California ISO

Q&A

Stakeholder Q&A from August 14th and 15th events

This document consists of questions that were submitted to the ISO, regarding the events of Aug. 14th and 15th, by ISO customers, market participants and stakeholders. An answer to each question has been provided and is categorized by topic.

Topic: Convergence Bidding

Q: What is the benefit of convergence bids in the CAISO's market and how does it impact the real-time market?

Convergence bidding enables financial supply and demand positions in the day-ahead market that are settled with day-ahead prices and are liquidated in the real-time market with real-time prices. These positions serve to better align day-ahead prices with market participant expectations of real-time prices. Convergence bidding also adds liquidity to the CAISO's market.

From a supply and demand perspective, convergence bidding impacts the day-ahead market because convergence bids provide non-physical supply and demand that will allow the market to balance supply with demand. The presence of these bids in the day-ahead market will therefore impact day-ahead energy prices. For example, a convergence demand bid can support physical supply bids so that the market has sufficient supply bids to clear demand, which allows the market to meet supply and demand. Similarly, a convergence supply bid can support a physical demand bid and again allow the demand bids to clear in the day-ahead market. Lacking such bids, the market would become infeasible and in order to clear would trigger uneconomical adjustments that are based on the bid cap ($1000/MWh) to relax constraints and clear the market. However, because physical supply and demand bids compete with the convergence bids, convergence bids can displace physical supply or support additional demand/exports in the day-ahead market. This can influence how the day-ahead market positions resources for the real-time market, which unlike the day-ahead market is based only on physical resources.

In order to ensure the day-ahead market provides a solution that can meet the expected demand of real-time, the day-ahead market also has a reliability unit commitment in which convergence bids are not considered, and demand is met strictly with physical resources.

Q: Why were convergence bids suspended in the CAISO's market?

Although convergence bidding provides benefits to the market, given the high temperatures and system conditions experienced during the August 14 – 17 heatwave the CAISO assessed the interaction of convergence bids with physical resources and cleared demand schedules, including exports in the day-ahead market that turned out to be infeasible in the real-time market. Essentially, the convergence supply positions may be facilitating demand schedules in the day-ahead market, while the CAISO faced the possibility that it would have to curtail schedules based on what the system could actually support physically to maintain reliability.

This detrimentally affected the CAISO's system operators' ability to maintain reliability as operators endeavored to take actions outside of the market to balance the system. For example, in anticipation of the ISO needing to

implement load curtailments in the real-time, the operators started to contemplate the need cut day-ahead export schedules that were cleared in the day ahead market just like they were contemplating that the heatwave and tight conditions might result in further load curtailments. This determination was based on a broader perspective relative to available supply to meet that level of demand. The CAISO determined that the presence of convergence bids contributed to supporting schedules that could not ultimately be honored in the real-time market. The CAISO determined that preventing the convergence bids from facilitating schedules that were not reliable provided the operators with fewer challenges in an already significantly constrained environment. The CAISO concluded it was better that the neighboring balancing authority areas know in advance instead of being in a challenging condition in real-time to serve their load having relied on unsupported exports, rather than first allowing the day-ahead market to schedule their export and then have to curtail it after it had been scheduled.

Q: Does the ISO have tariff authority to suspend Convergence Bidding?

Yes - Section 7.9 of the CAISO tariff authorizes the CAISO to suspend convergence bidding if it detrimentally impacts the CAISO's ability to operate system reliably.

Q: Why were convergence bids removed from the market on August 18 and not earlier?

The day-ahead market, in which convergence bids participate, runs one day in advance of the actual operating date (or Trade Date).

Based on observed conditions of a given operating date, the only opportunity to act on the day-ahead market is the following day. Once the CAISO observed that the system was at risk of actually curtailing load and exports in the real-time based on the events of August 14 and 15, the CAISO decided to suspend convergence bidding by the morning of August 17, for the day-ahead market that applied to the August 18 trading day.

The CAISO understands the value convergence bids provides to the market when it is not overly constrained and has a margin to allow these financial bids to serve their role. But when the system is as tight as it was during this current heat wave, convergence bids can allow for a day-ahead market that is not supportable by actual available resources and system conditions. Based on the timeline, the earliest we were able to notify the market and suspend convergence bidding was for trading day August 18.

Q: When will convergence bidding be reinstated in the CAISO market and under what criteria?

During the heat storms, the CAISO evaluated various factors to determine on a daily basis whether to continue to suspend convergence bidding or not. The CAISO considered the projection of supply shortage coming from the day-ahead market clearing against physical supply relative to the forecast conditions of the real-time market. These forecast conditions account for not only expected load but also for the uncertainty that demand may not materialize a higher value, as well as how conditions in the real-time market are evolving by the time the decision is made. For example, on August 20, the CAISO concluded it could reinstate convergence bidding for trading date August 22 after it considered the day-ahead projected shortage for August 21 as well as the evolving load conditions in the real-time market of August 20 when the decision was made. Convergence bidding has since remained in effect.

Topic: Capacity Procurement Mechanism (CPM)

Q: How do I know when I have been designated for a CPM?

Scheduling coordinators can subscribe to the Customer Interface for Resource Adequacy (CIRA) application so that you can receive the automated notifications.

Q: If I am issued an initial designation for CPM, what do I need to do?

Please review it in CIRA. If the Scheduling Coordinator accepts the CPM designation, the Scheduling Coordinator does not need to take further action. If the Scheduling Coordinator wants to decline the CPM, it must do so in CIRA within 24 hours of the initial designation.

Q: What is the obligation if I accept the CPM?

Accepting the CPM means that you have an obligation like any other resource adequacy unit obligation. The system CPM designation is a 30 day commitment.

Q: I received a CPM above the Net Qualifying Capacity (NQC). Is that ok?

Yes, you are obligated to provide the amount of capacity within the CPM above NQC. If you cannot commit to that capacity amount, you can decline the CPM within 24 hours.

Q: I received an Exceptional Dispatch CPM, but I already have a resource adequacy commitment for September. What do I do?

The CPM designation will be reduced by the increased resource adequacy commitment. That is, the CPM designation for September will be reduced by the increased resource adequacy between August and September.

Topic: Imports/Exports

Q: Why were exports curtailed and why did they start on Monday, Aug 17?

This question has three parts that need be addressed.

1) In the past we have curtailed exports when necessary. This is not a new practice that started on August 17.

   On August 17, because of constrained conditions, the ISO took the extra measure of reminding the market that exports could be subject to curtailment based on priorities we have defined in the market and that there was an increased likelihood of its occurrence given the ongoing system conditions.

2) Exports like other types of resources, namely generating units of any type of technology, imports or demand, can be curtailed in the market clearing process. These curtailments can be driven by one of two reasons: i) power balance constraint, or ii) congestion management. For power balance, it can happen in two instances. When there is too much generation, leading to oversupply and the need to curtail generation and imports, or when there is too little supply leading to under generation and curtailments of demand and exports.

3) Curtailments can be implemented through two different mechanisms. Either in the market clearing process or by CAISO operators issuing direct curtailments.

Market curtailments of price-taker schedules when there are infeasibilities

- The CAISO curtails export/import self-schedules (price-taker bids) at interties through the CAISO market when the CAISO market must relax constraints to clear the market. If there is enough supply and the transmission is not constrained, the CAISO markets normally honors self-schedules, including export self-schedules. But if there are constraints and transmission limits that are binding, or the power balance cannot be met, the market systems will begin to curtail self-schedules, including self-scheduled exports.
- When the market curtails exports the software is configured to follow a set of priorities. (Specified in tariff Section 31.4 for the day-ahead market and 34.12 for the real-time market)
    - Certain exports have a higher priority than others, so it is possible that not all exports get curtailed before the CAISO is able to clear the market.
    - For example, in the day-ahead market, if the CAISO must curtail self-schedules, the CAISO will treat CAISO demand self-schedules at the same priority that it treats export self-schedules that the SC has explicitly identified in a resource adequacy plan to be served by resource adequacy capacity explicitly identified and linked in a supply plan. The CAISO will also treat export self-schedules that are explicitly identified by the Scheduling Coordinator as sourced by non-resource adequacy capacity at the same level of priority. On the other hand, export self-schedules that are not explicitly identified as sourced by non-resource adequacy capacity will have a lower priority and will be curtailed before the two other types of self-scheduled exports. This means that if in the day-ahead market we run into infeasibilities, the export self-schedules will be cut with these levels of priority.
    - In the real-time market we follow similar priorities – If the real-time market runs into infeasibilities, it will also curtail real-time submitted self-schedules, and like the day-ahead, the real-time market will treat certain exports with a higher priority. For example, if the market needs to increase supply because it is short on supply to meet the power balance constraint or transmission constraints are binding, the system will allow an infeasibility to meet the CAISO load and curtail export self-schedules that are identified as served generation from non-resource adequacy Capacity or from non-residual unit commitment capacity. Again, the export self-schedules that are not explicitly identified as offered by generation from non-resource adequacy capacity or not offered by generation from non-residual unit commitment will have a lower priority than load and these other types of exports.
- These types of curtailments do not happen frequently but they do happen, and are more likely to happen when the system is significantly constrained.

Curtailments by CAISO operators for Reliability

- System operators may take out of market actions to curtail schedules (whether they are price taker schedules or not) to maintain system reliability. These actions will only be taken to maintain system reliability and they are carried out by our system operators under Section 7.1.3, 7.7.1 of the CAISO tariff and are done consistent with Section 40.6.11. In such cases, the operators are guided by the same order of priority the market follows as discussed above. However, ultimately the operators will take whatever action is necessary and best addresses the system reliability issue they are trying to address.
- Also, when system operators conduct such actions, the operators will evaluate and curtail the schedules pro-rata, or will conduct the curtailments that are most expedient and effective to resolve the reliability challenge.
- The operators would only curtail exports if the ISO finds itself in a situation where it is also curtailing or expects to curtail its own load.
- The CAISO rarely curtails its own load, and therefore, rarely curtails exports.

- After August 14 and 15, because the CAISO anticipated it may curtail load further, the ISO started notifying market participants that their export schedules may be curtailed either through the market or manually to address system reliability. The CAISO notified market participants that had received export schedules that there was the potential that their schedules would be curtailed. The CAISO did not determine the need to advise the broader market because not all market participants were affected. However, the CAISO may provide broader notice in the future if conditions warrant.

Q: Prior to the heat wave events, when was the last time that exports not backed by a specified generator were curtailed, pro-rated, or self-schedules denied in the IFM?

We do not have metrics on these statistics. Exports not supported by a non-resource adequacy resource are deemed low priority and will be curtailed after exhausting economic bids. Self-schedules for this type of export is not a guarantee of firm schedules, it only provides a relative priority over economic bids. As such they may be curtailed under supply tight conditions. If an export requires a higher priority, the simplest approach is for that resource to find a non-resource adequacy resource that can support the export. That will not guarantee the export will not be curtailed, but will provide it a higher priority, equivalent to internal load.

Q: Does there need to be sufficient resource adequacy capacity available to meet firm load and contract exports before allowing self-schedules? If so, is this value published?

Self-schedules are allowed for both demand and exports regardless of the resource adequacy capacity available. When the system is constrained, the positions taken can result in schedules that will not be feasible later. For example, there may be insufficient capacity to support load and export schedules coming out of the day-ahead market, which have to be curtailed to maintain reliability in real time. Exports do not ensure additional supply is available to meet load, they are effectively additional load that needs to be met with supply.

Topic: Load Forecast

Q: Would the CAISO please provide some insight as to the nature of the very significant load reductions observed on August 17 and August 18?

Circumstances that played a rule in actual demand materializing below forecasted demand:

1. Demand response activation
2. Energy efficiency – Conservation efforts (Flex Alert)
3. Temperature Change. Temperatures came in lower than forecasted for coastal PG&E and SCE areas. Atmosphere smoke from wild fires lowered temperatures.

Topic: Prices

Q: What is the price cap used in CAISO's markets and has it been raised under these conditions?

The CAISO's market does not have any price caps. However, it has a bid cap of $1000/MWh, which effectively limits how high a participant can bid in the CAISO's markets. The resulting market prices reflect the bids and other

system conditions, which in some cases, like congestion, can give rise to prices above the bid cap. Prices may exceed $1,000/MWh due to the cost of congestion from multiple constraints. The CAISO conducts security constrained economic dispatch and commitment to produce physically feasible schedules and commitments. When the CAISO must relax constraints to clear the market, the CAISO prices energy based on penalty prices that in some cases exceeds the bid cap. These penalty prices are described in Section 27.4.3 of the CAISO tariff and also in the BPM for Market Operations. These penalty prices are set above the bid cap because prior to relaxing binding constraints, the CAISO clears all effective economic bids that are otherwise useful in clearing the congestion first. If there are combinations of localized constraints binding, their combined effect can cause prices to go above $1000.

FERC Order No. 831, required ISOs and RTOs to set the bid cap to $2000/MWh for cost verified internal resources, and for interties and convergence bids. The CAISO has not yet implemented this requirement as it is currently addressing certain concerns raised by market participants and DMM regarding the CAISO's prior proposal on the treatment of intertie bids, convergence bids, and the setting of penalty prices in the pricing run.

The CAISO's preliminary observation is that even if the CAISO had implemented the requirements of FERC Order No. 831, fuel prices did not increase sufficiently to justify bids above $2000/MWh.

Q: Why is power pricing confidential, and how can consumers be assured that prices are not being manipulated?

Prices are not confidential. CAISO posts market prices as frequently as every five minutes through OASIS, which is open to any interested party. Prices are calculated through the CAISO market clearing process, consistent with the CAISO's tariff requirements that is approved by FERC. The details of this mathematical formulation are available both in the CAISO tariff and further described in the Business Practice Manuals. The pricing policy reflected in the tariff and Business Practice Manuals is the product of substantive stakeholder process and approved by the CAISO Board of Governors before submitted to FERC for their approval. The CAISO markets are also subject to automated market power mitigation procedures that mitigate resource's bids to their cost-based levels if the procedures detect that resources have to ability to exercise market power due to local constraints. The current $1000/MWh bid cap also provides a ceiling to how much participants can exercise market power to influence market prices. The CAISO is also currently conducting a substantial policy stakeholder process to consider new measures to address possible system market power. Finally, the CAISO's Department of Market Monitoring monitors the market and market behavior to address adverse market behavior. FERC's Office of Enforcement also monitors and takes action as necessary to address adverse market behavior.

Q: Does the flexible ramp test apply to the CAISO BAA and how did it perform on August 14 and 15?

Yes, the flexible ramp sufficiency test applies to each EIM BAA, including the CAISO BAA. The purpose of this test is to ensure that each EIM area has sufficient capability to meet its own flexible ramp requirement. If an area fails the test, the market limits EIM transfers into that area from the rest of the EIM areas to the amount of flows permissible before the area failed. Therefore, even though EIM transfers are limited, there could still be EIM transfers based on the amounts permitted before the area failed, and the CAISO can still rely on import bids at its interties that are cleared in the HASP, Fifteen Minute Market or through its dynamic schedules.

On August 14 and 15 the CAISO balancing authority area failed the flexible ramp test in a few intervals, which resulted in the capping of the EIM transfer with other areas to the EIM transfer values that it was permitted prior to failing the test.

Q: Did the EIM market help CAISO on August 14 and 15?

On these days, the EIM transfers between CAISO and other areas were generally a net import into the CAISO, which means the CAISO received EIM import transfers during the peak hours. These transfers were between 1100MW and 1500MW on August 14 and between 600MW and 1100MW on August 15. This was additional energy the CAISO area received through the EIM market.

Q: What happened to prices over the week of August 17th?

There are a variety of factors that impacted prices. Many of those situations are still being analyzed.

First, given the tight supply conditions experienced in the system, we expect that prices will naturally be higher since the market is clearing in the steep slope of the bid stack.

Second, in the week of August 17, we observed pronounced price separation between the northern and southern parts of the system, as reflected in price separation for the PG&E and SCE DLAPs. Congestion depressed prices in the PG&E area and increased prices in the SCE area. In the SCE area, prices reached $1500 while prices in PGE were below $500. There are multiple constraints causing such price separation. For instance, the constraint Midway-Vincent or Midway-Whirlwind is on the backbone of the system and when congested will naturally split the system. Congestion at Round Table will also impact the PG&E area heavily. Regarding interties, we observed Malin and NOB were both congested in the import direction and Malin had reduced capacity due to a derate.

In terms of the peak time, we observed high prices in both the day-ahead market and real-time market. In some cases $1000 prices indicating the upward pressure on the bid stack as we ran out of supply capacity. We also experienced some ancillary services scarcity (mainly for non-spinning reserves), which triggered the scarcity mechanism. As we moved into the following week, gas prices increased fairly, going from $4.4 on Friday August 14 to $6.4 for the weekend and Monday August 17, and then jumping to over $13 MMBTu for Tuesday August 18 and then dropping to $6 by Wednesday August 19. Since the CAISO area relies on gas-fueled generation, higher gas prices will directly be reflected in higher electricity prices.

These conditions combined with limited supply, meaningful congestion on the system, and higher gas prices led to high and volatile prices.

Q: Is administrative pricing applied during the period of a system emergency?

Administrative pricing does not trigger based on an emergency declaration. One of the conditions for applying administrative pricing is when one of the CAISO's markets is suspended as a whole. During the system emergency the CAISO markets, both the day-ahead and real-time markets were not suspended and continued to produce market solutions. The resulting market prices are financially binding, but are subject to price corrections under section 35 of the ISO tariff, as applicable.

Q: Is the CAISO considering raising the bid cap to $2000/MWh?

Other than complying with FERC's Order No. 831, the CAISO is not considering generally increasing the bid cap to $2000/MWh. The CAISO takes recommendations for such policy enhancements through the policy initiatives road map process.

Q: Can you confirm SP15 LMP reached a record high of $697.91/MWh for Aug. 18 delivery?

The CAISO has not conducted this analysis. However, all prices are available on the CAISO's OASIS and interested parties can conduct this analysis based on publically available data.

Q: What, if any, price caps are there for the day-ahead, 15-minute, real-time and convergence markets; what, if any, circumstances allow sellers to bid in power at a price higher than the regular caps and what controls can CAISO employ during the remaining weeks of the convergence market suspension?

There are no price caps in any of the ISO markets. There is a bid cap that does not allow any bid above the $1000/MWh to be used in the markets.

Q: Why were day-ahead market prices allowed to exceed $1000/MWh while convergence bidding was suspended, but are not allowed to do so otherwise?

As noted above, prices can exceed $1000/MWh bid cap. This can happen even when convergence bidding is active.

Q: During the heat wave period, we noticed a few intervals where the SMEC was above $1,000/MWh. What caused this since normally when the power balance constraint is violated the SMECs are essentially capped at $1,000/MWh?

There is no cap for system marginal energy component (SMEC) prices. SMECs are related to the power balance constraint in the system. As discussed above, prices can exceed $1000/MWh. During stressed conditions, the SMEC may exceed the $1000/MWh. When the system runs out of effective economic bids to relieve the power balance constraint, the market systems relax the power balance constraint as well as transmission constraints. Although the pricing run penalty prices are based on the $1000/MWh bid cap, the scheduling run parameters specified in section 27.4.3 of the tariff exceed the bid cap to ensure the CAISO schedules all effective bids before it begins to relax the constraints. When there are multiple constraints binding, such when there is high demand on the system, any shadow price associated with market constraints may clear between the penalty price of the scheduling run and the pricing run.

Topic: General

Q: Is the California ISO a government agency?

No. The CAISO is a non-profit, public benefit corporation that is responsible for operating the grid for most of the state of the California as well as the wholesale market for energy. The governance structure consists of a five-member board of governors, appointed by the Governor of California. The CAISO is also regulated by the FERC, NERC and WECC.

Q: Could you please explain how NERC and WECC regulations play a part in the recent heat wave events, specifically the requirement to hold 3% of load and 3% of generation in the reserve sharing pool? How is this calculated? What load forecast?

CAISO operating reserves are calculated as 3% of load and 3% of generation based on our daily load forecast. The CAISO does not participate in the reserve sharing pool. The CAISO procures reserves and meets its ancillary services requirements based on its ancillary services procurement target, and ancillary services bids in the day-ahead market. The real-time market may also procure incremental ancillary services if needed.

Q: In the event the CPUC authorizes IOU's to procure additional resources on an accelerated basis, e.g., several thousand MW of energy storage in the next few years, what could the ISO do to accelerate the interconnection study process?

Would the answer to the first question differ if the IC were for energy only and dispatchable only during certain hours, e.g., 6pm to 10pm?

Would it be beneficial to accelerate the study process if the IOU's identified preferred locations for large-scale storage facilities? And/or if the IOU's guaranteed payment for Interconnection Facilities and Network Upgrade Costs at preferred IC locations?

If there were a need to accelerate studies, the CAISO would work with stakeholders and the IOUs to develop an accelerated process which would then have to be approved by the FERC. The CAISO notes, however, that there are already projects in queue whose priority must be considered.

Q: Is there a particular level of operating reserves that can be associated with Stage 1, Stage 2 and Stage 3 emergencies? I seem to recall Stage 3 being activated at 3% in the past, but has that changed? Is this a NERC or WECC requirement or a CAISO operating procedure?

The NERC & WECC Standards require the CAISO always maintain our contingency reserves except in response to a contingency. If we dispatch our contingency reserves, we have 59 minutes to restore them to the required level.

The CAISO uses our markets to procure our contingency reserves and award the reserves to resources that have been certified to respond as required.

Stage 1– We forecast running out of capacity to meet our load obligation AND maintain our contingency reserves to the required levels.

Stage 2 – Our capacity continues to decline and we may be meeting our non-spinning reserve requirement with firm load that can be dropped within 10 minutes to allow us to dispatch the market procured resources.

Stage 3 – We have run out of capacity to meet our load obligation while maintaining our contingency reserve requirements, and will be shedding firm load as needed to maintain our load resource balance.