



Intertie Deviation Settlement

Issue Paper

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Intertie Deviation Settlement Issue Paper

Table of Contents

| | |
|--|----|
| 1. Purpose | 3 |
| 2. References | 3 |
| 3. Background | 4 |
| 3.1 Interties, Market Timing, and E-Tagging..... | 5 |
| 3.2 Declined Award | 8 |
| 3.3 Undelivered Energy (no E-Tag) | 9 |
| 4. Issue Paper: Decline Charge Policy is Outdated..... | 11 |
| 4.1 Current Decline Charge | 11 |
| 4.2 FERC Order 764 Impacts | 12 |
| 4.3 Energy Imbalance Market..... | 13 |
| 5. Impact of Undelivered Intertie Resources | 13 |
| 5.1 Operational Impacts of Intertie Declines..... | 13 |
| 5.2 Intertie Declines Examples..... | 14 |
| 5.3 Decline Charge Settlement Data..... | 25 |
| 6. Open Items..... | 26 |
| 7. Stakeholder Engagement and Next Steps..... | 26 |
| 7.1 Schedule..... | 26 |
| 7.2 EIM Governing Body Role | 27 |
| Appendix A: Charge Code 6455 Example..... | 28 |

1. Purpose

The purpose of this initiative is to incentivize delivery of awarded energy on interties to improve operational awareness and grid reliability. Intertie resources that do not meet their cleared market schedules cause impacts on market pricing and grid stability. The *Intertie Deviation Settlement* initiative will analyze the existing Intertie Decline Charge and ultimately propose a new settlement methodology for intertie deviations. The desired outcome of this initiative is to provide economic incentives for the delivery of intertie resources. The ISO expects this initiative to lead to more accurate estimates of the net scheduled interchange, increased grid reliability, and accurate market pricing.

What is the problem we aim to solve? When market participants fail to deliver intertie resources, grid operators and the ISO markets face operational challenges that can result in high prices, manual processes, and sub-optimal market solutions.

What expectations guide our decision making?

- Operational reliability
- Efficient market solutions
- Accurate and economic pricing signals

2. References

The following documents are referenced throughout the document and can be found at the respective links.

Business Practice Manual (BPM) for Market Operations:

<https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market%20Operations>

Settlements and Billing BPM Configuration Guide Charge Code 6455 Intertie Schedules Decline Charges:

https://bpmcm.caiso.com/BPM%20Document%20Library/Settlements%20and%20Billing/Configuration%20Guides/HASP-RT/BPM%20-%20CG%20CC%206455%20Intertie%20Schedules%20Decline%20Charges_5.9.doc

Declined Predispatched Intertie Bids – White Paper, 2007:

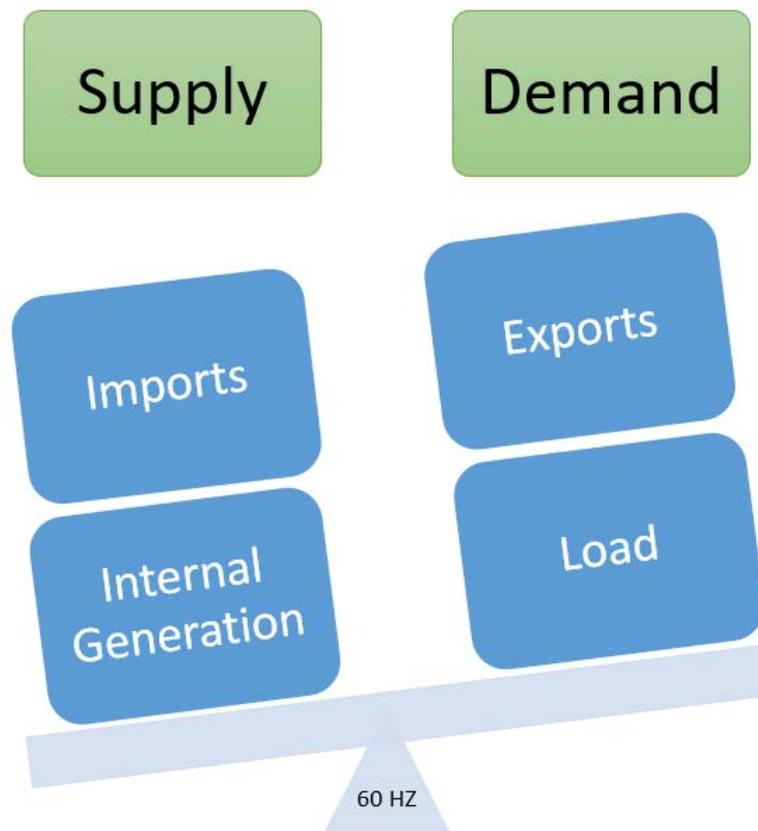
<http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=561FB99F-13BA-4B61-93EC-FAA77D134A55>

3. Background

It is the responsibility of the ISO to ensure there is enough energy supply to meet load across the balancing authority area footprint. Maintaining the balance between supply and demand will ensure stability of the bulk electric grid.

Internal supply sources and interchange, which is energy imported and exported across interties, are used to serve load across the ISO's balancing authority area. An intertie is an interconnection permitting the flow of electric power (current) between two or more electric utility systems. Figure 1 illustrates how a grid operator must ensure there is adequate supply to serve demand and maintain reliability.

Figure 1: Supply and demand must be balanced to maintain a grid stability. Supply is composed of internal generation and interchange (imports/exports).¹



When an intertie resource receives a market award to import energy into the balancing authority area but does not deliver the awarded energy, the grid operator must maintain system balance by increasing internal supply or finding another intertie resource to import from.

¹ Internal generation includes any supply source internal to the ISO balancing authority area and includes demand response or other energy sources that do not require rotating mass.

3.1 Interties, Market Timing, and E-Tagging

Intertie resources can submit bids and receive energy awards in both the day-ahead and real-time markets. Because intertie resources can submit bids indicating a price at which they are willing to buy or sell energy, it is expected if awarded in the day-ahead and real-time market, intertie resources will accept the award and deliver the awarded energy.

The tariff defines intertie resources as “system resources”, which can be associated with a specific generator or a balancing authority area’s portfolio of generating resources. A **system resource** is a group of resources, single resource, or portion of a resource located outside of the CAISO balancing authority area. System resources are categorized as dynamic or non-dynamic. A **dynamic system resource** is a type of system resource that is tied to a specific generator and has contractual agreements to respond to CAISO market dispatches every 5 minutes in the real-time dispatch. A **non-dynamic system resource** is a system resource that is not capable of submitting a dynamic schedule. It may be a collection of resources and not necessarily tied to a specific generator. Non-Dynamic System Resources are not capable of responding to 5-minute dispatches and instead participate in the ISO’s real-time 15-minute market.

Henceforth, this paper will use the term *intertie resource* instead of *system resource*. Additionally, for clarification purposes, when this paper uses the term *intertie resources*, it refers to non-dynamic system resources because dynamic resources are excluded from the Decline Charge policy because those resources behave similar to internal generators.

Scheduling Coordinators can elect one of several bid options for intertie resources. Intertie resources that are statically scheduled into the ISO (non-dynamic system resources) can bid using the following options²:

Self-scheduled hourly block. An intertie resource bid that is a price taker. A self-scheduled hourly block will be awarded in the hour-ahead scheduling process and settle at the fifteen-minute market locational marginal price. The schedule must remain constant throughout the operating hour and is unable to be dispatched on a fifteen minute basis.

Economic hourly block. An intertie resource bid that specifies a price. The economic hourly block intertie resource will only clear if the bid is economic in relation to the locational marginal price in the hour-ahead scheduling process. The schedule must remain constant throughout the operating hour and is unable to be dispatched on a fifteen minute basis. The schedule is a price taker in the fifteen-minute market and thus settles at the fifteen-minute market price.

² Additional information can be found in the BPM for Market Operations section 7.6.3.2: Treatment of System Resources.

Economic hourly block with intra-hour option. An intertie resource bid that specifies a price. The economic hourly block intertie resource will only clear if the bid is economic in relation to the locational marginal price for the balance of the operating hour. The schedule can only change one time during the operating hour. If the schedule is changed intra-hour, the resource becomes a price taker for the balance of the hour and is settled at the fifteen-minute market locational marginal price.

Economic. An intertie resource bid that specifies a price. The economic hourly block intertie resource will only clear if the bid is economic in relation to the locational marginal price. The schedule can change every fifteen-minute interval as scheduled by the fifteen-minute market.

Economic variable energy resource. A variable energy resource that is economically bid as an intertie resource. The variable energy resource submits a forecast into the scheduling infrastructure and business rules (SIBR) application. The forecast is used to determine the maximum amount that the resource can be scheduled to. The economic variable energy resource schedule can change every fifteen-minute interval as scheduled by the fifteen-minute market.

Market schedules are published at the top of the scheduling hour when a scheduling coordinator bids into the real-time market using the hourly block or intra-hour change option.³ The dispatch is published in the CAISO market results interface (CMRI) application and the automated dispatch system (ADS).⁴ Once the award is published, the scheduling coordinator has approximately five minutes to “accept”, “partially accept”, or “decline” the award. Once the award has been accepted, partially accepted, or declined, the new amount is reflected as the *automated dispatch system accepted value*.

Accept means the award is fully accepted at dispatched value.

Partially accept means the award is accepted at a value below the day-ahead and/or hour-ahead scheduling process award.

Declined means the market award is fully declined and 0 MW will be delivered.⁵

³ Here forward, the term “hourly block” will be inclusive of the intra-hour change option.

⁴ The scheduling hour is defined as the hour prior to the operating hour. For example, if the operating hour ends at 10:00AM (also known as HE10, which corresponds to 9:00AM – 10:00AM), the scheduling hour will end at 9:00AM (ask known as HE9, which corresponds to 8:00AM – 9:00AM).

⁵ For the purpose of this paper, the term “decline” is inclusive of “partially accept” unless specified differently. Generally, the term “decline” refers to a scheduling coordinator not fully accepting an award in the automated dispatch system.

Table 1: Examples for hourly block resources that accept, partially accept, and decline awards in the automated dispatch system.

| Day-ahead market award | Hour-ahead scheduling process instruction | Hour-ahead scheduling process award | Scheduling coordinator action | Automated dispatch system accepted value |
|------------------------|---|-------------------------------------|-------------------------------|--|
| 150 MW | No change | 150 MW | Accept | 150 MW |
| 150 MW | + 50 MW (INC) | 200 MW | Accept | 200 MW |
| 150 MW | - 50 MW (DEC) | 100 MW | Partially accept | 125 MW |
| 150 MW | + 50 MW (INC) | 200 MW | Partially accept | 175 MW |
| 150 MW | - 100 MW (DEC) | 50 MW | Decline | 0 MW |

During the five-minute window, the scheduling coordinator accepts, partially accepts, or declines, the award in the automated dispatch system. If the scheduling coordinator does not respond to the dispatch, the award is automatically accepted at the end of the five-minute window. The scheduling coordinator can call the ISO operator and request the award be manually changed up until T-40.⁶ The scheduling coordinator is then responsible to submit an E-Tag to serve as confirmation of the transaction.

Information contained on an E-Tag is like a receipt. It shows the scheduled energy (in MWs) that a scheduling coordinator agrees to deliver for a specified duration of time. Additionally, an E-Tag contains a physical path detailing how energy will be delivered to a specified location based on transmission purchased by the scheduling coordinator. For example, an E-Tag may depict a 100 MW transaction, sourcing in BPA and sinking in CAISO across the MALIN500 intertie for HE10. In this example, the E-Tag has an energy profile of 100 MW to match the ISO market award; it also has a transmission profile of at least 100 MW to indicate the scheduling coordinator has procured transmission to accommodate the energy transfer. Grid operators verify the scheduling coordinator's E-Tag information to ensure the scheduled energy matches the awarded energy.

The ISO's business practice manual for market operations states an E-Tag must be submitted before T-20 (20 minutes prior to the operating hour).⁷ This requirement is set forth by the North American Energy Standards Board (NAESB). However, the ISO's fifteen-minute market runs 37.5 minutes prior to the operating hour to determine the final market award. Consequently, it is ideal for hourly block E-Tags to be submitted at T-40 because E-Tag data is used as a market input. This allows time for the hourly block

⁶ Reference the CAISO *business practice manual for market operations, Section 7.8.3.1.3: ADS Decline Functionality for Non-Dynamic System Resource Instruction*.

⁷ The CAISO business practice manual for market operations requires E-Tags be submitted no later than 20 minutes prior to the operating interval (T-20). This is in accordance with the E-Tagging specifications maintained by the NAESB. Reference the *business practice manual for market operations, Section 8 - Tagging* for additional information.

E-Tag to be received and processed in advance of the market run. For intertie resources that submit economic bids that can be scheduled in the fifteen-minute market, the E-Tags must be submitted prior to T-40 with a transmission profile that supports the intertie resources bid range. The market uses the transmission profile from the E-Tag to ensure the resource is not scheduled above the lowest external transmission path outside the CAISO.

The ISO receives E-Tags through its interchange transaction scheduler (ITS) system. The ITS system produces a receipt of E-Tags and allows ISO operators to calculate the net scheduled interchange and verify scheduling limits are not exceeded for the upcoming operating hour. The NSI feeds directly into the area control error (ACE), which measures how well the balancing authority area is balancing load and supply. NERC standards are in place to ensure the area control error is appropriately controlled. Therefore, the net scheduled interchange (the total of all E-Tags) is a critical component in maintaining balance between supply and demand and adhering to NERC standards.

3.2 Declined Award

The ISO expects hour-ahead scheduling process awards will be accepted by scheduling coordinator. Scheduling coordinators submit bids, and if the market clears at a price in which the bid is awarded, it is assumed the schedule should be accepted.

Occasionally, however, conditions prohibit a scheduling coordinator from delivering awarded energy such as transmission outages, generation outages, or occasionally economic considerations. When those instances occur, the business practice manual requires the scheduling coordinator to notify the ISO of the un-deliverable energy. Intertie declines are critical information for the ISO operator as they provide additional time for operations to resolve system balance. Scheduling coordinators may notify the ISO through the automated dispatch system or by a phone call to the ISO operator before T-40. When the scheduling coordinator notifies the ISO of the intertie decline in advance, it is more likely that the 15-minute market will have adequate time to economically schedule and/or commit replacement energy. However, insufficient notice of the intertie decline will leave the replacement energy to be resolved by the 5-minute real-time dispatch which does not have the ability to commit additional resources if needed.

Let's assume the following example:

Net scheduled interchange as awarded by the hour-ahead scheduling process = 5,000 MW

Awards accepted by scheduling coordinators = 4,500 MW

Awards declined by scheduling coordinators = 500 MW

Net scheduled interchange used as an input to the fifteen-minute market = 4,500 MW

In this scenario, the scheduling coordinator declined 500 MW at the beginning of the scheduling hour. This enabled the fifteen-minute market to recognize the 500 MW shortage and economically schedule and/or commit additional resources to make up for the discrepancy. Additionally, the balancing authority area operator had adequate time to manually dispatch resources, if necessary.

By itself, a single decline is unlikely to cause operational or reliability problems. Simultaneous declines, however, especially large MW values, can cause operational problems and market inefficiencies. Additionally, when a scheduling coordinator accepts an energy award, but does not submit an E-Tag there are additional operational concerns.

3.3 Undelivered Energy (no E-Tag)

When energy on the interties cannot be delivered, scheduling coordinators should notify the ISO with as much notice as possible. However, not all scheduling coordinators follow the ISO's best practice of declining hourly block intertie awards by T-40. Occasionally, scheduling coordinators do not take action when awards are published in the automated dispatch system – this results in the award being auto-accepted on behalf of the scheduling coordinator. In turn, the market assumes the energy will be delivered.

Let's assume a second example:

Net scheduled interchange as awarded by the hour-ahead scheduling process = 5,000 MW

Awards accepted by scheduling coordinators = 4,500 MW

Awards *automatically* accepted by the automated dispatch system = 500 MW

Net scheduled interchange used as an input to the fifteen-minute market = 5,000 MW

In this scenario, the automated dispatch system automatically accepted 500 MW on behalf of the scheduling coordinator. However, the scheduling coordinator is unable to deliver the energy and did not submit an E-Tag. When this occurs, the fifteen-minute market assumes 5,000 MW will be delivered on the interties because a total of 5,000 MW shows as accepted in automated dispatch system. In reality, only 4,500 MW will be delivered. The undelivered intertie energy (no E-Tag) won't be recognized in the market until the real-time dispatch 5-minute market run.⁸

⁸ The fifteen-minute market will recognize the shortage during the third and fourth intervals of the operating hour. The market timing is discussed more in Section 5.2: Intertie Declines Examples.

Undelivered energy (no E-Tag) on the interties can have serious negative impacts on grid reliability. Once the grid operator recognizes the shortage, the operator is unable to schedule additional energy on the interties due to the NAESB E-Tagging timeline of T-20. It is also too late to manually schedule energy on the interties.⁹ The real-time dispatch will recognize the shortage and dispatch energy, but cannot commit additional resources. As a result, the energy may be expensive or unavailable without emergency actions and could even lead to capacity procurement mechanism (CPM) designations.

For example, if an intertie resource under-delivers by 250 MW, the fifteen-minute market has already run, thus cannot account for this energy. Therefore, the real-time dispatch must dispatch an additional 250 MW. Assuming there are limited internal supply resources available, pricing may increase in order to accommodate the need for an additional 250 MW. Therefore, the 250 MW intertie shortage directly affected pricing throughout the real-time market.

Table 2: Difference between Intertie Decline and No E-Tag.

| Name | Description | Impact |
|---|---|---|
| Intertie decline (or partially accept) | Energy award is declined in the automated dispatch system or via phone call before T-40 | The grid operator is aware the energy will not be delivered and likely has adequate time to economically schedule and/or commit additional energy through the market systems or an exceptional dispatch. |
| No E-Tag | Energy award is accepted but not delivered in real time | The grid operator is <u>un</u> aware the energy will not be delivered until T-20. This energy shortage at the beginning of the ramp for the corresponding interval leaves the operator an extremely limited time to respond and there is potentially very limited resources available for dispatch. This may lead to CPM. |

In summary, the ISO expects all awards be delivered and finds it optimal if there are no intertie declines at all. However, if the full dispatch cannot be delivered, it is better for scheduling coordinators to notify the ISO by T-40. When an award is accepted but an E-Tag is not submitted, there are challenges for the ISO operator and the market.

⁹ Exceptional dispatches on the interties must occur with enough time for the ISO operator to make verbal agreement and the scheduling coordinator to submit an E-Tag.

4. Issue Paper: Decline Charge Policy is Outdated

4.1 Current Decline Charge

In spring of 2007, the ISO experienced an unusually high amount of declines, which led to the ISO's Department of Market Monitoring (DMM) conducting an analysis of the issue. DMM concluded that bidding behavior may have contributed to the spring event. ISO Management then determined the ISO's current tariff provisions did not provide clear guidance on expected bidding behavior or consequences for undelivered import or export bids. Consequently, the ISO conducted the *Charge for Undelivered Import or Export Bids* stakeholder initiative to make tariff provisions clearer.

The ISO determined with stakeholders that a financial charge for declines would discourage excessive declines of pre-dispatched real-time bids from imports and exports. However, because unpredictable events may occur, the decline charge only applies if the scheduling coordinator fails to deliver 10% or more of total intertie transactions (in the import and export directions separately) or 300 MWh, whichever is greater. The total undelivered value is calculated in MWh over the course of a month to determine if the 10% threshold (or 300 MWh, whichever is greater) has been exceeded. If intertie declines are less than 10% of total transactions, no charge applies. If intertie declines are greater than or equal to 10% of total transactions, the market participant is subject to the decline charge. The decline charge is equal to is the maximum of \$10.00 or 50% of the fifteen-minute market locational marginal price per MW that exceeds the 10% threshold.

At the time the policy was implemented, ISO settlement system had no way to distinguish between an intertie decline and a reliability curtailment. It only has visibility to the hour-ahead schedule process schedules and final E-Tag values. Therefore, the total amount of "declines" may also include E-Tags that were curtailed for reliability reasons – curtailments are not the fault of the market participant but still count towards the decline charge. This contributed to the need to have a threshold to determine if the decline charge should apply or not.

At the time the original policy was developed, there was "widespread agreement that there should be a mechanism that discourages market participants from submitting bid that they do not have a reasonable expectation of delivering".¹⁰ Stakeholders disagreed on how the ISO would define "reasonable" through the threshold amount. Some stakeholders criticized the 10% threshold as being too high. They argued a 10% threshold would open the door for speculative behavior and reliability concerns from scheduling coordinators who were currently at a 5% decline threshold. Any threshold above 5%, they argued, would incentivize scheduling coordinators to decline more and negate the intent of the ISO's policy.

¹⁰ Declined Predispatched Intertie Bids – White Paper, 2007:
<http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=561FB99F-13BA-4B61-93EC-FAA77D134A55>

The ISO ultimately decided to use a 10% threshold because it would provide scheduling coordinators sufficient “headroom” to remain below the threshold if conditions outside their control arose.¹¹ It would be the responsibility for the market participant to track monthly their declines and remain below the threshold. Ultimately, the policy balanced limiting the number of declines and ensuring sufficient energy bids were available for reliability.

4.2 FERC Order 764 Impacts

Historically, interchange (imports and exports) bids were scheduled by ISO/RTO’s on an hourly basis. The Federal Energy Regulatory Commission (FERC) issued Order No. 764, which required all public utilities to revise their open access transmission tariffs to include the option of using intra-hour transmission scheduling at 15-minute intervals. The requirement to implement 15-minute transmission scheduling only applied to intertie transactions in organized wholesale energy markets. The California ISO implemented this requirement through the initiative, *FERC Order No. 764 Market Changes*. This initiative also introduced binding 15-minute scheduling and settlement for both internal and intertie resources.

As a result of the *FERC Order No. 764 Market Changes* initiative, the hour-ahead scheduling process no longer determines financially binding locational marginal prices. Prior to Order 764 implementation the hour-ahead scheduling process was binding because it produced a single dispatch and a single price for the entire hour. With FERC 764, hourly pricing was eliminated. Now, the ISO produces prices and settlements for each 15-minute interval.

To accommodate intertie resources that cannot change schedules every 15-minutes, the ISO created an “hourly block” option. This allows intertie resources to keep the same schedule for all four 15-minute intervals. However, the schedule will be individually settled at the fifteen-minute market price for each interval.

At the time of the FERC 764 implementation, the ISO determined no changes to the decline charge were necessary. Since then, the ISO has recognized impacts of undelivered interties. Specifically, the ISO has identified that scheduling coordinators are not delivering awarded energy (no submission of an E-Tag) instead of declining awards at the beginning of the scheduling hour. The ISO analyzed the available data to understand the magnitude and impact of underlived intertie resources. The analysis can be found in [Section 5: Impact of Intertie Declines](#).

¹¹ See *Cal. Indep. Sys. Operator Corp.*, Transmittal Letter to Tariff Amendment to (Both Current and MRTU) to Implement a Charge for Undelivered Import or Export Bids, Docket No. ER8-628-000 (February 29, 2008) at p. 6.

4.3 Energy Imbalance Market

The energy imbalance market (EIM) design does not include intertie bidding. Therefore, EIM is not subject to the decline charge. Reviewing and assessing EIM's current policy for intertie bidding is outside the scope of this initiative.

5. Impact of Undelivered Intertie Resources

This section quantifies the magnitude of undelivered intertie schedules. Additionally, this section provides examples that explain the operational and settlement impacts of no E-Tag submitted as opposed to declined awards by T-40.

Please note, these examples have been simplified for educational purposes. The full settlement of an hourly-block intertie resource and the applicable decline charge (charge code 6455) is included in Appendix A.

5.1 Operational Impacts of Intertie Declines

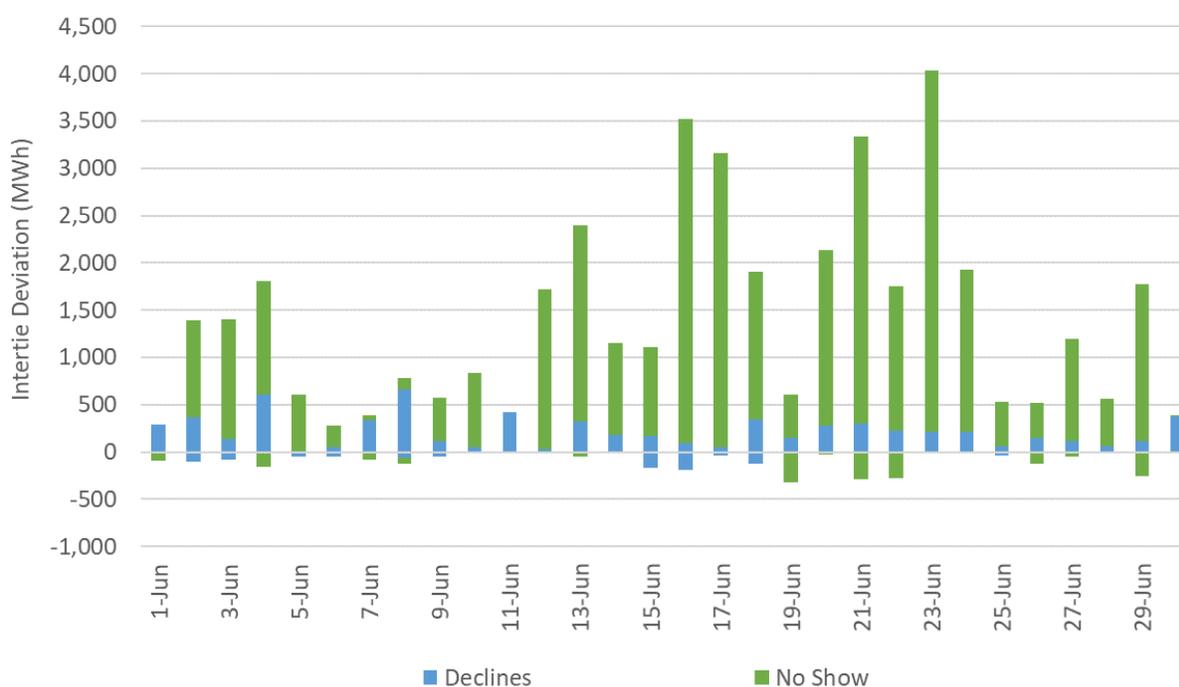
As explained in [Section 3: Background](#), undelivered energy caused by the failure to submit an E-Tag has more significant operational impacts than declining an award in the automated dispatch system prior to the fifteen-minute market run.

Envision the following scenario:

A scheduling coordinator bids into the ISO's real-time market and receives a 500 MW award through the hour-ahead scheduling process. The scheduling coordinator does not take manual action when the schedule is first published and a 500 MW award is automatically accepted by the automated dispatch system. Later in the scheduling hour, the scheduling coordinator decides not to deliver the awarded energy due to economic considerations. Although the award was accepted, the scheduling coordinator does not submit an E-Tag. At this point, the ISO is still anticipating delivery of 500 MW across the interties and will not recognize the shortage until after T-20. At that point, it is too late for the fifteen-minute market to dispatch additional energy on the interties. Instead, regardless of cost, the five-minute market must dispatch 500 MW of supply.

It is a significant operational burden when E-Tags are not submitted for awarded energy on the interties. Operators would prefer to receive advanced notification of the decline **before** T-40 because it would allow operators to dispatch additional energy. As a representative pattern Figure 2 shows the volume of under-delivered intertie resources. The majority of undelivered intertie resources are due to no E-Tag as opposed to a decline in the automated dispatch system by T-40.

Figure 2: Undelivered interties (Declines and no E-Tag) for a representative month of June 2018.



In Figure 2, the green bars are the total MWh of non-delivered intertie awards due to no E-Tag (“No Show”). The blue bars are the total MWh of non-delivered intertie awards due to a decline (or partially accepted award). The data shows the majority of awarded but undelivered energy occurs because the scheduling coordinator fails to submit an E-Tag on time rather than decline the award prior to T-40 in automated dispatch system. Failure to submit an E-Tag results in decreased operational situational awareness and leaves market resolution to the 5-minute real-time dispatch.

5.2 Intertie Declines Examples

The ISO always expects hour-ahead scheduling process awards will be accepted. This is the best outcome for operators and the market. However, if an award cannot be delivered, there is operational benefit to have advanced notification of the intertie decline. That being said, based on the current decline charge, there is an economic incentive not to provide advanced notification of undeliverable energy on the interties.

Since the FERC 764 implementation, the decline charge is more severe when a scheduling coordinator declines an award in advance as opposed to not submitting an E-Tag. This settlement consequence contradicts the ISO's best practice of declining awards in advance to improve situational awareness for the operators as well as improve market outcomes. Additionally, an E-Tag that is curtailed for reliability reasons has the same impact as not delivering an E-Tag even though the scheduling coordinator is not at fault for the discrepancy. These concepts are explained further in the examples below.

Definitions

The following terms have been defined as they relate to intertie transaction, the settlement of intertie transactions, and the decline charge.

Table 3: Settlement terms in relation to intertie deviations and the decline charge.

| Term | Acronym | Definition |
|---|---------|--|
| Total Expected Energy | TEE | Final dispatch instruction. For intertie resources, this is typically the fifteen-minute market binding award. ¹² |
| Instructed Imbalance Energy | IIE | Instructed change between market runs. For interties, this may be the difference between day-ahead and fifteen-minute market awards. |
| Uninstructed Imbalance Energy | UIE | Uninstructed deviation from the real-time market dispatch. Compares the meter value (what was delivered) to the total expected energy (final dispatch instruction). Interties do not have metered values, therefore there is no uninstructed imbalance energy for generic intertie system resources. ¹³ |
| Operational Adjustment | OA | Comparison of the E-Tag's final energy profile to the total expected energy. ¹⁴ |
| Fifteen-Minute Market Undelivered Quantity | | Difference between hour-ahead scheduling process and fifteen-minute market schedules that are not the result of an economic dispatch. ¹⁵ |

¹² If an intertie resource is exceptionally dispatched, the TEE will be the exceptional dispatch instruction instead of the FMM binding award.

¹³ Dynamic intertie resources are tied to metered data and therefore are settled for UIE.

¹⁴ OA is settled under IIE. Even though the E-Tag may differ from the FMM instruction at the fault of the Scheduling Coordinator (could be considered "uninstructed"), there was originally no way to distinguish between instructed and uninstructed changes. Because an E-Tag may be curtailed for reliability reasons by the grid operator, the ISO elected to categorize OA as Instructed Imbalance Energy.

¹⁵ For economic hourly blocks, clearing HASP is economic over the hour. Therefore, any changes that result in the FMM are due to tagging changes and are considered the Undelivered Quantity.

| | | |
|---|--|---|
| Decline Charge | | A charge applied to market participants if the total fifteen-minute market undelivered quantity over the course of the month exceeds 10% of total intertie transactions for the corresponding month. |
| Hour-Ahead Scheduling Process Clawback | | A penalty applied if the E-Tag energy profile at T-45 does not match the corresponding day-ahead market award. This incentivizes scheduling coordinators to tag day-ahead market awards and eliminates the need for a day-ahead decline charge. |

Market Timing & Logic

Day-ahead market awards are published and settled at approximately 1PM prior to the trade date. Day-ahead awards are used in the real-time market optimization; therefore, it is critical that the scheduling coordinator submits E-Tag to match the market award. Market awards that are not tagged by T-45 (45 minutes prior to the operating hour) will be subject to the hour-ahead scheduling process (HASP) clawback. The HASP clawback incentivizes delivery of intertie resources that were awarded in the day-ahead market.

Hour-ahead scheduling process awards are published at the top of the scheduling hour. It is expected that energy awarded in the hour-ahead scheduling process will be accepted by the scheduling coordinator. If the scheduling coordinator is unable to deliver the scheduled value, it is his responsibility to partially accept or decline the award in the automated dispatch system. The accepted award is used as an input to the fifteen-minute market. This value is used to clear the fifteen-minute market and determine the appropriate award, which is used for settlement purposes. The fifteen-minute market runs approximately 37.5 minutes prior to the corresponding interval and the results are published approximately 10 minutes after the market run starts.

The fifteen-minute market uses the following logic to determine awards for hourly block intertie resources. It assumes market participants will deliver what has been accepted in the automated dispatch system for the first two intervals of the operating hour. The ADS accepted schedule will become the binding award for interval 1 & 2. For the last two intervals of the operating hour, scheduling coordinators cannot make E-Tag changes. Therefore, the E-Tag value will become the binding award for interval 3 & 4.

Table 4: Market logic used to determine awards for hourly block intertie resources.¹⁶

| FMM Binding Interval of Operating Hour | Time of Operating Hour | RTPD # ¹⁷ | Logic Used to Determine Binding Award |
|--|------------------------|----------------------|---------------------------------------|
| 1 | 00 – 15 | 5 | ADS Accepted Award |
| 2 | 15 – 30 | 4 | ADS Accepted Award |
| 3 | 30 – 45 | 7 | E-Tag energy profile |
| 4 | 45 – 00 | 6 | E-Tag energy profile |

Based on this logic, if an award is automatically accepted by the automated dispatch system, the fifteen-minute will assume the award will be delivered for the first two 15-minute intervals of the operating hour. If in reality the E-Tag is not submitted, it is too late to dispatch additional energy through the fifteen-minute market for those intervals. Thus, the real-time dispatch is forced to make up for the shortage with internal supply and/or dynamic (or pseudo-tie) generators. Therefore, the acceptance of an award on the interties combined with the failure to submit an E-Tag directly impacts the real-time market prices.

Additional information related to the existing Decline Charge can be found in the *Settlements and Billing Configuration Guide - Intertie Schedules Decline Charges CC 6455*:

https://bpmcm.caiso.com/BPM%20Document%20Library/Settlements%20and%20Billing/Configuration%20Guides/HASP-RT/BPM%20-%20CG%20CC%206455%20Intertie%20Schedules%20Decline%20Charges_5.9.doc

¹⁶ Intertie resources with contract rights or transmission operating rights (TOR) can submit an E-Tag any time before T-20 even if there is no bid or market award. Therefore, the fifteen-minute market logic will use the E-Tag value for intertie E-Tags tied to a TOR even if a market award does not exist.

¹⁷ The real-time pre dispatch (RTPD) is the security constrained economic dispatch (SCED) for the fifteen-minute market. It consists of 7 forward looking runs. It starts with RTPD 7, which coincides with the hour-ahead scheduling process run. Each RTPD run gets closer to real-time up until RTPD 1.

Example #1 – Day-ahead market import resource declined

Setup: A resource receives a 100 MW award in the day-ahead market. The scheduling coordinator does not bid into the real-time market, therefore, the award remains at 100 MW. The 100 MW award is *declined* in the automated dispatch system.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 100 MW | 100 MW | 100 MW | 100 MW |
| HASP award | 100 MW | 100 MW | 100 MW | 100 MW |
| FMM binding award | 0 MW | 0 MW | 0 MW | 0 MW |
| eTag | 0 MW | 0 MW | 0 MW | 0 MW |

Settlement: The fifteen-minute market undelivered quantity is 100 MW for intervals 1 – 4. Therefore, 100 MWh is applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 0 MW for all intervals because the E-Tag matches the total expected energy. Additionally, the hour-ahead scheduling process reversal rule would ensure that buy back of the day-ahead schedule is not profitable because there is no E-Tag to match the day-ahead market award.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|---------|
| FMM Undelivered Quantity | 100 MW | 1 – 4 | 100 MWh |
| Operational Adjustment | 0 MW | N/A | 0 MWh |

Summary: The scheduling coordinator notified the ISO in advance of the undeliverable energy. Although intertie declines are not beneficial for the ISO, both the operator and the market are aware of the change and may have time to re-commit internal supply or intertie resources. The scheduling coordinator has 100 MW applied toward the decline charge threshold.

Example #2 – Day-ahead market import resource not tagged

Setup: A resource receives a 100 MW award in the day-ahead market. The scheduling coordinator does not bid into the real-time market, therefore, the award remains at 100 MW. The 100 MW award is *accepted* in the automated dispatch system, but no E-Tag is submitted.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 100 MW | 100 MW | 100 MW | 100 MW |
| HASP award | 100 MW | 100 MW | 100 MW | 100 MW |
| FMM binding award | 100 MW | 100 MW | 0 MW | 0 MW |
| eTag | 0 MW | 0 MW | 0 MW | 0 MW |

Settlement: The fifteen-minute market undelivered quantity is 100 MW for the intervals 3 and 4. Therefore, 50 MWh will be applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 100 MW for intervals 1 and 2 because the E-Tag does not match the total expected energy. This totals 50 MWh of operational adjustment at the real-time dispatch locational marginal price.¹⁸ This resource is also subject to the hour-ahead scheduling process reversal rule.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|--------|
| FMM Undelivered Quantity | 100 MW | 3 – 4 | 50 MWh |
| Operational Adjustment | 100 MW | 1 – 2 | 50 MWh |

Summary: The scheduling coordinator did not notify the ISO in advance of the undeliverable energy. Undelivered intertie resources are never beneficial for the ISO, but the failure to submit an E-Tag to match the corresponding award is even worse than declining an award by T-40. In this case, neither the operator nor the market are aware of shortage for the first two intervals of the operating hour. In comparison to Example #1 however, the scheduling coordinator only has 50 MW applied toward the decline charge threshold. The scheduling coordinator has a smaller MW amount applied towards the decline charge even though the behavior of not tagging creates operational challenges for the ISO.

¹⁸ MW is the unit of instantaneous power at any given moment in time. MWh is a unit of energy, which is defined as power over a specified time – in this case an hour. MWh can be calculated by determining the power (MW) for each 15-minute interval. For example #2, 100 MW was generated for two 15-minute intervals and 0 MW was generated for two 15-minute intervals. Therefore, $(100 * (1/4) + 100 * (1/4) + 0 * (1/4) + 0 * (1/4)) = 50$ MWh.

Example #3 – Real-time market import resource declined

Setup: A resource receives no award in the day-ahead market. The scheduling coordinator bids into the real-time market and is awarded 100 MW. The 100 MW award is *declined* in the automated dispatch system.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 0 MW | 0 MW | 0 MW | 0 MW |
| HASP award | 100 MW | 100 MW | 100 MW | 100 MW |
| FMM binding award | 0 MW | 0 MW | 0 MW | 0 MW |
| eTag | 0 MW | 0 MW | 0 MW | 0 MW |

Settlement: The fifteen-minute market undelivered quantity is 100 MW for intervals 1 – 4. Therefore, 100 MWh will be applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 0 MW for all intervals because the E-Tag matches the total expected energy.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|---------|
| FMM Undelivered Quantity | 100 MW | 1 – 4 | 100 MWh |
| Operational Adjustment | 0 MW | N/A | 0 MWh |

Summary: The scheduling coordinator notified the ISO in advance of the undeliverable energy. The decline of an intertie award is never beneficial for the ISO, but in this case both the operator and the market are aware of the shortage in advance of the fifteen-minute market run. The scheduling coordinator has 100 MW applied toward the decline charge threshold. Declining an award has the same impact and settlement (with the exception of the hour-ahead scheduling process reversal rule) regardless if the award was from the day-ahead or real-time market.

Example #4 – Real-time market import resource not tagged

Setup: A resource receives no award in the day-ahead market. The scheduling coordinator bids into the real-time market and is awarded 100 MW. The 100 MW award is *accepted* in automated dispatch system, but no E-Tag is submitted.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 0 MW | 0 MW | 0 MW | 0 MW |
| HASP award | 100 MW | 100 MW | 100 MW | 100 MW |
| FMM binding award | 100 MW | 100 MW | 0 MW | 0 MW |
| eTag | 0 MW | 0 MW | 0 MW | 0 MW |

Settlement: The fifteen-minute market undelivered quantity is 100 MW for intervals 3 – 4. Therefore, 50 MWh will be applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 100 MW for intervals 1 -2 because the E-Tag does not match the total expected energy. This totals 50 MWh of operational adjustment at the real-time dispatch locational marginal price.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|--------|
| FMM Undelivered Quantity | 100 MW | 3 – 4 | 50 MWh |
| Operational Adjustment | 100 MW | 1 – 2 | 50 MWh |

Summary: The scheduling coordinator did not notify the ISO in advance of the undeliverable energy. The decline of an intertie award is beneficial for the ISO, but by failing to submit an E-Tag neither the operator nor the market are aware of the change. However, in comparison to Example #3, the scheduling coordinator only has 50 MW applied toward the decline charge threshold. The scheduling coordinator has a smaller MW amount applied towards the decline charge even though the behavior of not tagging is less desirable than declining an award in advance of the fifteen-minute market run. Not submitting an E-Tag has the same impact and settlement (with the exception of the hour-ahead scheduling process reversal rule) regardless of the award was from the day-ahead or the real-time market.

Example #5 – Tag submitted for partial amount of award

Setup: A resource receives a 100 MW award in the day-ahead market. The scheduling coordinator bids into the real-time market and is awarded an additional 20 MW. The 120 MW award is *accepted* in automated dispatch system, but an E-Tag is submitted for only 80 MW.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 100 MW | 100 MW | 100 MW | 100 MW |
| HASP award | 120 MW | 120 MW | 120 MW | 120 MW |
| FMM binding award | 120 MW | 120 MW | 80 MW | 80 MW |
| eTag | 80 MW | 80 MW | 80 MW | 80 MW |

Settlement: The fifteen-minute market undelivered quantity is 40 MW for intervals 3 – 4. Therefore, 20 MWh will be applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 40 MW for intervals 1 - 2 because the E-Tag does not match the total expected energy. This totals 20 MWh of operational adjustment at the real-time dispatch locational marginal price.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|--------|
| FMM Undelivered Quantity | 40 MW | 3 – 4 | 20 MWh |
| Operational Adjustment | 40 MW | 1 – 2 | 20 MWh |

Summary: The scheduling coordinator did not notify the ISO in advance that a portion of the energy was undeliverable. This is not beneficial for the ISO; neither the operator nor the market are aware of the change. The scheduling coordinator has a smaller MW amount applied towards the decline charge even though the behavior of not tagging is less desirable than declining an award. Submission of an E-Tag that is only a portion of the accepted award still has operational and settlement impacts.

Example #6 – Tag curtailed for reliability reasons

Setup: A resource receives a 100 MW award in the day-ahead market. The scheduling coordinator bids into the real-time market and is awarded an additional 20 MW. The 120 MW award is *accepted* in the automated dispatch system, an E-Tag is submitted, but the E-Tag is curtailed to 80 MW for reliability reasons.

| | Interval 1 | Interval 2 | Interval 3 | Interval 4 |
|-------------------|------------|------------|------------|------------|
| DA Award | 100 MW | 100 MW | 100 MW | 100 MW |
| HASP award | 120 MW | 120 MW | 120 MW | 120 MW |
| FMM binding award | 120 MW | 120 MW | 80 MW | 80 MW |
| eTag | 80 MW | 80 MW | 80 MW | 80 MW |

Settlement: The fifteen-minute market undelivered quantity is 40 MW for intervals 3 – 4. Therefore, 20 MWh will be applied towards the end-of-month summation to determine if the 10% threshold is exceeded and the decline charge should be applied. The operational adjustment is 40 MW for intervals 1 - 2 because the E-Tag does not match the total expected energy. This totals 20 MWh of operational adjustment at the real-time dispatch locational marginal price.

| Settlement | Quantity | Intervals | MWh |
|--------------------------|----------|-----------|--------|
| FMM Undelivered Quantity | 40 MW | 3 – 4 | 20 MWh |
| Operational Adjustment | 40 MW | 1 – 2 | 20 MWh |

Summary: The scheduling coordinator correctly accepted the market award and submitted an E-Tag. However, the E-Tag was curtailed for reliability reasons. In comparison to Example #5, this example has the same settlement implications. The scheduling coordinator is impacted and has 20 MWh applied towards the decline charge threshold even though the scheduling coordinator was not at fault.

Example #7 – Real-time market export resource partial accepted

Setup: An intertie resource bids into the real-time market as an export (exporting energy out of the CAISO balancing authority area) and is awarded 50 MW. The export resource partially accepts the award to 25 MW. The ISO net schedules intertie resources meaning the summation of import and export resources cannot exceed the scheduling limit. Therefore, an increase of an export enables additional import resources to be dispatched. Because the export resource only partially accepts the award but the import resources fully accept their awards, the ISO exceeds the scheduling limit and must pro-rata curtail all import resources.

| | eTag | DA | HASP | Accepted DOT | Curtailed MW | Final eTag |
|---------------------------------------|----------|-----|------|--------------|--------------|------------|
| Accepted incremental dispatch | Import_1 | 50 | 50 | 50 | 5 | 45 |
| | Import_2 | 100 | 100 | 100 | 10 | 90 |
| | Import_3 | 0 | 25 | 25 | 2 | 23 |
| | Import_4 | 50 | 75 | 75 | 8 | 67 |
| Partial accepted decremental dispatch | Export_1 | 0 | (50) | (25) | 0 | (25) |
| | LIMIT | 200 | 200 | 200 | 200 | 200 |
| | TOTAL | 200 | 200 | 225 | 25 | 200 |

Summary: In this scenario, the partially accepted export in combination with the fully accepted imports resulted in the intertie being net scheduled over its limit. The ISO always expects hour-ahead scheduling process awards to be accepted. Based on that assumption, the partially accepted export resource has caused the intertie to be over scheduled. This results in curtailments to all import resources – even import resources that were scheduled in the day-ahead market and have not made any bidding and/or tagging changes. The curtailment negatively impacts all import resources but does not negatively impact the export resource. The ISO requests stakeholder feed to discuss possible solutions to address this problem.

5.3 Decline Charge Settlement Data

The decline charge is calculated by summing the total fifteen-minute market undelivered quantity (in MWh) over the course of a month. If the total exceeds 10% of total transactions (in the import and export direction individually) the decline charge applies. The price applied is the maximum of \$10.00 or 50% of the fifteen-minute market locational marginal price for each MWh that exceeds the threshold.

The data below summarizes the total decline charge applied to all scheduling coordinators the 2017 calendar year.

Table 5: Total applied decline charge (\$) due to undelivered imports for all scheduling coordinators in 2017

| TRADE_MTH | YEAR | TOTAL DECLINE CHARGE \$ |
|-----------|------|-------------------------|
| January | 2017 | \$1493.08 |
| February | 2017 | \$9095.32 |
| March | 2017 | \$0.00 |
| April | 2017 | \$465.31 |
| May | 2017 | \$1473.40 |
| June | 2017 | \$4041.20 |
| July | 2017 | \$0.00 |
| August | 2017 | \$5886.38 |
| September | 2017 | \$0.00 |
| October | 2017 | \$0.00 |
| November | 2017 | \$66660.26 |
| December | 2017 | \$7933.93 |

Table 6: Total applied decline charge (\$) due to undelivered exports for all scheduling coordinators in 2017

| TRADE_MTH | YEAR | TOTAL DECLINE CHARGE \$ |
|-----------|------|-------------------------|
| January | 2017 | \$0.00 |
| February | 2017 | \$3587.64 |
| March | 2017 | \$11538.94 |
| April | 2017 | \$10648.32 |
| May | 2017 | \$0.00 |
| June | 2017 | \$7779.59 |
| July | 2017 | \$0.00 |
| August | 2017 | \$0.00 |
| September | 2017 | \$10809.45 |
| October | 2017 | \$0.00 |
| November | 2017 | \$0.00 |
| December | 2017 | \$0.00 |

6. Open Items

This section will be used to track open items for discussion at stakeholder meetings and development in subsequent papers.

- Should the ISO's curtailment practice move from hourly to 15-minute granularity? Would 15-minute curtailments impact hourly blocked resources?
- Does the ISO need to receive 15-minute integrated E-Tag information instead of hourly integrated E-Tag information?
- How should the ISO address a declined (or partially accepted) export resource that results in an over-scheduled intertie and requires pro-rata curtailments to import resources?

7. Stakeholder Engagement and Next Steps

Stakeholder input is critical for developing market design policy. The schedule proposed below allows several opportunities for stakeholder's involvement and feedback. At this time, management will only seek policy approval from the ISO Board of Governors. The EIM Governing Body may choose to provide advice on the policy to the Board of Governors.

7.1 Schedule

Table 7 lists the planned schedule for the *Intertie Deviation Settlement* stakeholder process. The ISO proposes to present its proposal to EIM Governing Body and the ISO Board of Governors at the respective March 2019 meetings.

Table 7 : Proposed schedule for the Intertie Deviation Settlement stakeholder process

| Item | Date |
|------------------------------------|-------------------|
| Post Issue Paper | August 15, 2018 |
| Stakeholder Conference Call | August 22, 2018 |
| Stakeholder Comments Due | September 5, 2018 |
| Post Straw Proposal | October 8, 2018 |
| Stakeholder Meeting | October 15, 2018 |
| Stakeholder Comments Due | October 29, 2018 |
| Stakeholder Working Group Meeting | December 10, 2018 |

| | |
|------------------------------------|---------------------|
| Stakeholder Comments Due | December 19, 2018 |
| Post Draft Final Proposal | January 15, 2019 |
| Stakeholder Conference Call | January 22, 2019 |
| Stakeholder Comments Due | January 29, 2019 |
| EIM Governing Body Meeting | March 12, 2019 |
| Board of Governors Meeting | March 27 – 28, 2019 |

The ISO will discuss this paper during a stakeholder conference call on August 22, 2018. The ISO requests that stakeholders submit written comments by September 5, 2018 to InitiativeComments@caiso.com.

7.2 EIM Governing Body Role

The EIM Governing Body has an advisory role over policies that impact the real-time market. This policy impacts the real-time market and therefore the EIM Governing Body “has the right to submit to the Board its advice on” the issue. Please note that the policy changes will be directed only toward settlement rules for intertie bidding for the ISO balancing authority area. The energy imbalance market design does not include intertie bidding and is not subject to the decline charge.

This EIM classification is temporary and may change at any time during the stakeholder process. If any stakeholder disagrees with the ISO’s initial classification, please include in your written comments a justification of which classification is more appropriate.

Appendix A: Charge Code 6455 Example

Hourly Block Example - Charge Code 6455

| | Int 1 | Int 2 | Int 3 | Int 4 | Hrly Total |
|---|----------|----------|----------|----------|-------------|
| DA Sched | 100 | 100 | 100 | 100 | 400 |
| FMM OE | 25 | 25 | 22.5 | 22.5 | 95 |
| Deemed Delivered (Meter) | 122.5 | 122.5 | 122.5 | 122.5 | 490 |
| OA = Meter - DA - FMM OE | -2.5 | -2.5 | 0 | 0 | -5 |
| Hrly HASP Advisory | 125 | 125 | 125 | 125 | 500 |
| FMM Transmission etag (T-20 minutes) | 122.5 | 122.5 | 122.5 | 122.5 | 490 |
| FMM Accept Schedule (ADS) | 125 | 125 | 122.5 | 122.5 | 495 |
| FMM LMP | \$ 25.00 | \$ 30.00 | \$ 20.00 | \$ 15.00 | |
| Binding Energy: | | | | | |
| IMPORT = min(ADS, etag) | | | | | |
| EXPORT = max(ADS, etag) | 122.5 | 122.5 | 122.5 | 122.5 | 490 |
| Expected Flow: | | | | | |
| Hrly HASP Advisory | 125 | 125 | 125 | 125 | 500 |
| Neg OA: | | | | | |
| IMPORT = min(0, OA) | | | | | |
| EXPORT = max(0, OA) | -2.5 | -2.5 | 0 | 0 | -5 |
| Deviation Energy: | | | | | |
| Binding Energy - (Expected Flow + Neg OA) | 0 | 0 | -2.5 | -2.5 | -5 |
| Undelivered Energy/Decline Quantity (basis for BQ): | | | | | |
| IMPORT = min(0, Deviation Energy)*(-1) | | | | | |
| EXPORT = max(0, Deviation Energy) | 0 | 0 | 2.5 | 2.5 | 5 |
| Decline Charge Price: | | | | | |
| max (\$10, FMM LMP * 50%) | \$ 12.50 | \$ 15.00 | \$ 10.00 | \$ 10.00 | |
| Potential Decline Charge = | | | | | |
| Undelivered Energy * Decline Charge Price | \$ - | \$ - | \$ 25.00 | \$ 25.00 | \$ 50.00 |
| Total Hourly HASP Dispatch: | | | | | |
| Abs(Expected Flow + Neg OA) | 122.5 | 122.5 | 125 | 125 | 495 |
| Total HASP Dispatch MTD | | | | | 600 |
| Total Monthly HASP Dispatch | | | | | 1095 |

| | | |
|---|--|------------|
| Threshold Quantity: max(300 MW, Total Monthly HASP Dispatch * 10%) | | 300 |
| Total Undelivered Energy MTD | | 400 |
| Total Monthly Undelivered Energy | | 405 |
| Ratio: max (0, (Total Monthly Undelivered Energy - Threshold Quantity)) / Total Monthly Undelivered Energy | | 0.25925926 |
| Potential Decline Charge MTD | | \$ 500.00 |
| Total Monthly Potential Decline Charge | | \$ 550.00 |
| Intertie Schedules Decline Charge - CC 6455: Total Monthly Potential Decline Charge * Ratio | | \$ 142.59 |