



California ISO
Shaping a Renewed Future

FERC Order 764 Compliance 15-Minute Scheduling and Settlement

Straw Proposal

October 23, 2012

15-Minute Scheduling and Settlement Straw Proposal

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1 Introduction

On June 22, 2012, FERC approved Order 764¹ to remove barriers to the integration of variable energy resources by requiring each transmission provider to: (1) offer an option to schedule energy with 15-minute granularity; and, (2) require variable energy resources to provide meteorological and forced outage data for the purpose of power production forecasting. For ISO's the primary impact of the 15-minute scheduling is intertie transactions since internal resources are dispatched every five minutes. The California ISO (ISO) must make a compliance filing with FERC in September 2013 to describe how it proposes to address these items.

The purpose of this straw proposal is to discuss the changes to the ISOs real-time market to address item (1) above. On October 29, 2009, the ISO Board of Governors approved outage and forecasting modifications for eligible intermittent resources². The ISO is confirming that the outage and forecasting modifications fully address item (2) above. The ISO will propose changes, if necessary, in this stakeholder initiative.

In this proposal, the ISO is seeking to maximize the use of existing market functionality while not creating seams issues with neighboring balancing authorities. The ISO proposes to introduce a 15-minute financially binding settlement within the real-time market that will apply to both intertie and internal resources as well as load. Currently, the ISO real-time market includes a fifteen minute process for real-time unit commitment (RTUC) and procurement of incremental ancillary services. The hour-ahead scheduling process (HASP), in the existing market, is a special run of the real-time unit commitment run which results in financially binding hourly energy and ancillary services schedules for non-dynamic intertie transactions. Under the proposed 15-minute market, energy and ancillary services schedules for internal generation, and dynamic and non-dynamic intertie transactions will be financially binding every fifteen minutes. Load will also settle in this 15-minute market based on deviations from day-ahead energy schedules and ISO forecast. The ISO does not propose any changes to the existing five minute real-time dispatch (RTD).

FERC Order 764 only requires that transmission providers offer resources an *option* to update energy schedules every fifteen minutes. It does not require a transmission provider to require 15-minute energy scheduling for interties, neither does it address internal resource scheduling. However, it does provide a transmission provider the option to propose a superior approach.

Consequently, the ISO believes that Order 764 is an opportunity to implement real-time market changes that were not possible before the order. As described in more detail below, adding full 15-minute energy scheduling is a superior option because:

- It complies with the Order 764 to allow for 15-minute energy scheduling at the interties. At the same time, it will allow hourly schedules of intertie transactions to remain. However, those schedules would no longer have their price guaranteed for the entire hour.

¹ Additional information is available at www.ferc.gov on the Commission's order in Docket No. RM10-11-000; Order No. 764 Integration of Variable Energy Resources

² The Board documents for the outage and forecasting modifications are available at <http://www.caiso.com/Documents/Board%207%20Decision%20on%20Outage%20and%20Forecasting%20Modifications%20for%20Eligible%20Intermittent%20Resources>

- It addresses existing real-time imbalance energy offset issues due to changes in system conditions between the HASP optimization and RTD optimizations. The energy settlement of internal and external resources will occur in the same market optimization.
- It addresses convergence bidding issues at the interties, which result from virtual bids for interties settling at the HASP locational marginal price (LMP) and internal nodes settling at the RTD LMP. The proposal would allow for the reinstatement of convergence bidding at the interties.
- It lets variable energy resources to provide more frequent energy schedules using forecast updates closer to the financially binding interval.

The ISO believes external parties will take advantage of 15-minute energy scheduling. However, over the next few years, transmission reservations within WECC will remain predominantly hourly. There is also no indication that NERC or FERC will modify the e-tag deadlines within the compliance timeline of the order. Therefore the ISO believes it is prudent to leverage the market functionality gained from the Dynamic Transfers initiative which is being implemented to award financially binding hourly transmission reservations for dynamic intertie transactions. Under the new real-time market design, the ISO would no longer award hourly, financially binding energy schedules in the real-time market for intertie transactions. Instead, the ISO would clear and settle intertie energy schedules on a fifteen minute basis through the RTUC process. In order to align with the twenty minute e-tag submission deadline prior to energy flow, the ISO would align the market timeline for the 15-minute market such that the market results are consistent with WECC tagging practices. If WECC moves to 15-minute transmission reservations and shorter e-tag timelines in the future, the ISO can modify its timeline to run the 15-minute market closer to actual flow.

Order No. 764 does not require that the ISO settle its interties on a fifteen minute basis. But, the Commission recognizes that transmission providers may wish to adopt additional market redesigns that provide better flexibility than the minimal requirements in the order.³ In the past two years, the ISO has identified a number of inefficiencies with its current hour-ahead scheduling processes and real-time market settlement. Introducing the financial settlement of the 15-minute market addresses these market inefficiencies. In its recent stakeholder efforts, the ISO and participants determined a root cause of the market inefficiencies under the current market design. They observed that intertie transactions are financially binding based on the HASP LMPs: however, load and internal generation are financially binding based on the RTD LMPs. The HASP and RTD optimizations run at different time delays and with different market interval durations. So, system conditions are not aligned when running these applications. This results in price divergence and market uplifts.

By aligning to a single, 15-minute financially binding real-time optimization, most of the current real-time market pricing issues can be addressed. This will enable the reintroduction of convergence bidding on the interties. Prior to suspension, convergence bids for interties were priced in real-time at the HASP LMP and internal nodes were priced at RTD LMPs. Convergence bids settled in different market optimizations negatively impacted the market efficiency of virtual bids. This limited the fundamental purpose of convergence bids, to improve price convergence between the day-ahead and real-time market by changing day-ahead unit

³ See Order No. 764 PP 99, 107.

commitment. The alignment of the real-time settlement addresses these issues. The other issue that must be addressed in order for convergence bidding to be reinstated on the interties is prices inconsistent with bids as a result of the enforcing both the physical and physical + virtual constraints in the day-ahead market.

The 15-minute market will be designed in a manner consistent with the flexible ramping product market design discussed with stakeholders in 2012. The 15-minute market requires only two minor changes to the flexible ramping product design: (1) add a financially binding settlement for flexible ramping product awards in the 15-minute market and (2) change the initial cost allocation basis to the three categories (load, supply, and fixed ramp) from 10-minute movement to 5-minute movement.

2 Plan for Stakeholder Engagement

Item	Date
Post Straw Proposal	October 23, 2012
Stakeholder Meeting	October 30, 2012
Stakeholder Comments Due	November 16, 2012
Post Revised Straw Proposal	December 10, 2012
Stakeholder Meeting	December 17, 2012
Stakeholder Comments Due	January 8, 2013
Post 2 nd Revised Straw Proposal	February 5, 2013
Stakeholder Meeting	February 12, 2013
Stakeholder Comments Due	February 26, 2013
Post Draft Final Proposal	March 26, 2013
Stakeholder Meeting	April 2, 2013
Stakeholder Comments Due	April 9, 2013
Board Meeting	May 2013
Tariff Filing	September 2013

3 Renewable Integration: Market Vision and Roadmap

During the Renewable Integration: Market and Product Review Phase II initiative, the ISO discussed with stakeholders a potential redesign of the real-time market to a 15-minute dispatch and a new balancing product to manage changes between the dispatch and regulation. During the stakeholder process it was concluded that in the next two to three years 15-minute schedules within WECC would not be realized. Also, the implementation complexity of the 15-minute dispatch design would not be achievable in two to three years due to significant software changes. As a result, the ISO developed seven guiding principles to assess the comparative value and merits of the market enhancements proposed near, mid, and long term market enhancements. The ISO briefed the Board of Governors in December 2011 on these guiding principles. FERC Order 764 significantly shortened the assumed timing for the implementation of 15 minute scheduling in WECC. In considering options to allow 15 minute scheduling, the ISO sought to be consistent with the guiding principles in this proposal.

The seven guiding principles are:

Technology Agnostic

Principle	The ISO market accommodates new resource types based on their performance capabilities, without preference for specific technologies.
Expected Outcomes	<ul style="list-style-type: none"> ✓ Enables any technically capable resource, regardless of technology, to provide services on a level playing field based on performance ✓ Resource technologies are viable based on innovation and competition rather than on resource-specific market rules ✓ Integrates devices that can both produce and consume energy

Transparent

Principle	The ISO market relies on price signals to incent participant behaviors that align with ISO operating needs.
Expected Outcomes	<ul style="list-style-type: none"> ✓ Products are competitively procured through transparent market mechanisms ✓ Procurement targets are transparent and tied to operational needs ✓ Operating constraints are reflected in price signals, minimizing non-market solutions ✓ Prices incent performance from supply and demand that supports operational needs and encourages mitigation of generation variability and congestion ✓ Pricing rules allow transparent allocation of renewable integration costs

Deep and Liquid

Principle	The ISO market attracts robust resource participation.
Expected Outcomes	<ul style="list-style-type: none"> ✓ More economic bids and less self-scheduling ✓ More price responsive demand ✓ Increased participation from resources in other balancing authorities through improved interchange scheduling ✓ Minimal seams issues with neighboring balancing authorities

Durable and Sustainable

Principle	The ISO market ensures an efficient mix of resources to maintain reliability and attracts new investment when and where needed.
Expected Outcomes	<ul style="list-style-type: none"> ✓ Resources are commercially viable through a combination of ISO market revenues and forward contracts ✓ Resource fleet and mix enables the ISO to meet NERC and WECC reliability standards ✓ Resources are incented to enhance availability and performance ✓ Market products and rules are stable ✓ Known real-time market issues are addressed

Flexible and Scalable

Principle	The ISO market easily adapts to new and changing energy policy goals and resource mix.
Expected Outcomes	<ul style="list-style-type: none"> ✓ Establish flexible market design that can accommodate reasonable changes in policies and technologies ✓ Recognize key linkages and coordinate with initiatives and proceedings of state agencies ✓ Compatible with high penetration levels of distributed energy resources

Cost-effective and Implementable

Principle	The ISO market design leverages existing ISO infrastructure, industry experiences and lessons learned.
Expected Outcomes	<ul style="list-style-type: none"> ✓ A market design that is cost-effective to implement for market participants and the ISO ✓ Build on existing functionality and market systems to extent possible ✓ Design leverages the experience of other ISOs/RTOs as to what works and what does not; do not re-invent

Cost Causation

Principle	The ISO market allocates costs based on cost causation
Expected Outcomes	<ul style="list-style-type: none"> ✓ Market participants better manage their load and resource variability ✓ More accurate forecasting and scheduling by market participants reduces operational uncertainty and associated costs

4 Real-Time Market Timeline

The current real-time market is composed of three processes. The HASP establishes hourly financially binding energy and ancillary services for intertie transactions. The RTUC establishes financially binding ancillary services awards and unit commitment for internal generation. The RTD then establishes financially binding energy dispatches for internal generation. In real-time, load is settled based upon the ISO load forecast used for the RTD optimization.

This proposal seeks to align the financially binding settlement of energy schedules and ancillary services awards for intertie transactions, internal generation and load, while maximizing the use of existing market functionality. The proposed real-time market timeline limits seams issues with neighboring balancing authorities by acknowledging the existing e-tagging and intra-interval ramping practices in the west. The ISO proposes to maintain existing market timelines wherever possible to minimize impact on the business processes of market participants and neighboring balancing authorities.

4.1 Hourly Process Overview

The ISO proposes to retain hourly submission of bids to the real-time market. These bids will be used to:

- Make hourly transmission awards;
- Economically schedule resources for energy in the 15-minute market; and,
- Economically dispatch resources in the 5-minute real-time market runs.

The ISO believes that, over time, the hourly timeline could be pulled in. But, this would require additional automation of intertie scheduling checkout business processes. However, it is important to note that the transmission reservation awards must be made at or before the market optimization starts for the first binding 15-minute market in a trade hour. In Figure 1 below, transmission reservations are awarded forty-five minutes before the hour. As is explained below, this is 7.5 minutes prior to the start of the optimization for the first 15-minute market in the trade hour.

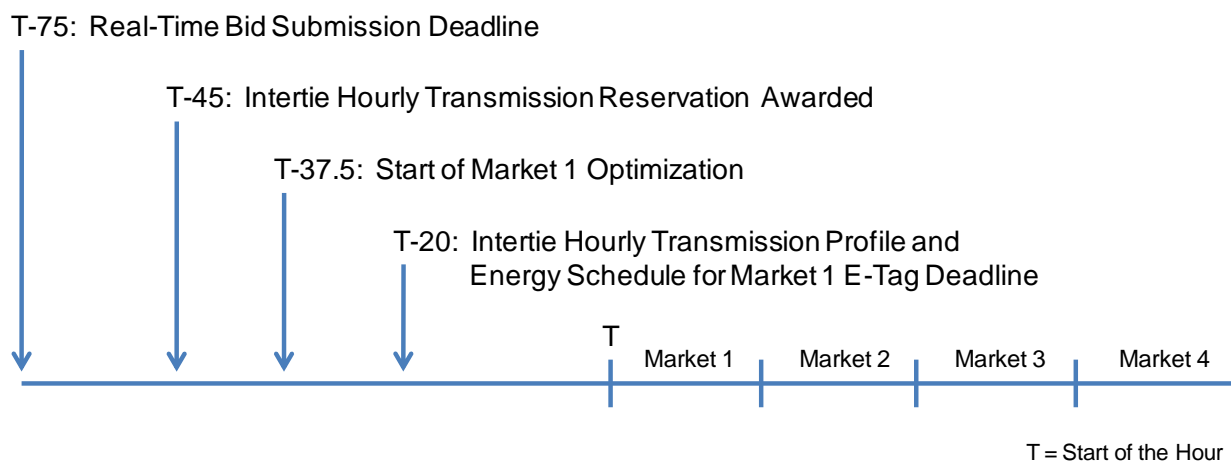


Figure 1 - Timeline of Hourly Real-Time Processes

4.2 Real-Time Bid Submission

The ISO's proposed design requires market participants to submit real-time bids seventy-five minutes prior to the start of the operating hour. This is the same deadline under the current real-time market design. These bids will be used in both the 15-minute market and RTD. Load will clear based on ISO forecasted demand. Therefore, load serving entities will not be allowed to bid their load in the real-time market.

There will be no changes to the hourly bid information provided by internal generation. Variable energy resources that plan to self-schedule in the 15-minute market can provide additional bid information⁴.

FERC Order 764 does not require changes from hourly transmission reservations to 15-minute transmission reservations – it only addresses *energy* schedules, as opposed to *transmission* scheduling. In addition, the ISO proposes not to require that intertie resources provide 15-minute energy schedule updates. Consequently, the ISO will leverage functionality being implemented through the Dynamic Transfers⁵ stakeholder initiative to award financially binding transmission reservations on an hourly basis.

The bids submitted by intertie resources will change somewhat under the ISO's proposal. Since the ISO will be running separate processes for determining financially binding transmission reservations and financially binding energy schedules / ancillary services awards, there will be separate bids from intertie resources for energy, ancillary services, and transmission capacity:

- a) Energy self-schedule and/or energy bid, same as currently;
- b) Ancillary services bids, same as currently; and
- c) An optional transmission capacity reservation bid (\$0/MW by default) for intertie transmission capacity in excess of energy schedules and ancillary services awards up to a submitted capacity limit.

4.3 Hourly Transmission Capacity

Under the changes proposed by the ISO, the currently financially binding HASP energy schedules for Non-Resource-Specific System Resources (non-dynamic intertie resources) will be advisory. Financially binding energy schedules and ancillary services awards will be determined based on the energy self-schedule and/or energy bids and the ancillary services bids simultaneously within each 15-minute interval by the existing RTUC application. As illustrated in figure 1 above, for each trading hourly there will be four 15-minute markets.

The transmission capacity bid will be used in HASP to reserve financially binding intertie transmission capacity up to the submitted capacity limit. The transmission capacity award will be constrained to be hourly in HASP, i.e., the four 15-minute intervals comprising the trading hour that begins at time T, as shown in Figure 1, will be constrained to the same transmission capacity award across that hour. This HASP transmission capacity award will be the hourly transmission profile that needs to be tagged by the relevant Scheduling Coordinator for the relevant resource for that hour.

⁴ As part of the flexible ramping product design, variable energy resources can submit additional information so that they can be awarded flexible ramping down and can be decremented from their 15-minute self-schedules.

⁵ Additional information on the Dynamic Transfers stakeholder initiative is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/DynamicTransfers.aspx>

The HASP transmission capacity award provides hourly financial rights for transmission capacity for the delivery of financially binding energy schedules and ancillary services award for each of the four 15-minute intervals. For non-dynamic intertie resources, the 15-minute energy schedules will not be changed by the subsequent RTD runs, but will be impacted by the 15-minute scheduling check-out. Any unused transmission capacity will be released every fifteen minutes. For Resource-Specific System Resources (dynamic intertie resources), the HASP transmission capacity award can also be used and will also provide financial transmission rights for financially binding 5-minute energy schedule deviations for each 5-minute interval in that trading hour in subsequent RTD runs and any unused transmission capacity will be released every five minutes.

The HASP transmission capacity award will be priced at the shadow cost of the relevant intertie transmission congestion in HASP. Financially binding energy schedules and ancillary services awards using awarded transmission capacity will be exempt from intertie transmission congestion charges in the 15-minute market runs within the hour, and for dynamic intertie resources in RTD, as well. The hourly transmission reservation process can result in market uplifts due to differences in congestion between the transmission reservations process and real-time energy schedule/dispatch. However, the magnitude of the uplifts will be significantly lower than under the current market structure due to the elimination of different real time energy settlement periods. The ISO is seeking stakeholder comment on how to allocate the resulting uplift.

4.4 Intertie Scheduling Options

This proposed design is flexible enough to support:

- 1) Hourly transmission capacity reservation; and
 - a) Hourly energy schedules; or
 - b) 15-minute energy schedules; or
 - c) 5-minute energy schedules.

4.4.1 Hourly Energy Schedules

Hourly energy schedules can be achieved by submitting an energy self-schedule for the entire hour equal to the capacity award limit, in which case the HASP transmission capacity award will be equal to the energy schedule without any additional transmission capacity reservation. The energy schedule will be settled at the 15-minute LMP calculated by RTUC for the relevant scheduling point for each 15-minute interval. Any relevant intertie congestion charges incurred for the 15-minute interval will be refunded since these charges are covered by the HASP transmission capacity award. Then in the 15-minute energy market, the energy schedule will be self-scheduled at the transmission capacity award level unless there is a physical curtailment. If a physical curtailment occurs, then the energy self-schedule will be reduced in subsequent RTUC runs. Intertie resources under this scenario are price takers in the 15-minute market. There is no bid cost recovery for self-schedules under current rules and the ISO is not proposing to add a make whole payment. Assuming that this scheduling practice is selected by an intertie resource with a bilateral contract, price certainty can be achieved, if needed, through bilateral contract terms such as contracts for differences or through inter-SC trades.

4.4.2 Participation in 15-Minute Market and RTD

Intertie resources may submit an energy self-schedule and an optional transmission capacity reservation bid for additional transmission capacity between the energy self-schedule and the capacity limit submitted as part of a transmission capacity bid. Under this scenario, intertie

resources will be awarded additional transmission capacity when the congestion cost at the relevant intertie scheduling point is at or below the transmission capacity reservation bid. Then, in the subsequent 15-minute energy markets intertie resources may choose to revise their energy self-schedule by submitting 15-minute updates to their capacity limit on a rolling fifteen minute basis. It is important to note that self-schedules can only be changed based upon physical changes of the resource. The revised capacity limit may even exceed the HASP transmission capacity award, but the additional energy self-schedule will have a lower scheduling priority. The additional energy schedule will be subject to any relevant congestion charges

If an intertie resource provides an energy bid and an optional transmission capacity reservation bid, the resource will be economically scheduled in each of the 15-minute markets of the relevant hour using the hourly transmission capacity awarded in HASP. This does provide the option for conventional resources to hedge real-time congestion for 15-minute energy schedules above the advisory energy schedule from HASP. The ISO will use ramp profiles for non-dynamic intertie resources so that the 15-minute energy schedules will observe the 20-minute cross-hour ramp and the 10-minute intra-hour ramp. Since under this scenario intertie resources are scheduled economically, they will be eligible for bid cost recovery in the event the schedule is inconsistent with its bid price. If a resource suffers a derate or an outage, it will be treated similarly to internal generating resources reflecting the reduced capacity in the 15-minute schedule. Intertie resources under this scenario may choose to submit 15-minute updates to their capacity limit on a rolling 15-minute basis to limit or extend their 15-minute energy schedules with an energy bid. The revised capacity limit may even exceed the HASP transmission capacity award, but the additional energy schedule will be subject to relevant congestion charges. The 15-minute energy schedules will be fixed for non-dynamic intertie resources in RTD, whereas dynamic intertie resources with energy bids will be dispatched economically by RTD in the subsequent 5-minute markets. Dynamic intertie resources may choose to submit 5-minute updates to their capacity limit on a rolling 5-minute basis to limit or extend their 5-minute energy schedules with an energy bid. The revised capacity limit may even exceed the HASP transmission capacity award, but again the additional energy schedule deviations from the 15-minute energy schedule will be subject to relevant congestion charges. This scenario is again relevant for a VER whose output is expected to change within the hour.

4.5 15-Minute Market Process

The ISO proposes that 15-minute energy schedules will be financially binding for imports, exports, internal resources, and load. The ISO will leverage the existing real-time unit commitment process which currently co-optimizes energy and ancillary services, but only results in financially binding unit commitment and ancillary services awards. The current co-optimization calculates non-binding 15-minute energy schedules and LMPs. The 15-minute market will clear against the ISO's forecast of real-time demand.

In order to minimize seams issues with intertie transactions, the ISO will align the 15-minute market timeline so that the e-tag deadline at twenty minutes in advance of flow can be met for the energy schedules dispatched by the 15-minute market runs. Aligning the 15-minute market timeline to allow for tagging energy schedules for the 15-minute markets requires that the ISO begin the market optimization 37.5 minutes prior to the binding interval so that awards can be made at 22.5 minutes prior to the binding interval. This allows 2.5 minutes for intertie transactions to submit updated e-tags reflecting the binding energy schedule twenty minutes prior to flow. Figure 2 below shows the timeline for the second financially binding 15-minute schedules in a trade hour.

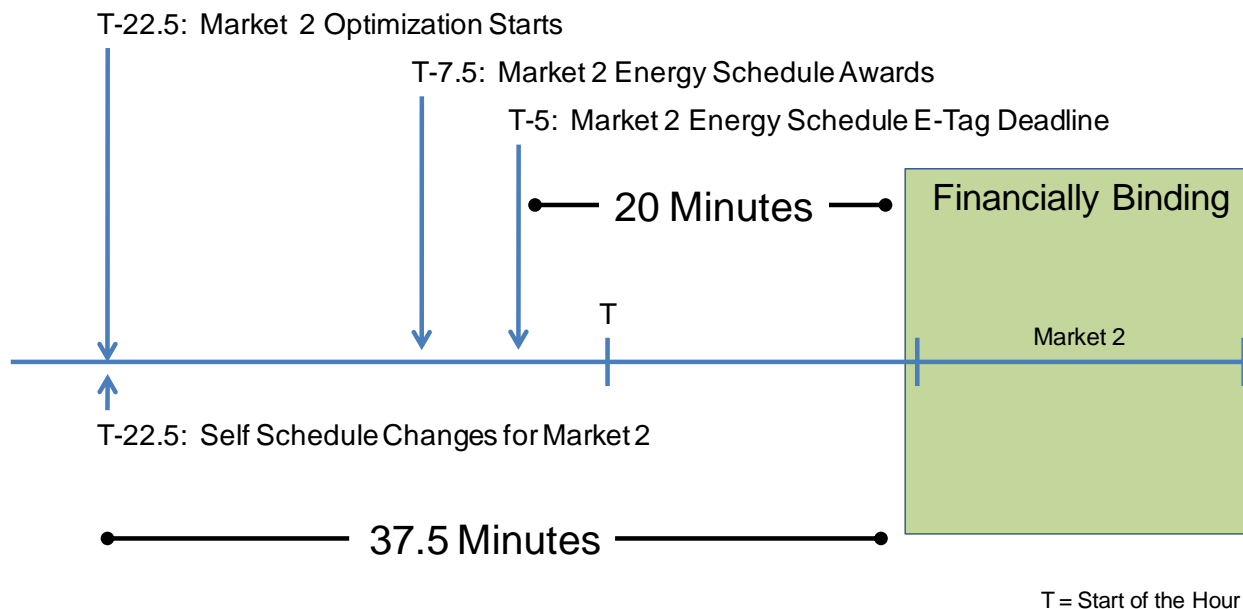


Figure 2 - Timeline of 15 Minute Real-Time Processes

Beginning the 15-minute market 37.5 minutes prior to the binding interval is a change from the current real-time unit commitment process, which currently begins 15 minutes later, at 22.5 minutes prior to the binding interval. The ISO has analyzed market data to estimate the impact of extending this timeline. This analysis has compared both the differences between RTUC 15-minute market results for the current binding RTUC interval compared to the binding RTD intervals within each 15-minute period, as well as the RTUC 15-minute market results for the first advisory interval to the corresponding binding RTD intervals. The comparison of the first advisory RTUC interval to the binding RTD intervals is analogous to the ISO proposal for the new 15-minute market. The ISO will publish the analysis on the ISO website and will discuss the results at the upcoming stakeholder meeting.

The ISO does not believe that there will be changes to the WECC interval ramping protocols. Currently hourly changes have a 20-minute ramp and 15-minute changes will have 10-minute ramps. The ISO will use the appropriate ramp profile to ensure awarded 15-minute schedules are feasible. As business processes evolve within WECC and the checkout of energy schedules becomes more automated, the ISO anticipates the 15-minute market could be pulled in closer to the binding interval.

4.6 5-Minute Real Time Dispatch

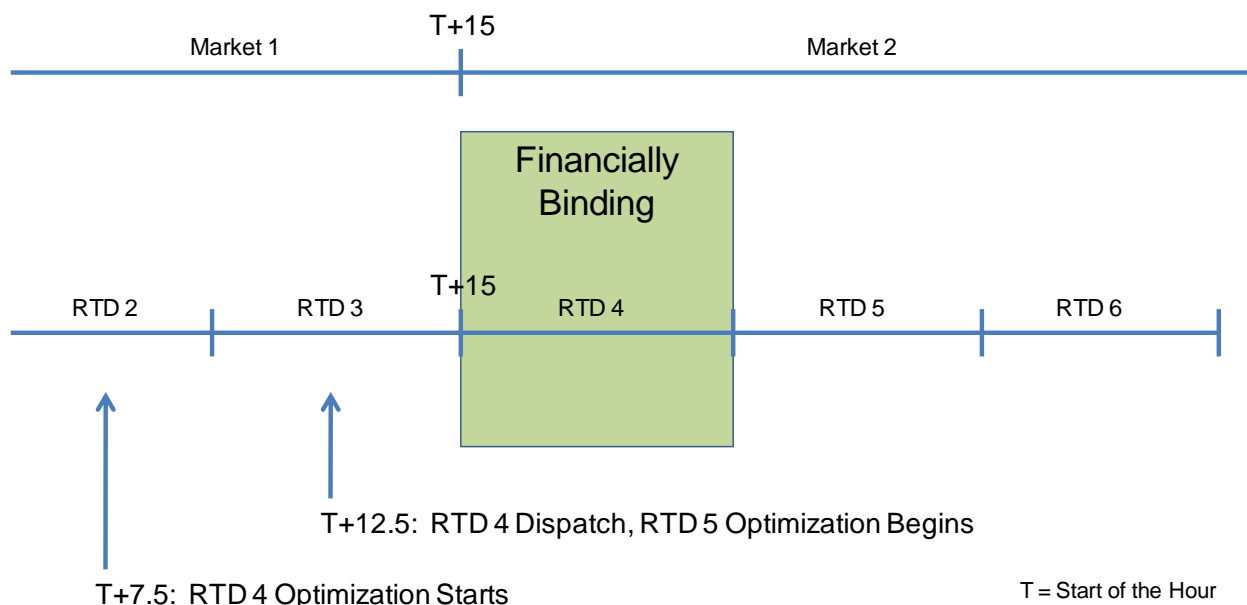


Figure 3 - Timeline of 5 Minute Real-Time Dispatch

The ISO is proposing no changes to the 5-minute real-time dispatch timeline or business processes. The market optimization determines the financially binding dispatch and communicates to resources 2.5 minutes prior to the binding RTD interval. Figure 3 above shows the market timeline for the first RTD run in the binding 15-minute market 2 shown above. The 5-minute RTD will continue to clear against the ISO's real-time demand forecast

5 Settlement with 15-Minute Market

5.1 Energy Deviations for Generation and Intertie Transactions

With the introduction of financially binding energy schedules for the 15-minute market, energy in the various markets will be settled as follows:

- Day-ahead energy schedules will be settled at the day-ahead LMP.
- The difference between the 15-minute market energy schedule and the day-ahead energy schedule will be settled at the 15-minute market LMP.
- The difference between RTD energy dispatch and the 15-minute market energy schedule will be settled at the RTD LMP.
- Instructed energy will be calculated every five minutes in RTD. Uninstructed imbalance energy will be calculated every five minutes and settled at the RTD LMP.
- The real-time bid cost recovery will include revenue and cost from both the 15-minute market and RTD using the same hourly bid curve.
- Current make whole payments due to price corrections for export resources will be provided for both 15-minute and/or 5-minute LMP corrections.

All intertie transactions will be settled in a consistent manner to internal resources. For intertie transactions, if a 15-minute self-schedule or awarded energy schedule is not e-tagged at twenty minutes prior to flow, the deviation or operational adjustment will be settled at the RTD price in the same manner as internal generation deviations to 15-minute energy schedules.

The ISO seeks stakeholder input on the potential elimination of the HASP Schedules Decline Charge for intertie transactions or if changes are needed to align with the 15-minute market. Since the hourly transmission reservation is financially binding, a non-dynamic intertie transaction that does not tag an energy schedule in the 15-minute market will still be financially responsible for paying for the transmission reservation (the ITC shadow price). In addition, if a non-dynamic intertie transaction does not fully utilize its hourly transmission reservation in the 15-minute market or RTD, the transmission capacity is made available for other intertie transactions. This transmission capacity would be only available to other resources in the financially binding interval and would not be guaranteed to the other resources for the future advisory intervals. These two elements of the proposed design may sufficiently address the reliability concerns from incremental transmission reservations being made in HASP, but unused in the 15-minute market or RTD.

The ISO proposes to meter generation every five minutes. Currently the ISO receives 5-minute meter data from internal generation, but then sums two five minute intervals to align with the ten minute settlement interval for purposes of calculating uninstructed imbalance energy. The ISO proposes to change settlement granularity from ten minutes to five minutes, but is seeking stakeholder comments on the implementation timing and complexity of making this change to market participant settlement systems.

5.2 Settlement of Load

As previously described, both the 15-minute market and RTD will clear against the ISO forecasted demand. Load will not be allowed to bid in to the 15-minute market or RTD. Differences in load from day-ahead schedules will be settled at the weighted average LMP of the 15-minute market and RTD. The LMPs will be weighted by the MW cleared in the two respective markets. Figure 4 illustrates the settlement of Load.

	LSE 1	LSE 2	LSE 3	Total	LMP	MW Cleared
Day Ahead Schedule	20,000	10,000	5,000	35,000	\$ 50.00	35,000
15 Minute Forecasted Demand	N/A	N/A	N/A	37,000	\$ 60.00	2,000
RTD Forecasted Demand	N/A	N/A	N/A	38,000	\$ 65.00	1,000
Hourly Metered Demand	19,250	13,250	5,500	38,000		
Deviation	(750)	3,250	500	3,000		
Real Time Weighted Average LMP					\$	61.67
Real Time Settlement	\$ (46,250)	\$ 200,417	\$ 30,833	\$ 185,000		

Figure 4 - Settlement of Load Deviations Using Real-Time Weighted Average Price

5.3 Grid Management Charge

The ISOs Grid Management Charge (GMC)⁶ consists three main cost categories or buckets (Market Services, System Operations, and CRR Services), and four transaction fees (bid segment fee, inter SC trade fee, CRR bid fee, and SCID fee).

⁶ Additional information on the Grid Management Charge is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/Budget-GridManagementCharge.aspx>

Since the 15-minute market is now financially binding for both energy and ancillary services, the ISO proposes to include energy and ancillary services awards in two GMC charge codes: Market Services and the Bid Segment Fee.

The Market Services charge code is designed to recover costs the ISO incurs for running the markets. As such, this charge code will be applied to each scheduling coordinator's gross absolute value of awarded MWh of energy and MW per hour of ancillary services each market.

The Bid Segment fee is set at \$0.005 per bid segment and is applied to all bid segments submitted.

6 Variable Energy Resources

6.1 Participating Intermittent Resource Program (PIRP)

The ISO believes that with the improved opportunities for variable energy resources to self-schedule their production closer to real time, the existing PIRP will no longer be needed. Under PIRP, variable energy resources are able to net uninstructed imbalance energy over a month since the RTD deviations are measured from the resource's hourly self-schedule. A resource is eligible for monthly netting if the resource submits the ISO's forecast from T-90 minutes as its hourly self-schedule. The hourly self-schedule is considered instructed energy and priced at the relevant 5-minute RTD price. By allowing variable energy resources to submit updated self-schedules every fifteen minutes at T-37.5, the forecast of instructed energy will be improved and the uninstructed imbalance energy will be significantly reduced. As a result, the monthly netting will no longer be needed to address the time delay of the forecast used to establish the resources instructed energy.

6.2 Update of 15-Minute Self-Schedule

In order to use the latest possible forecast under these proposed market changes, variable energy resources will provide at a minimum a two-hour rolling forecast with fifteen minute granularity. The forecast will be received by the ISO for the binding interval at 37.5 minutes prior to flow (the start of the market optimization for the binding interval). If no forecast is provided, the ISO will use the previous binding intervals telemeter energy.

As part of the Dynamic Transfer stakeholder initiative, variable energy resource that are importing can provide a two-hour rolling forecast with five minute granularity. The ISO proposes to also allow all intertie resources and also internal variable energy resources to optionally provide the same forecast granularity and will use the average of the three 5-minute forecasts to determine the self-schedule for the binding 15-minute market interval. The ISO will use the forecast data received 37.5 minutes prior to the binding 15-minute market.

6.3 Decremental Bid from Self-Schedule

In the Flexible Ramping Product⁷ stakeholder initiative, the ISO has proposed to allow decremental bids from variable energy resources that submit real-time self-schedules. The ISO believes that variable energy resource can be suppliers of the flexible ramping product in the downward direction (FRD). The revenues from providing the flexible ramping product can be used to offset costs incurred by variable energy resources. A key requirement for providing the

⁷ Additional information on the Flexible Ramping Product stakeholder initiative is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleRampingProduct.aspx>

flexible ramping down product is that the resource must submit an energy bid in the real-time market.

With the implementation of FERC Order 764, there are minor modifications to the decremental bidding proposal discussed in the flexible ramping product. On an hourly basis, variable energy resources that wish to participate in the flexible ramping down product will provide the energy bid that will be used to reduce the 5-minute energy schedule from the 15-minute self-schedule, the resources ramp rate, and FRD bid price. In the 15-minute market, the ISO will utilize the resource's submitted 15-minute self-schedule to assess the amount of FRD that can be awarded in the 15-minute market and RTD. A variable energy resource can be awarded flexible ramping down based upon the amount it can ramp down in five minutes, which is the same rule for any other resource providing FRD. The variable energy resource with a decremental bid can be dispatched economically in RTD below its 15-minute self-schedule up to the maximum MW to be curtailed below its 15-minute self-schedule. The settlement of energy dispatches and flexible ramping down awards in the 15-minute market and RTD is the same as for any other resource.

7 Flexible Ramping Product

7.1 IFM, 15-Minute Market, and RTD

The current proposed flexible ramping design enforces the flexible ramping product requirements in integrated forward market (IFM), RTUC, and RTD. The day-ahead and RTD flexible ramping product awards are financially binding. The RTUC ensures units committed in real-time have sufficient headroom to meet flexible ramping product requirements, but the ramping capability is not financially binding because the energy schedules are not financially binding. This previous design decision was made to address concerns that false opportunity costs could arise since the energy settlement is not financially binding. Since the ISO is proposing in this initiative, to make the 15-minute energy schedules financially binding, we propose to settle the flexible ramping products in the 15-minute market.

The settlement of flexible ramping products is as follows:

- Day-ahead procured flexible ramping products will be settled at the day-ahead flexible ramping prices.
- The difference between the 15-minute market flexible ramping award and the day-ahead flexible ramping award will be settled at 15-minute flexible ramping price.
- The difference between the RTD flexible ramping award and the 15-minute flexible ramping award will be settled at RTD flexible ramping price.
- Flexible ramping products will be included in bid cost recovery. The flexible ramping product bid cost will be added to total bid cost, and the flexible ramping product payment will be added to total revenue.
- When day-ahead and real-time bid cost recovery are separated, IFM procured flexible ramping products will be included day-ahead bid cost recovery, 15-minute market procured flexible ramping products will be included in real-time bid cost recovery, and RTD procured flexible ramping products will be included in real-time bid cost recovery.
- Flexible ramping No Pay will be further refined to recognize the difference between RTPD and RTD flexible awards

The ISO will protect a resource's flexible ramping awards from a forward market by using a \$0.00 bid price for previous FRP awards in the subsequent markets. Day-ahead awards will have an assumed 15-minute market bid price of \$0.00. 15-minute awards will have an assumed RTD bid price of \$0.00. A resource can change its flexible ramping product bid price between

day-ahead and the real-time markets, but the same rule will apply as for energy in the real-time markets. On an hourly basis a resource will provide a single flexible ramping product bid price and single energy bid curve that will be used in both the 15-minute market and RTD.

No other changes are necessary to align the flexible ramping product design with the implementation of the 15-minute market and settlement.

7.2 Cost Allocation

The ISO proposes to initially allocate the costs for the flexible ramping product to three categories based upon movement that requires changes in real-time dispatch of resources. The market changes discussed in this proposal requires the interval in which movement is measured to change from ten minutes to five minutes because of the metering of internal generation moving to five minutes. Movement for load is defined as changes in observed load every five minutes. Movement for supply is defined as changes in uninstructed imbalance energy and change in internal self-schedules every five minutes. Movement for static intertie ramps is calculated based upon the change in MWhs deemed delivered every five minutes.

There are no changes needed for the cost allocation used within the three categories.

8 Convergence Bidding

When the ISO implemented convergence bidding on February 1, 2011, market participants had the ability to submit virtual bids on the intertie scheduling points in the ISO market. On November 28, 2011 the ISO suspended convergence bidding on the interties.

8.1 Settlement in Real-Time

Under these proposed market changes, the ISO proposes to allow convergence bidding on internal nodes and intertie scheduling points. With the implementation of 15-minute market settlement, the ISO will liquidate and price convergence bidding positions in the same market optimization as physical bids for both internal resources and interties. Virtual supply awards will receive the day-ahead LMP and pay the 15-minute market LMP. Virtual demand awards will pay the day-ahead LMP and receive the 15-minute market LMP.

The ISO proposes not to allow convergence bidding between the 15-minute market and RTD. Unlike the day-ahead market, load will not be able to economically bid in the 15-minute market, thus it would be inappropriate to allow virtual demand to bid in the 15-minute market. In addition, the ability for physical resources to update their 15-minute schedule every fifteen minutes reduces the duration a resource is exposed to 5-minute deviations for an outage.

8.2 Day-Ahead Dual Constraint Issue

During the time convergence bidding was allowed on the interties, the ISO saw cases where physical export bids are clearing the market at LMPs that are inconsistent (higher) than the submitted bid for the scheduled resource. Market participants raised concerns regarding the negative impact this pricing inconsistency may have on their settlement outcome.

Under the current design for convergence bidding on the interties, the ISO enforces two constraints at scheduling points: (1) net physical schedules across each scheduling point, ignoring the accepted virtual schedules to ensure that the physical schedules are within the established scheduling limit for that scheduling point and (2) physical and virtual imports net of physical and virtual exports must also be within established scheduling limits for that scheduling point.

The ISO proposed two potential solutions to the dual constraints issue in earlier stakeholder initiatives. In order to re-instate convergence bidding on the interties, the ISO will seek stakeholder input on selecting the appropriate solution.

8.2.1 “Option A”

“Option A” was discussed in detail in the Price Inconsistency Caused by Intertie Constraints⁸ stakeholder initiative. To address the pricing inconsistency, the ISO proposed incorporating the shadow price of the two constraints in to the settlement Locational Marginal Price (LMP) for physical bids and virtual bids on the interties. This will result in different settlement LMPs for virtual and physical imports/exports when the physical intertie scheduling limit is binding and will eliminate the discrepancy between market clearing and bid prices.

8.2.2 Day-Ahead E-Tag Approval Limit

In the Intertie Pricing and Settlement⁹ stakeholder holder initiative the ISO proposed an alternative solution. The ISO proposed to eliminate the “physical only” constraint in the day-ahead market. However, in order to comply with WECC interchange scheduling requirements, based on an intertie’s ITC, the ISO would impose a limit on the number of e-tags it will accept for IFM physical market awards.

9 Next Steps

The ISO plans to discuss this straw proposal with stakeholders during a meeting to be held on October 30. The ISO requests comments from stakeholders on the proposed market design described in this straw proposal. Stakeholders should submit written comments by November 16 to Order764@caiso.com.

⁸ Additional information on the Price Inconsistency Caused by Intertie Constraints stakeholder initiative is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/PriceInconsistencyCausedIntertieConstraints.aspx>

⁹ Additional information on the Intertie Pricing and Settlement stakeholder initiative is available at http://www.caiso.com/informed/Pages/StakeholderProcesses/IntertiePricing_Settlement.aspx