



California ISO
Shaping a Renewed Future

**FERC Order 764 Compliance
15-Minute Scheduling and Settlement
Addendum to Draft Final Proposal**

April 24, 2013

15-Minute Scheduling and Settlement Addendum to Draft Final Proposal

Table of Contents

- 1 Introduction 3
- 2 Plan for Stakeholder Engagement..... 5
- 3 Changes to Draft Final Proposal 5
- 4 Renewable Integration: Market Vision and Roadmap..... 5
- 5 Real-Time Market Timeline 7
 - 5.1 Real-Time Bid Submission..... 8
 - 5.2 Hourly Process to Accept Block Schedules 10
 - 5.3 15-Minute Market Process 15
 - 5.4 5-Minute Real Time Dispatch 17
- 6 Settlement with 15-Minute Market..... 18
 - 6.1 Energy Deviations for Generation and Intertie Transactions..... 18
 - 6.2 Hourly Block Process Decline Charge 19
 - 6.3 Settlement of Load..... 21
 - 6.4 Inter-SC Trades..... 22
 - 6.5 Grid Management Charge..... 22
- 7 Variable Energy Resources..... 22
 - 7.1 Participating Intermittent Resource Program (PIRP) 22
 - 7.2 Update of 15-Minute Self-Schedule..... 24
 - 7.3 Instructed energy in RTD..... 25
 - 7.4 Economic Bid with Forecast Used to Cap Bid Curve..... 25
- 8 Convergence Bidding..... 26
 - 8.1 Settlement in Real-Time..... 26
 - 8.2 Day-Ahead Dual Constraint Issue 26
 - 8.3 Position Limits 28
- 9 Next Steps..... 29

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 the California ISO (ISO), the primary changes required by the 15-minute scheduling option required under the FERC order are to intertie transactions since internal resources are dispatched every five minutes. The ISO is required to make a compliance filing with FERC by November 12, 2013 to describe how it proposes to address these items.

In this draft final proposal, the ISO is seeking to maximize the use of existing market functionality to meet the FERC compliance obligation and address real-time market inefficiencies while minimizing potential 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 is not proposing 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, the ISO's proposal for adding full 15-minute energy scheduling and settlement 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 the proposal includes provisions to allow for hourly schedules of intertie transactions to remain. However, the ISO would no longer guarantee the price of those schedules for the entire hour.
- It addresses existing real-time imbalance energy offset issues that occur because of changes between the HASP and RTD optimizations. Under the ISO's proposed design, the same market optimization will produce settlement prices for both internal and external resources.

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

California ISO

- It addresses previous convergence bidding issues at the interties, which resulted from virtual bids for interties settling at the HASP locational marginal price (LMP) and internal nodes settling at the RTD LMP. The proposal includes the reinstatement of convergence bidding at the interties.
- It meets the needs of variable energy resources through the ability to provide more frequent energy schedules using forecast updates closer to the financially binding interval.

The ISO believes that many external parties will take advantage of 15-minute energy scheduling. However, over the next few years, transmission reservations within WECC will likely remain predominantly hourly. There is also no indication at this time that NAESB, NERC or FERC will modify the e-tag deadlines within the compliance timeline of the order. Under its proposed 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. In order to align with the twenty minute e-tag submission deadline prior to energy flow, the ISO will 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 further enhance the real-time market design to run the 15-minute market closer to actual flow.

Order No. 764 does not require that the ISO settle intertie transactions 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.² 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 HASP LMPs, however, load and internal generation are financially binding based on RTD LMPs. The HASP and RTD optimizations run at different time delays and with different market interval durations. As a result, system conditions are not aligned when running these applications which 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 are addressed. This enables 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. The alignment of the real-time settlement addresses these issues. While not the driver of suspending convergence bidding on the interties, 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.

² See Order No. 764 PP 99, 107.

2 Plan for Stakeholder Engagement

Item	Date
Post Addendum to Draft Final Proposal	April 24, 2013
Stakeholder Conference Call	May 1, 2013
Board Meeting	May 15/16, 2013
Tariff Filing	November 2013

3 Changes to Draft Final Proposal

- Convergence bidding position limit for the first twelve months will be zero percent and then follow the scheduled increases as previously proposed.
- Establish a process to identify existing PIRP resources where operational characteristics may require additional protective measures for the energy settlement provisions under the FERC Order No. 764 market design changes.

4 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 it would be unlikely 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 required for implementing the new balancing product. 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

5 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 inertie 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. The RTD optimization is based on demand (including losses) calculated by the ISO’s state estimator, and load is settled based upon the actual metered demand.

The ISO proposes to replace the HASP with an hourly process to accept block schedules on the interties. The 15-minute market run will dispatch other inertie transactions. To address the

need to support hourly intertie energy schedules, in the straw proposal, the ISO proposed leveraging the market functionality gained from the Dynamic Transfers initiative to award financially binding hourly transmission reservations for dynamic intertie transactions.

Based upon further discussion with stakeholders, the ISO is no longer proposing to implement transmission reservations bidding and settlement. The Dynamic Transfer initiative assumed that all static intertie energy schedules would be hourly. The transmission reservation established a process to ensure that dynamically scheduled variable energy resources could (1) secure sufficient hourly transmission capacity to meet positive forecast errors and (2) establish a cost of securing hourly transmission capacity in excess of its expected energy to incentivize improved forecasting.

Under the FERC Order 764 paradigm, the two objectives above can be met by a market design that creates incentives for static intertie schedules to be able to be economically reduced if variable energy imports schedule greater import quantities in the 15-minute market than they would have reserved if required to commit to energy delivery for the entire hour. As a result, it is no longer necessary to implement transmission reservations to support dynamic transfers.

The proposed real-time market timeline has been designed to limit seams issues with neighboring balancing authorities by remaining consistent with the existing e-tagging and intra-interval ramping practices in the West. The proposal maintains existing market timelines wherever possible to minimize the impact on the business processes of market participants and neighboring balancing authorities.

5.1 Real-Time Bid Submission

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

- Economically accept hourly block schedules
- Economically schedule resources for energy in the 15-minute market
- Economically dispatch resources in the 5-minute real-time market runs

The bid submission timeline has the same deadline under the current real-time market design. The same economic bids will be used in both the 15-minute market and RTD. There will be no changes to the hourly bid information provided by internal generation. As is currently the case, load will clear based on ISO forecasted demand by DLAP. Therefore, load serving entities will not be allowed to bid their load in the real-time market.

Variable energy resources that plan to use their forecast unless the price is below certain amount can use an economic bid curve³ to indicate the willingness to forgo the forecast schedule. If the economic bid curve is submitted, the forecast schedule will essentially be used as a cap on the economic bid curve for both the 15-minute market and RTD. This will allow the 15-minute and RTD to clear accordingly. This will provide the ISO with a mechanism to

³ 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. The ability to submit a decremental bid to a variable energy resource's self-schedule will be implemented with the FERC Order 764 market design changes, which is before the implementation of the flexible ramping product.

economically curtail variable energy resources below their forecasted output, which will provide significant reliability benefits in over-generation conditions. To get this functionality in as soon as possible, the proposal includes implementing this functionality in the fall of 2013 for hourly variable energy resource self-schedules until the 15 minute market is implemented in the spring of 2014. This is further described in section 7.4 below.

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 intertie resources to provide 15-minute energy schedule updates.

The ISO believes, over time, the hourly timeline, as illustrated in Figure 1, could be pulled in closer to the start of the hour though additional automation of intertie scheduling checkout business processes. However, it is important to note that the hourly block schedules must be accepted at or before the market optimization starts for the first binding 15-minute market in a trade hour. As shown in Figure 1 below, hourly block schedules are accepted 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.

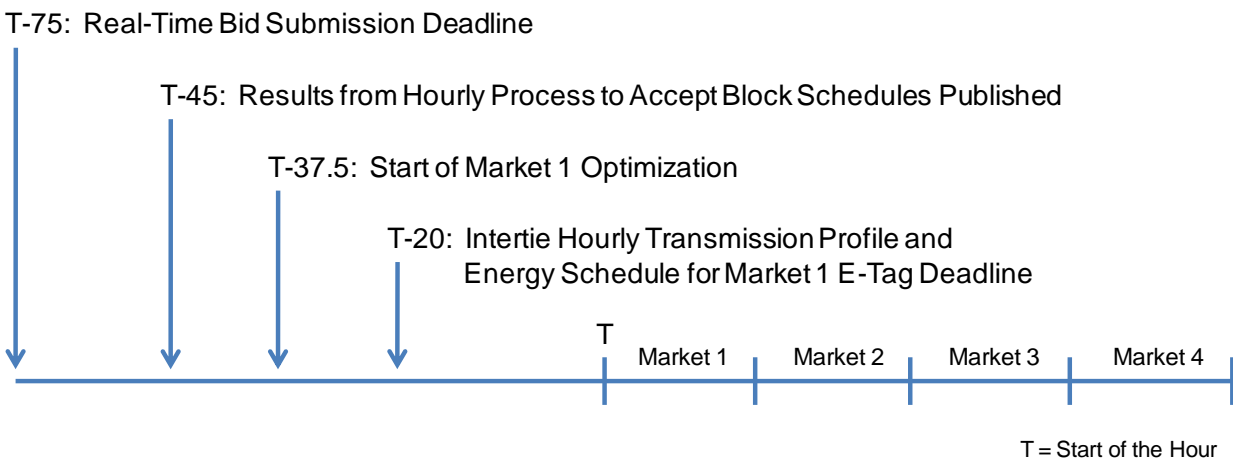


Figure 1 - Timeline of Hourly Real-Time Processes

The bids submitted by intertie resources will change somewhat under the ISO's proposal to accommodate both hourly and 15-minute economic bids and self-schedules. The ISO will run separate processes for accepting hourly block schedules and determining binding energy schedules and ancillary services awards. Intertie resources will submit the following information:

1. Energy self-schedule and/or energy bid, same as currently
2. Ancillary services bids, same as currently
3. Flag to require bid to be considered as an hourly block schedule
4. Flag to allow a single curtailment for the remainder of the hour for accepted block schedules

5. Flag to determine participation in the 15-minute market if the intertie transaction is not accepted in the hourly process

5.2 Hourly Process to Accept Block Schedules

Under the proposed 15-minute market design, there no longer will be financially binding HASP schedules for energy and ancillary services over the interties. Using the existing RTUC market functionality, the ISO will determine financially binding energy and ancillary services schedules within each 15-minute interval. The ISO will determine these simultaneously for each 15-minute interval based on energy self-schedules and energy and ancillary services bids. As illustrated in figure 1 above, for each trading hourly there will be four 15-minute markets.

The ISO will also run a market optimization to accept hourly block schedules and provide advisory energy schedules and ancillary services awards. The results will be published at T-45 which is the same time as current HASP schedules are provided and will be used for tagging hourly transmission profiles.

The proposal includes several options for intertie resources to manage any transitional seams issues as the WECC moves to 15-minute energy scheduling. The following six scheduling options will be available for intertie transactions:

1. Self-scheduled hourly block
2. Self-scheduled variable energy resource forecast
3. Economic bid hourly block
4. Economic bid hourly block with single intra-hour schedule change
5. Economic bid with participation in 15-minute market
6. Dynamic Transfer

In the hourly process to accept block schedules, the market optimization will enforce a constraint that each 15-minute interval, the energy schedule of submitted hourly block schedules will be equal. Then in the financially binding 15-minute market, the accepted hourly block schedule will be considered a self-schedule. For self-scheduled variable energy resource forecast, the market optimization will use the forecasted energy for each 15-minute interval, thus there is not restriction that the expected energy is flat for the hour. Then in the financially binding 15-minute interval the variable energy resource can update its self-schedule based on the most current forecast which will be used in the 15-minute market.

For economic bids submitted in the 15-minute market and dynamic transfers, the market optimization will produce advisory energy schedules for each 15-minute interval. The energy schedule in the financially binding 15-minute market can be different than the advisory schedule that cleared the hourly process to accept block schedules. However, the 15-minute energy schedule cannot exceed the transmission capacity listed on e-tag prior to the start of the binding 15-minute market optimization.

Ancillary services can also be awarded as a block schedule and will be considered self-provision in the 15-minute market to determine the financially binding ancillary services price. Currently, if the ISO dispatches contingency reserves on the interties the energy schedule remains at the dispatched level for the remainder of the hour. The implementation of the 15-minute market will not change this WECC practice. For example, assume a resource has an hourly block advisory energy schedule of 100 MW and a spinning reserve schedule of 50 MW. In the event that the spinning reserve was dispatched in interval 2, the energy schedule would increase to 150MW, the remaining intervals of the hour, including 15-minute and 5-minute markets, will reflect a self-schedule of energy at 150 MW.

Figure 2 below illustrates the outcome of the hourly process to accept block schedules. In this example, the intertie has an import limit of 1,000 MW. The sum of economic bids which would clear if not limited by transmission capacity would be 800 MW in interval 1, 900 MW in interval 2, 1,000 MW in interval 3 and 1,100 MW in interval 4. Since the sum of economic bids which would clear is greater than the import limit, the full sum of economics bids which would clear cannot be awarded in interval 4. The hourly blocks and hourly blocks with intra-hour schedule change clear at the same MW quantity for each 15-minute interval – 300 MW for hourly blocks and 200 MW for hourly blocks with intra-hour schedule change. The variable energy resource’s hourly forecast is 100 MW for interval 1, 200 MW for interval 2, 300 MW for interval 3 and 400 MW for interval 4. The economic bids that will participate in the 15-minute market and Dynamic Transfers clear at 200 MW for the first three intervals, but at 100 MW for the fourth interval since the import limit has been reached. Figure 2 also shows variable energy resources can exceed their forecasted energy up to the MW quantity of economic bids participating in the 15-minute market and the amount of Dynamic Transfers since those advisory schedules can be curtailed economically in the binding 15-minute market.

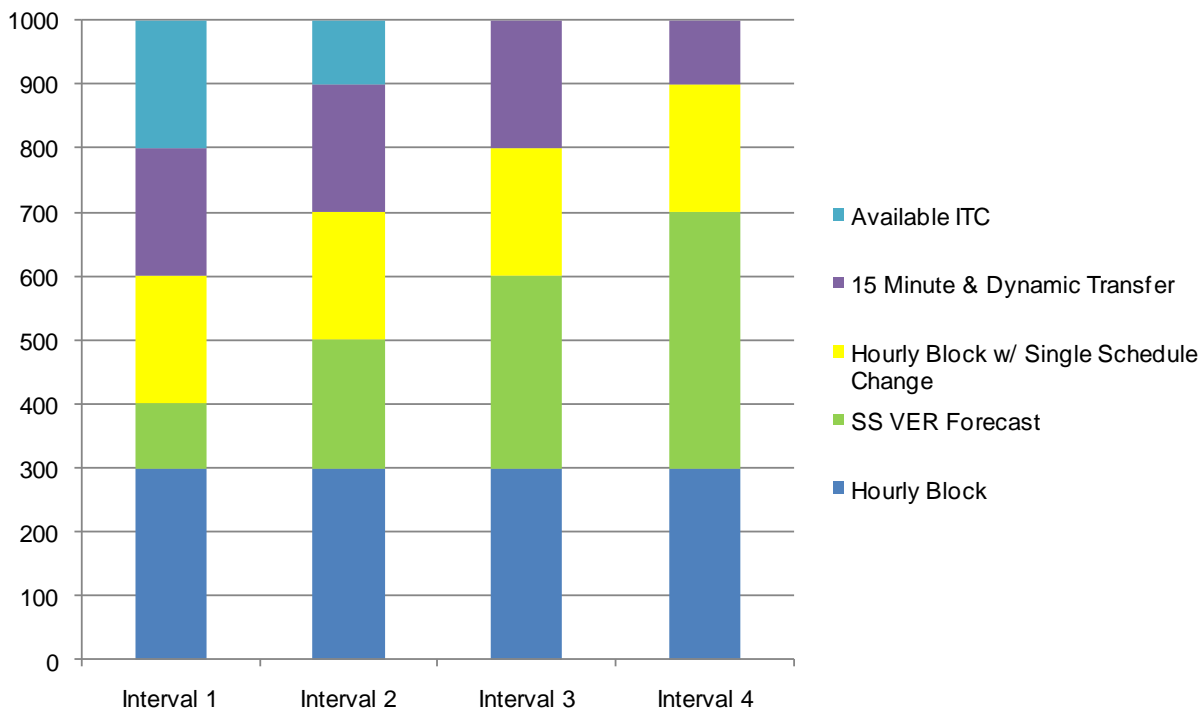


Figure 2 - Example of hourly process to accept block schedules

California ISO

The following outlines the e-tags the ISO would approve by the hourly tagging deadline for each of the intertie bidding options above. As shown, the ISO would approve e-tags with transmission profiles that exceed the maximum projected 15-minute energy or hourly block award (if submitted with single intra-hour change). This is so the ISO can dispatch these intertie resources with these e-tags in the 15-minute market above their projected 15-minute energy or hourly block award. This may result in the ISO accepting tags with transmission profiles that in aggregate exceed the transfer capacity of an intertie, but in no case will the ISO accept e-tags that have energy profiles and ancillary services awards that in aggregate exceed the transfer capacity of an intertie.

E-tags would be submitted as follows:

1. Self-scheduled hourly block

T-20 (before the hour) Tag

Transmission profile = hour ahead process schedule

Energy profile = hour ahead process schedule

No changes to tag made from 15-minute market

Energy profile can be updated intra-hour due to reliability curtailments

2. Self-scheduled variable energy resource forecast

At T-75, use 15-minute granular forecast for hour-ahead process

At T-37.5, updated forecast used for self-schedule in first 15-minute market

T-20 (before the hour) tag,

Transmission profile \geq maximum projected energy award in 15-minute intervals from hour-ahead process

Energy profile = 15-minute market schedule for interval 1

Energy profile updated every 15 minutes

3. Economic bid hourly block

T-20 (before the hour) Tag

Transmission profile = hour ahead process schedule

Energy profile = hour ahead process schedule

No changes to tag made from 15-minute market

Energy profile can be updated intra-hour due to reliability curtailments

4. Economic bid hourly block with single intra-hour schedule change

T-20 (before the hour) Tag

Transmission profile \geq hour ahead process energy schedule

Energy profile = hour ahead process schedule unless updated in first 15-minute market

15-minute market can increment energy profile up to lowest transmission profile tagged prior to start of binding 15-minute market optimization.

15-minute market can decrement.

Energy profile updated once within the hour 20 minutes prior to flow and remains unchanged for balance of hour.

5. Economic bid with participation in 15-minute market

T-20 (before the hour) Tag

Transmission profile \geq maximum MW energy bid submitted for participation in 15-minute market

Energy profile = 15-minute market schedule for interval 1

Energy profile is updated every 15 minutes based upon 15-minute market results

6. Dynamic Transfer

T-20 (before the hour) Tag

Transmission profile \geq maximum MW bid submitted

Final energy profile in dynamic tag will be updated after schedule hour

5.2.1 Self-Scheduled Variable Energy Resource Forecast

Variable energy resources can use the ISO forecast for their 15-minute expected energy in the hourly process to accept block schedules. In addition, a variable energy resource can also use its own forecast of expected energy; however, if the expected energy is not delivered in the 15-minute market, the variable energy resource will be subject to a penalty similar to the existing HASP schedules decline charge, as discussed in more detail in a section 6.2 below. This ensures that variable energy resources using their own forecast do not overstate expected energy that crowds out hourly block schedules. Since the advisory energy schedule that clears from the hourly process to accept block schedules is not financially binding this penalty mechanism is used to incentivize forecasting actual expected energy. The hourly block process schedules declines charge also applies to other intertie transactions that do not e-tag an accepted hourly block schedule which is advisory.

5.2.2 Economic Bid Hourly Block with Single Intra-Hour Schedule Change

In order to increase the amount of energy schedules that can change in the 15-minute process, the ISO proposes to allow hourly block schedules the option of being economically dispatched once in the hour. Given the proliferation of intermittent resources, the ISO believes entities throughout the WECC region will take advantage of 15-minute energy scheduling. However, over the next few years, transmission reservations within WECC will remain predominantly hourly. Currently WECC allows and has established business processes that support a single intra-hour schedule change of intertie schedules. While the WECC provisions are for

California ISO

reliability, rather than economic curtailments, it is reasonable to expect the associated business processes could be relatively easily adapted to accommodate economic curtailments.

The proposed single intra-hour schedule change of intertie schedules will work as follows for a curtailment:

- Assume an hourly block import has bid of \$50.00. In the hourly process to accept block schedules, the import is accepted for 100 MW.
- In interval 1 of the 15-minute market the LMP is \$55.00 and the import is economic for the remainder of the hour, the import flows and is paid \$55.00.
- Then in interval 2, the 15-minute market the LMP drops to \$45.00 and the import is not economic for the remainder of the hour, the import is curtailed and does not flow in interval 2, interval 3, and interval 4.
- If in interval 3 and interval 4, the price increased to \$55.00, the import schedule would remain at the curtailed level in interval 2.

The proposed single intra-hour schedule change of intertie schedules will work as follows for an increment:

- Assume an hourly block import has bid of \$50.00. In the hourly process to accept block schedules, the import is accepted for 50 MW.
- The lowest transmission profile tagged in a neighboring balancing authority at T-37.5 is equal to 100 MW. The ISO market optimization will not award energy schedules which exceeds the lowest transmission profile tagged at the start of the binding 15-minute market optimization.
- In interval 1 of the 15-minute market the LMP is \$55.00, but is only economic for the balance of the hour at 50 MW, the energy schedule is unchanged and is paid \$55.00.
- Then in interval 2, the 15-minute market determines that the import is economic for the remainder of the hour at 100 MW, the energy schedule is increased to 100 MW and will remain at that level for interval 3 and interval 4.
- In interval 3 and interval 4, the import is paid the relevant LMP for 100 MW

In the revised straw proposal, the ISO proposed that the hourly block schedule with the option to curtail once is eligible for real-time bid cost recovery if it is decremented from its day-ahead schedule. However, after considering stakeholder feedback, the ISO agrees that a subset of hourly block schedules should not be eligible for bid cost recovery as this could provide disincentives to move to 15-minute scheduling. In addition, the opportunity to curtail once per hour mitigates the risk of exposure to LMPs below a resources bid price if system conditions change between the hour-ahead process to accept block schedules and the financially binding 15-minute market.

5.2.3 Economic Bid Participation in 15-Minute Market

There may be instances when an intertie resource submits an economic bid and is willing to be rescheduled in the 15-minute market, but is not accepted through the market optimization of the hourly process to accept block schedules. In the event that an intertie resource does not want to participate in the 15-minute market for a quantity greater than an advisory energy schedule (including zero), the resource would simply update its transmission profile to the maximum amount it wants to make available to the 15-minute market prior to the start of the binding 15-minute market optimization (T-37.5 minutes). If the resource does not have a transmission profile in excess of its advisory energy schedule, the resource cannot be scheduled for energy in the 15-minute market higher than its advisory energy schedule.

Intertie resources that participate in the 15-minute market are eligible for bid cost recovery.

5.3 15-Minute Market Process

Under the proposed 15-minute market design, 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, earlier than the current 22.5 minutes prior to the binding interval, so that the ISO can issue awards 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. Only the energy portion of e-tags for energy schedule changes made in the 15-minute market need to be updated, because market participants will presumably submit a tag with an hourly transmission reservation prior to the start of the hour. During the implementation phase of these market design changes, the ISO will assess if the 15-minute market solution time can be optimized such that the results could be published earlier allowing more time for updating of energy schedules on e-tags. Figure 3 below shows the timeline for the second financially binding 15-minute market interval in a trade hour.

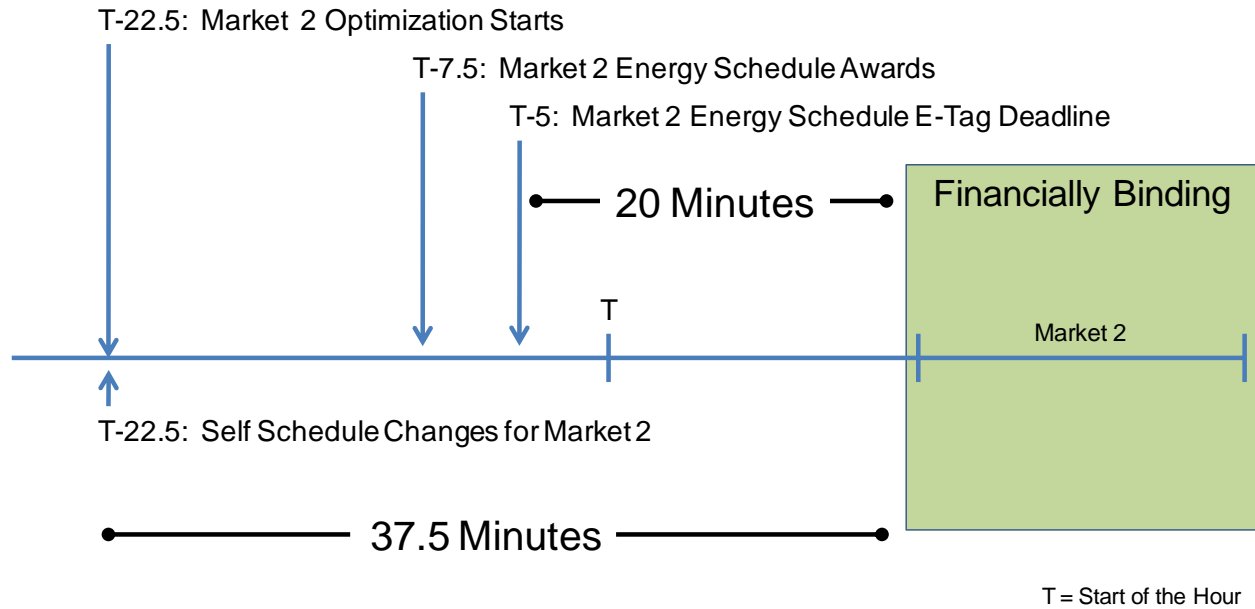


Figure 3 - Timeline of 15 Minute Real-Time Processes

The ISO does not believe that in the near future 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.

Based on discussions with neighboring balancing authorities and recognition that the 2.5 minutes between 15-minute market awards and the tagging deadline requires automation, the ISO will update energy schedules on e-tags for the 15-min market awards within an hour. Neighboring Balancing Authority Areas have stated this will expedite their subsequent approval of the updated tags. This will help ensure that energy schedule changes based upon the results of the 15-minute market will be reflected in e-tags prior to the T-20 tagging deadline and limit the market participant's role to approving the updated tag. This is comparable to the timeline to internal generation dispatches in which the ISO issues the dispatch 2.5 minutes prior to the start of the applicable dispatch interval. However, an important difference is the generation behind imports will have an additional fifteen minutes compared to internal generation before it has to change its output – the tagging deadline is at T-20 while the ramp for intrahour 15-minute schedule changes starts at T-5.

Scheduling coordinators can opt out of having the ISO update the energy schedule on e-tags. The scheduling coordinator is then responsible for updating the e-tag with the 15-minute energy schedule within the 2.5 minutes before the tagging deadline. The scheduling coordinators decision to opt out will be reflected in the bid. For multiple tags related to the same energy schedule, ISO will adjust energy schedules on a pro-rata basis.

As described above in Figure 3, beginning the run of the optimization for the 15-minute market at 37.5 minutes prior to the binding interval is 15 minutes earlier, than the current real-time unit commitment process, which begins at 22.5 minutes prior to the binding interval. The ISO has analyzed market data to estimate the impact of extending this timeline on the accuracy of

estimating system conditions (i.e. projected price). 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 analysis shows that while the tagging timeline required the ISO to start the new 15-minute market earlier than the existing RTUC process, there is not a material difference in system condition changes that would negatively impact the improved market efficiency of implementing the 15-minute market.

5.4 5-Minute Real Time Dispatch

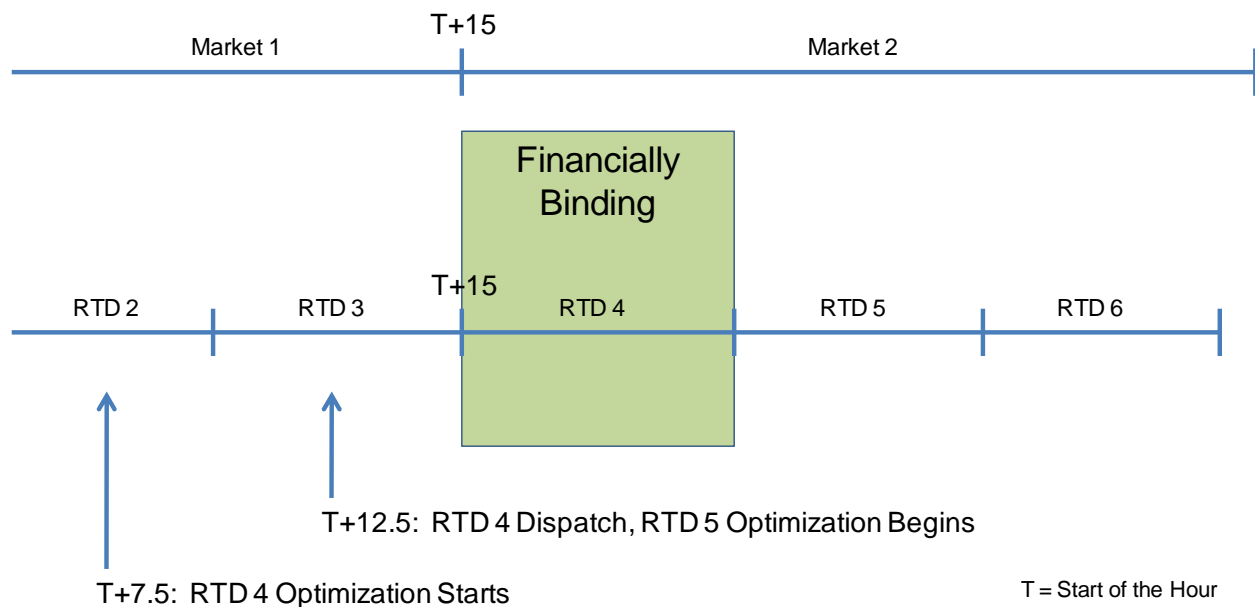


Figure 4 - Timeline of 5 Minute Real-Time Dispatch

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 4 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.

It is important to note that the market timeline of RTD minimizes potential “implicit” virtual bidding on the interties. It is argued that intertie schedules may not tag their energy schedule awarded in the 15-minute market so that they will be settled at a lower RTD price for their deviation. Since the 15-minute market schedule is determined at 22.5 minutes prior to the start of the first binding RTD interval, the intertie schedule would not have visibility to actual RTD pricing as it is published 2.5 minutes prior to the bidding interval before the tagging deadline of 20-minutes prior to the binding RTD interval. The ISO will monitor for potential “implicit” virtual bidding and if this behavior results in reliability issues or market inefficiencies the ISO would consider an uninstructed deviation penalty.

6 Settlement with 15-Minute Market

6.1 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 follows⁴:

- 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 imbalance energy will be calculated every fifteen minutes for the 15-minute market and every five minutes for 5-minute market. The 15-minute instructed imbalance energy will be based on a flat 15-minute energy schedule across the relevant 15-minute interval and settled at the 15-minute LMP. The 5-minute instructed imbalance energy will be based on the Dispatch Operating Point (DOP), which is the dispatch trajectory between consecutive 5-minute dispatches considering the applicable dynamic ramp rate, and it will be settled at the 5-minute LMP. Uninstructed imbalance energy will be calculated every five minutes and settled at the 5-minute LMP. With the transition to 5-minute meter data, there will be no reason to distinguish between tier-1 and tier-2 uninstructed imbalance energy; all uninstructed imbalance energy will be calculated and settled in one tier.
- Real-time bid cost recovery will include revenues and costs 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, if applicable, for 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. For hourly block schedules, if the energy schedule is curtailed for physical reasons the self-schedule for each of the 15-minute market can be updated. If the outage or other schedule change (e.g., a schedule that is affected by outages or changes in variable energy resources' output in other balancing authority areas, by priorities of transmission service using non-ISO transmission providers, or similar reasons) is known prior to the start of the 15-minute optimization, the 15-

⁴ The ISO has posted an illustrative spreadsheet of energy settlement with the revised straw proposal.

minute energy schedule will reflect the schedule change.⁵ Thus, it would not be considered as a deviation between the 15-minute energy schedules which is settled at the RTD price.

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.

Several stakeholders have advocated that deviations between the 15-minute market and RTD should be settled at the “worse of” price. For example, positive generation deviations would be paid the lower of the 15-minute price or RTD and negative deviations would be charged the higher of the 15-minute price or RTD. This is intended to incentivize resources to follow RTD dispatch since uninstructed deviations can never be profitable, but would be a departure from the settlement of deviations common in LMP markets, i.e. deviations are paid/charged at the price existing in the timeframe in which the deviation occurs. The ISO believes that if additional measures are needed, such as implementation of uninstructed deviation penalties, they should be reviewed after implementation the new 15-minute market.

In addition, several stakeholders have expressed concern that intertie schedules could engage in “implicit” virtual bidding between the 15-minute market and RTD. Since deviations are settled at the RTD price, an intertie schedule could exploit predicted differences between the 15-minute market price and the RTD price. Based on the historical data provided, no analysis has concluded that there is a predictable price difference. The tagging deadline for 15-minute energy schedules is 20 minutes prior to flow. Since the pricing results of the first RTD interval are not published until 2.5 minutes prior to flow, there is not the ability for an intertie resource to observe the first RTD prices and then not tag their energy schedule from the 15-minute market. The ISO believes that if additional measures are needed, such as implementation of uninstructed deviation penalties, they should be reviewed after implementation the new 15-minute market.

6.2 Hourly Block Process Decline Charge

Since the hour ahead process to accept block schedules does not result in financially binding settlements there can be instances where a resource does not bear a financial consequence if it is unable to meet its advisory energy schedule. The following are examples:

- An incremental export when constrained in the import direction;
- An incremental import when constrained in the export direction;
- An import from a variable energy resource that overstates its expected energy output.

Similar issues occur under the current HASP market design, since deviations or operational adjustments from the hourly HASP schedule are settled at the HASP price. In order to address potential gaming concerns, the HASP Schedules Decline Charge was implemented. The HASP import (exports) schedule decline charge monthly threshold is the highest of 300 MW or 10% of

⁵ See Order on rehearing and clarification and granting motion for extension of time re Integration of Variable Energy Resources under RM10-11, PP 5

total imports (exports). The price applied to the MW above the threshold is the maximum of \$10.00 or 50% of the HASP LMP.

Economic dispatch in the 15-minute market, dynamic transfers and VERs using the ISO forecast will be exempt from the hourly block process decline charge.

Under the ISO's proposed real-time market changes, an hourly block process decline charge, similar to the current HASP Schedules Decline Charge would apply to various intertie schedules. The intent of this charge is to penalize energy schedules that are not delivered or VERs forecasts that are over-stated that do not otherwise incur a financial obligation in the market for the undelivered energy. The proposed hourly block process decline charge is as follows:

Hourly Block

- Imports and exports that are incremental to day-ahead schedules and that result from the hour-ahead process to accept block schedules are subject to the hourly block process decline charge to the extent the decline is made prior to the start of the market run for the applicable 15-minute interval. This is because the resource would then be dispatched down prior to the 15-minute interval and the resource would not receive a financially binding dispatch despite tying up intertie capacity in the hourly process. The declines charge will not apply if the decline is made after the start of the market run for the applicable 15-minute interval because in this case the resource will receive a financially binding 15-minute market dispatch and be subject to the RTD price for the undelivered portion.
- If a resource has a day-ahead schedule, any operational adjustment will be settled at the 15-minute price, thus the day-ahead schedule is not considered in the decline charge.

Hourly Block with Schedule Change

- Imports and exports that are incremental to day-ahead schedules and that result from the hour-ahead process to accept block schedules are subject to the hourly block process decline charge to the extent the decline is made prior to the start of the market run for the applicable 15-minute interval. This is because the resource would then be dispatched down prior to the 15-minute interval and the resource would not receive a financially binding dispatch despite tying up intertie capacity in the hourly process. The declines charge will not apply if the decline is made after the start of the market run for the applicable 15-minute interval because in this case the resource will receive a financially binding 15-minute market dispatch and be subject to the RTD price for the undelivered portion.
- If the incremental import or export is schedule is curtailed through the 15-minute market, the 15-minute interval where the resource follows the ISO instructions are no subject to the hour ahead schedules decline charge.

Variable energy resource using its own forecast

- To address concerns that variable energy resources will overstate their forecast in the hourly process to crowd out hourly block schedules from conventional resources,

imports from variable energy resources are subject to the hourly block process decline charge to the extent the resource over-forecasts over the month.

- For each hour, the ISO will compare maximum 15-minute financially binding schedule (that is submitted 37.5 minutes prior to flow) to the maximum 15-minute advisory schedule from the hour-ahead process to accept block schedules (based upon the hourly forecast received 75 minutes prior to flow). Over the course of the month, positive deviations can offset negative deviations in monthly threshold calculations. Thus if the maximum advisory schedule exceeds the actual financially bidding schedule by the threshold over the course of the month, the hourly forecast has on average overstated the actual production and as a result, crowded out hourly block schedules that otherwise might have been awarded if the forecast used in the hourly process was not biased upward.

6.3 Settlement of Load

As previously described, both the 15-minute market and RTD will clear against the ISO forecasted demand. Non-participating Load will not be allowed to bid in to the 15-minute market or RTD. (Participating Loads, Proxy Demand Resources, and other dispatchable demand response will continue to participate in the 15-minute market and RTD.) Differences in load from day-ahead schedules will be settled at the hourly weighted average LMP of the 15-minute market and RTD by DLAP. The LMPs will be weighted by the MW cleared in the two respective markets and will be bounded by the most extreme LMP from those relevant intervals. A spreadsheet had been posted with the revised straw proposal that illustrates the load settlement.

The use of DLAP load forecasts to determine the hourly weighted average price will require additional payloads to settlements. The DLAP load forecasts will be included in the settlement data provided to load serving entities.

As illustrated in the spreadsheet example, since load continues to be metered on an hourly basis, the weighted average approach does result in neutrality charges that are allocated to load. SCE requested that these neutrality charges be allocated to all deviations from net load – ISO load forecast less variable energy resources forecast. This is not appropriate as variable energy resources are settled in the 15-minute market based upon their forecasted output. Thus the hourly weighted average is only applicable to Load which is metered hourly. The variable energy resource forecast error is settled correctly as deviations between the 15-minute market and RTD. As a result, only ISO load forecast result in the neutrality charge of the Load settlement.

The settlement of load based upon the weighted average price is only applicable for load that is metered hourly. Load following MSS will be settled similar to the current market design. In the 15-minute market, load following MSS will need to balance their load and supply. In RTD, the load following MSS must balance their load and supply in the five minute interval within the established threshold or be subject to MSS load following deviation penalties. Similarly to internal generation, load following MSS settlement intervals will be changed from a 10-minute granularity to a 5-minute granularity.

6.4 Inter-SC Trades

The proposed changes to the real-time market will not result in inter-SC trades becoming a 15-minute product. Inter-SC trades will remain an hourly product and will be settled in real-time at the simple average of the four 15-minute market LMPs.

6.5 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).

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.

7 Variable Energy Resources

7.1 Participating Intermittent Resource Program (PIRP)

In return for providing meteorological data to allow production forecasting, PIRP resources were allowed to net over the month uninstructed imbalance energy if they submitted the ISO production forecast to establish their 5 minute instructed imbalance energy (hourly forecast divided by 12). FERC Order 764 now requires that variable energy resources provide meteorological data and the ISO believes that with the improved opportunities for variable energy resources to self-schedule their production closer to real time, the existing PIRP should be modify provisions to net uninstructed imbalance energy.

Currently PIRP resources must submit the ISO hourly forecast generated 90-105 minutes prior to the hour to be eligible for monthly netting of uninstructed imbalance energy. This hourly forecast is used to establish instructed energy in RTD dispatch intervals by dividing the total hourly forecast by twelve. If the PIRP resource does not submit the hourly forecast, the hour is excluded from monthly netting of uninstructed imbalance energy. If the PIRP resource does not have a day-ahead schedule (which is very common), the resource's scheduled instructed energy output based on the hourly forecast is settled at the average hourly RTD price. Instructed energy is settled at the 10-minute weighted average of the two RTD intervals, but since PIRP instructed energy is flat for the hour, the price is equal to the average hourly RTD price. For non-PIRP resources, uninstructed energy is settled at the 10-minute average price of the two RTD intervals. For PIRP resources, the uninstructed imbalance energy is netted over the month and paid (or charged) the average monthly LMP.

In the Renewable Integration: Market and Product Review Phase 1, several stakeholders argued that PIRP should not be eliminated until changes were made to the real-time market that

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

allowed for closer and more granular schedule updates. The changes made as a result of this stakeholder initiative will do this. Under the 15-minute market settlement, variable energy resources will now be able to secure a forward energy position in the 15-minute market, based upon a forecast received 37.5 minutes prior to flow. This 15-minute price should be less volatile than the RTD price because resource commitment decisions can be made, greatly reducing variable energy resources' exposure to price volatility.⁷ Variable energy resources will only be subject to the RTD price for forecast error between the 15-minute schedule and RTD interval and for ramping between 15-minute schedules. This amount of energy subject to the RTD price will be significantly less than under the current market design in which all of variable energy resources output is subject to the RTD price (unless scheduled in the day-ahead market).

With 5-minute metering and if the resource elects to use 5-minute forecast granularity, both instructed and uninstructed imbalance energy are settled at the same 5-minute LMP.

7.1.1 PIRP Modifications

To align with the proposed real-time market structure changes, the ISO proposes the following modifications to the PIRP. The scheduling opportunities based upon forecast closer to actual production significantly reduce exposure to uninstructed imbalance energy; however, VERs will be settled on instructed deviations between the 15-minute schedule and RTD.

The following outlines how the PIRP would function under the new real-time market structure:

- PIRP certification remains unchanged.
- PIRP participation will be identified in the ISO's master file. No hourly option to be in/out PIRP.
- Scheduling coordinators will not have to send back the ISO forecast which reduces scheduling delays and potential errors.
- Economic bids can be submitted hourly for use in the 15-minute market and RTD to award an energy schedule or dispatch different than the resource's forecast.
- PIRP will use the ISO forecast with a two-hour look-ahead and five minute granularity.
- The 15-minute self-schedule will be the sum of the relevant three five minute forecasts received 37.5 minutes prior to flow.
- The RTD instructed energy the self-schedule based upon the relevant five minute forecast received 7.5 minutes prior to flow.
- RTD instructed energy deviations from the 15-minute schedule divided by three will be settled at the RTD LMP.

⁷ The ISO posted DA, advisory RTPD and the weighted average RTD price data on the FERC Order 764 market design changes website on October 26, 2012

California ISO

- Uninstructed imbalance energy will be the difference between the meter and the RTD instruction based upon the forecast from 7.5 minute prior to flow and will settle at the RTD price.
- The monthly netting of uninstructed imbalance energy will be eliminated.

The ISO proposes to establish a process to identify existing PIRP resources that have operational characteristics that require additional protective energy settlement measures under the FERC Order No. 764 market design changes. This process will be used to identify if there are any impacted resources, so that mitigation measures can be developed that address the specific issues identified.

The ISO proposes that PIRP resources will have 30 days from the May Board of Governors meeting to notify the ISO that they meet the specified criteria and they request mitigation measures to address their operational characteristics. The ISO proposes that it would develop mitigation only if resources are identified that meet the criteria below:

1. A material portion of the existing plant's output uses technology that lacks the ability to receive and follow ISO curtailment dispatches; and
2. The PIRP resource bears the imbalance market costs under its existing PPA.

Based on data provided by the IOUs, we anticipate the number of resources meeting these criteria to be extremely limited and therefore believe it is best to address their particular circumstances on a case by case basis. If the ISO identifies any resources that meet the criteria above, it will commence a stakeholder process to develop any protective measures needed to address the operational characteristics of these resources. The possible set of protective measures to be developed is not limited to monthly imbalance netting in some form and could be provided in an alternative settlements arrangement. This approach will insure that the protective measures will not be overly complex relative to the issues that need to be mitigated, and will be narrowly tailored to address any facilities identified in this process to have met the criteria above.

7.2 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, although variable energy resources will be able to submit a 5-minute forecast to be used in the RTD dispatch as described further below. 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 resource telemetry for dispatch.

As part of the Dynamic Transfer stakeholder initiative, variable energy resource that are dynamically scheduling can provide a two-hour rolling forecast with five minute granularity. The ISO proposes to also allow internal variable energy resources to optionally provide the same forecast granularity and will use the average of the projected energy output for 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 start of the market optimization of the binding 15-minute market.

Variable energy resources will have the option to use the ISO forecast or their own forecast. Variable energy resources pay \$0.10 per MWh for the ISO to provide forecasting services. If a variable energy resource elects to use its own forecast, it will be subject to the modified HASP schedules decline charge from the hourly process to accept block schedules. There are no

other settlement differences if the ISO forecast or resource's forecast is used in the 15-minute market or RTD.

In the resource's master file, variable energy resources will select if they are using the ISO forecast or their own forecast. The ISO's master file update process takes approximately 7-10 business days for changes to become effective in the market. In addition, the ISO will develop a certification process to approve variable energy resources to use their own forecast. The ISO will reserve the right to cancel a variable energy resource's ability to use their forecast if the resource's forecast is significantly less accurate than the ISO forecast.

7.3 Instructed energy in RTD

If the variable energy resource forecast uses 15-minute granularity, the ISO will divide the 15-minute forecast by 3 and return this value as the RTD instructed energy. For example, assume the 15-minute forecast was for 30 MWh. For each of the three relevant RTD intervals the instructed energy will be 10 MWh.

If the variable energy resource forecast uses 5 minute granularity, then the ISO will then use the 5-minute forecast available prior to the start of the RTD optimization to determine the instructed energy of the resource. RTD will return the 5-minute forecast value as the instructed energy for the binding RTD interval.

7.4 Economic Bid with Forecast Used to Cap Bid Curve

In the Flexible Ramping Product⁸ 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). By fully participating in the market and providing the flexible ramping product, variable energy resources will offset, at a minimum, the other costs associated with fully participating in the market. A key requirement for providing the flexible ramping down product is that the resource must participate in the market by submitting an energy bid to be used by RTD.

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 be economically dispatched below their self-schedule based on their forecast and in the future participate in the flexible ramping down product will provide an energy bid that will be used to clear in both 15-minute and 5-minute markets, along with the resource's ramp rate. In both markets, the ISO will utilize the resource's or ISO forecast as the upper bound for the energy dispatch when considering the economic bid curve in both 15-minute and 5-minute. 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 settlement of energy dispatches and flexible ramping down awards in the 15-minute market and RTD is the same as for any other resource.

Beyond the flexible ramping product, economic bids from variable energy resources can protect against negative prices during periods of over-generation. The ISO bid floor is being reduced from -\$30.00 to -\$150.00 in Fall 2013. The lower bid floors provide additional incentives for variable energy resources to provide economic bids to ensure that their forecast is only

⁸ Additional information on the Flexible Ramping Product stakeholder initiative is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleRampingProduct.aspx>

scheduled if the LMP is greater than their bid. The ISO is evaluating the implementation of PIRP economic bidding in Fall 2013 which is earlier than the other Order 764 changes planned for in Spring 2014. This implementation will allow the PIRP resources to submit energy bids (without self-schedule) and will use the PIRP forecast in RTD as the upper bound for the energy dispatch. In the intervals that the ISO dispatches a PIRP resource different from the PIRP forecast, the resource will not be eligible for the PIRP monthly netting of uninstructed imbalance energy for the applicable trading hour.

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 because of market inefficiencies and excessive real-time imbalance energy offset uplift charges attributable to convergence bidding on the interties.

8.1 Settlement in Real-Time

Under the proposed 15-minute market design, 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 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.

The ISO proposes to also modify its e-tagging rule, designed to deter implicit virtual bidding, to state that an intertie transaction must be tagged at the time of the hourly process for an intertie transaction originally scheduled in the day-ahead market to be bought back at a profit in the real-time market. The current rule only requires an e-tag to be submitted at some point before the HASP, but does not require the tag to be maintained through the HASP.

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 previous design for convergence bidding on the interties, the ISO enforced 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.

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.

The ISO proposes to establish the number of e-tags it will accept by enforcing the “physical only” constraint in RUC. The ISO will use penalized energy bids, such as applying a -\$250 adder to IFM bid of cleared IFM schedules. This will have the effect of creating a merit order list of IFM schedules which with ISO will accept day-ahead e-tags. The results of the RUC process to determine which IFM schedules can be tagged will be published at the same time as day-ahead market results. IFM schedules that are not allowed to tag in the day-ahead, due to the RUC results, will not be subject to the existing HASP reversal rule. For settlement purposes, these schedules will be assumed to have tagged prior to the start of the hour ahead process to determine block schedules. In addition, IFM schedules whether tagged or not tagged will have scheduling priority over incremental schedule submitted in real-time. This scheduling priority is the same as exists in the current market.

The past rationale for the physical import and export constraints is that they prevented physical intertie market awards from exceeding an intertie’s capacity. However, based on further consideration of the WECC reliability standards, the standards only require that total tagged interchange not exceed an intertie’s capacity¹⁰. Thus, physical intertie market awards could potentially exceed an intertie’s capacity, but the ISO would only accept e-tags for a total net interchange up to the intertie’s capacity. In the hourly process to accept block schedules and the financially binding 15-minute market, the net physical intertie market awards would then be reduced to the intertie’s capacity.

Some market participants have expressed concerns that allowing physically infeasible market awards and imposing a tagging limit would yield undesirable outcomes. First, parties are concerned that giving a physical resource a market award and not allowing it to tag would put the market participant at risk of violating WSPC Schedule C contracts that require market awards be tagged by 3:00 pm of the day prior to delivery. The ISO recognizes that such an approach may lead to e-tags not being accepted but observes that even under the current market design there is no assurance that a physical intertie bid will clear the IFM and consequently be allowed to tag. In addition, the ISO observes the following:

- The conditions under which a physical intertie bid clears the IFM but would not be allowed to tag are the same conditions under which the a physical intertie constraint was binding but the physical plus virtual intertie constraint was not binding previous to virtual bidding on the interties being suspended (i.e. virtuals providing counterflow to physicals to meet the tie constraint). As this circumstance did not occur frequently, the ISO anticipates that circumstances in which tags would potentially not be accepted for day-ahead physical intertie awards will occur relatively infrequently, and when it did occur, the amount of tags that would be cut would be small.

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

¹⁰ WECC standard INT-006-3 requirement R1.2 <http://www.nerc.com/files/INT-006-3.pdf>

- E-Tags may be cut for physical market awards under the current market rules. For example, e-tags for physical imports may be cut if e-tags are not submitted for physical exports providing counterflow on an intertie with import congestion.

Nevertheless, in the case an IFM physical intertie award is not allowed to tag prior to the hour ahead process to accept block schedules, two circumstances could result:

- The IFM physical intertie award clears the hour-ahead process to accept block schedules. Subsequently, the ISO would accept the e-tag for the market.
- The IFM physical intertie award does not clear or is reduced in the hourly process to accept block schedules. In this case, it is possible that the IFM physical intertie award would be subject to the existing HASP buy-back rule that specifies that untagged imports be bought back at the higher of the IFM or 15-minute price (and that untagged exports are sold back at the lower of IFM or 15-minute price). The ISO proposes that the HASP buy-back rule not be applied to IFM awards that were not tagged as a result of the merit order approval process. These IFM awards will be assumed tagged for settlement purposes.

8.3 Position Limits

Given the uncertainty of the market impacts of convergence bidding at intertie scheduling points, at the onset of convergence bidding the ISO imposed a position limit on convergence bids of 5 percent of an intertie's average transfer capacity per SC at each intertie. If no adverse market impacts were observed, the position limits were to increase from 5 percent to 25 percent after eight months of implementation. Then they were to increase to 50 percent after 12 months from implementation. After 16 months there would be no position limits. This phasing in of convergence bidding enabled the market participants to gain experience under the new market design and allow the ISO and stakeholders to address any unanticipated market issues prior to adding the complexity of convergence bidding.

In the revised straw proposal, the ISO proposed changing the position limit to 10 percent of the largest intertie across all interties scheduling points for each scheduling coordinator¹¹. This position limit would remain in place for at least six months after convergence bidding on the interties is reopened. Before lifting this limit, the ISO, in conjunction with the DMM, would examine the performance of convergence bids on the interties to determine if additional measures need be implemented to prevent inefficient market participant behavior or if the position limits can be raised. This was the same proposal as the ISO made during the Intertie Pricing and Settlement stakeholder initiative.

Upon further reflection, the ISO believes the implementation costs of redesigning the position limits on the interties outweigh the benefits changing the basis from intertie scheduling point to scheduling coordinator. In addition, many stakeholders opposed the lack of a firm timing for elimination of position limits. As a result, the ISO proposes to use the same position limit methodology and timing of increases used at the onset of convergence bidding.

Many stakeholders continue to express concern of immediately reinstating convergence bidding with the FERC Order No. 764 design changes. The FERC Order No. 764 real-time market

¹¹ Currently, the single largest intertie is the Tracy intertie at 3,829 MW

California ISO

changes will be a relatively major change to the market, especially to the scheduling and pricing of intertie transactions. In addition, the ISO is planning to implement the Energy Imbalance Market in Fall 2014 which will expand the real-time market, both the 15-minute market and RTD, to include other balancing authorities. The ISO is proposing an initial twelve month period, without intertie convergence bidding, to allow market participant's to observe the operation of the new 15-minute market under various seasonal conditions. This is similar to the initial operation of the nodal market, in which there was an initial period without convergence bidding to allow the ISO and stakeholders to address any unanticipated market issues prior to adding the complexity of convergence bidding.

The position limits will be based on the average transfer capacity of each intertie. The limit per scheduling coordinator and timing will be as follows:

0%	15-minute market implementation to 12 months
5%	12 months to 20 months
25%	20 months to 24 months
50%	24 months to 28 months
No Limit	28 months

9 Next Steps

The ISO plans to discuss this addendum to the draft final proposal with stakeholders during a conference call to be held on May 1. The ISO will answer questions relating to the changes in this addendum to the draft final proposal on that call and will provide an opportunity for stakeholders to share their comments. The ISO plans to present its FERC Order No. 764 design changes proposal to its Board of Governors at their May meeting.