Straw Proposal

Mitigation and Allocation of Real-Time Imbalance Energy Offset Costs (CC 6477)

September 23, 2009

1 Background

On August 26, 2009 the ISO presented an issue paper entitled "Analysis of Real-Time Imbalance Energy Offset" that addressed the significant charges in real-time imbalance energy offset found in Charge Code CC 6477 and in Section 11.5.4.2 of the ISO Tariff under the new market model. [1] The paper identified two key drivers of the imbalance energy offset:

- Significant differences in the RTD energy price over the HASP energy price combined with substantial negative imbalance HASP energy, i.e. energy sold as exports at the inter-ties in HASP; and
- The effect of using an average hourly price for RT demand imbalance energy settlement.

The August paper proposed several options for long-term solutions to the imbalance energy offset issue. One option consisted of a 2-tier allocation scheme. The proposal defined a Tier 1 that would be allocated based on the positive UIE of load. The positive UIE of load is energy associated with day-ahead over-scheduling, which can be attributed for the selling of some of the HASP energy to inter-ties. The proposed rate for applying this billing determinant was the positive difference of the RTD price over the HASP price, with a cap on the rate such that the total revenue under this formula would not exceed the total amount of the offset charge for each hour. Tier 2 would consist of the remainder of the offset charges to be collected and allocated to measured demand.

As a follow up to the August issue paper, this paper includes the following:

- Analysis of May, June and July data in addition to the April data analysis presented in the August paper;
- Analysis of the root causes behind the large price differences in RTD over HASP for certain high impact hours; and
- Options for either a two-tiered allocation scheme or for using a single-tier allocation scheme.

Finally, the August paper was unclear on the treatment of the real time marginal cost of losses credit currently embedded within CC 6477. As a clarification, the ISO is not proposing to change the allocation of the Real-Time Marginal Cost of Losses Offset also found in CC 6477. This effort and proposal are intended to address only the Real-Time Imbalance Energy Neutrality Offset included in CC 6477 after excluding the losses offset.

2 Analysis of May, June and July Data

The issue paper posted on August 26 presented results based on the analysis of April data. Since then, the ISO has conducted analysis for additional months including May, June and July similar to for April analysis. For these 3 months, net charges accrued into CC 6477 were $21.01 million, $9.69 million and $6.89 millions for May, June and July respectively.

[1] Note that Charge Code 6477 is composed of the Real-Time Imbalance Energy Neutrality Offset and the Real-Time Marginal Cost of Losses Offset.

While real-time imbalance energy neutrality offset charges vary from month to month and have decreased noticeably in recent months, the ISO's general observations from the April analysis remain the same:

- The major portion of the monthly offset charges occur during a small number of hours within each month; and
- Large energy price differences between RTD and HASP are occurring during those few hours resulting in large hourly offset charges. Moreover, during these hours, a high percentage of the hourly offset charge can be attributed to large price differences between RTD and HASP combined with the large volume of HASP energy sold as exports at the inter-ties through the ISO market.

In essence, in these few hours, large offset charges arise from procuring energy from internal generation at much higher RTD prices to offset the sale of HASP energy to exports at lower prices. Moreover, the significant variations of the offset charge among months are the result of the highest charges coming from a small number of hours. This strongly suggests that the offset charge is event driven.

3 Root Causes of Large Differences in Energy Price in RTD over HASP

Given that significant differences in the energy price between RTD and HASP is the most significant driving force resulting in large RT imbalance energy offset charges, the ISO has conducted a thorough study on the real-time market run results to determine the reasons behind the large price differentials. The large observed price differentials have been caused by several different occurrences including:

- The load forecast is revised between HASP and RDT, and the forecast used in RTD is several hundred MW higher than the forecast load used in the HASP. Operators may also bias the RTD load forecast up from one to three hundred MW. This has been observed in hours between 12 p.m. and 9 p.m. in the evening and has been the most common cause for the large price differences. In addition, in RTD the volume of supply available for dispatch is significantly decreased from the supply available in HASP due to ramping constraints and inability to re-dispatch hourly ties. In these situations, the RTD price can rise to the bid cap or even higher while HASP price is usually below $100/MWh.
- Severe over-generation occurred during off-peak periods as well as during steep load ramping-up periods, resulting in very low (often negative) prices in HASP. During these periods, operators have used market mechanisms to reduce supply to deal with over-generation which has driven HASP prices to very low levels. Anticipating the occurrence of over-generation in real-time, ISO operators will bias HASP load down to facilitate the selling of HASP energy to exports. By selling energy in HASP, internal generators are dispatched upward above their minimum loading levels in RTD to enable downward dispatch capability for meeting load variations in real-time. In over-generation scenarios, the RTD price is normally low but not far below the –$30 bid floor even though generator self-schedules are uneconomically curtailed in the market solution. Yet, HASP energy prices can be as low as negative several hundred dollars due to mathematical anomalies

under the modeling of additional types of constraints such as ancillary service requirements and hourly intertie schedules within the HASP optimization formulation.[2]

- Operators bias down the flow limits on major internal branch groups in RTD after the execution of HASP. As an example, after the loss of the Pacific DC inter-tie on May 19, operators biased down the flow limit on PATH 26 from north to south direction to facilitate the dispatch of generating units in the south to higher operating levels. At this limited transfer capability on PATH 26, the branch group constraint limit was relaxed at the scheduling run penalty price in RTD. This caused the pricing run shadow price of the constraint to rise above one thousand dollars as well as the RTD energy price south of PATH 26.
- The loss of several hundred MW or more of generation capacity in RTD. This caused the RTD energy price to rise to several hundred dollars above HASP price. Due to reduced dispatch capacity available and the inability to re-dispatch hourly ties, RTD prices are significantly more sensitive to loss of generation capacity, changes in load or other deviations such that even relatively small deviations or changes in load forecast can result in large price changes in RTD.

4 Addressing the Large Price Differences

Since the start of the ISO new market on April 1, 2009, the ISO has made it a high priority to address volatility and the occasional extreme real-time prices. The following are some of the key steps that ISO is taking to mitigate real-time price volatility and the price differential between RTD and HASP.

- Develop a systematic procedure for operators to perform load biasing and branch group biasing
- Improve the resolution for hour-ahead load forecasting and load forecast alignment between HASP and RTD
- Improve accounting of intertie hourly ramp when dispatching in HASP.
- Represent the use of regulating reserve to balance high frequency load fluctuations by allowing limited relaxation of the power balance constraint through a lower scheduling run penalty price. Prior to relaxing the power-balance constraint in the scheduling run at a penalty price of $6500, the power-balance is allowed to relax at a price slightly above the bid cap in case of acute under-generation conditions and slightly lower than the bid floor for acute over-generation conditions for a limited quantity of MW reflective of a portion of awarded regulation capacity to account for effect of regulation ramping capability that will naturally pick-up via the Automatic Generation Control function of the Energy Management System.

Finally, the ISO recognizes that very high prices in RTD and very low (negative) prices in HASP are occasionally the result of anomalous market outcomes derived from running the market software under some very constrained scenarios. Vigilant and diligent price correction efforts

[2] For more information see ISO Technical Bulletin 2009-07-01 Negative LAP Prices For June 5, 2009 HE23 at http://www.caiso.com/23df/23dfbcb4677d0.pdf and Technical Bulletin 2009-05-02 SDG&E Constrained 5-minute Default LAP Price on 4/19/09 at http://www.caiso.com/23b4/23b4caaf479b0.pdf.

prior to the settlement process will significantly reduce the price differences and hence the offset charges.

5 Offset Charge Allocation Options

While the ISO has made progress in evaluating the causes of large price difference between RTD and HASP, price differences will continue to persist to some extent into the future due to the asymmetry created by settling hourly intertie schedules at prices generated in the HASP run and internal load and generation at RTD prices. The separate calculation of HASP and RTD settlement prices increases the potential for large offsets that reflect the impacts of any load forecast changes or uninstructed deviations. It is therefore important to reassess the current allocation rule for the offset charge in light of the analysis discussed above and determine what if any changes are warranted.

Since the August 28th stakeholder conference call, the ISO has received supporting and thoughtful comments from stakeholders. Stakeholders are nearly unanimously against option 4 of settling the HASP energy using the RTD price. Stakeholders are divided between the 2-tier allocation with positive UIE as the basis for tier 1 versus the alternative of leaving the cost allocation as is (spread pro rata to measured demand) and continuing further analysis to identify and mitigate the root causes of the large price differentials between RTD and HASP.

Below, we discuss merits for both a two tiered allocation scheme and continuing with a single allocation to measured demand.

Two-tier allocation

The ISO now proposes an expansion of the original proposal in the August 26 issue paper in order to reflect cost causation more accurately and address HASP-to-RTD cost deviations in either direction. Under the August 26 proposal, a tier-1 offset charge would be allocated to positive UIE of load at rate equal to the positive difference of the RTD energy price over HASP energy price. The rate for the tier-1 charge would be capped so that the total amount allocated to SCs would be no greater than the total offset charge amount for the trading hour. Tier-2 would consist of the remaining portion of the offset charge after tier-1 and is allocated to measured demand among all SCs.

The expansion now proposed for consideration would extend the billing determinant from just the positive UIE of load to include negative UIE of supply resources in RT (i.e., delivering less energy than scheduled or instructed), in situations where net interchange scheduled in HASP was in the export direction. In other words, when net energy transactions in HASP were sales to exports and then additional energy had to be procured in the RTD at higher prices, both positive load UIE and negative supply UIE would have played a causal role in the price differential and would therefore be allocated a share of tier 1. Alternatively, when net energy transactions in HASP were purchases from imports and then energy had to be sold off in the RTD resulting in lower RTD prices, then both negative load UIE and positive supply UIE would have played a causal role and would be allocated a share of tier 1.

The following provides an illustration of the tier 1 calculation under the first scenario, where net HASP energy was a sale to exports. The total tier-1 offset charge is calculated as:

Tier-1 Offset Charge total = min (A, B) * max (RTD energy price minus HASP energy price, 0)

A = total of net positive load UIE and negative supply UIE of all SCs

B = absolute value of the net negative imbalance HASP energy (i.e., net HASP energy sales to exports) netted among all SCs.

In determining the total amount of tier-1 offset charge, the energy amount used in calculation on the right hand side of the equation is the lesser of the total of net positive load UIE and negative supply UIE of different SCs and the HASP energy sold to SCs in net quantity. This is the energy amount that incurs charges into the offset associated with day ahead over-scheduling. The $/MWh value for the calculation is RTD and HASP price difference but will be restricted to no less than zero. For RTD price below HASP price, tier-1 offset charge total is zero and will not become negative.

The tier-1 offset charge total is limited to no greater than the original offset charge. The tier-1 offset charge total is allocated to the net positive uninstructed imbalance energy of SCs. The rate that is charged to SCs would not be greater than the difference between the RTD price and the HASP price if the difference is positive. Otherwise the rate would be zero.

Tier-1 offset charge total is allocated to the net positive uninstructed imbalance energy of SCs. The remaining balance of the offset charge is tier-2 offset charge total, allocated to measured demand of SCs.

The supporting argument for this approach is that day ahead final schedules influence the amount of energy sold (or purchased) in HASP and could cause operators to bias down (or up) the HASP system load. The resulting increase in the amount of energy sold in HASP through inter-ties results in offset charges when the RTD prices for the hour are higher. Therefore, positive load UIE and negative supply UIE are allocated this portion of the costs since the net selling of HASP energy and the need to purchase additional energy in the RTD under large price differences between RTD and HASP are both key drivers of the large offset charge. Under this allocation, the total tier-1 allocated amount will consist of the majority of the offset costs and the tier 2 allocation would be relatively small.

However, it should be noted that large offset charges do not only occur during periods of significant day ahead over-scheduling. The ISO has observed several hours with very small day ahead over-scheduling or even under-scheduling that have produced large price differentials and offset charges. In this situation, the majority of the costs would be allocated to tier 2.

Single-tier allocation

This option would continue to allocated costs to pro rata measured demand of SCs. The supporting argument is that the day ahead schedule does not enter anywhere into the mathematical formulation of HASP or RTD optimization model. However, while the day ahead load schedule does not mathematically enter into the formulation of the HASP and RTD, the supply schedules that may be over-scheduled to relative to the actual load do factor in and contribute to the operational behavior of trying to get these resources dispatched off of minimum operating levels or bid minimums by selling off energy and potentially generating very low or negative prices. Real time imbalance energy offset charges calculated on the basis of scheduling and pricing results from HASP and RTD are not always linked to DA scheduling. As such, day ahead over-scheduling is not always for the cost associated with RT imbalance energy offset. Real time imbalance energy offsets can occur due to a variety of factors and

therefore there is no single cost allocation scheme that is truly based on cost causation. Therefore the best approach may be to mitigate the price differentials to the extent possible and continue to allocate these costs pro rata to measured demand.

6 Conclusion

The ISO would like stakeholders to comment on the benefits of moving to a two tier allocation scheme versus leaving the allocation as is and work towards further addressing the price differentials between HASP and RTD. If questions, comments or concerns arise with respect to the discussions of the paper, please address them to Edward Lo at elo@caiso.com