not proposing any refinements to the last two temporary measures improving suppliers' ability to reflect cost expectations in bid prices in either day-ahead or real-time.

Minor refinements to increased access to information

As the ISO discussed with stakeholders during the *Aliso Canyon Gas-Electric Coordination Phase 2* straw proposal stakeholder call and the September 19, 2016 Market Surveillance Committee meeting, the ISO will continue to look for on-going opportunities to enhance gas-electric coordination and increase access to information supporting those efforts between the ISO, gas companies, and scheduling coordinators.

NRG submitted comments in response to the Phase 2 Straw Proposal supporting providing scheduling coordinators their unit-specific gas burn data. Since this is a minor addition to the Phase 1 measure providing this data in MW, the ISO will propose to continue to pursue providing the residual unit commitment schedules in MMCFd to market participants in the same frequency as that provided to the gas companies.

While the ISO does not need to make tariff revisions to pursue its proposed coordination enhancements, it will pursue the following enhancements to provide:

- 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[12] for each gas burn amount reported to the gas company.

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

No revisions to the suppliers ability to reflect cost expectations and gas system limitations in day-ahead or real-time bids

Under Phase 2, the ISO evaluated whether it should continue to pursue the use of the next day gas index published morning of its day-ahead market[13] and application of commodity price scalar on the same index for its real-time market. Given the broad support from stakeholders and the favorable gas burn imbalance trends shown in Figure 1 as well as the analysis below, the ISO finds that these improvements to its gas price index formulations in both day-ahead and real-time should be extended beyond the sunset date.

The advantages are:

- Day-ahead Gas Price Index: Formed using gas market price benchmarking the average price for the majority of the ISO's operating day and the fundamental factors driving those expectations rather than the gas market price benchmarking the majority of the prior day's market and that day's market fundamentals.

- Real-time Gas Price Index: Formed by applying a commodity price scalar to the next day gas index allows the commitment cost bid cap and default energy bids to include a premium acknowledging that intra-day, same-day, or custom deals will have prices that could be higher in real-time due to illiquidity and gas system limitations.

The discussion below first examines the potential for differences between gas costs the ISO uses in its calculations of commitment costs and default energy bids in the day-ahead market and actual gas costs. Next the ISO examines these differences in the real-time market.

Figure 2 below shows the benefits gained from these two measures by calculating the premium needed to reflect the highest traded price relative to the next day index used by that market. The green and yellow circles represent the potential for prices to exceed the next day average price in the day-ahead and real-time markets respectively:

- For the day-ahead market: The ISO calculated the percent difference between the highest traded prices traded on or reported by either the Intercontinental Exchange (ICE), SNL, or Natural Gas Index (NGI) to ICE's next day gas index published for the prior gas day (green circles).

- For the real-time market: the ISO calculated the percent difference between the highest prices traded on ICE to the ICE's next day gas index published morning of the day-ahead market (yellow circles).

[13] While the provision to use the next day gas index published the morning of its day-ahead market in its day-ahead market processes has not been implemented yet, once the ISO receives a FERC order to its request for clarification it will implement this measure directly.

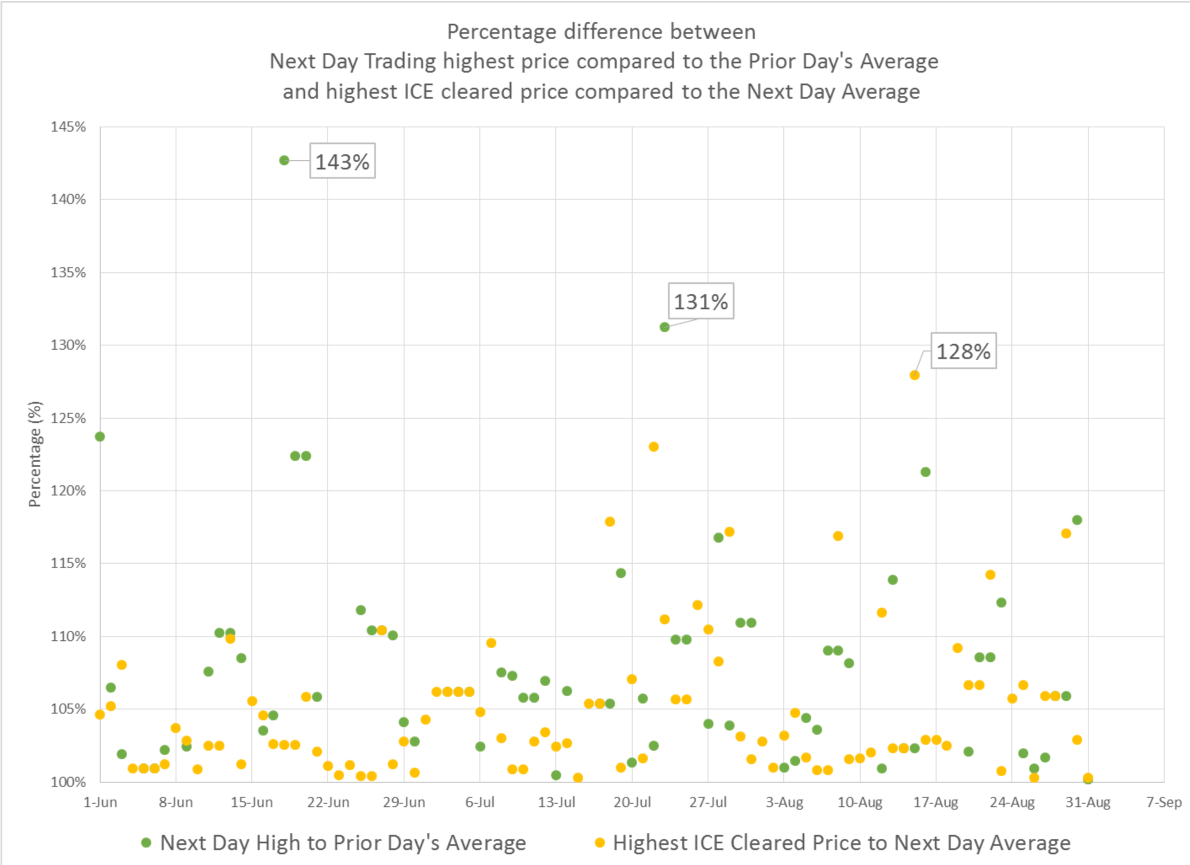

Figure 2: Compare high trades to next day gas indices

<u>The day-ahead market</u>

ISO believes Figure 2 shows significant benefits are provided by using the more timely gas market price in its day-ahead market, which is the next day gas index published morning of the ISO's day-ahead market. Of the 92 days from June through August 2016, the ISO saw 19 days where the highest traded price was over 110% higher than the next day gas index published the day prior to the ISO's day-ahead market. This would mean that default energy bids may not have accounted for costs on 20 percent of those days[14]. If the use of the more timely gas index had been in place during this period, the number of days where the highest traded price exceeded 110 percent of the next day gas index used would have dropped to 12 out of 92.

20 percent of days observed potentially not supporting cost recovery for mitigated energy offers is a substantial risk. The 7 percent reduction in days where mitigated energy prices might not account for costs if the enhancement where implemented is a significant benefit. Consequently, the ISO finds it appropriate to continue pursuing the use of the next day index published the morning of the ISO's day-ahead market run to narrow this likelihood.

[14] Day-ahead gas price index (DAM GPI) is the sum of the next day index published one day prior to the ISO day-ahead market run plus the geographically appropriate transportation rate.

The potential for the commitment cost bid cap to limit suppliers' ability to submit commitment cost bids consistent with their cost expectations due to the gas price the ISO currently uses is much lower. Out of 92 days reviewed, only 2 days[15] had trading where the highest traded price was more than 125% higher than the next day gas index used. If the relevant price index had been used, the two days' percent differences would have been 122 percent and 110 percent instead of 143 percent and 131 percent respectively.

In addition to this analysis, the ISO considered stakeholders' feedback[16], which generally supported the implementation of the temporary measure that would increase the 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 reference levels (Phase 1 Revised Draft Final Proposal, Section 7.3).

NRG supports this measure as a near-term measure but continues to encourage the ISO to investigate longer term solutions enabling market participants to reflect their own gas costs and risks in bid prices. DMM strongly supports this temporary feature. They recommend the ISO file to make this a permanent feature in its tariff rather than temporary.

Based on the ISO's support provided above and evaluation of stakeholders' comments, the ISO proposes to retain the authority to use this feature without any revisions to the Phase 1 approved language. For the purposes of this Phase 2 of the Aliso related measures, the ISO proposal to extend this provision will be on a temporary basis.

<u>The real-time market</u>

ISO believes Figure 2 shows significant benefits were provided by applying the commodity price scalar to the next day gas index published the morning of its day-ahead market to form the real-time gas price index (RTM GPI). The commodity price scalars are a measure that did help mitigate the risk that real-time market bid costs might not fully reflect costs when energy offers were mitigated. Regarding commitment costs, the ISO does not observe significant benefits from looking at systematic price differences alone by applying a scalar higher than 125 percent to the next day gas index. There are additional benefits provided by having this higher scalar in place beyond capturing systemic price differences as it allows resources to reflect gas system constraints so the supplier can manage their unit within gas rules.

The ISO finds that the commitment cost scalar at 175 percent is appropriate at this time. The ISO's analysis is strictly based on the experience over this past summer. The ISO and stakeholders do not know whether the current values will be appropriate over the months to come. Because of the uncertainty the ISO proposes to retain the current values and the authority it has to increase or decrease those amounts as appropriate.

Of the 92 days from June through August 2016, the ISO saw 12 days where the highest traded ICE price was over 110% higher than the next day gas index published the morning of its day-

[15] June 18 and July 23.
[16] NRG, WPTF, and DMM.

ahead market run. This would mean that default energy bids may not have accounted for costs on 13 percent of those days[17]. The temporary measure resulted in the number of days that may not have accounted for costs when mitigated dropping to 1 percent of those days.

The potential for the commitment cost bid cap to limit suppliers' ability to submit commitment cost bids consistent with their cost expectations due to the gas price the ISO currently uses is much lower. Out of 92 days reviewed, only 1 day[18] had trading where the highest traded price was more than 125 percent higher than the next day gas index published the morning of the ISO's day-ahead market. With the commodity price scalar of 175 percent applied to the next day gas index to set the commitment cost bid cap, the ISO did not see any ICE traded gas prices in real-time that approached those price levels.

Again the ISO weighed stakeholders' feedback on this measure. Stakeholders[19] generally supported the implementation of the temporary measure that would 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 reference levels (Phase 1 Revised Draft Final Proposal, Section 7.3).

While supportive, NRG and WPTF expressed concerns that the commodity price scalar levels may not be sufficiently high to reflect winter conditions. In response to the above described analysis, NRG comments, "NRG also agrees that, based on the experience from Summer 2016, the 75% scalar used in the real-time market for commitment cost caps and default energy bids has been sufficient. However, given that past performance does not always reliably capture the range of possible future results, the CAISO should be ready to adjust the scalar based on conditions observed at the time.[20]" WPTF echoed this concerns, stating: "It is unclear why the ISO believes that 125% will continue to be sufficient through the winter. If gas prices indicate 125% was about right most of the time in the summer when there were no significant gas events and the ISO didn't even have to use any of their sought measures from FERC, it seems like this would need to be increased given expected winter conditions. The analysis on slide 23 demonstrates the appropriateness of 125%, but if this is not increased, when the ISO redoes this analysis into the winter, WPTF would expect there to be a very different story told.[21]"

In response to these comments, the ISO would like to clarify that the analysis of summer conditions provides information at this time as to whether any changes to the filed tariff language need to be made through Phase 2. The tariff language as approved by FERC states that:

> 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

[17] Day-ahead gas price index (DAM GPI) is the sum of the next day index published one day prior to the ISO day-ahead market run plus the geographically appropriate transportation rate.
[18] August 15.
[19] NRG, WPTF, SCE, and DMM.
[20] NRG Comments, Page 4, available at http://www.caiso.com/Documents/NRGComments_AlisoCanyonGas-ElectricCoordinationPhase2StrawProposal.pdf.
[21] WPTF Comments, Page 2, available at: http://www.caiso.com/Documents/WPTFComments_AlisoCanyonGas-ElectricCoordinationPhase2StrawProposal.pdf.

> 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 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 increase in the gas price is necessary after the initial increase, the CAISO will issue a Market Notice specifying the amount of the increase. [emphasis added]

The ISO proposes to retain the authority to increase the current values as appropriate. The ISO's Phase 2 proposal is to retain the scalars at their initial levels with the authority to increase or decrease if winter conditions arise that warrant the adjustments.

The ISO continues to commit to consider adjustments if the scalars are not representing the increased Bid amount that fulfills the following 3 criteria: (1) improves the dispatch of these resources so that they more likely to be dispatched to address local needs and not system needs; (2) better accounts for systematic differences between day-ahead and same-day natural gas prices that materialize; and (3) improves ability to manage the generators gas usage within applicable gas balancing rules.

Based on the ISO's analysis provided above, and its consideration of stakeholder and DMM input, the ISO proposes to retain the authority to use this feature without any revisions to the Phase 1 approved language.

Proposals to Improve ISO's Ability to Manage Operations

This section describes the ISO's proposal to extend, retire, or refine the temporary measures[22], implemented as part of the Phase 1 of the A*liso Canyon Gas Electric Coordination* initiative, that were put into place to improve the ISO's ability to reliably manage electric operations in light of concerns of limitations on the gas system and to mitigate potential adverse market outcomes associated with implementing these measures.

The ISO implemented five temporary measures to improve its ability to manage electric operations in light of gas concerns and mitigate against potential adverse market outcomes, the measures were:

(1) Ability to enforce gas constraints for either capacity or imbalance limitations (Phase 1 Revised Draft Final Proposal, Section 6.1) and proposes to make refinements to the original constraints design,

(2) Allow the ISO to manually override the dynamic competitive path assessment to determine transmission paths should be deemed uncompetitive if the gas constraint is

[22] The temporary measures[22] in this section only apply to units in the Southern California Gas system. The ISO identifies eligible units using a list SoCalGas provided of electric generators within its system. The measures would remain effective beyond November 30th through Phase 2's new sunset date.

enforced based on a forward competitive path assessment (Phase 1 Revised Draft Final Proposal, Section 6.4),

(3) Ability to suspend virtual bidding in the event the CAISO identifies market inefficiencies when the gas constraint is enforced or internal paths are adjusted (Phase 1 Revised Draft Final Proposal, Section 6.5),

(4) Ability to adjust internal transfer capability to ensure sufficient transfer capability in real-time to support reliable grid operations including meeting incremental energy needs in Southern California or assuring deliverability of contingency reserves (Phase 1 Revised Draft Final Proposal, Section 6.2), and

(5) Ability to limit the amount of congestion revenue rights it releases in the monthly allocation and auction to be consistent with the reduced transfer capability (Phase 1 Revised Draft Final Proposal, Section 6.2).

For details on the original design, see the original Revised Draft Final Proposal for Phase 1 in Phase 1 Revised Draft Final Proposal, Section 6.

The ISO proposes to extend three of the five temporary measures improving ISO's ability to reliably manage electric operations in light of concerns of limitations on the gas system combined with mitigation measures. The ISO proposes to extend the authority to enforce gas constraints with refinements.

Proposed Extensions and Refinements

The purpose of this section is to discuss the temporary measures the ISO proposes to extend, propose refinements to the gas constraints design, and to provide guidance as to what additional detail it will provide in the implementation phase.

The three temporary measures proposed to extend under Phase 2 are:

(6) Ability to enforce gas constraints for either capacity or imbalance limitations (Phase 1 Revised Draft Final Proposal, Section 6.1) and proposes to make refinements to the original constraints design,

(7) Allow the ISO to manually override the dynamic competitive path assessment to determine transmission paths should be deemed uncompetitive if the gas constraint is enforced based on a forward competitive path assessment (Phase 1 Revised Draft Final Proposal, Section 6.4),

(8) Ability to suspend virtual bidding in the event the CAISO identifies market inefficiencies when the gas constraint is enforced (Phase 1 Revised Draft Final Proposal, Section 6.5).

The ISO proposes to maintain the ability to enforce gas constraints in the day-ahead or real-time market to address either gas capacity or imbalance limitations. However, some modest adjustments to the gas constraint designs are appropriate.

Stakeholders[23] generally supported extending the authority to enforce the gas constraints to manage gas-electric reliability. While supportive, WPTF and NRG both requested the ISO provide additional information as to when the constraint would be applied versus exceptional dispatches. The ISO directs these stakeholders to its relevant operating procedure. Operating Procedure 4120c[24] provides the defined procedures Operators follow during SoCalGas and SDG&E service area actual or anticipated limitations or outages. The Operating Procedure will be updated as necessary.

After considering both internal and stakeholder feedback on the gas constraints design, the ISO determined minor adjustments would be appropriate. Generally, the ISO is proposing to automate the gas constraint[25] and refine the gas constraint formulation for either a capacity or imbalance limitation, the capacity limitation formulation and its appropriate use, the imbalance limitation and its appropriate use, and changes to the transformation of a daily limit to an hourly limit. Specifically, the ISO proposes four refinements to:

- Revise constraint to only limit maximum operating levels (This requires a tariff change)[26]

- Clarify documentation that capacity limitation is based on ISO assessment of its system needs in light of gas supply concerns (This will not require a tariff change. It will be implemented through BPM and or operating procedure changes)

- Clarify documentation imbalance limitation's constraint implementation to include managing electric system in response to gas company issuing a curtailment watch (This will not require a tariff change. It will be implemented through BPM and/or operating procedure change)

- Revise the gas constraint implementation to automate the ability to distribute either a capacity or imbalance limitation across hours as deemed appropriate (This will not require a tariff change. It will be implemented through BPM and/or operating procedure change)

The rest of this section will describe the proposed refinements, clarifications or plans to provide additional detail during the implementation phase.

[23] WPTF, NRG, SCE, and DMM.
[24] 4120C – SoCalGas Service Area Limitations or Outages, http://www.caiso.com/Documents/4120C.pdf.
[25] Until automated, the ISO will continue to have the functionality to manually calculate and enforce the constraint.
[26] ISO considers this sufficient clarification in response to DMM's request for clarification that the ISO was retiring the authority to impose a minimum gas burn constraint in its comments on Page 6.

Item 1 - revise constraint to only limit maximum operating levels

The ISO proposes to maintain the ability to enforce gas constraints in the day-ahead or real-time market to address either gas capacity or imbalance limitations. However, some modest adjustments to the gas constraint designs are appropriate.

As shown in Equation 1, the original gas constraints formulation showed that the affected areas' gas burn could be constrained to either be higher than or lower than an imposed limit.

Equation 1: Original Gas Constraint(s)

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

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)
LHS_t	Left hand side limit enforcing lower bound constraint (only allowed for imbalance limitations).
RHS_t	Right hand side limit enforcing upper bound constraint (different limit formulation for capacity versus imbalance limitations)

Additionally, the imbalance limitation formulation specifically included a calculation for determining the LHS_t, shown in Equation 2.

Equation 2: Gas System Imbalance Limitation

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

$$LHS_t = \beta_t \left[R_l + \sum_{i \in S} \alpha_i \left(\bar{G}_{i,t}\right)\right]$$

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

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

S	Set of generators in affected area
$\bar{G}$	Day-ahead market schedule
$\propto_i$	Energy (MW) to million cubic feet (MMcf) gas conversion factor (Masterfile heat rate value at given MW output * unit conversion factor)
R_l	Daily lower bound deviation allowance relative to day-ahead market schedule
R_h	Daily upper bound deviation allowance relative to day-ahead market schedule
β_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
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 proposes to retire the authority to enforce the left hand side of the gas constraint. The left hand side would have limited market output to levels higher than that limit. Through further review the ISO believes that resources have the ability to meet imbalance limitations in which they need to burn a minimum amount of gas. They can be more assured of operating at a certain minimum output by lowering their bid price or self-scheduling.

On the other hand, the ISO believes it is still appropriate to maintain a gas constraint that limits the maximum burn. Resources ability to manage their unit to be assured of operating at a certain maximum output by increasing their bid price could be limited by its commitment cost cap or its default energy bid.

The proposed revised formulations are shown below in Equation 3 and

Equation 3: Revised 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)

Equation 4: Revised 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
$\propto_i$	Energy (MW) to million cubic feet (MMcf) 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[27].**
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

<u>Item 2: ISO will use the constraint based on its assessment of its system needs in light of concerns with gas supply</u>

ISO proposes to increase the flexibility to enforce the gas constraint with a capacity limitation. The ISO policy for deciding to enforce a gas constraint with a capacity limitation is that the maximum operating limit, or right hand side of the gas constraint, for capacity limitations is

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

established by an input (R_h) that is determined by the ISO based on a generation amount in the area that the ISO determines is needed for electrical reliability.

The winter assessment technical report identified as a primary risk that gas demand could exceed system capacity because gas system peaks in the winter. During winter months, core demand is about 60 percent of SoCalGas' system capacity and with the other non-core demand could exceed system capacity. The gas system capacity combined with its forecasted core demand drive the capacity limitation since the gas system must serve its core first. The winter assessment also found the ISO only needs to operate a limited amount of generation on the SoCalGas system to support reliable grid operations since electric load is lower in winter and sufficient energy could be delivered into the area to serve electric load.

To do so, the (R_h) input in Equation 5 is defined as shown in the variable descriptions below.

Equation 5: Revised Gas Capacity Reduction Limitation

$$\textit{Where limit is set as follows}:$$

$$RHS_t = \gamma_t \, R_h$$

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

$\boldsymbol{R_h}$	**Amount of generation expressed in MMCFd that the ISO determines 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/day 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

<u>Item 3: The ISO intends to continue to be able to use the constraint in response to gas company issuing a curtailment watch.</u>

The ISO will ensure its operating procedure reflects that it may enforce the constraint when a gas company issues a curtailment watch.[28] The ISO also notes that in such circumstances depending on the totality of system conditions it observes it may use other tools such as exceptional dispatch to manage the gas limitations based on its coordination with the gas company.

The ISO's policy for enforcing a gas constraint with an imbalance limitation is the same as discussed above, the policy is: when deciding to enforce a gas constraint with an imbalance limitation the maximum operating limit, or right hand side of the gas constraint, for imbalance

[28] A notification that conditions are present that could result in curtailment

limitations is established by an input (R_h) that is determined by the ISO based on an incremental generation amount relative to the day-ahead residual unit commitment run in the area that the ISO determines is needed for electrical reliability.

Item 4: The ISO also plans on revising the gas constraint design to provide greater flexibility for ISO Operations to distribute either a capacity or imbalance limitation across hours as deemed appropriate.

The ISO proposes to maintain its original design for distributing the daily limitation across hours as the default method and would add a feature for Operators to override the default method. They would be able to override if there was a specific shape needed to better support electric operations.

NRG commented in response to the ISO's request for input on the best design for this transformation suggesting that the hourly shape be based on what drives the gas burn over the relevant time horizon. The ISO appreciates this suggestion and after further internal discussions found that the best design would allow a reasonable default, the original method, and give flexibility to choose to update the shape representative of the best information for burn drivers during the relevant time horizon.

The original design of the formulation for a capacity or imbalance limitation included allowance distribution coefficients that would transform a daily limit into an hourly value. This hourly value relates to 1 of the 24 hourly curves used to enforce the gas constraint in the market[29]. In the *Aliso Canyon Gas-Electric Coordination Phase 1* Revised Draft Final Proposal, Section 6.1.2 described how the ISO would perform this distribution. The ISO would distribute the daily limitation across hours based on a ratio of hourly load forecast to daily load forecast. This would support greater electric flexibility and be able to recapture portions of the allocated range unused for earlier intervals if necessary.

The ISO plans on enhancing the functionality for Operators 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 could override the default through inputting ~4% as the distribution factor for each hour.

Item 5: Guidance as to what additional detail it will provide in the implementation phase

The ISO does not at this time believe that any refinements should be made to the mitigation measures proposed to extend. The ISO recognizes that WPTF and NRG reiterated their comments that bids should not be mitigated unless the potential to exercise market power or that the constraint is predictable and consistently binding can be demonstrated. Both stakeholders requested increased transparency on the two mitigation measures.

WPTF seeks additional information on the ISO ability to manually override the dynamic competitive path assessment to determine transmission paths should be deemed uncompetitive

[29] ISO uses existing nomogram functionality.

if the gas constraint is enforced based on a forward competitive path assessment (Revised Draft Final Proposal, Section 6.4):

- What would qualify as systemic binding to trigger overriding the dynamic competitive path assessment?
- How would the determination that systemic binding renders paths uncompetitive when gas constraint is enforced be communicated to market participants?
- How long would the determination remain in effect?

Under its implementation phase, the ISO plans on adding a description of its forward competitive path assessment methodology in its Market Operations BPM, Attachment B Competitive Path Assessment. Additionally, clarification will be added to how Operations will use this forward competitive path assessment when Operators make a judgement to enforce the gas constraint.

Any additional details on how the ISO might determine to suspend virtual bids in the event of adverse market impacts will not be provided at this time. NRG commented that the ISO must present a clear case backed up by evidence that it is necessary to suspend convergence bidding and identify criteria for restoration of convergence bidding. The ISO believes its commitment to issue a technical bulletin with justifications for a general suspension or limitation of Virtual Bids if suspended using this temporary authority should satisfy NRG's request.

Proposed Retirements

The purpose of this section is to discuss and provide support for the two temporary measures the ISO proposes to retire:

The two temporary measures proposed to be retired under Phase 2 are:

(1) Ability to adjust internal transfer capability to ensure sufficient transfer capability in real-time to support reliable grid operations including meeting incremental energy needs in Southern California or assuring deliverability of contingency reserves (Phase 1 Revised Draft Final Proposal, Section 6.2),

(2) Ability to limit the amount of congestion revenue rights it releases in the monthly allocation and auction to be consistent with the reduced transfer capability (Phase 1 Revised Draft Final Proposal, Section 6.2).

After Phase 1 of *Aliso Canyon Gas Electric Coordination* was completed, the Peak Reliability Coordinator (Peak RC) modified its system operating limit (SOL) methodology to allow a path's rated limit to exceed its rating under emergency conditions. As a result, the ability to limit is no longer needed to ensure sufficient transfers. The original policy goal is met through the new Peak RC policy.

To ensure it can serve load, ISO Operations can now utilize real-time contingency analysis to increase transfer capability while ensuring ISO grid reliability. The real-time contingency analysis will show what level the system operating limit of each path should be to simultaneously serve load and maintain reliability. If the ISO's real-time contingency analysis shows that a reliability issue would not occur if load continues to be served above the path rating, Operations would not shed load pre-contingency. This would be due to the market or operators seeing a lower WECC Path Rating.

Stakeholders generally supported the ISO's proposal to retire this temporary measure as logical given its new ability to increase transfer capability. WPTF supported the retirement as the real-time contingency analysis allows the ISO to use up to date information to increase the transfer capability supporting reliability. NRG also supported the retirement as long as the alternative of not shedding load under emergency conditions up to the real-time system operating limit does not become a way in which ISO Operators take actions to "opaquely affect market results". The ISO would like to clarify that the revised system operating limit is not a limit that would go into the market. The ISO only has the authority to use the WECC path ratings for clearing bids and offers within its market.

The ISO found this alternative to be preferable because the revised limit would allow the ISO to avoid load shedding without having to employ a market intervention in day-ahead that could have significant impacts on the market solution and potentially introduce inefficiencies between the day-ahead and real-time market.

The ISO directs NRG and PG&E to Peak Reliability Coordinators' (Peak RC) information on their policy changes. Peak RC fact sheet states, "Peak has modified its System Operating Limits (SOL) Methodology to allow a Path SOL to exceed the Path rating under anticipated emergency conditions, requiring a significant amount of coordination in advance with Peak and other impacted TOPs and BAs.[30]" The mechanism that Operations would use to exceed the path rating is defined within NERC EOP-002-3.1[31]. Operations would declare an Energy Emergency Alert (EEA), which under Section 3.4 allows use to revisit SOL limits given RT information.

The second measure to adjust congestion revenue right amounts was a mitigation measure proposed to protect against potential adverse market outcomes if the ISO adjusted internal paths limits in the day-ahead market run systematically. If the adjustments were made systematically, congestion revenue right auction participants could have an incentive to procure congestion revenue rights on paths based on expectations that the limit used in the auction would be different than the limit used in the day-ahead market. The congestion revenue right holder could then profit off a difference in the definition of the path instead of congestion.

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[30] Peak Reliability Coordinator Fact Sheet on Aliso Canyon, https://www.peakrc.com/aboutus/Facts/2016_05_23%20peak_reliability_fact_sheet_aliso_canyon_FINAL.pdf; Peak Reliability RC SOL methodology posted at https://www.peakrc.com/SOLDocs/Peak%20RC%20SOL%20Methodology%20for%20the%20Operations%20Horizon%20v7.1.pdf.

[31] http://www.nerc.com/_layouts/PrintStandard.aspx?standardnumber=EOP-002-3.1&title=Capacity%20and%20Energy%20Emergencies&jurisdiction=United%20States

Since this measure was approved to be used as a result of using the ability to adjust the internal paths it is not needed without that measure. Consequently with the proposed retirement of the ability to adjust internal paths, the ISO will also retire the mitigation measure allowing an adjustment of the amount of congestion revenue rights available in the auction[32].

Summary of General Stakeholder Comments

In addition to specific stakeholder comments submitted on the ISO's proposal for Phase 2, several stakeholders submitted comments requesting long-term market enhancements or recommendations outside the scope of Phase 2.

The Environmental Defense Fund, NRG, and DMM all requested long-term market enhancements. The ISO understands that the strained conditions resulting from the limited operations of Aliso Canyon has exacerbated stakeholders' concerns that previously identified market design issues have not been addressed to their satisfaction. However, the measures pursued under the *Aliso Canyon Gas-Electric Coordination* initiative are primarily designed to address new concerns that arose not bridge the gap on long-term market design issues.

Any long-term market design enhancements should be pursued under a normal stakeholder process where the issue can be thoroughly explored and the best solution proposed after robust stakeholder participation.

The ISO will be evaluating its market design features impacting bidding flexibility balanced against market power protections and robustness of its mitigated prices under the *Commitment Cost and Default Energy Bid Enhancements* initiative. The ISO looks forward to continuing this discussion with its stakeholders under that effort.

DMM has recommended that the ISO consider mitigation for incremental or decremental exceptional dispatches. In addition several external stakeholders submitted comments supporting DMM's recommendations. The ISO believes considering this would benefit from additional time and stakeholder process. The ISO will continue to consider these recommendations.

Plan for Stakeholder Engagement and Next Steps

The current schedule for this initiative is shown below. Stakeholder comments will be due September 28, 2016. In comments, the ISO asks stakeholders to provide input on the ISO's draft final proposal. The ISO will present its proposal to its Board of Governors on October 3, 2016.

Milestone	Date
Issue and Straw Proposal Posted	9/7/2016
Stakeholder Call	9/9/2016

[32] WPTF submitted comments supporting the retirement of this provision.

Milestone	Date
Stakeholder Written Comments Due	9/14/2016
FERC Technical Conference	9/16/2016
Market Surveillance Meeting discussion item	9/19/2016
Draft Final Proposal and Draft Tariff Language Posted	9/21/2016
Stakeholder Call	9/26/2016
Stakeholder Written Comments Due	9/28/2016
Special Session Board Meeting	10/3/2016
Tariff Filing	10/14/2016