# Bid Cost Recovery Enhancements

## Straw Proposal

**June 3, 2016**

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# 1. Introduction

This paper describes the ISO's evaluation of potential enhancements to the current bid cost recovery (BCR) methodology. BCR payments ensure resources scheduled in the market recover their costs when the market does not provide sufficient revenues to do so. This daily calculation includes bids for start-up, minimum load, ancillary services, residual unit commitment availability, and day-ahead and real-time energy costs. Excessively high bid cost recovery payments can indicate inefficient unit commitment or dispatch. Costs of these BCR payments are funded through uplift costs which are allocated to market participants.

This initiative explores three potential modifications to existing calculations for BCR payments and allocation methods for real-time BCR uplift costs in the ISO markets. Two of the proposed modifications are a result of FERC directed enhancements via the original 2006 FERC order on the ISO's nodal market design. Specifically, in the original 2006 FERC filing process, market participants advocated for:

- real-time bid cost recovery uplift costs to be allocated using a two-tiered allocation approach, similar to IFM and RUC.[1]

- start-up costs (but not necessarily all bid cost recovery costs) to be divided by the total run time of the unit per commitment period even if the run time exceeds the 24 hours of a calendar date.

The last proposed modification in this initiative is in response to stakeholder comments on the Issue Paper. One stakeholder noted the self-scheduling adjustment in the IFM BCR uplift charge calculation is inconsistent with incentives provided through other policies to provide more flexibility via economic bids.

This stakeholder process for Bid Cost Recovery Enhancements initiated with an issue paper exploring stakeholder's positions on a two-tier real-time BCR uplift charge[2]. The issue paper considered complexities of designing a RTM two-tier uplift cost allocation for BCR compared to the existing two-tier RUC and IFM cost allocation designs. The scope has expanded to include the two additional BCR items described above.

In compilation, the proposed modifications herein are intended to reduce uplift costs, further align cost allocation with cost causation, and provide an incentive to increase economic bidding.

[1] *See* September 2006 FERC order

[2] *See* Two-tier allocation of real-time bid cost recovery uplift

## 2. Plan for stakeholder engagement

| Item | Date |
|---|---|
| Issue Paper posted | November 24, 2015 |
| Stakeholder call on Issue Paper | December 21, 2015 |
| Issue Paper comments due | January 15, 2015 |
| Straw Proposal posted | June 3, 2016 |
| Stakeholder call | June 21, 2016 |
| Stakeholder comments due | June 28, 2016 |
| Revised straw proposal | August 2016 |
| Draft Final Proposal | September 2016 |
| Board of Governors Meeting | October 26/27, 2016 |

## 3. Background

In September 2006 FERC (Federal Energy Regulatory Commission) conditionally accepted the ISO's proposal to implement the nodal market design, with a directive to implement certain additional market enhancements within three years of implementation.  On April 1, 2009, the ISO commenced operation of locational marginal price based day-ahead and real-time markets. The ISO has since designed and implemented most of those additional elements along with several other significant market enhancements to address evolving needs and further improve the overall market design.   A two-tier allocation of real-time bid cost recovery uplift charges and bid cost recovery for resources operating over multiple days are the two remaining market enhancements from the original FERC order.

In March 2012 and again in March 2014, the ISO filed an extension of time with FERC on the two BCR items discussed above.  In both instances, the ISO had recently implemented significant market modifications and argued for additional time to accurately evaluate a real-time two-tier uplift allocation. In addition, the ISO continued to find the impact of units operating across multiple days to be minimal (2-3 percent of all resource commitments), and stakeholders rated this concern as a low priority.  FERC granted the ISO an extension of time until April, 2014, and then subsequently until April 2017.[3]

The current methodology of calculating and allocating IFM and RUC BCR uplift costs, respectively, are discussed below:

[3] *See* September 2014 FERC order

**IFM BCR** is calculated daily and considers eligible costs[4] and revenues for resources committed through the IFM incurred in a single trade date. If the revenues earned within the trade date are not sufficient to cover incurred costs, the resource is then eligible for a bid cost recovery payment to make the resource whole.

The payments are funded through uplift charges, which are allocated using a two-tiered system. The first tier is allocated to scheduling coordinators based on the portion of their demand, including virtual demand that is not served by self-scheduled generation and/or imports but is served by energy supplied through the market[5].

**RUC BCR** is calculated daily and considers the costs and revenues for resource committed through the RUC process. If the revenues earned within the trade date are not sufficient to cover incurred costs, the resource is then eligible for a bid cost recovery payment to make the resource whole.

The payments are funded through uplift charges, which are allocated using a two-tiered system. The first tier of RUC BCR uplift is allocated to scheduling coordinators based on their net negative ISO demand deviation (load that deviated from the day-ahead schedule) and virtual supply awards. This first tier rate is capped to reflect the amount of RUC bid cost recovery paid per MWh of the RUC energy committed for the trading hour.[6]

**RTM BCR** is calculated daily and considers the costs and revenues for resources committed and/or dispatched incremental to any day-ahead schedules through the real-time markets.

Real-time BCR uplift costs are socialized across beneficiaries of the make-whole payment, thus allocated to load and exports.

The cost causation rationale for allocating IFM BCR uplift costs to a first tier is it is feasible to attribute the portion of cleared demand that is being met by generation committed and scheduled by the market, thus driving BCR costs. Similarly, there is a cost causation rationale for allocating RUC BCR uplift costs to a first tier because it is possible to attribute the volume of procurement driving RUC BCR uplift costs with specific scheduling coordinators' day-ahead market schedules. Consider the situation in which a scheduling coordinator has 100 MW less load clear the IFM than its actual metered load. The ISO forecasts this under-scheduled load in its RUC forecast and the RUC commits 100 MW of generation to make up the difference between demand scheduled in the IFM and the forecast. Consequently, this scheduling coordinator's IFM schedule clearly causes the RUC to procure 100 MW of additional generation and there is a clear basis for this scheduling coordinator to receive a tier 1 allocation of RUC

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[4] Costs include those for start-up, minimum load, transitions, energy, and ancillary services. Commitment costs are only considered for resources which are not self-scheduled or self-committed by the market participant.

[5] This allocation is determined by calculating each
scheduling coordinator's day-ahead scheduled demand less self-scheduled generation
and imports plus or minus any inter-scheduling coordinator trades of IFM load obligation.
The second tier is allocated to load and exports.

[6] *See* CG 6806 RUC Tier 1 Allocation

BCR costs for this 100 MW of under-scheduled load. The market will incur the BCR costs associated with this 100 MW irrespective of what happens in real-time.

However, the link between real-time BCR costs and specific participants' schedules is less clear. For example, while under-scheduled load would tend to cause the real-time market to commit additional generation or increment on-line generation and incur BCR costs, there will usually be other real-time conditions that are at the same time also contributing to BCR costs. For example, there may also be transmission outages or unscheduled flow causing different congestion than modeled in the day-ahead market. The congestion deviation would cause the real-time market to commit the same generation that is needed to serve under-scheduled load.

The remaining paper is organized as follows:

Section 4 discusses stakeholder comments received on the issue paper and modifications made in response to such comments.

Section 5 explains the three modifications considered for BCR.

Section 5.1 discusses potential two-tier real time BCR allocation methodologies along with additional analysis conducted.

Section 5.2 discusses a modification to the tier 1 IFM BCR uplift charge calculation.

Section 5.3 discusses a potential modification to address start-up cost consideration in the BCR calculation for resources operating across multiple trade dates.

Section **Error! Reference source not found.** discusses the next steps for this initiative, including a request for stakeholder comments on the straw proposal.

## 4. Consideration of Stakeholder comments

The proposed modifications consider stakeholder feedback on the Issue Paper, additional data analysis, as well as the cost allocation guiding principles developed in 2012[7]. For additional detail regarding stakeholder comments and ISO responses, please see the stakeholder Comments Matrix in Appendix A of this document.

To support the development of this initiative, the issue paper requested comments from stakeholders regarding the following:

1. ***The merit of the previous proposals for two-tier allocation of real-time BCR uplift included in the appendix of the issue paper. (Recognizing that changes may be necessary to reflect BCR changes made since the time the ISO developed the issue paper.)***

2. ***Alternatives to allocation of real-time BCR uplift, including maintaining the current allocation of real-time BCR uplift to measured demand.***

[7] *See* CostAllocationGuidingPrinciples

3. ***Additional considerations, if any, for determining the appropriate method to allocate real-time market BCR.***

4. ***The scope of additional market data analyses that would be appropriate to assess the benefits of a two-tier allocation of real-time market BCR***

Support for the real-time two-tier uplift allocation methods proposed in the appendix of the issue paper was split amongst the 9 stakeholders who provided comments. Arguments against adoption primarily focused on the complexity of ascribing causation in real-time to a particular activity. Stakeholder comments in support of adoption cited practices by other ISOs/RTOs to track the basis for unit commitment in real-time, along with requests for treatment similar to the RUC tier 1 allocation based on net negative demand deviations. They requested if the ISO were to pursue a two-tiered approach, the contributing factors must be first identified such that cost allocation can be accurately aligned along with a cost benefit analysis.

Stakeholders also requested the ISO conduct additional analysis with the two proposed options as well as with current real-time BCR uplift costs. The ISO conducted additional analysis, as shown in section 5.1.2, on current real-time BCR uplift costs to better inform stakeholders of the primary cost components that make up those costs, as well as correlation between real-time BCR uplift costs and deviations.

In addition to comments related to a two-tiered BCR uplift cost allocation method, SCE noted an additional item that should be considered in this initiative. SCE states there is an inconsistency of creating an incentive to provide economical bids between the day-ahead tier 1 uplift allocation method and the Resource Adequacy Availability Incentive Mechanism (RAAIM). A proposed market design enhancement for the adverse self-schedule incentives is detailed in Section 5.2.

# 5. Straw Proposal

This initiative explores:

1. Modifications to the existing real-time BCR uplift charge allocation;
2. Stakeholder consideration of BCR for units operating across multiple days; and
3. Enhancements to the first-tier allocation of IFM BCR uplift charges.

## 5.1. Two-tier real-time uplift charge allocation

Real-time BCR uplift costs are currently allocated in a single tier to measured demand (i.e. load and exports). The rationale for this allocation is that many factors can cause real-time market BCR and a cost-causation basis for allocating a portion of these costs to a specific subset of the market, other than load, may not be clear. Consequently, these costs are currently allocated to load and exports, which is the portion of the market benefiting from the generation receiving real-time BCR payments.

In contrast, the ISO allocates Integrated Forward Market (IFM) and Residual Unit Commitment (RUC) bid cost recovery uplift costs in two tiers. Tier one of IFM BCR uplift costs are allocated to scheduling coordinators based on scheduled demand, including virtual demand not served by self-scheduled generation and/or imports. Tier one RUC BCR uplift costs are allocated to scheduling coordinators based on their net negative ISO demand deviation (load that deviated from day-ahead schedule) and virtual supply awards.

The link between real-time BCR uplift costs and specific scheduling coordinators' schedules is less clear. Developing a method for allocating real-time BCR uplift costs in two tiers will require the ISO and stakeholders to carefully consider the causes of real-time BCR relative to the design of the tiers, while also evaluating the cost allocation guiding principles.

### 5.1.1. Regulatory review

In an effort to better inform the ISO and stakeholders, Table 1 below summarizes how other ISOs/RTOs allocate uplift costs analogous to the ISOs real-time bid cost recovery uplift costs.

**Table 1 Comparison of make whole payment allocation methods across ISOs/RTOs**

| ISO/RTO | Bid Cost Recovery Mechanism |
|---|---|
| ISO-NE | Four categories of cost recovery payments: economic (first contingency), second contingency protection, costs paid for voltage control, and special constraint resource. Costs for each category of make whole payments are allocated using a single tier to particular load. |
| MISO | Two tier allocation with first tier allocated to market participants that contributed to the cause of unit commitment. Second tier is based on load share. |
| NYISO | Aside from special case resources and local reliability instances, real-time make whole payments are allocated pro-rata to load. |
| PJM | Two-tiered with first tier based on deviations between real-time and day-ahead scheduled quantities of 1) cleared generation offers, 2) cleared incremental offers, and 3) cleared demand and decremental bids. Second tier to real-time demand. |
| SPP | Single tier based on deviations between real-time and day-ahead and/or resource activity that contributed to an uneconomic dispatch. |

### 5.1.2. Data analysis

In response to stakeholder comments on the issue paper, the ISO included additional data analysis to 1) better assess potential benefits with implementing a two tiered approach, 2) determine the proportion of real-time BCR due to commitment costs versus energy costs, and 3) assess the effectiveness of using net negative demand deviations as an indicator for real-time bid cost recovery uplift.

Figure 1 below shows the total monthly real-time bid cost recovery uplift from May 2013 through September 2105 by market. Real-time bid cost recovery uplift accounts for approximately fifty million annually in both 2014 and 2015. Fifty million per year could be considered the estimated benefit of implementing a two-tiered approach.

Comments were received on the Issue Paper requesting clarification regarding the treatment of BCR uplift costs for short-start resources awarded RUC capacity. For non-short start resources awarded RUC capacity, the ISO calculates the related BCR costs through the two-tier RUC allocation process. Short start unit committed in real-time due to awarded RUC capacity receive bid cost recovery costs in real-time market compensation costs.[8]

**Figure 1 Bid cost recovery by market (May 2013 – September 2015)**

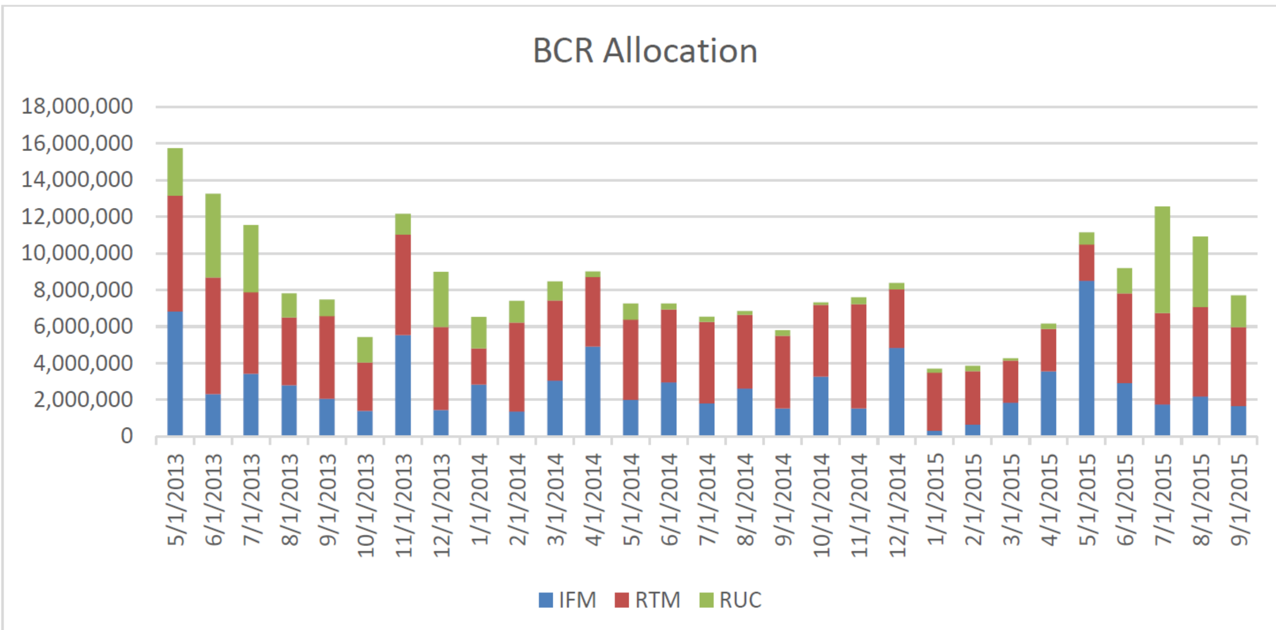
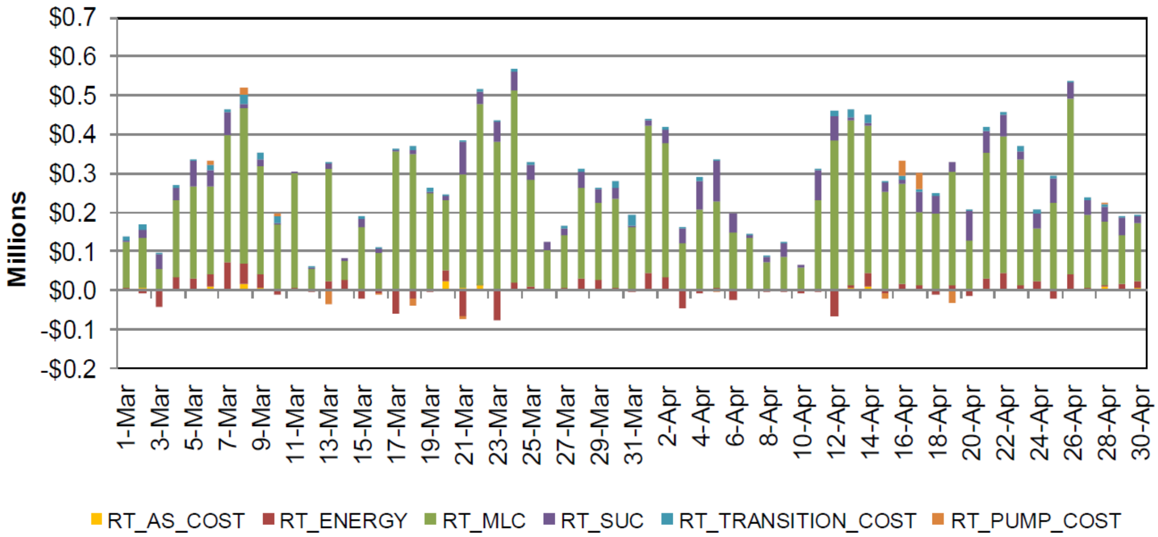



Figure 2 below estimates the portion of real-time bid-cost recovery uplift that is associated with commitment costs versus energy bid costs. This figure shows the daily breakdown for March and April 2016, which is representative of most months throughout the year[9]. As shown below, commitment costs represent a significant percent of monthly uplift. Therefore structuring the first tier based on causes of unit commitment in real-time would align allocation with cost causation.

[9] This figure is produced monthly by the CAISO in the Monthly Market Performance Reports http://www.caiso.com/Documents/MarketPerformanceReportforApr2016.pdf

**Figure 2 Real-time bid cost recovery by cost type (March – April 2016)**




The ISO included two options in the Issue Paper as potential methods for a two-tier real-time bid cost recovery uplift allocation. The first was based on net negative uninstructed imbalance energy, which includes both under scheduled load and over scheduled generation, the second option was based on net negative demand deviations, which is metered load above day-ahead scheduled load. The concept in both methods being that the uninstructed imbalance energy, whether on the load or generation side, contribute to real-time bid cost recovery uplift. Figure 3 and Figure 4 below show the correlation between real-time bid cost recovery uplift with net negative demand deviation and uninstructed imbalance energy respectively. There does not appear to be a strong correlation between deviations and real-time bid cost recovery uplift. Furthermore, real time unit commitment is driven primarily by differences between two market runs that conduct unit commitment, and that were not reflected in the day-ahead market, as opposed to deviations. Therefore, the ISO is no longer considering a two tiered allocation approach based solely on deviations.

**Figure 3 Net negative deviations vs real-time bid cost recovery uplift (Oct 2014 – Apr 2016)**

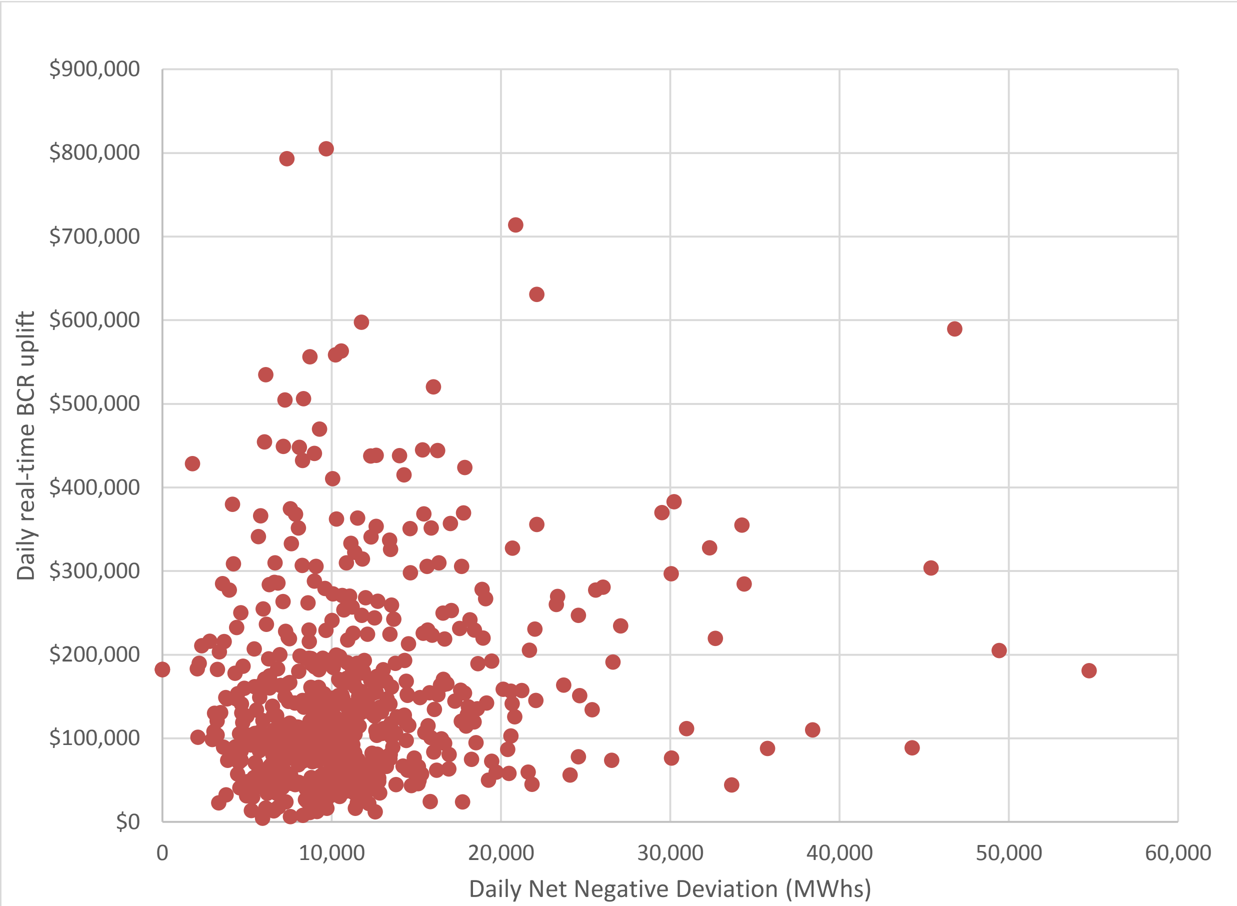
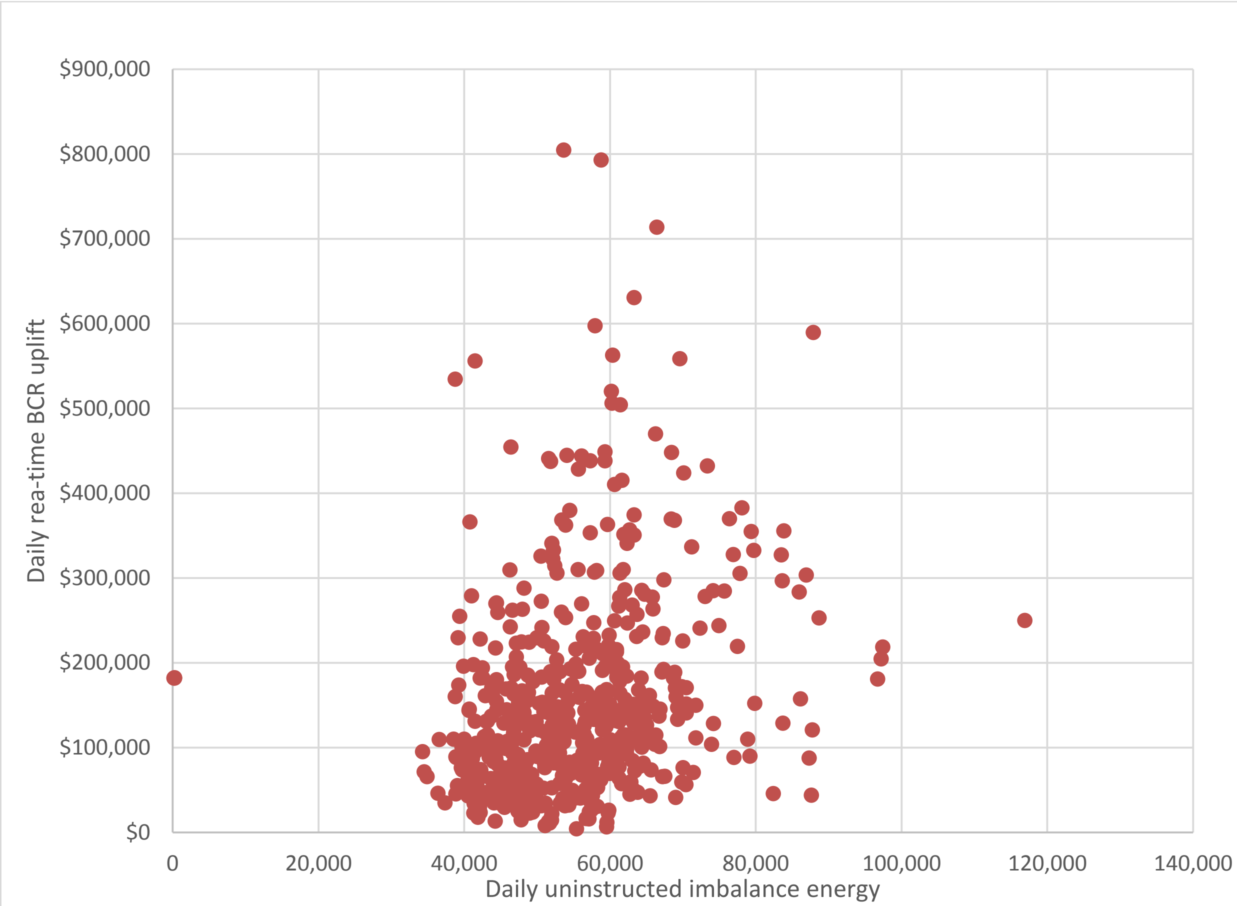


**Figure 4 Uninstructed imbalance energy vs real-time bid cost recovery uplift**




### 5.1.3. Two Tier 1 real-time BCR allocation method

Allocating costs based on cost-causation is one the ISO's cost allocation guiding principles. To achieve such an objective for real-time bid cost recovery uplift costs, the ISO and stakeholders must first identify these cost's primary contributing factors. Commitment costs comprise the majority of real-time BCR uplift costs, therefore the primary factors are those that result in the market having to commit additional resources in real time.

Resources are committed in real time in the 15-minute granularity real-time unit commitment (RTUC) run. Therefore any increases in load or decreases in supply from either the previous unit commitment run or day-ahead process may result in additional real-time unit commitment. The ISO has identified the following contributing factors for real-time unit commitment, and thus real-time BCR uplift costs:

- Changes in load forecast between two RTUC market runs that was not reflected in the day-ahead market.
- Changes in VER forecasts between two RTUC market runs that was not reflected in the day-ahead market.

- Outages of resources with a day-ahead schedule that was not reflected in the previous RTUC market run.
- Changes in net import positions between the two hour-ahead scheduling processes that was not reflected in the day-ahead market[10].
- Transmission outages/de-rates.
- Congestion management.
- Generation deviations.

Transmission outages/de-rates and congestion management cannot be linked to a specific scheduling coordinator and therefore would not be included in the first tier allocation methodology. When a generator is deviating below its real-time market dispatch in one interval, the market will dispatch it in the subsequent real-time interval from its actual position. The market will continue to reflect the lower operating point rather than from where the generator should be operating at based on its dispatch instruction from the previous interval. Therefore generation deviations are not a primary factor to real-time unit commitments contributing to real-time BCR uplift costs.

The concept that differences between two RTUC runs is what drives market costs, as opposed to deviations, is one that was explored under the Flexible Ramping Product's (FRP) allocation of costs due to uncertainty movement. FRP will procure additional ramping capacity from resources to cover potential ramping needs that were not forecasted in the binding market runs, resulting in uncertainty movement costs. Similarly, RTUC may need to commit or re-dispatch resources due to unforeseen changes in either load or supply, resulting in real-time BCR uplift costs. While FRP uncertainty movement costs are associated with energy bid costs, real-time bid cost recovery uplift costs are primarily comprised of commitment costs. Therefore, it would be reasonable to allocate uplift costs associated with commitment costs in a similar manner as the uplift costs associated with energy costs procured for uncertainty movement under FRP.

As noted above, there are several similarities between the uncertainty costs under Flexible Ramping Product and real-time bid cost recovery uplift costs. The allocation of FRP uncertainty costs align with cost causation, which is the objective of implementing a two-tiered real-time BCR cost allocation. Therefore, the ISO would allocate real-time BCR uplift costs with a similar structure as the FRP uncertainty movement costs.

Real time bid cost recovery uplift costs will be allocated on a daily basis to recognize the fact that a resource committed in one interval may be addressing an issue for an interval later in the day as a result of the RTUC look out horizon. A daily allocation will then allocate BCR costs

[10] The ISO did consider basing the difference on day-ahead and fifteen minute net import positions, but that would provide a disincentive for market participants to offer flexibility across the interties in the FMM.

associated with the resource commitment to all causations that may have potentially resulted in the need for the market to commit another resource.

The list of contributing factors can be categorized into load, supply, and interties. Therefore BCR uplift costs under Tier 1 will first be allocated to three categories; load, supply, and interties. The costs within each category will then be allocated to scheduling coordinators using a different billing determinant methodology for each category.

The allocation of costs into the three categories will be conducted by 1) determining the allocation quantity (MWhs) of the three categories, and then 2) determining the rate at which to charge the allocated quantity.

***Determination of allocation quantity***

Quantity allocated to the load category will be based on differences of forecasted load between the current and previous binding RTUC intervals that was not reflected in RUC[11]. The daily summation will only include positive interval quantities, indicating the differences in forecasted load increased, thus contributed to the need for additional unit commitment(s).

Load allocation quantity =

$$\sum Max\left(0,\left(\left(LoadRTUC_{h,i} - LoadRUC_{h,i}\right) - \left(LoadRTUC_{h,i-1} - LoadRUC_{h,i-1}\right)\right)\right)/4$$ [12]

Where

$LoadRTUC_{h,i}$ is forecasted load in RTUC for interval i of trade hour *h*.

$LoadRUC_{h,i}$ is forecasted load in RUC for trade hour *h* of interval *i.*

$LoadRTUC_{h,i-1}$ is forecasted load in RTUC for interval *i-1* of trade hour *h*[13].

$LoadRUC_{h,i-1}$ is forecasted load in RUC for trade hour h of interval *i-1*.

Quantity allocated to the supply category will be based on the summation within each interval of 1) VER forecast differences between the current and previous binding RTUC intervals that was not reflected in RUC, and 2) positives differences between the resource's RTUC schedule from the previous interval and RTUC upper operating limit in the current interval[14]. The adjustment for upper operating limit relative to day-ahead and fifteen minute schedules is intended to capture the impact a resource outage has on real-time unit commitment when the outage is submitted any time after the day-ahead market closes and during the trading day. The daily summation will

[11] Differences in RUC load forecasts will only impact the calculation across hours since RUC load forecasts are hourly.
[12] Dividing the summation by four to convert fifteen minute load values into MWhs
[13] If interval *i* is the first interval of a trade hour, then hour h associated with interval *i-1* will be *h-1*
[14] For interval 1 of trade hour 1, it will be the difference between the day-ahead schedule for HE1 and RTUC upper operating limit for HE1 interval 1.

only include intervals with positive values, indicating supply for the given interval decreased from RUC, day-ahead, and/or previous RTUC market run, thus contributed to the need for additional unit commitment(s).

Supply allocation quantity =

$$\sum\left(\left(\max(0,\sum_{r}\left(VERRTUC_{r,h,i}-VERRUC_{r,h,i}\right)-\left(VERRTUC_{r,h,i-1}-VERRUC_{r,h,i-1}\right)\right)/4)+\left(\sum_{k}\max(0,(RTUCSched_{k,h,i-1}-RTUCUOL_{k,h,i}\right)\right)$$

Where

| | |
|---|---|
| $VERRTUC_{r,h,i}$ | is the VER forecast in RTUC of resource *r* for trade hour *h* and interval *i*. |
| $VERRUC_{r,h,i}$ | is the VER forecast in RUC of resource r for trade hour *h* of interval *i*. |
| $VERRTUC_{r,h,i-1}$ | is the VER forecast in RTUC of resource *r* for trade hour *h* of interval *i-1* |
| $VERRUC_{r,h,i-1}$ | is the VER forecast in RUC of resource *r* for trade hour *h* of interval *i-1* |
| $RTUCSched_{k,h,i-1}$ | is the RTUC schedule of resource *k* for trade hour *h* of interval *i-1* |
| $RTUCUOL_{k,h,i}$ | is the upper operating limit in the RTUC of resource k for trade hour *h* of interval *i* |

Quantity allocated to the intertie category will be based on the differences of net import position between the current and previous HASP that was not reflected in day-ahead. The daily summation will only include hourly differences where net import position decreased in HASP relative to day-ahead, thus contributing to the need for additional unit commitment(s). The ISO is proposing to use HASP schedules as opposed to fifteen minute schedules because there would be a disincentive to provide flexibility in the fifteen minute market.

Intertie allocation quantity = $\sum Max(0,(DANetimp_{h}-HASPNetimp_{h})-(DANetimp_{h-1}-HASPNetimp_{h-1})$

Where

| | |
|---|---|
| $DANetimp_{h}$ | is the day-ahead net import position of hour *h* |
| $HASPNetimp_{h}$ | is the HASP net import position of hour *h* |

$DANetimp_{h-1}$ is the day-ahead net import position of hour *h-1*

$HASPNetimp_{h-1}$ is the HASP net import position of hour *h-1*

***Determination of rate***

Each MWh for each bucket will need to be charged a rate to determine the total real-time BCR uplift cost to be allocated in that bucket. A rate cap is an optional element to an allocation process and is used to protect market participants from excessive BCR uplift costs due to small billing determinant quantities. A rate cap may be more appropriate with more granular allocation, i.e. hourly allocation as opposed to daily allocation. Or when there are other factors contributing to real-time bid cost recovery uplift costs that are not captured in the first tier allocation, i.e., congestion management. As noted above, the ISO is proposing a daily allocation, therefore a rate cap may not be a necessary element of the design. If the ISO were to implement a rate cap with a two-tiered real-time BCR uplift cost allocation methodology it would be based on the quantity of MWhs associated with resources committed in real-time. The second formulation below represents the proposed rate cap. Therefore, the rate at which to charge each allocated MWh in the three categories will be determined by the minimum of:

Total daily RTM BCR Cost/ ∑Tier 1 Quantity, and

Total daily RTM BCR Cost/∑(BCRPmin/4)

Where

Tier 1 Quantity is the summation of allocated quantities in the three categories, load, supply, and interties, as determined above

BCRPmin is the summation of minimum load of resources committed in real-time and eligible for RTM BCR for commitment costs for each interval the resource was committed.

In the event a rate cap is not included in the design, all real-time BCR uplift costs will be allocated through the Tier 1 methodology.

***Allocating RTM BCR costs within each category***

The total BCR cost to be allocated within each category is determined by the product of allocated quantity and rate. Each categories' costs will be allocated daily as follows:

Load is allocated to each SC based on the pro-rata share of net negative demand deviations over the day. There is no netting between settlement intervals.

Supply is allocated by calculating positive differences between fifteen minute VER forecast differences and corresponding RUC forecast differences for VERs (∆VER), and positive differences between day-ahead schedules and upper operating limit in RTUC for non-VERs (∆UOL), plus UIE. Each resource is allocated its pro-rata share of gross (∆VER+∆UOL+UIE) over the day. Uninstructed imbalance energy is including to provide dispatchable resources and incentive to follow dispatch instructions. If deviations persist, a resource may no longer be able to meet previous advisory schedules such that RTUC must commit another resource.

Intertie category is allocated to each SC based on the pro-rata share of gross operational adjustment over the day.

***Tier 2***

Remaining real-time BCR uplift costs not allocated under Tier 1 will be allocated to those entities benefiting from the additional generation, i.e., load and exports.

#### 5.1.4. Consideration of continue existing single-tier allocation

The second option for real-time BCR uplift cost allocation is to maintain the status quo and allocate to load and exports. While allocating similar to the FRP methodology aligns with cost causation, there are other factors and cost allocation guiding principles that need to be evaluated.

Real-time BCR uplift costs for 2014 and 2015 were $52 million per year and $49 million per year, respectively.  Real-time uplift costs could significantly decrease with the implementation of Flexible Ramping Product (FRP). Short start, fast ramping resources are those likely to be currently held out of merit to provide ramping capability. Thus, candidates for receiving RTM BCR payments as the energy prices do not compensate for the ramping need. FRP will provide a revenue stream for capacity held to meet ramping needs, thus a decrease in real-time BCR uplift costs. A quick analysis of 2015 real-time BCR indicates $25 million was BCR payments made to fast ramping[15] resources that can be committed in real-time, based on start-up time. Therefore, the $50 million per year benefit of implementing a two-tiered allocation approach could be significantly reduce[16]. At this time, the ISO does not have the ability to conduct further analysis evaluating FRP impact on real-time BCR uplift costs until market data becomes available.

In addition, the allocation approach described in Section 5.1 will likely continue to allocate a majority of costs to load. This would ultimately result in minimal change between the current single tier and proposed two-tiered allocation methods. To the extent a two-tried allocation approach continues to allocate the majority of costs to load, the benefit associated with allocating costs based on cost-causation is further reduced.

Currently, supply is not allocated real-time BCR uplift costs. However, under the proposed two-tiered method, supply will be allocated BCR uplift costs. This may result in generators pricing the risk of incurring additional costs into energy bids, thus increasing energy prices. Load would

[15] A resource with a ramp rate greater than or equal to 15MW/min is considered “fast” ramping in this analysis, which is a conservative assumption.
[16] A more accurate estimate of the impact FRP will have on RTM BCR cannot be determined until a few months after FRP implementation.

then see an increase in energy costs, which may more than offset any reduced allocated BCR uplift costs under the two-tiered approach.

Lastly, FRP allocation methodology could be considered a "pseudo" tier one allocation of current real-time BCR uplift costs. As previously noted, short start, fast ramping resources currently receiving real-time BCR payments will likely be those awarded flexible ramping capacity. To the extent the capacity is reserved for uncertainty movement, the cost associated with that capacity, which may be currently included in real-time BCR, will be allocated via the FRP uncertainty movement allocation process. This would ultimately result in an uplift cost shift from real-time BCR to FRP uncertainty movement; the FRP uncertainty movement costs will then be allocated based on cost causation.

The currently estimated benefit of $50 million per year have the potential to be significantly reduced. In addition, the portion of BCR that is reduced may, in the end, be allocated based on cost-causation principles under FRP uncertainty movement. Therefore implementing a two-tiered approach may not align with "rational" cost allocation guiding principles as the benefits may be minimal, if not outweighed, by the costs.

#### 5.1.5. Stakeholder feedback

The ISO seeks stakeholder feedback on the two-tiered allocation approach discussed in section 5.1, or maintaining the current single tier allocation for real-time BCR costs. Specifically, the ISO is seeking input and comments on:

- Consideration of allocating real-time BCR in a structure similar to FRP, and proposed methodology.
- Consideration of a rate cap in the two-tiered approach.
- Potential benefits of implementing a two-tiered real-time BCR allocation methodology given the current $50 million/year real-time BCR costs, along with the impact FRP may have on estimated benefits. .
- Costs associated with implementing a two-tiered real-time BCR allocation methodology relative to the benefits.
- Consideration of maintaining status quo until such a time where the real-time BCR uplift costs, post FRP, warrant implementing a two-tiered approach.

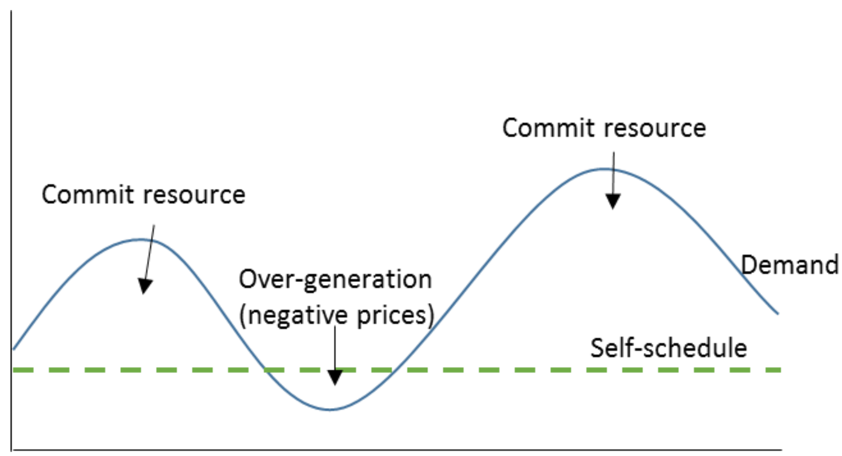
### 5.2. IFM Tier 1 uplift cost allocation modification

The first tier of IFM BCR uplift is allocated to scheduling coordinators based on the portion of their demand that is not served by self-scheduled generation and/or self-scheduled imports but is served by demand, including virtual demand supplied through the IFM. This allocation is determined by calculating each scheduling coordinator's day-ahead scheduled demand less self-scheduled generation and imports plus or minus any inter-scheduling coordinator trades of IFM load obligation. The rationale for the first tier's allocation is that the demand allocated the first tier costs is the portion of the demand causing commitment costs; it is the demand using generation committed and scheduled by the market, rather than using its own self-scheduled generation or imports.

Given the increasing need for flexibility, self-scheduled generation and imports may be contributing to, rather than minimizing, commitment of other resources. Thus the historical rationale for providing this adjustment based on self-schedules may be outdated.

Figure 5 below illustrates how self-scheduled generation and imports may be contributing to commitment of other resources. Assume the resource is self-scheduled across the day. The market will then have to commit a resource to help meet the first peak, shut the resource down to prevent over-generation, and then commit another resource to help meet the second peak. To the extent the self-schedule contributes to over-generation during the "belly of the duck", this will result in lower, possibly negative, energy LMPs, which can also increase bid cost recovery payments. Had the resource not self-scheduled, the market may have been able to commit a more optimal mix of flexible resources, further reducing overall market production costs.

**Figure 5 Illustration of self-scheduling contributing to bid cost recovery payments**




The ISO is considering to modify the IFM tier 1 uplift cost allocation by eliminating the generation and import offsets provided by self-schedules. The current practice may provide an adverse behavioral incentive for market participants to self-schedule resources to avoid uplift charges, and is inconsistent, as noted by SCE, with the ISO's efforts to incentive economic bidding. Given the advancing needs for flexible grid operation, the ISO questions the rationale that resources providing their own generation and imports through self-schedules reduce the demand for generation scheduled by the market. Eliminating the adjustment of self-schedules in the Tier 1 IFM BCR uplift cost allocation would further align this allocation with the ISO's goal of encouraging generators to provide flexibility through market changes.

At this time, the ISO is seeking stakeholder feedback on this proposed modification to the first tier of IFM BCR uplift cost allocation methodology.

## 5.3. BCR for units operating across 24-hour periods

Under the ISO tariff, a resource's eligibility for BCR is determined based on the resource's commitment and dispatch during a given day. As previously noted, bid cost recovery ensures a resource is made whole within the trade date, therefore bid cost recovery payments are calculated daily. If a resource operates across different trade dates, two bid cost recovery calculations are conducted for the same commitment period; each daily calculation only considers the costs and revenues incurred during hours within the trade date for which the BCR calculation is being conducted.

Most costs considered in the BCR calculation and all revenues, are incurred hourly or more granular. Therefore conducting a daily calculation based on hourly costs and revenues is an accurate representation of a resource's overall revenue shortfall. The one exception is start-up costs, which are incurred once for every commitment period. The ISO currently does not spread the start-up costs over multiple hours or days; nor does it account for revenues outside of the 24 hour period in which a unit was committed and could be used to offset the one-time start-up cost incurred for that commitment period. Therefore, the current consideration of start-up costs in the bid cost recovery calculation could result in inflated payments, and thus uplift charges.

Consider a resource that is committed in hour 23 of trade day 1, and operates into hour 2 of the following trade day, trade day 2. Assume the resource is dispatched as indicated in Table 2 below, and receives the hourly revenues shown in row 4. Across the commitment period, the resource incurred $14,000 in costs and earned $13,000 in revenues. In total, the resource is short $1,000.

Currently, the BCR calculation would apply the minimum load cost of $2,000/hr to each hour the resource is committed, whereas the start-up cost, $6,000/start, is only applied to hour 23. On trade day 1, the current BCR calculation would show $10,000 in costs, which are partially offset by the $7,500 in energy revenues. The resource would receive a bid cost recovery payment of $2,500 on trade day 1. On trade day 2, the current BCR calculation would show $4,000 in costs which are more than fully offset by the $5,500 of energy revenues, thus no BCR payment. In trade day 2 the resource profited $1,500 but the additional revenues earned where not considered as offsetting revenues towards the start-up costs incurred on trade day 1.

A potential solution, which is illustrated in rows 8-10, evenly distributes the start-up cost to each hour of the commitment period. In this example, each hour would then have a start-up cost of $1,500/hr in the BCR calculation. This resource would incur $7,000 in costs on the first day, which are fully offset by the revenues, and thus no BCR payment. The second day would have $7,000 in costs, which would be partially offset by $5,500 in revenues, resulting in a BCR payment of $1,500.

**Table 2 Example of BCR calculation for resource operating across two trade dates**

| Row # | | Trade Day 1 | | Trade Day 2 | |
|---|---|---|---|---|---|
| 1 | Trade hour | 23 | 24 | 1 | 2 |
| 2 | Dispatch | 100 | 100 | 100 | 100 |
| 3 | Energy LMP | $ 40 | $ 35 | $ 30 | $ 25 |
| 4 | Revenues | $ 4,000 | $ 3,500 | $ 3,000 | $ 2,500 |
| ***Current cost consideration and BCR calculation*** | | | | | |
| 5 | Minload cost | $ 2,000 | $ 2,000 | $ 2,000 | $ 2,000 |
| 6 | Start-up cost | $ 6,000 | | | |
| 7 | Daily BCR | **$ 2,500** | | **$ -** | |
| ***Proposed cost consideration and BCR calculation*** | | | | | |
| 8 | Minload cost | $ 2,000 | $ 2,000 | $ 2,000 | $ 2,000 |
| 9 | Start-up cost | $ 1,500 | $ 1,500 | $ 1,500 | $ 1,500 |
| 10 | Daily BCR | **$ -** | | **$ 1,500** | |

Distributing the start-up costs evenly across the hours of the unit commitment period would enable the BCR calculation to account for revenues incurred in the second trade date of a commitment period as revenues eligible to cover start-up costs. This modification could reduce BCR payments and uplift costs to the extent current BCR payments are inflated by the current consideration of start-up costs.

To assess the potential benefits associated with such a change in BCR payment calculations, the ISO analyzed the quantity of BCR payments made to resources which operated across two trade dates from May 2014 to April 2016. The analysis shows $8.15 million of BCR payments, representing 4 percent of total IFM and RTM BCR payments over the two year period, were made to resources which operated across two trade dates. This represents the maximum potential benefit gained with such a modification. As illustrated above, the BCR payment to the resource decreased from $2,500 to $1,500, whereas this estimated benefit assumes the full $2,500 would be covered by revenues earned on the second trade date.

The ISO finds the potential benefits minimal in comparison to the costs that would be incurred to modify existing settlement systems for both the ISO and market participants. Therefore, at this time, the ISO proposes to retain the current consideration of start-up costs in the BCR payment calculation.

The ISO seeks stakeholder feedback on maintaining the current accounting of start-up costs in BCR calculations.

## 5.4. Next steps

The ISO will discuss this straw proposal with stakeholders on a conference call on June 21, 2016. Stakeholders should submit written comments by June 28, 2016 to initiativecomments@caiso.com.

# Appendix A: Stakeholder Comments Summary

| Topic | Stakeholder | Comments | ISO Response |
|---|---|---|---|
| Merit of proposed two-tiered options | NCPA | Of the two options, NCPA finds allocating based on net negative uninstructed deviations to be more appropriate of the two options in the issue paper, but supports the current methodology. | The ISO has re-evaluated the original proposed methods under the current market structure and conditions. Unit commitment in real-time occurs due to differences between two RTUC processes and/or day-ahead and RTUC market run. Given that the majority of real-time BCR uplift costs are due to commitment costs, the ISO is pursuing a method that attempts to allocate based on reasons for unit commitment rather than solely based on the need for incremental or decremental energy. |
| | SWP | Prefer the first option of allocating based on the need for incremental and decremental energy in real-time. Believes Unaccounted for Energy be included in socialized demand under tier 2. | |
| | NRG | In order to determine whether proposal 1 or 2 is preferable, the CAISO should provide information on the relative costs of RT BCR uplift associated with incremental and decremental energy. | |
| | Six Cities and SWP | Note that the reliance on the ISO's October 9, 2008 issue paper may not provide a complete analysis of either option under current conditions. The change of resources, in particular, may render the 2008 assessments outdated. | |
| | NRG, Six-Cities, SWP, SCE, PG&E | The precise causes of uplift costs need to be clearly defined and explained to ensure equitable allocation. | Data analysis shows the majority of real-time BCR uplift costs are due to commitment costs. In this straw proposal, the ISO has identified the primary contributing factors to unit commitment in real-time. |
| Maintaining current allocation method | NCPA, WPTF, and NRG | Supports the current methodology for allocating RT BCR uplift costs based on measured demand. WPTF and NRG note the difficulty of assigning costs to the cost causers for RT BCR. | The ISO agrees it would be challenging to accurately identify the exact reason each resource is committed as the market optimization may commit resource(s) for multiple reasons that occur simultaneously. |

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| Analysis | Calpine, SCE, WPTF | Requested clarification as to whether units that were awarded in RUC but not issued a binding commitment would fall into the RUC BCR or the RT BCR bucket. | As clarified in the straw proposal, BCR costs for non-short start resources awarded RUC are allocated through the RUC allocation process. Short start resources committed in real-time due to awarded RUC capacity have BCR costs included in real-time allocation process. |
| | SCE | Requests a detailed breakdown of RT BCR cost components into start-up costs, minimum load costs, and energy bid costs, to better inform stakeholders. | ISO has included the most recent Monthly Market Performance Metric with the breakdown of real-time BCR costs. The ISO is continuing to pull data over a longer period of time. |
| | | ISO should conduct a cost benefit analysis of implementing a two-tiered allocation methodology. | The ISO has initiated a discussion in this straw proposal on estimated benefits of implementing a two tiered approach, along with a request for stakeholder feedback on costs that will likely be incurred for their systems to be modified. |
| Additional considerations | PSE | PSE favors the current Balancing Authority Area level allocations in CAISO's OATT 11.8.3.2. CAISO should provide clarity as to how this section would be affected by a two-tier allocation. | Section 11.8.3.2 is for RUC Market Revenues. At this time, the ISO does not anticipate any changes if real-time BCR uplift costs are allocated via a two-tiered method. |
| | NRG | States that if the ISO were to allocate hourly, a rate cap must be included in the design. | The ISO is now proposing to allocate real-time BCR uplift costs daily and is seeking stakeholder feedback on including a rate cap in the current proposed design. |
| | SCE | Requests the ISO explore inconsistencies between tier 1 IFM BCR cost allocation methodology and RAAIM. Also states hourly allocation is in appropriate given the optimization horizon in real-time. | The ISO has explored this inconsistency in the straw proposal and is currently proposing a modification to the IFM BCR uplift cost allocation methodology. |

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|---|---|---|---|
| | WPTF | Does not support a methodology that would allocate real-time BCR to virtual transactions as that impact is accounted for between IFM and RUC. | The proposed methodology does not include virtual transactions. |