

Opinion on Market Enhancements for Summer 2021 Readiness

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1. Introduction and Summary

The Market Surveillance Committee has been asked to comment on elements of this initiative. The initiative is in response to the events of August 2020,² and its purpose is to implement changes to market rules and procedures that are practical to implement in the near-term to help ensure grid reliability during the upcoming summer high load period.³

The initiative is recommending changes to several features of the ISO markets. In this Opinion, we comment on three of the changes, some of which have attracted significant stakeholder attention. In particular, we address the following parts of the initiative: revision of short-term scarcity pricing capabilities (Section 2); resource sufficiency evaluation tests applied to individual balancing authority areas (BAAs) in the Energy Imbalance Market (EIM) (Section 3); and bid cost recovery provisions for block imports participating in the hour-ahead scheduling procedure (HASP) (Section 4).

In separate draft Opinions that will be considered for adoption later in March 2021, we consider two other elements of the ISO's proposals to address summer 2021 readiness: export and load scheduling priorities;⁴ and a minimum state-of-charge requirement for short-term storage, which is part of the separate Resource Adequacy Enhancements, Phase I initiative.⁵ Other areas in which changes are recommended by the readiness initiative include reliability demand response dispatch and real-time price impacts; however, we are not commenting on those proposed changes. The initiative also considered but did not recommend system market power mitigation, deferring that until that particular initiative can be coordinated together with a comprehensive review of scarcity pricing.

¹ The opinions in this document reflect the personal views of the members of the committee and do not necessarily represent or reflect the views of any institutions with which they are affiliated.

² See California Independent System Operator, California Public Utilities Commission, and California Energy Commission, *Root Cause Analysis, Mid-August 2020 Extreme Heat Wave, Final Report*, January 13, 2021 www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

³ See <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-enhancements-for-summer-2021-readiness>

⁴ *Ibid.*, pp. 14-29.

⁵ See <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements>.

In preparation for this Opinion, the MSC held public meetings that included agenda items addressing the heat wave events of August 2020 on October 9, 2020 and November 13, 2020. The MSC then reviewed the elements of the Summer 2021 readiness initiative with stakeholders and ISO staff in a public meeting held on February 11, 2021.

The opinion devotes a section to each of the three areas of the initiative that we are commenting on (Sections 2-4). Each section closes with a summary of the conclusions the analysis.

2. Scarcity Pricing

2.1 Background

It is somewhat of an overstatement to describe the CAISO pricing proposal as a “Scarcity Pricing” proposal as both staff and stakeholders have acknowledged. The proposed pricing change will not implement a scarcity pricing design in the sense that such designs are implemented in eastern ISOs. Instead, the proposed pricing rule will set prices that will be more consistent with system conditions when the CAISO is on the verge of controlled load shedding and CAISO load is at risk of being shed within minutes were a major CAISO generator to trip off-line. The proposed design will continue to block resources scheduled to provide reserves in the IFM off from the real-time dispatch in either RTPD or RTD without regard to their relative economics unless released by the operation of the proposed rules.

In contrast, a complete scarcity pricing proposal would define mechanisms for prices to rise in increments as the probability of load shedding increases as a result of falling reserve margins and would reoptimize resource schedules between the energy dispatch and ancillary services in both RTPD and RTD to meet load with the least cost mix of resources in real-time. Furthermore, the scarcity prices in a more complete scarcity pricing design would be predictably, transparently, and logically related to the likelihood of, and of consumer costs resulting from, load shedding and to the costs that the CAISO is required to incur to meet NERC and WECC reliability standards. Nevertheless, the CAISO proposal is a substantial and needed improvement over the current design during periods when the system is so close to load shedding that the CAISO must arm load in order to meet WECC reserve requirements. Moreover, we understand that these changes can be implemented by this summer because the CAISO’s design makes use of existing software capabilities.

The flexible ramp (flexiramp) product design should serve an important role in scarcity pricing in the CAISO market, causing prices to rise as the CAISO supply demand balance tightens. But it presently does not have this effect because of the flaws in the current flexiramp implementation that were discussed in the flexiramp improvements stakeholder process. The ineffectiveness of the flexiramp design in sending scarcity signals was evident last summer, when the price of flexiramp remained around zero until 5:30 pm on August 14,⁶ and until 6 pm on August 15.⁷

In the next subsection, we analyze the proposed pricing rule revision that would apply when reserves are provided by arming load for shedding. Then in Section 2.3, we consider the implications of the changes in import pricing under FERC Order 831 as well as the readiness initiative’s

⁶ See www.caiso.com/Documents/Real-TimeDailyMarketWatchAug14-2020.html.

⁷ See www.caiso.com/Documents/Real-TimeDailyMarketWatchAug15-2020.html.

proposed changes to block import pricing. (The proposed block import pricing changes are further considered in Section 4 of this Opinion.) We conclude that these two elements do not by themselves provide effective scarcity pricing and should not be considered adequate substitutes for this element of the readiness proposal. A summary of our conclusions closes this section (Section 2.4).

2.2 Revised Pricing Rule when Load Armed for Shedding is Used to Provide Reserves

During the heatwave of August 2020, day-of market prices appear to have been inconsistent with system conditions in several hours leading up to the load shedding events. During several periods, energy prices were relatively low despite the fact that operating reserves were reaching critically low levels and utilities were preparing to shed load. The inappropriately low prices may have contributed to the CAISO's inability to schedule sufficient imports and avoid the need for load shedding. The proposed pricing rule will avoid the potential for the CAISO market software to set HASP, FMM and RTD prices at levels that are substantially inconsistent with system conditions at times when CAISO has "armed load" for shedding in order to comply with WECC requirements.

Under extremely tight supply conditions, load can be armed for shedding in order to provide non-spinning operating reserve, thereby allowing conventional resources that had been providing reserves to be released to provide energy. This process of arming load in order to provide reserves is not the same as instructing the distribution companies to prepare load for shedding with rolling blackouts when the CAISO is unable to maintain reserves. The process of arming load to provide reserves occurred during the August heatwave, with rolling blackouts occurring later after the generation resources released from providing reserves by arming load had been used to meet load. When load was armed to provide reserves, and generation providing reserves was released into the bid stack during the load-shed days in August, that released generation was dispatched at its offer price, resulting in the outcome that HASP, FMM and RTD prices remained in the range of \$100 to \$200 as load shedding approached. The purpose of this part of the readiness proposal is to eliminate such occurrences of low prices that are inconsistent with conditions of severe system stress.

Under this proposal, the energy offer price of any generation scheduled to provide reserves but released for dispatch when the reserves were replaced by armed load would be automatically set at the prevailing bid cap level, which is either \$1000 under normal conditions, or \$2000/MWh if Order 831 conditions were triggered. Market energy prices would be set by these bid cap level offer prices if the released reserves were needed to meet load. If load were armed for shedding but changes in conditions allowed load to be met without dispatching the released reserves, prices would continue to be set by incremental energy offers. Hence, prices would not be set at \$1000 or \$2000 per MWh whenever load is armed to provide reserves. Prices would only be set at these levels when the reserves released by arming load were actually dispatched to meet load.

As PG&E has noted, this design, like the current design, would not reoptimize resource schedules between energy and reserves in either RTPD or RTD, so it could be the case that load would not be met with the least-cost mix of resources. This lack of real-time co-optimization of energy and ancillary service schedules is a core feature of the current CAISO real-time market design.

As desirable as it might be, shifting to a design based on real-time co-optimization would be a major design and software change that could not possibly be implemented by this summer.

With the proposed pricing changes, it is anticipated that the CAISO market software will send a price signal that will attract additional imports during periods that load has been armed for shedding. If available, this additional supply will reduce the amount of load that would need to be shed following a significant generation or transmission contingency and also reduce the likelihood that reserves will fall to a level that requires load shedding. Setting prices at a level that will attract additional net interchange in HASP and FMM will be even more important prospectively than in the past because of the increased potential for the CAISO to be locked out of receiving incremental EIM imports as a result of failing the resource sufficiency bid range test.⁸

It would be preferable to implement a full scarcity pricing design that would cause prices to gradually rise as the CAISO approached the point at which it was necessary for the CAISO to “arm load” and rely on load shedding to meet its WECC reserve requirements, and that would also re-optimize IFM energy and ancillary service schedules in real-time, as PG&E recommends. There is, however, not nearly enough time to develop and implement a complete scarcity pricing design for summer 2021. The CAISO’s proposed pricing changes are a reasonable approach to expeditiously addressing one of the more problematic failings of the current pricing design during shortage conditions. These changes can be implemented in time to reduce the need for load shedding should the coming summer have heat waves similar to last year, or if the CAISO encounters other unanticipated conditions that lead to extreme reserve shortages.

As we briefly discuss in Section 2.3 below, the CAISO initially proposed to also set a \$2000/MWh price during load shedding conditions in real-time by using higher penalty parameters for the load balance constraint. The objective was to reduce the likelihood of the need for load shedding by increasing the incentive of LSEs to schedule imports to cover their load, provide stronger incentives for importers to deliver power to cover their day-ahead market schedules and more appropriately price both exports and wheel-through transactions. However, we understand there were complexities to implementing this design in combination with the as-yet unimplemented Order 831 that have deterred the CAISO from also implementing those changes for summer 2021.

2.3 Discussion of Import Payment Impacts: Proposed Uplift Payments to Import Transactions Scheduled in HASP and Day-Ahead Market Export Transactions, and Order 831

Impact of Proposed Uplift Payments. The CAISO has also proposed rules that would make uplift payments to real-time import transactions scheduled in HASP and to day-ahead market export transactions that are not scheduled in HASP (Option 2, discussed in Section 4). There are several reasons that the proposed uplift payments for import supply scheduled in HASP are not a substitute for the application of the proposed pricing changes when reserves have been released to meet load and load has been armed for shedding in the event of a contingency.

⁸ See Section 3 of this Opinion, *infra*.

First and most critically, *the proposed uplift rules will have no impact on the pricing of import supply needed to avoid load shedding if HASP prices are low because reserves have been released at the time HASP is run.* This is not an abstract hypothetical concern. Although there has not been a complete discussion of the HASP results in the hours leading up to load shedding in August, or of actual results when the reserves released by arming load were modeled in HASP, it does appear that HASP and FMM prices remained low after the point in time at which the CAISO found it necessary to release generation providing reserves to meet load while using armed load to meet its reserve requirement.⁹ The proposed rules providing uplift to imports scheduled in HASP, and to curtailed exports, will have no impact in a situation in which both HASP and FMM prices are artificially low because generation providing reserves has been replaced with armed load, with those reserves being dispatched to meet load based on their offer prices. This would occur even as the CAISO slides closer to load shedding with every megawatt of reserves dispatched in this manner. In contrast to the uplift rules, the proposed scarcity pricing rules will directly address and reduce the potential for HASP prices to remain at inappropriately low levels after reserves have been released; by reducing this potential, the risk of load shedding can be decreased because interchange supply that might be available would be more likely to be scheduled in HASP or FMM.

Second, *uplift payments to real-time imports and day-ahead exports to compensate for low FMM prices will not provide appropriate incentives for imports scheduled in the day-ahead market to be delivered in real-time* if FMM prices are depressed due to reserves being released. The pricing anomalies that would be addressed by the proposed changes could, if not corrected, result in imports not being delivered when the CAISO needs them most--when the CAISO is already short of reserves and approaching load shedding. It is noteworthy that while the CAISO intertie deviations settlements changes impose penalties on import transactions that are scheduled in HASP but do not flow, those penalties are based on the LMP price, so are much less meaningful if the LMP price is \$100/MWh than if it is \$1000/MWh.¹⁰

Third, *the proposed pricing rules, which will apply when the CAISO relies on load shedding to meet WECC reserve requirements, will mitigate some of the pernicious effects of the uplift payments for imports on load serving entity procurement incentives,* thereby helping to avoid putting the CAISO in a position in which load shedding is necessary. The uplift paid to transactions scheduled in HASP when FMM prices are low will be allocated to all load and exports.¹¹ This allocation of uplift costs will have the undesirable effect that LSEs that have scheduled enough supply to cover their real-time load will share the uplift costs associated with the CAISO acquiring supply in HASP to cover the supply of LSEs that failed to schedule enough supply to meet their real-time load. In contrast, if FMM prices are set at \$1000 when the CAISO is so short of reserves that it must arm load for load shedding in order to meet WECC reserve requirements,

⁹ See California ISO, Department of Market Monitoring, *Report on System and Market Conditions, Issues and Performance: August and September 2020*, November 24, 2020 Figure 3.5, p. 15.

¹⁰ See the California ISO filing letter in Docket ER20-1890. We note that 50% of \$100 provides a minimal deterrent to non-delivery during tight system conditions, while a \$500/MWh charge provides much more effective deterrence to non-delivery when the CAISO is relying on armed load to meet WECC reserve requirements.

¹¹ See California ISO, *Market Enhancements for Summer 2021 Readiness*, Draft Final Proposal, February 18, 2021, pp. 32-33.

the FMM price will only be paid by the LSEs responsible for the problem—those that neither cleared enough supply in the day-ahead market to cover their real-time load, nor took actions intra-day to contract for additional imports to cover their load. The present arrangements that shift the costs of such failures from LSEs that failed to cover their real-time load onto LSEs that have procured enough supply to cover their load constitutes an extremely inappropriate cost shift that undermines the incentive for LSEs to incur costs to cover their real-time loads. Furthermore, low FMM prices combined with uplift payments also increases the risk of load shedding because it reduces the incentive for LSEs to contract for import supply to cover their real-time load.¹²

Impact of Order 831 Implementation. We now consider what happens if load shedding is necessary and FERC Order 831 triggers based on the CAISO maximum import bid price. LSEs that fail to cover their real-time load and suppliers (including virtual suppliers) that fail to cover their day-ahead market schedules will be exposed to a \$2000 imbalance price which will impose a more appropriate cost on those responsible for the need for load shedding, whether they are LSEs or suppliers.

However, it is not assured that Order 831 will trigger during summer load shedding conditions. Gas prices may not be particularly high during summer load shedding conditions; this was the situation during the reserve short periods in August and September 2020. It is also not assured that bilateral price indexes outside California will be high enough to trigger Order 831, as they apparently would not have been during a number of the reserve-short days over August and September 2020. Whether Order 831 is likely to trigger depends not only on bilateral hub prices but also on the shaping factors, which can vary considerably from day to day and between day-ahead and real-time.

Market participants will be aware that if the Order 831 provision to raise the price cap has not been triggered based on day-ahead bilateral hub prices, the imbalance price will not rise above \$1000, even during periods when load shedding occurs. This knowledge will contribute to a higher risk of load shedding in general, and, in particular, more frequent load shedding if there are adverse conditions this summer. This is because LSEs that have not scheduled enough supply in the day-ahead market to cover their real-time load will have a reduced incentive to schedule high-cost imports to cover their real-time load if the highest possible real-time imbalance price is only \$1000. If the highest price during load shedding is only around \$1000, LSEs that did not cover their expected real-time load in the day-ahead market, perhaps because of load forecast error, or perhaps by intention, will have a diminished incentive to schedule imports costing \$800 or \$900 in order to cover their remaining real-time load. They will have a much stronger incentive to take actions to cover their real-time load if they would be charged \$2000 for their uncovered load if load shedding becomes necessary. However, we understand there were more complexities involved in implementing penalty prices above \$1000 in combination with Order 831 rules than could be resolved within the time available to the CAISO to prepare for summer 2021.

¹² If the need for load shedding is due to generators or import suppliers that failed to cover their day-ahead market schedules, artificially low FMM prices combined with uplift payments for imports shifts the cost of the supplier performance failure from the supplier onto load.

Our comments above have focused on the improved price signal for imports and exports. Another consideration is that there will be much more battery capacity on the CAISO system by the end of summer 2021 than was in operation during August 2020. It will therefore be more important than in summer 2020 to set prices that are consistent with system conditions so that the market software will charge and discharge batteries consistent with system conditions. While operators can use exceptional dispatch to override the software dispatch instructions, this will become more of an operational challenge for operators and more likely to lead to unintended outcomes as the number of batteries on the system increases and their importance in meeting CAISO load increases. The proposed pricing rule is a small but urgently needed step towards setting prices that will incent the efficient operation of California's storage resources to support system reliability needs.

2.4 Summary Conclusion

The pricing changes the CAISO proposes to apply when it must rely on load armed for shedding to meet WECC reserve requirement will fall far short of implementing a true scarcity pricing design. Nevertheless, those changes will address a critical limitation of the current pricing rules in time to reduce the potential need for load shedding as a result of inadequate supply during the coming summer. We agree with other commenters that these changes do not constitute a full scarcity pricing design, and we support the CAISO moving forward with the effort to develop a comprehensive scarcity pricing design. However, we also agree with the CAISO that some of the critical weaknesses of the current pricing rules need to be addressed with these changes in time to help avoid the need for load shedding during the coming summer.

3. Resource Sufficiency Test

3.1 Background and Proposal

We support the CAISO's intent to avoid implementing major changes in the resource sufficiency test design prior to summer 2021 and to instead focus on making sure that the current design is currently implemented, which we understand was not the case during summer 2020. The CAISO has identified some flaws in the implementation of the bid range resource sufficiency test during summer 2020 and plans to correct the software prior to summer 2021. We understand that the CAISO analysis indicates that these implementation flaws account for why the CAISO passed the bid range sufficiency test when it was in a Stage 3 emergency. However, these errors are not sufficient to explain why the CAISO passed the bid range sufficiency test in prior FMM intervals when the CAISO was in a Stage 2 emergency.¹³ In Section 3.2, we discuss the need to verify the implementation of the resource sufficiency test, and to make any corrections that are needed.

One change in the resource sufficiency test that the CAISO proposes to make prior to summer 2021 is to include the flexiramp uncertainty requirement in the bid range requirement. We understand that there is relatively broad stakeholder support for this change. However, we have a concern that this change will create an inflexible requirement that is inconsistent with the de-

¹³ Rahul Kalaskar, "Presentation on California ISO, Resource Sufficiency Evaluation," January 13, 2021, p. 17.

mand curve design of the flexiramp product and may have unintended consequences. We discuss this design change and other changes proposed by stakeholders below in Sections 3.3-3.5, prior to summarizing some conclusions in Section 3.6.

3.2 Analysis of Resource Sufficiency Test Implementation

We believe it is important for the CAISO to maintain confidence in the way the resource sufficiency test is applied by explaining how the CAISO passed the resource sufficiency test not just during the period of load shedding on August 14 and 15, 2020 but when the CAISO was in a Stage 2 emergency prior to load shedding.

Further examination may also show that the CAISO passed the resource sufficiency test because of core features of the test that would need to be broadly discussed within the EIM before changes are made that could impact both the CAISO and other EIM entities. However, it is also possible that this is not the case. In particular, it could be that there are simple, easy to correct software bugs that led to the anomalous outcomes, in addition to the issues already identified by the CAISO. Hence, the CAISO should prioritize continued examination of the factors that allowed the CAISO to pass the resource sufficiency test while being in a Stage 2 emergency, and whether this was an intended outcome of the current design or reflects some kind of software bug.

While a number of EIM entities have expressed a concern that the CAISO passed the bid range resource sufficiency test in part because EIM transfers created additional bid range on CAISO resources, it is our understanding that this should not have been the case. It is our understanding that while EIM transfers create additional bid range on CAISO resources that are dispatched down to accommodate the transfers, there should be no impact on the resource sufficiency test because the EIM transfers are to be added to the CAISO capacity requirement. While we understand that this is the *intended* design, it is possible that the CAISO may have passed the resource sufficiency test in some intervals when it should not have passed as a result of some kind of software implementation flaw. An example of such a possible flaw would be if the EIM transfers were not added to demand as intended. We do not know whether this or other implementation elements have been checked, but we think it would help maintain confidence in the resource sufficiency test if the CAISO would verify that the calculations accounting for EIM transfers were correctly carried out in the hours leading up to the load shedding events.¹⁴

On the other hand, it is also our understanding that the CAISO could pass the resource sufficiency bid range test when it might be expected to fail during emergency conditions because the increased bid range made available by releasing generation providing reserves for dispatch and then replacing those reserves with load armed for shedding is not offset by an increased capacity requirement.

Since this outcome is only applicable to EIM balancing areas that have entered a state of emergency and are using load shedding to meet WECC reserve requirements, it may be that the EIM entities indeed did not intend to freeze EIM transfers during these conditions. Indeed, it is our

¹⁴ While this discussion focuses on the resources sufficiency test as applied to the CAISO, implementation errors that are identified in this review might impact BAA's in addition to the CAISO.

impression that the resource sufficiency test is intended to prevent a balancing area from being able to lean on other EIM entities so as to avoid entering a state of emergency; it is not intended to reduce the ability of a balancing area that has already entered a state of emergency to avoid shedding load. If it is intended that EIM entities would fail the bid range resource sufficiency test during conditions in which the balancing area has entered a stage of emergency and is using armed load to meet its WECC reserve requirement, the CAISO of course has visibility into the amount of its reserves that have been released for dispatch and replaced with armed load, and it could add that capacity to its own capacity requirement. Since we understand the CAISO does not have similar visibility into the amount of reserves that other balancing areas have released and used to meet their load, we presume that it was not intended that reliance on armed load would be taken into account in applying the resource sufficiency test. This is of course a design feature that could be reconsidered going forward.

Another element of the resource sufficiency test that might have contributed to the CAISO passing that test as the CAISO approached load shedding was the interaction between the way FMM import offers are accounted for in the resource sufficiency test and the way armed load impacted dispatch and pricing outcomes. FMM import offers are counted as part of CAISO supply based on the presumption that they would be scheduled if they were needed to meet CAISO load. However, because of the impact of the release of generation reserves at incremental cost on HASP and FMM prices, import supply offered in the FMM might not have been scheduled even as the CAISO approached load shedding because HASP and FMM prices remained very low.

The CAISO should examine whether the following combination of factors accounts for the CAISO passing the bid range sufficiency test in hours leading up to load shedding in August 2020. These factors include the calculation errors that have been identified, together with how the test treats released reserves, FMM imports that were offered but not scheduled, and capacity of resources that were coming on-line but unable to ramp up to their upper limit. Such an examination, together with any appropriate adjustments in the calculation of the bid range sufficiency test if any remaining implementation flaws are identified, would maintain confidence in the CAISO's application of that test. It is important that the resource sufficiency tests be applied correctly to both the CAISO and other balancing areas, particularly during high load summer conditions. To the extent that there is time to do so prior to summer, the CAISO should also undertake some review of how the resource sufficiency test was applied to EIM entities that frequently failed the test last summer and then assess whether there may have been software flaws that caused EIM entities to fail the test when they should not have failed.

In the course of our discussions of the application of the bid range resource sufficiency test with the CAISO, we have come to understand that there is also a potential for the CAISO to fail the bid range test when it should not. This potential exists because the HASP takes account of the amount and offer prices of EIM transfer supply in scheduling CAISO imports and exports in HASP. The HASP economic evaluation could choose not to schedule hourly block imports that would have allowed the CAISO to pass the bid range sufficiency test because lower cost supply would be available through EIM transfers than by scheduling the HASP transaction. Similarly, the HASP economic evaluation could choose to schedule hourly block exports that would in practice be supported by EIM transfers, without considering whether scheduling these exports would cause the CAISO to fail the bid range sufficiency test. These EIM transfers would not be included in the bid range resource sufficiency test supply, nor would the hourly import offers

they displaced in the HASP evaluation be included in supply, while the hourly block exports supported by EIM transfers in the HASP evaluation would be included in the CAISO capacity requirement. The failure of the HASP to take account of the need to schedule hourly imports and exports in a manner that allows the CAISO to pass the EIM resource sufficiency test could result in the CAISO failing the test when it could have passed the test by scheduling additional hourly imports or fewer exports.

While it might at first appear that these unintended outcomes could be addressed by not including EIM supply in the HASP evaluation, that approach would lead to other unintended consequences because CAISO FMM prices would then be systematically lower than HASP prices during periods in which EIM transfers would flow into the CAISO, and systematically higher than HASP prices during periods in which EIM transfers would flow out of the CAISO.¹⁵ We do not propose that the CAISO take any short-run steps to address the potential for the CAISO to fail the resource sufficiency test when it should pass it because we view the issues as much too complex to address within the available timeline. However, we think that this interaction between HASP and the resource sufficiency test should be taken into account in considering other long-run changes in the resource sufficiency test or in the consequences of failing that test.

If the CAISO RUC pass clears without curtailing load, then there should generally be enough supply available in real-time to pass the resource sufficiency test. However, this will not be the case under any of the following conditions: if net load is higher than expected in real-time during particular hours; if HASP schedules additional exports not cleared in RUC, or if HASP does not schedule economic imports that were included in the RUC evaluation because of the availability of lower cost EIM transfers.

3.3 Including the Uncertainty Requirement in the Bid Range Resource Requirement

The CAISO proposes to include the full amount of the flexiramp uncertainty requirement in the bid range capacity requirement to be met with the resource sufficiency test. We understand that this change has fairly widespread stakeholder support but we have a few concerns about unintended consequences from this change if it were to be implemented for the first time going into this summer.

First, the flexiramp uncertainty requirement is defined as a demand curve. The intent is that the maximum amount would be procured if its cost was very low. It is explicitly not intended that the full target amount of ramp be procured at any cost. This is a particularly important consideration for the CAISO because HASP does not treat the flexiramp requirement as an absolute requirement but instead schedules ramp based on the demand curve. HASP might therefore not schedule imports that would have allowed the CAISO to pass a bid range test that included the uncertainty requirement because the imports were more expensive than the value of ramp based

¹⁵ As with many other elements of the Western EIM, the scheduling of supply in HASP versus relying on EIM transfers is impacted by the flawed implementation of flexiramp (www.caiso.com/InitiativeDocuments/FinalProposal-FlexibleRampingProductRefinements.pdf). The economic evaluation of EIM transfers within a constrained EIM region should include the impact on flexiramp scarcity relative to a HASP import but this would not be the case if the flexiramp evaluation counts on ramp located outside the constrained area.

on the demand curve. We think the CAISO should examine how such a requirement would in practice operate in combination with the HASP.

Second, a number of current and prospective EIM entities have pointed out that the use of the historic histogram to set uncertainty requirements has the potential to set a high requirement based on historic upward uncertainty reflecting a high historical level of intermittent resource output that would be applied to a future interval in which intermittent resource output is projected to be low relative to historical levels, and hence cannot decline much more. The uncertainty requirement should be set low for these future intervals with low projected intermittent resource output, making capacity available to meet the higher net load. If a high uncertainty requirement is applied to intervals when intermittent output is projected to be low, balancing areas could fail the resource sufficiency test when they should not, and perhaps not be able to make use of the EIM diversity benefit as a consequence of failing the test.

The CAISO noted in the draft final proposal that these flaws in the current flexiramp histogram design will be addressed by design changes being developed in the flexiramp improvements stakeholder process.¹⁶ These include use of quantile regression-based estimates of flexiramp requirements that will better reflect current resource conditions. However, these changes will not be implemented until after summer 2021 and we are not aware that any test results have been presented showing that the proposed changes will be effective in correcting the flaws in the current method for setting the flexiramp requirement. Until the flaws in the histogram method for setting the uncertainty requirement are corrected, including the uncertainty requirement in the bid range capacity requirement could result in some number of unintended sufficiency test failures. If the CAISO proceeds with implementing this change for summer 2021, the CAISO should carefully test the implementation in order to understand its impacts and avoid unintended impacts during this summer. The CAISO and EIM entities might also want to retain the ability to switch this feature off on short notice if it becomes apparent that it is operating in a manner materially different than intended.

3.4 Start Time, Ramp Constraints, and Resource Availability

We agree with the CAISO's intent to defer changes to the resources included in the bid range test prior to summer 2021. It might appear that it would be desirable to exclude from the bid range sufficiency test any resources that cannot be committed within the HASP time frame. However, if there is a very high level of intermittent resource output that is available for transfer within the EIM, it would neither be efficient nor consistent with the environmental goals that motivated the construction of those zero emission resources to require balancing areas to committed unneeded thermal generation to meet the resource sufficiency test requirements in order to avoid being cut off from zero emission imports.

The relevant start time under these conditions is not the time frame of the HASP evaluation but the time frame in which a large enough change in system conditions to require starting the units might occur. We think it will be very difficult to set a general rule for such a time frame. Ex-

¹⁶See California ISO, *Market Enhancements for Summer 2021 Readiness, Draft Final Proposal*, February 18, 2021 p. 27.

cluding resources that can be brought on-line within the operating day from the resource sufficiency test changes it from a resource sufficiency test to a short-term commitment decision test. The dispatch range test could potentially be modified to account for ramp rate constraints, but this would be very complex to implement without unintended consequences. A resource could be ramped down precisely because there is availability of surplus renewable output that is zero or even negatively priced, but once the resource is ramped down to accommodate this renewable output, it may not be able to reach its upper limit within particular time periods. We recommend that ramp and commitment-related changes be discussed among EIM entities and their impacts carefully evaluated before being implemented, which would be impractical to accomplish prior to summer 2021. Another set of issues that should perhaps be discussed would be how resources coming back on-line and ramping up should be accounted for in the resource sufficiency test.

Moreover, we have some reservations about whether a bid range resource sufficiency test based on intra-day unit commitment outcomes is necessarily appropriate. As we discuss in the next subsection, we believe that a thorough rethinking of the penalties for failure of the test should be undertaken. In particular, we think that a more appropriate consequence of failing to commit enough short-starting units to meet load at least cost within the operating day would be economic penalties, set by high prices if the BA is short. This of course requires that EIM prices send appropriate price signals, which they will not send at least until the flaws in the flexiramp implementation are corrected. This rethinking would not be possible prior to the summer of 2021, and should instead be undertaken as part of the planned comprehensive evaluation of the resource sufficiency test.

3.5 Changes in Penalties

As just stated, we support consideration of changes in the consequences for failing the various resource sufficiency tests. We also support the CAISO's intent to not try to develop and implement such changes prior to summer 2021. We do not believe any stakeholders have identified changes that are such a clear improvement on the current design, so easy to implement, and so devoid of potential adverse impacts that the CAISO should attempt to implement them prior to this summer. Ideally the penalties should serve as a deterrent to leaning and thereby result in improving overall reliability, rather than a punishment that could have the unintended consequence of harming reliability.

We also have reservations with implementing changes that materially increase the penalty for failing the test if it is expanded to include the uncertainty requirement until the ISO addresses the following two issues. First, flaws in the histogram approach should be corrected so that balancing areas are less likely to fail the resource sufficiency test when they should not, and, second, the CAISO should address the inconsistencies between its HASP evaluation and the way the resource sufficiency test is applied. Inappropriately high penalties, combined with sufficiency test failures due to flaws in the test, could produce the unintended consequence of discouraging participation in the EIM.

3.4 Summary Conclusion

In summary, we agree with the CAISO's view that EIM entities should not attempt to develop substantive changes in the way unit commitment decisions, start times and ramp constraints are

accounted for in applying the bid range sufficiency test prior to this summer. In our view there are complex interactions between participation in the EIM dispatch and potential tests that account for ramp and commitment decisions that could have serious unintended consequences if any changes to the test are not carefully developed and tested.

Second, we recommend that any discussion of changes to the consequences of failing the various sufficiency test need to consider the following issues. First, what should the consequences be for a balancing area that has declared a state of emergency relative to a balancing area that might be leaning on the EIM in order to avoid needing to declare a state of emergency? Second, how should any changes in penalties be applied to balancing areas that fail because of flaws in the histogram approach used to set ramp targets or that fail a revised test that includes rules that apply to unit commitment decisions and ramp constraints that may be based on very simplified rules.

Third, if the uncertainty requirement is included in the bid range test, we recommend that the CAISO and other EIM entities retain the ability to switch this feature off without delay if it proves to adversely impact EIM operations and reliability by frequently triggering failures that are not warranted by conditions.

Fourth and finally we recommend that the CAISO provide a more detailed accounting of how it passed the bid range resource sufficiency test in the hours leading up to load shedding in August 2020. This will likely result in one of two outcomes, or some combination of the two. The first possible outcome would be that this outcome was consistent with the design of the test and the actions the CAISO was taking. The second possible outcome is the identification of additional implementation errors that we hope could be corrected prior to the coming summer. In addition, the CAISO should conversely attempt to understand the reasons that other EIM entities failed the test during critical times or at high rates and verify that these failures were not due to some type of implementation error.

4. Make-Whole Payment Provisions for Imports in HASP

4.1 Background and ISO Proposal

The California market imports approximately one-quarter of its electricity needs, on average. The crisis of 2000-2001 and the heat wave of August 2020 show that disrupting imports can have severe consequences for costs and reliability. For that reason, under the 2008 Market Redesign and Technology Upgrade, the CAISO created both a real-time 5 minute dispatch market for clearing internal supply and demand for imbalance energy, as well as an Hour Ahead Scheduling Process in order to accommodate WECC rules governing the scheduling of imports from outside the ISO. At that time, these rules included hourly block scheduling for the majority of import sources, as well as deadlines for tagging accepted schedules at the CAISO interties that precede the cleared schedules flowing in the 5 minute market. HASP performs an optimization of import offers and internal ISO resources against forecast ISO internal demand and anticipated exports. HASP yields a financially binding schedule for import energy offers (to be settled at subsequent real-time prices) and a physical commitment schedule for internal resources that need to be com-

mitted within that time frame, but not a financially binding energy schedule for internal resources. The five-minute dispatch market was complemented by an every 15 minute real-time pre-dispatch (RTPD) which ran a short-term security constrained unit commitment that determined what resources would be available to be dispatched in the 5 minute market. One of the four RTPD commitment runs serves as the HASP market run, coinciding with the time frame required to schedule hourly block transactions.

Later, in 2014, the RTPD process was modified to create a fifteen-minute market (FMM) which determines financially binding energy schedules for internal resources. The FMM was implemented in anticipation that an increasing amount of imports on the interties would be dispatchable on a quarter hourly basis, in part because of FERC Order 764. This expectation has to a large extent not been realized. However, the FMM plays another important role, which is to calculate the prices at which the hour ahead import schedules are to be settled. In summary:

1. HASP creates financially-binding schedules for block imports at the interties, as well as physical unit commitment schedules for internal resources.
2. The FMM performs unit commitment and energy scheduling for internal resources, calculating LMPs that are used to settle both internal resource schedules and, after averaging over the relevant hour, HASP import schedules.
3. The 5 minute market redispaches internal resources, and the imbalances (relative to the FMM schedules) are settled at 5 minute prices.

Average prices in the FMM for a given hour may be less or more than the HASP market clearing prices for that hour. This means that there is a risk that HASP schedules will receive revenues that are less than their bid, but also a possibility of receiving revenues in excess of their bid or the HASP clearing price. As described by DMM,¹⁷ there was a pattern in Q3 of 2020 in which 15 minute prices paid approximately \$4M/hour more to hourly transactions scheduled in HASP than HASP prices would have during the early evening hours (19 and 20). In most hours, actual settlements (15 minute prices) were higher than HASP prices, but the differences in those hours were usually well below \$1M/hour for the quarter. On net, import revenues based on 15 minute prices exceeded those that would have resulted from HASP prices.

Nevertheless, the risk of selling power for materially less than the offer price can be significant. The Proposal cites a case in which one intertie's HASP price during one hour on August 16, 2020 was +\$262/MWh, while the corresponding average FMM price that any block import offer would've been settled at was -\$149/MWh. We understand that this outcome was at least in part due to out-of-market import transactions that were scheduled by CAISO operators after HASP had run but that were reflected in FMM schedules and prices.¹⁸ The ISO, DMM,¹⁹ and stakeholders recognize that this risk can discourage non-RA imports when they are most needed, since they could choose to be sold into other Western markets without having to bear that risk. The

¹⁷ CAISO Department of Market Monitoring, *Q3 2020 Report on Market Issues and Performance*, Special Issues, p. 114-116, www.caiso.com/Documents/2020ThirdQuarterReportonMarketIssuesandPerformance-Feb4-2021.pdf.

¹⁸ California ISO, *Market Enhancements for Summer 2021 Readiness*, Draft Final Proposal, February 18, 2021, p. 30, www.caiso.com/InitiativeDocuments/DraftFinalProposal-MarketEnhancementsforSummer2021Readiness.pdf

¹⁹ CAISO Department of Market Monitoring, *Q3 2020 Report on Market Issues and Performance*, Special Issues, p. 115, www.caiso.com/Documents/2020ThirdQuarterReportonMarketIssuesandPerformance-Feb4-2021.pdf.

potential for CAISO operators to schedule out-of-market transactions that could lead to wide divergence between HASP and FMM prices is much greater during highly stressed system conditions, such as those in August 2020, than during normal operating conditions.

Therefore, it is reasonable to conclude that removing this risk and the possible disincentive to scheduling imports during times of system stress for the ISO could increase available supply of non-RA imports. (RA imports are obliged to bid into the CAISO markets, but the price risks they bear are arguably a disincentive to perform.²⁰) It is at such times that RA imports may be insufficient to meet system needs,²¹ so incentivizing non-RA imports becomes even more important then.

There are several possible ways for this risk to be mitigated by altering how HASP schedules are settled. These include:

1. The ISO's "Option 1" (settle imports at the higher of HASP and FMM prices, guaranteeing that imports will recover their offer price, which the market software guarantees will be no more than the HASP price).
2. The ISO's "Option 2" (provide a make-whole payment based on the import's offer price, which would pay the positive difference between that offer price and the hourly average FMM price-based settlement).
3. Various versions of an "Option 3" proposed by stakeholders²² (which would always pay the HASP price to real-time block imports).
4. Although it is not practical for the coming summer, a longer run solution would be the addition of a fourth spot market to the existing IFM, FMM, and 5 minute markets that would settle HASP imbalances (relative to day-ahead quantities) in imports, exports, internal resources, virtual trades, and load at HASP prices. The possibility of such a market was discussed by MSC members during the planning for MRTU, but not seriously considered at that time. However, improvements in software execution times, together with growth in variable renewables and the more accurate forecasts available several hours ahead compared to day-ahead, make this alternative worth considering if loads and supply side resources would make use of it.²³

²⁰ See www.caiso.com/Documents/MSO-OpiniononIntertieDeviationSettlement-Jan18_2019.pdf

²¹ *Final Root Cause Analysis Mid-August 2020 Extreme Heat Wave report*, p. 48, www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

²² Stakeholder Comments on *Straw Proposal, Market Enhancements for Summer 2021 Readiness*, <https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/bbc85fdd-01b0-4901-b544-81791ba65481#question-30128e8a-b686-4533-a965-8e7ada3872c7>.

²³ Several European markets have developed intraday markets which, in Germany's case, now have a much greater volume than the nominal real-time imbalance market (T. Brijs, C. de Jonghe, B.F. Hobbs, and R. Belmans, "Interactions between the design of short-term electricity markets in the CWE region and power system flexibility," *Applied Energy*, 195, 1 June 2017, pp. 36–51; see also Mastropietro, P., Rodilla, P., Rangel, L.E. and Batlle, C., 2020. "Reforming the Colombian electricity market for an efficient integration of renewables: A proposal," *Energy Policy*, 139, p.111346.). The intraday and real-time market designs are very different from US markets, and so conclusions cannot be drawn about the desirability of instituting intraday markets in the US. In particular, real-time markets do not use locational market pricing and often involve nontransparent incs and decs, similar to the early California ISO market. Further, intraday markets in Germany and elsewhere involve matching of offers and bids as they

5. Another long-run solution would be a scarcity pricing design that incented load serving entities to contract intra-day for imports to cover their expected net load. This is not an alternative to the other four options above, but rather a market enhancement that in our opinion that would complement and strengthen each of them.

Variants of Options 1, 2, and 3 can be defined based on the circumstances under which their settlement rules would be used instead of the present FMM price-based rule. Those circumstances could be defined very narrowly, corresponding to emergency or highly stressed conditions alone. Alternatively, they could instead be defined broadly, including most or even all hours, or somewhere in between the two extremes. Variants of the options can also be defined regarding how any make whole payments or other extra costs borne by the ISO would be allocated.

The ISO's recommendation is Option 2, in which the provision of a make-whole payment based on the import's offer price would be applicable when system conditions are tight. These trigger conditions are defined by the proposal as an hour for which:

- The ISO issues an alert notice by 3 p.m. the day before an operating day that states that an operating reserve deficiency is anticipated by the ISO for the hour in question, or
- A warning or emergency notice is used by the ISO during an operating day that states that the ISO anticipates or is experiencing an operating reserve deficiency during the hour in question.

4.2 Analysis

There are several criteria by which the above proposals, along with the do-nothing alternative, could be compared:

- whether it is practical to test and implement by the summer of 2021;
- whether the proposal would ameliorate the risk of settlements being less than accepted bids in HASP;
- the desire to make no more changes than are needed to encourage import supply at critical times, and reduce the potential for unanticipated consequences;
- whether the proposal would weaken incentives for 15 minute bidding by imports;
- whether the proposal would increase discrimination against internal ISO resources;
- whether the proposal would be susceptible to gaming; and
- whether the cost allocation conforms with possible cost causality and fairness principles.

Below we compare Options 1, 2, and 3 with the status quo (do nothing) option. We consider the merits of a narrowly or broadly defined set of circumstances in which an option would be applied. We do not consider the long-run alternative of implementation of a full HASP market with settlements based on HASP prices for all internal and external resources and transactions.

come in, which consideration of congestion management; although that is compatible with European zonal market designs, it is entirely incompatible with US LMP-based designs.

Considering first the criterion of practicality, the ISO has stated that they can't do Option 1 or the stakeholders' Option 3 by this summer because this would require expensive and complex revision of settlement systems to store and apply HASP prices to import transactions. This conclusion by the ISO has not been questioned by stakeholders; indeed, many stakeholders have been concerned about the complexity and implementability of other parts of this initiative, and we would expect that such concerns would also apply if the ISO were to put Options 1 or 3 forward. By this criterion, only Option 2 or doing nothing is viable for this summer.

Options 1, 2, and 3 would all satisfy the criterion of mitigating the risk of import offers being scheduled in HASP at offer prices that materially exceed the FMM price-based settlement. Conversely, doing-nothing would mean that risk would still exist next summer, possibly discouraging imports, especially at times that they would be most needed. Although importers would certainly prefer having this insurance in a broader set of circumstances, the ISO's and stakeholders' desire to keep the scope of changes narrow and the need to avoid the risk of unanticipated consequences imply that the change in settlements should only be applicable in a narrow set of circumstances. Moreover, there is no undue reliability risk if non-RA imports are not offered under normal operating conditions.

For a given level of a HASP offer, Option 2 results in less (or at least no more) payment to accepted import offers than Options 1 or 3. Thus, the issue of discriminating against within-CAISO resources (who only have the option of 15 minute and 5 minute prices in real-time) is less of an issue with Option 2.

There are two concerns about the potential for strategic behavior under these options. One concern applies to all three options. By potentially providing a make-whole payment that results in paying some or all intertie transactions more than the FMM prices, while maintaining FMM price-based settlements for other intertie transactions or virtual transactions, the possibility of profitable offsetting trades is opened up. Although offsetting trades would result in no net payment in the IFM, the two sides of the trades would be settled differently in the real-time markets (HASP and FMM). The entity involved could earn positive revenue, in the form of the make-whole payment whenever the transactions are settled at different prices in HASP or FMM.

The specific offsetting trade opportunity that is a risk differs between Options 1 and 2. Under Option 1, since all interchange transactions settle at the higher of the HASP- or FMM-based prices, imports and exports will settle at the same price, so there is no issue with offsetting interchange transactions. The issue is instead offsetting virtual supply and exports in the IFM, with the export not flowing in real-time. Since IFM virtual supply would settle as virtual demand at the FMM price, while the export would settle at the higher of the HASP or FMM price, this would be profitable if the HASP price is higher. The same strategy might be profitable for Option 3 if the HASP price was predictably higher in a given interval. Meanwhile, under Option 2 there are three offsetting trade opportunities:

- i. Offsetting real-time imports and exports. This is not likely to be an issue because real-time exports would likely be curtailed under the circumstances when this rule would be applied, as the ISO notes in its proposal.

- ii. Offsetting DAM exports and virtual supply as under Option 1. It would be much harder to earn profits from this strategy than under Option 1, however, because in order to be paid more than the FMM price the exporter would need to set an export bid price higher than the FMM price. That would create the risk that the export would be scheduled to flow in HASP, instead of being dispatched down, if the HASP price exceeded their bid. The FMM price might be high when this occurs, exposing the seller to losses on the virtual supply position. This strategy only appears to be likely to be profitable if there is a high probability that the HASP price will clear at a very high level.
- iii. Have IFM imports that do not flow in real-time, settling the resulting imbalance at FMM price, while submitting high priced real-time imports to HASP that could get up-lift if accepted and the FMM price was lower than the HASP price. This has the same risks as the second strategy, unless there is a high probability the HASP price will be significantly greater than FMM prices. There is an additional risk to the market party using this strategy of the real-time import not clearing in HASP and then having to dispose of the energy while possibly settling the IFM import deviation at a high price in FMM.

In summary, opportunity (i) appears unlikely, and options (ii) and (iii) are both riskier under Option 2 than under Option 1. Further, Option 2, by paying no more than Options 1 and 3, should be less subject to the risk of offsetting trades. The ISO claims that the conditions under which their proposed Option 2 would apply should minimize the probability of this strategy being pursued successfully. While the conditions in which significant round-trip transactions would be profitable appear to be unlikely, we cannot foresee all of the system conditions that may arise at particular times during the coming summer. Hence, we agree with the ISO that it will be prudent to monitor bidding behavior and have the capability to suspend the make-whole payments provision if adverse market outcomes are detected, as the ISO proposes.

A second strategic behavior concern applies to Option 2. An issue with the make-whole payment system like Option 2 is that importers will be incented to increase their bids to get closer to (while still remaining under) the HASP prices in order to maximize their revenue. Thus, the make-whole payment can provide incentives similar to pay-as-bid settlements, which have the potential for two negative effects. The first effect concerns the market efficiency implications of the incentive to misstate costs: a seller may misjudge what the HASP clearing price will be, and offer too high, and thereby not be selected. If other resources or imports are selected instead that are in reality more costly than the supply offered by seller who offered its supply at too high a price, the cost of serving load has been increased. The second potential effect is that a seller may decide to devote additional resources to estimating HASP prices; such efforts would be unnecessary in a first-price (market clearing-type) market, in which a competitive firm only needs to offer their true cost in order to maximize their profits. This increases the cost of market participation and can disadvantage small firms and thereby harm the competitiveness of the market.

To the extent that circumstances in which Option 2 would be invoked occur frequently and can be predicted prior to submitting offers, and to the extent that the level of HASP prices can be predicted, raising import offers can become more attractive and these two effects have the potential to lower market efficiency. However, if the trigger for providing the make-whole payment is

uncommon and difficult to predict, and if the HASP prices themselves are difficult to forecast, problems with these two types of adverse effects are less likely. Moreover, import supply offers are likely to reflect opportunity costs in other markets rather than incremental costs in the circumstances in which the CAISO rules are likely to apply; as a result, importers will have similar or identical costs so their offers would likely be similar anyway, so there appears less potential for the first effect (i.e., inflation of offers to the anticipated marginal clearing price level).

Regarding cost allocation, one set of stakeholder comments (Idaho Power) objected to any of the uplift costs of Option 2's make-whole payments being allocated to EIM transfers from the CAISO.²⁴ However, their comments also noted that the amount of such transfers during tight conditions are likely to be small or nonexistent, so that load and other exports would bear most or all of the uplift. We view this as a cost allocation issue that might be discussed in the long-term, but it is not so important as to justify holding up summer implementation. If the uplift to EIM transfers turns out to be significant, the ISO and its stakeholders could then consider if it is worthwhile incurring additional costs for settlement system changes.

4.3 Summary Conclusion

We understand that the CAISO would be able to implement Option 2 for summer 2021 and that Option 2 would establish a relatively circumscribed application of make-whole payments for hourly block imports. We believe that Option 2 will be effective in eliminating the potential for import supply to be materially reduced during highly stressed system conditions by the risk of imports being scheduled in HASP but being paid materially less than their as-bid costs. We cannot predict the magnitude of impact of these rules on the amounts of non-RA imports that will be offered during tight conditions, but we anticipate it will be at least somewhat helpful. We also conclude that the risks of adverse market outcomes from strategic behavior, in the form of off-setting schedules or inflation of offers in order to increase make whole payments, are likely to be small, given the narrow set of circumstances in which the payments would be applicable. We agree that market behavior at such times should be closely monitored for such strategic behavior, and anticipate that offers and market outcomes will be highly scrutinized, as they have been for the heat wave event of last August.

An impact of this type of bid cost recovery proposal if implemented during normal market conditions, could be to discourage flexible (non-block, 15 minute) offers by imports. However, this is unlikely to be an issue during highly stressed system conditions when offer prices reflect the opportunity cost of selling to another buyer in the hourly market in the West. We encourage the ISO to investigate the reasons why importers and intertie owners continue to schedule on an hourly basis, since there are no apparent technical reasons blocking 15 minute scheduling. As a long-run remedy, we encourage consideration of the implementation of a HASP market with 15 minute prices that would settle all import, export, and internal resource deviations from day-ahead schedules. Such an intraday market would eliminate the source of the price risk that this part of the initiative is addressing. That market would also enable the ISO and market participants to take advantage of the resource and load forecasts that are available a few hours before

²⁴ Stakeholder Comments on *Draft Final Proposal, Market Enhancements for Summer 2021 Readiness*, <https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/a1105b73-c668-4ba5-9858-9e183a2cd852>. PowerEx also provided oral comments during a stakeholder call supporting these concerns.

real-time and that are more accurate than the forecasts used in the IFM. The creation of intraday markets in Europe is an example that could be followed by US markets if loads and suppliers were incented to make use of it.