California ISO

Two-Tier Allocation of Real-Time Bid Cost Recovery Uplift

Issue Paper

November 24, 2015

Table of Contents

1. Executive Summary

The ISO market includes bid cost recovery (BCR) rules to ensure resources scheduled in the market recover their costs when the market does not provide sufficient revenues to do so. The costs of these BCR payments are funded through uplift charges. This paper explores developing a two-tier allocation method for real-time market BCR uplift.

Real-time BCR uplift is allocated in a single tier to measured demand. In contrast, the ISO allocates Integrated Forward Market (IFM) and Residual Unit Commitment (RUC) bid cost recovery uplift in two tiers, with the first tier allocated to demand not served by self-scheduled generation, net of negative demand deviations, and virtual bids. Developing a method for allocating real-time BCR uplift 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.

2. Plan for Stakeholder Engagement

The current schedule for this initiative is shown below. The ISO will develop the remainder of the schedule after receiving stakeholder comments.

Milestone	Date
Issue Paper posted	November 24, 2015
Stakeholder call on Issue Paper	December 21, 2015
Issue Paper comments due	January 15, 2015

3. Background

When FERC conditionally accepted the ISO's Market Redesign and Technology Update (MRTU) proposal, it directed the ISO to implement several market enhancements within three years of the date the ISO implemented its nodal markets (i.e., by April 1, 2012), including a two-tier allocation of real-time bid cost recovery uplift. In June 2012, FERC accepted the ISO's motion for an extension of time to complete a comprehensive review of cost allocation principles that would inform an appropriate allocation for the real-time market BCR uplift. In September 2014, FERC again granted the ISO an extension of time to gain experience with market changes that went into effect in May 2014. These market changes included no longer netting together day-ahead and real-time market revenue surpluses and shortfalls, but rather calculating and paying BCR separately for the day-ahead and real-time markets, which increased real-time flexibility and decreased real-time BCR costs. But FERC directed the ISO to begin a stakeholder process addressing two-tier allocation of real-time BCR by the end of November, 2015 and submit any tariff modifications addressing this issue by April 30, 2017.

BCR ensures resources are able to recover their start-up costs, minimum load costs, multi-stage generator resource transition costs, and energy and ancillary services bid costs to the

extent market revenues are not sufficient to cover such costs.[1] A resource may recover start-up costs and minimum load costs if it is committed by the ISO. Likewise, the ISO must economically dispatch a multi-stage generating resource in order for it to receive transition cost compensation. BCR for economic bids of energy and ancillary services applies to BCR eligible resources (e.g. generating units, pumped-storage units, proxy demand resources and resource-specific system resources) scheduled or dispatched by the ISO, independent of whether they are ISO-committed or instead self-committed.

The BCR provisions in the MRTU Tariff submittal explained that the ISO would allocate the BCR uplifts associated with the IFM and the RUC in two tiers, while the ISO would allocate BCR uplifts associated with the real-time market to load and exports. In response to an argument raised by one stakeholder, the Commission concluded that the ISO had not "justified the socialized allocation of real-time uplift costs," and directed the ISO to allocate real-time BCR costs "in a two tier method similar to the day ahead."

The ISO requested a rehearing of FERC's directive on the two-tier BCR allocations, arguing it is impossible to allocate real-time BCR uplift costs in a two-tier method similar to day-ahead BCR costs. FERC granted the ISO rehearing and accepted the single-tier allocation as written, while directing the ISO to work with stakeholders to develop a proposal for two-tiered allocation of real-time BCR costs.

On October 9, 2008, the ISO initiated a stakeholder process to explore two-tier allocation of real-time BCR uplift. This issue paper proposed two options for creating a two-tier real-time uplift charge with tier 1 based on direct cost causation and tier 2 allocated to load and exports. The two options explored two different premises of cost-causation for the first tier's allocation:

1. Scheduling and bidding behavior creating the need for incrementing or decrementing energy in the real-time market that contributes to real-time BCR.

2. Uninstructed deviations in the real-time market and virtual supply clearing in the IFM creating the need for incremental energy in the real-time market that contributes to real-time BCR.

These two options are explained in detail in the 2008 issue paper included as an appendix in this document. The stakeholder process concluded without the ISO pursuing tariff changes for the allocation of bid-cost recovery uplift.

In 2014, the ISO implemented significant market design enhancements, which impacted BCR in both day-ahead and real-time markets. The ISO eliminated the practice of netting a resource's bid costs and revenues across the day-ahead and real-time markets for the same trading day. In addition, the ISO lowered the bid floor from -$30/MWh to -$150/MWh to encourage energy bids in the real-time market and implemented new mitigation measures as a safeguard against inflated BCR and residual imbalance energy payments. The changes created greater real-time

[1] *See* Tariff section 11.8.

flexibility so that the ISO could dispatch resources more economically and reduce rigidities that historically lead to real-time uplift costs.

4. Considerations

The purpose of having a two-tier cost allocation is to first allocate a portion of a total pool of costs to a subset of market participants identified as directly causing that portion of the costs. The remainder of the pool of costs is then socialized across a broader range of market participants that benefit from those costs. The ISO market currently does this for IFM and RUC BCR uplift as described below. It is less clear how to allocate the first tier for real-time market BCR uplift because there are many factors that can drive real-time market BCR.[2]

The BCR uplift charges are currently allocated as follows:

- 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 imports but is served by energy supplied through the market. The first tier of IFM BCR uplift is also charged to virtual demand. 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. 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 because it is the demand using generation scheduled by the market, rather than using its own generation or imports.

- 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. The second tier is allocated to load and exports. The rationale for the first tier's allocation is that demand not scheduled in the IFM is the demand causing the RUC to commit additional generation and incur BCR costs.

- Real-time BCR uplift is allocated to scheduling coordinators in a single tier based on their load and exports. The rationale for this allocation is that many factors can cause real-time market BCR and the basis for allocating a portion of these costs to a specific subset of the market is not clear. Consequently, these costs are allocated to load and exports, which is the portion of the market benefiting from the generation receiving real-time BCR payments.

There is a cost causation rationale for allocating IFM and RUC BCR costs to a first tier, because it is possible to attribute the volume of procurement driving IFM and RUC BCR costs with specific scheduling coordinators' day-ahead market schedules. Consider the situation in which

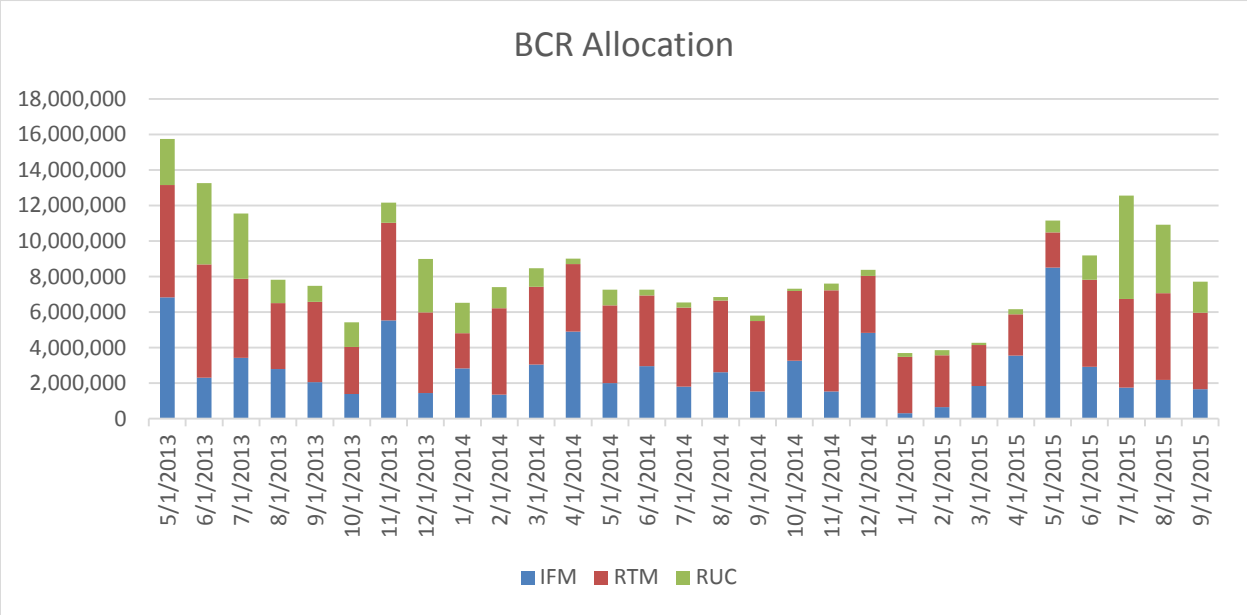
[2] A key consideration in the design of cost allocations are the ISO's cost allocation guiding principles developed in 2012. This review established seven guiding principles for allocating costs: (1) causation, (2) comparable treatment, (3) accurate price signals, (4) incentivize behavior, (5) manageable, (6) synchronized, and (7) rational.

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 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 market 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.

5. Data Analysis

Figure 2 examines BCR uplift before and after the May 2014 market changes went into effect.



Real-time BCR has increased slightly as a proportion of total BCR since the May 2014 market changes went into effect. From May 1, 2013 to May 1, 2014 the ISO's real-time BCR uplift monthly average was approximately 47.4% of total BCR uplift. From May 1, 2014 to September 1, 2015 the ISO's real-time BCR uplift monthly average was approximately 51.6%of total BCR uplift.

6. Stakeholder Input

The ISO requests stakeholder input regarding the following:

- The merit of the previous proposals for two-tier allocation of real-time BCR uplift included in the appendix. (Recognizing that changes may be necessary to reflect BCR changes made since the time the ISO developed the issue paper.)
- Alternatives to allocation of real-time BCR uplift, including maintaining the current allocation of real-time BCR uplift to measured demand.
- Additional considerations, if any, for determining the appropriate method to allocate real-time market BCR.
- 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.

7. Appendix – October 9, 2008 Two Tier Real-Time Uplift Issue Paper

Issue Paper

Two-Tier Real-Time Uplift

October 9, 2008

Table of Contents

1. Introduction

At MRTU start-up the allocation of real-time market bid cost recovery (BCR) uplift is a single tier charge allocated to metered demand. Such an allocation scheme is pure socialization based and cost causation is not accounted for which is contrary to the approach that was adopted for the IFM and RUC BCR charges where tier 1 is based on cost causation and tier 2 is based on socialization.

Market participants have expressed their desire for the development of a two-tier Real-Time Uplift charge in various stakeholder forums over the last several years. Most recently this topic has been discussed in the convergence bidding stakeholder forum due to the fact that the other two bid cost recovery uplift charges (IFM and RUC) are being redesigned as part of this effort. With this paper and further discussion, the CAISO seeks to consider all uplift charges (including any Real Time redesign) as a package that is integral to the policy design and development for convergence bidding.

FERC ordered the CAISO as part of its September 21 2006[1] order to develop a two-tier Real-Time uplift charge no later than three years after MRTU start-up. Real-Time Uplift was ranked as part of the Market Initiatives Roadmap effort. While it did not rank the highest of the FERC mandated market enhancements the CAISO is proposing to address it as soon as possible due to synergies with the design of the BCR Uplift charges for Convergence Bidding. However, the CAISO has not yet analyzed the requirements for implementing such a charge and depending on the complexity of the solution desired and agreed upon by stakeholders a concurrent implementation with Convergence Bidding may or may not be possible.

A number of factors may contribute to the CAISO's need to commit, decommit, increment and decrement Generating Units in Real-Time which creates Real-Time Uplift. Some of those factors could be accounting for forecast errors, generation or transmission deratings, uninstructed deviations, congestion management and virtual transactions that clear the Day-Ahead market but are liquidated in Real-Time. It would thus be very difficult to determine exactly what action in Real-Time created what component of the Real-Time Uplift. This issue paper describes several possibilities for creating a two-tier Real-Time Uplift charge for stakeholder discussion and consideration where Tier 1 is based cost causation and Tier 2 is allocated to metered demand. The two options discussed follow the premise that 1) all deviations, including virtual demand and virtual supply create the need for inc energy and dec energy in Real-Time and are the primary cause for Real-Time uplift, or, 2) uninstructed deviations, including virtual supply, that create the need for inc energy in Real-Time are the primary cause for Real-Time uplift.

The goal is to implement two-tier Real-Time uplift that is fair and reasonable but also simple enough to implement on a time-line to be concurrent with convergence bidding.

2. Background

Under MRTU all supply resources are eligible for Bid Cost Recovery (BCR) which allows Generating and Dynamic System Resources to recover their Start-Up Costs, Minimum Load

[1] The September 21,2006 MRTU FERC Order can be accessed at:http://www.caiso.com/1878/1878f9725ef80.pdf

Costs, and Energy and Ancillary services bid costs to the extent those costs are not covered by LMP and AS revenues from the market.

Generating Units and Resource Specific System Resources that are committed by the CAISO in the IFM, RUC, or RTM are eligible to recover Start-Up Costs and Minimum Load Costs as well as Bid Costs for Energy and Ancillary Services. Supply Resources that are self-committed are eligible to recover only Bid Costs for Energy and Ancillary Services. The funds needed to compensate eligible resources for their Bid Cost Recovery are collected through the IFM and RUC Tier 1 and Tier 2 Uplift charges, and RTM Uplift charge, all of which are charged to demand (with exports being exempt from RUC uplift charges.) The Tier 1 costs for BCR uplift are designed to charge the entities that created them and the Tier 2 costs are designed to recover what could not be recovered through cost causation in Tier 1 and are charged to metered demand.

The Bid Cost Recovery (BCR) uplift charges that were developed as part of the initial MRTU design process and will be in place at MRTU start-up are as follows:

- IFM Tier 1 BCR Uplift is charged to SCs based on the portion of their demand that is not served by self-scheduled generation and/or imports but is served by energy supplied through the market. This allocation is determined by calculating each SC's Day-Ahead Scheduled Demand less Self-Scheduled Generation and Imports plus or minus any Inter-SC Trades of IFM Load Obligation. Tier 2 is allocated to measured demand.
- RUC Tier 1 BCR Uplift charge is allocated to SCs based on their Net Negative CAISO Demand Deviation (load that deviated from the Day-Ahead schedule) in a Trading Hour. Tier 2 is allocated to measured demand.
- Real-Time Uplift is a single tier charge that is allocated to SCs based on their metered demand.

The settlement of all BCR uplift is system wide and does not account for the location of the sources of the energy or the load.

As part of the convergence bidding design the CAISO has proposed that SCs engaged in virtual bidding will also pay a portion of these uplift charges associated with the DA (IFM) and RUC markets. These changes would not go into affect until the planned start date of convergence bidding which is one year after the start-up of MRTU. The proposed methodology for allocation to virtual transactions is described in the *January 28, 2008 Straw Proposal for Convergence Bidding Cost Allocation which can be accessed at:*

http://www.caiso.com/1f60/1f60e10811e40.pdf

3. Process and Timetable

The CAISO proposes the following schedule for this stakeholder engagement. In December the CAISO will post a Straw Proposal for changes to all three bid cost recovery uplift charges, IFM, RUC and RTM so they can be reviewed by market participants as a package. Modifications to the IFM and RUC Uplift charges are a result of virtual bids being added to billing determinant. Changes to the Real-Time uplift charge will reflect a proposal for moving from a single tier charge to a two-tier charge.

Tentative Date	Milestone
October 9, 2008	Post Issue Paper

October 16, 2008	Convergence Bidding Stakeholder Meeting
October 30, 2008	Stakeholder Comments Due to MMiller@caiso.com
December 2008	Post Straw Proposal for all BCR Uplift charges
Mid December	Stakeholder Conference Call
Late December	Stakeholder Comments Due
February - 2009	Draft Final Straw Proposal for all BCR uplift charges
March 2009	Tentative Board of Governors Meeting

4. Two-Tier Real-Time Uplift Design Issues

The following sections discuss a number of design issues that will need to be resolved through the design and stakeholder process. As is the case with the other two existing IFM and RUC BCR charges there is a Tier 1 purchase rate with a determined maximum and an allocation methodology to determine each SCs obligation to pay BCR uplift. Again the Tier 1 charge is designed to allocate costs to the entities that created them.

In order to create a two-tier Real-Time uplift charge the CAISO will need develop a purchase rate with a maximum and allocation methodology for Real-Time Tier 1 Uplift. A maximum rate is necessary to ensure that the purchase rate for Real-Time uplift does not become excessively high when the billing determinant derived from SCs that are determined to be the cause of the uplift is very small.

4.1. Allocation of Real-Time Uplift to SCs

There are several options that could be considered to allocate Real-Time Tier 1 Uplift costs. These options consider both the contribution of virtual bids and physical bids to Real-Time uplift.

Option 1- Allocation based on each SCs need for either inc and dec imbalance energy in Real-Time

In the Real-Time market, both inc and dec instructed imbalance energy could give rise to bid cost shortfall, hence requiring BCR. On the other hand, it may not be possible to separately identify the specific causes for the inc and dec instructed imbalance energy. The cause of the instructed imbalance energy could stem from deviations in Real-Time resulting from physical or virtual market activity. Under this option virtual supply and virtual demand are both considered deviations along with the physical uninstructed deviations from generation and load.

In this option, we assume that the per-MW uplift costs are about the same between the inc and dec instructed imbalance energy. Therefore, both scheduling coordinators that need inc instructed energy for balancing as well as those requiring dec instructed energy for balancing could be subject to the uplift cost allocation.

Assuming that both the need for inc and dec energy contribute to bid cost shortfall, allocation of Real-Time Tier 1 Uplift could be based on an SCs net deviations across their portfolio that resulted in the need for Real-Time inc balancing energy minus deviations that resulted in need for Real-Time dec balancing energy. In this case virtual supply is considered to contribute to the

need for inc energy and virtual demand is considered to contribute to the need for dec energy. For each SC, the CAISO would calculate a signed quantity by netting over each SCs portfolio to determine the SC's net inc or net dec imbalance energy requirement with a positive value indicating net inc and negative value indicating net dec. Therefore the calculation of the total billing determinant (total obligation to pay Real-Time Uplift) could be based on the absolute value of the following quantity:

a) the net deviation of actual load from the DA schedule plus DA virtual supply schedule minus DA virtual demand schedule

minus,

b) max (generator RT self schedule minus DA final schedule, 0) and; min (generator RT bid max minus DA final schedule, 0)

minus

c) the uninstructed deviations of generating resource

minus

d) max(import HASP self-schedule minus DA final schedule,0) and min (import HASP bid max minus DA final schedule, 0)

plus

e) max (export HASP self-schedule minus DA final schedule,0) and; min(export HASP bid max minus DA final schedule, 0)

The above imbalance energy requirement quantities for different SCs are then summed algebraically to determine the net overall imbalance energy requirement. Only those SC's with their required real-time imbalance energy aligned with the net overall system required imbalance energy in the sense of inc or dec are allocated for Tier-1 Real-Time uplift allocation and the billing determinant for each SC is its imbalance energy requirement in absolute value.

For example, if the algebraic sum reflects a net inc energy requirement for the system, only those SCs with inc energy requirement would be allocated for Tier-1 Real-Time uplift. SCs with a net dec energy requirement would have a zero obligation for tier-1 uplift.

Option 2 – Allocation Based on Net Negative Uninstructed Deviation

Another option could be to base the allocation of Tier 1 Real-Time uplift on each SCs net negative uninstructed deviation. The calculation for net negative uninstructed deviation is a calculation that exists currently in CAISO settlements and would be a more simplistic approach. This approach would assume that the need for inc energy is the main contributor to Real-Time Uplift and would not take into account dec energy. Net Negative Uninstructed Deviation is defined as the real-time change in generation or demand associated with underscheduled Demand and overscheduled Generation which are netted for each Settlement Interval, and apply to an SCs entire portfolio and include Demand, Generation, imports and exports. Net virtual supply could be added to the calculation since virtual supply disappearing in Real-Time could require the need for additional generation to be committed in Real-Time.

Each SCs obligation would be determined based on their percentage share of the total billing determinant.

Under either Option 1 or Option 2 the charge could be allocated to SCs on an hourly basis as is the case today.

4.2. Determination of Real-Time Tier 1 Rate

This section describes some possibilities for how a Tier 1 rate could be developed for Real-Time Bid Cost Recovery Uplift. As a comparison the existing rate for IFM Tier 1 BCR Uplift is explained below.

For IFM Tier 1 Uplift SCs will be charged a rate which is the lower of:

1) Hourly net IFM Bid Cost Uplift ($) divided by the IFM Load Uplift Obligation (MW)[2] or,

2) Hourly Net IFM Bid Cost Uplift($) divided by the sum of all hourly Generation in the Day-Ahead Schedule(MW) and IFM Upward AS Awards (MW).

A cap was put on the rate to insure against an excessively high rate when the billing determinant, which in this case would be Demand that is not covered by self-scheduled Generation or Imports, is small.

The allocation methodology for IFM Tier 1 Uplift is explained in Section 2 above and is allocated to SCs that have Demand in the Day-Ahead Market that is not covered by Self-Scheduled Generation or Imports or inter-sc trades of IFM Uplift. SCs will pay the Tier 1 rate multiplied by their obligation.

Based on the idea that the need for both inc and dec energy contribute to real-time uplift and following similar methodology to the IFM Tier 1 rate, SCs could be charged a Real-Time Tier 1 Uplift rate which is the lower of:

A) *Hourly net RTM Bid Cost Uplift ($) divided by the RTM Load Uplift Obligation (MW) or,*

B) *Hourly Net RTM Bid Cost Uplift ($) divided by the sum of the absolute value of incs and decs in the real-time market.*

The obligation specified in A will depend on what option the CAISO and stakeholders choose to determine that calculation. B represents the maximum purchase rate and would include the absolute value of the Instructed Imbalance Energy (IIE) portion of the inc and dec energy which would allow for a larger denominator in the case when the RTM Load Uplift Obligation specified in A above is small in order insure against a very high rate. On the other hand using the absolute value of inc and dec could result in a very small rate and therefore more uplift would have to be recovered through Tier 2.

Other ideas that could be considered for the calculation of the maximum purchase rate instead of the absolute value of incs and decs are:

The Net IFM Bid Cost Uplift divided by:

A) Net of dispatched generation (MW) that is eligible for BCR

This smaller denominator could result in an excessively high Tier 1 rate

or,

B) Generator inc MW only

[2] As part of the *January 29, 2008 Straw Proposal for Convergence Bidding Cost Allocation* the CAISO is proposing to add virtual demand obligation as a part of the denominator for this calculation to be in effect at the onset of convergence bidding.

This could result in a higher rate for Real-Time uplift and does not necessarily represent all of the generation supply that resulted in the need for uplift.

5. Examples of Options for Two-Tier Real-Time Uplift

The following examples will provide a simple illustration of the options for calculating Tier 1 Real-Time Uplift described in this issue paper. For the purpose of calculating the RTM Tier 1 uplift rate the examples will assume the maximum purchase rate as the absolute value of incs and decs in Real-Time.

Example 1 – Based on Option 1 and concept that both the need for inc and dec energy contribute to Real-Time Uplift.

Assume there are four SCs participating in the market. The Real-Time Bid Cost recovery dollar amount that needs to be allocated is $1000.

SC1 : virtual transactions only

Cleared Virtual Supply = 30

Cleared Virtual Demand = 20

Required Imbalance Energy = 30 – 20 = 10 MW

SC1 requires 10MW of inc energy from the market

SC2: Physical Transactions only

Generation:

DA Final Schedule = 40MW

RT Bid Max = 38MW; RT Dispatch Schedule = 30MW

Required Imbalance Energy = 40MW – 38MW = 2MW

SC2 requires 2MW of Inc energy from the market

SC2 also provided 8MW of dec IIE based on RT Dispatch Level (30MW) - RT Bid Max (38MW) = -8MW (dec)

SC3: Virtual and Physical Transactions

Underscheduled load = 10

Uninstructed Generation below Day-Ahead schedule = 10

Virtual Supply = 15

Virtual Demand = 10

Required Imbalance Energy = 10MW + 10MW + 15MW – 10 MW = 25MW

SC3 requires 25MW of Inc energy from the market

SC4:Physical load and generation only

Load

DA Final Schedule = 50MW

RT Measured Demand = 50MW

Generation

DA Final Schedule = 10MW

RT Self Schedule = 15MW; RT Bid Max = 80MW; RT Dispatch Schedule = 55MW

Required Imbalance Energy = (50MW – 50MW) – (15MW – 10MW) = -5MW

SC4 requires 5MW of Dec energy because the RT Self-Schedule is > DA Self-Schedule

SC4 also provided 40MW of inc IIE because RT Dispatch Level (55MW) – RT Self Schedule (15MW) = 40MW

By adding the signed quantities of required market imbalance energy associated with the four SCs, we obtain the minimum required balancing market energy for the system.

10MW + 2MW +25MW – 5MW = 32MW

The above quantity is positive, indicating the minimum required balancing market energy is inc type. 10MW + 2MW + 25MW = 37 MW represents the total billing determinant for RTM Tier 1 Uplift which is based on SC1, SC2 and SC3 requiring inc energy from the market. Since SC4 requires dec type of balancing energy while the entire system required inc type of balancing energy, tier-1 billing determinant for SC1 is zero.

Now we will calculate the purchase rate for RTM Tier 1 Uplift. The rate would be calculated as the maximum of either the total RTM Uplift Obligation which equals 37 MW

Or, the absolute value of all inc and decs which equals 48MW. Since only SC2 and SC4 provided IIE we obtained the 48MW by taking the absolute value of the IIE for those two SCs.

In this case the rate would be $1000/48MW = $20.83

The $1000 of uplift would be allocated as follows:

	MW Obligation	Rate	Total
SC1	10	$20.83	$208.33
SC2	2	$20.83	$41.67
SC3	25	$20.83	$520.83
Total			**$770.83**

In this case $770.83 would be recovered through Tier 1 Uplift and the remainder would be recovered through Tier 2 Uplift by allocating the costs to metered demand.

Example 2 – Based on Option 2 and the concept that net negative uninstructed deviation and net virtual supply is the contributor to Real-Time Uplift.

Assume the same four SCs with the same portfolio as Example 1. In this case the CAISO would use net negative uninstructed deviation as the billing determinant to determine what SCs will pay RTM Tier 1 Uplift.

SC1 : virtual transactions only

Cleared Virtual Supply = 30

Cleared Virtual Demand = 20

= 30 – 20 = 10 MW

Since SC1 has a net negative uninstructed deviation of 10MW based on net virtual supply

SC2: Physical Transactions only

Generation:

DA Final Schedule = 40MW

RT Bid Max = 38MW; RT Dispatch Schedule = 30MW

SC2 has a net negative uninstructed deviation of 0 MW since we will assume this generator delivered what was dispatched.

SC2 also provided 3MW of dec IIE based on RT Dispatch Level (30MW) - RT Bid Max (38MW) = -8MW (dec)

SC3: Virtual and Physical Transactions

Underscheduled load = 10

Uninstructed Generation below Day-Ahead schedule = 10

Virtual Supply = 15

Virtual Demand = 10

SC3 has a net negative uninstructed deviation of 10MW+10MW+15MW – 10MW = 25MW

SC4 – Physical load and generation only

Load

DA Final Schedule = 50MW

RT Measured Demand = 50MW

Generation

DA Final Schedule = 10MW

RT Self Schedule = 15MW; RT Bid Max = 80MW; RT Dispatch Schedule = 55MW

SC4 has a net negative uninstructed deviation of 0 since we will assume the generator delivered what was dispatched.

SC4 also provided 40MW of inc IIE because RT Dispatch Level (55MW) – RT Self Schedule (15MW) = 40MW

The total billing determinant would be 10MW + 25MW = 35MW based on the net negative uninstructed deviations of SC1 and SC3. SC2 and SC4 would have an obligation of 0 since they had no net negative uninstructed deviations.

If we again assume for this example the maximum rate is based on the absolute value of IIE inc and dec energy the rate = $1000/ 48MW = $20.83The $1000 of uplift would be allocated as follows:

	MW Obligation	Rate	Total
SC1	10MW	$20.83	$208.33
SC3	25MW	$20.83	$520.53
Total			**$729.17**

$729.17 would be allocated through RTM Tier 1 Uplift and the remaining $270.83 would be recovered through Tier 2 RTM Uplift.

6. Comparison to other ISOs

The table below summarizes how other ISO's are allocating Real-Time uplift costs to their market participants. For MISO, New England ISO and PJM the Real-Time Bid Cost Recovery includes costs for RUC and Real-Time in the same charge. For the CAISO RUC and Real-Time BCR Uplift are broken out into two separate charges.

	NY ISO	MISO	PJM	NE ISO
Allocation of Real-Time BCR Uplift	No costs allocated to virtual bids unable determine how costs (if any) are allocated for physical transactions.	Allocated in three buckets 1) Units committed for constraint management ▪ Costs are allocated to all deviations including virtual supply and demand. Deviations can be netted across portfolio and market participants can make changes to schedules up to 4 hours prior to operating hour and net those changes against deviations to reduce obligation for uplift. 2) Units committed due to Intra-Hour changes to provide ramp and headroom capability. ▪ Allocated to metered demand 3) Schedule changes ▪ Allocated to uninstructed deviations and net virtual	Costs are allocated based on deviations both negative and positive including virtual demand and virtual supply. Virtual transactions can net against physical transactions	Same as PJM

		supply. Market participants can net schedule changes given prior to the notification deadline to reduce obligation for uplift.		

7. Next Steps

The CAISO seeks stakeholder input in the form of written comments on options presented in this issue paper by October 31, 2008 to Margaret Miller at mmiller@caiso.com. The CAISO will review the existing Straw Proposal for Convergence Bidding Cost Allocation dated January 29, 2008 regarding changes to IFM and RUC BCR Uplift charges, make modifications if necessary, and post a revised `Straw Proposal for all BCR uplift charges including Two-Tier Real-Time Uplift in December of 2008.