

# Market Redesign & Technology Upgrade (MRTU) Project

## CAISO Proposal

### Trading Hubs

#### 1 Statement of Issue

Trading hubs are used to facilitate bilateral transactions between energy buyers and sellers and may be used to share price risks between buyers and sellers<sup>1</sup>. Energy suppliers would prefer to sell energy at their generator nodes, so the buyer would be exposed to LMP differential between supplier's source and buyer's load. Similarly, buyers would prefer to purchase energy at their load nodes, so the risk of price differential from the supplier's source to buyer's load is borne by the supplier. Balancing the risk of LMP differential between suppliers and buyers<sup>2</sup> is one of the desirable features of trading hubs.

After an extensive stakeholder process, the CAISO proposed and FERC approved in its June 10, 2005 Order, Existing Zone Generator Trading Hubs (EZ Gen Hubs) as successor delivery points to today's Existing Zones (NP15, SP15, ZP26). The proposal included a base definition of EZ Gen Hubs as "the average price paid to generation in the zone" and as such would be based solely on generator LMPs. As to the relative weights applied to generator LMPs, the CAISO sought input from the stakeholders and took the position to agree to whatever weighting methodology the stakeholders could agree to and propose. Despite several attempts, the stakeholders have not been able to reach consensus on the basis for LMP weights. The CAISO will be making an MRTU tariff filing at the end of November in which tariff language concerning the composition of trading hubs will be specified.

#### 2 Summary of CAISO Proposal:

CAISO proposes to develop the LMP of trading hubs using two sets of weights for the entire year, one set for the peak periods and one set for the off peak periods. The relative weights for each generation location for each period will be based on the metered generation output at that generation location during the similar period in the previous year (Option 1b below). These two sets of peak and off-peak weights would change once a year and would be coordinated with the annual release of peak and off-peak CRRs.

#### 3 Rationale for CAISO Proposal

The CAISO believes this option will likely produce the best compromise between hub price volatility and representation of the average price paid to generation in the zone. It facilitates bilateral trades at hubs and is consistent with the release of peak and off peak CRRs from the generator nodes to hubs and from hubs to LAPs.

---

<sup>1</sup> Trading hubs could be used to settle the sellers' choice contracts.

<sup>2</sup> Load (LSE) is allocated CRRs which would hedge part of their price risk. Suppliers would be able to obtain CRRs through the CRR auction or in the secondary market.

### 3.1 Alternatives Considered:

The following options have been proposed addressing the following features: a) which nodes are included, b) what sort of average is calculated (simple or weighted), and c) if weighted average is used, how often the weightings change.

**3.1.1 Option 1:** Base the set of weights on the relative historical metered output of generation within the zone. Two variants are considered:

Option 1a: Use a single set of weights based on the relative metered output of the generators within the zone for the prior year. The drawback of Option 1a is that during peak periods, it may underestimate hub prices since peakers will be underrepresented and during off-peak hours it may overestimate hub prices, as peaker generation will be partially included in the hub price even though they are not running.

Option 1b (CAISO proposal): Use two sets of weights for the entire year, one for peak and one for off peak periods based on the metered generation output of all generating resources within the hub. This option addresses the drawback stated under option 1a, and is more consistent with peak and off-peak CRR release during the annual SFT. A variant of this option which would be more consistent with the seasonal CRR release would have eight sets of weights one for each seasonal peak and off-peak respectively. The CAISO would be amenable to such seasonal variant if the stakeholders prefer it to annual weights<sup>3</sup>.

**3.1.2 Option 2:** Use simple average of all generation LMPs. There is no differential weighting of the LMPs in this option, merely a simple average of all generation node LMPs, so each generation node has the same weighting regardless of Pmax or output. The disadvantage of this option is that a generator with a 10 MW schedule receives the same weighting as a generator with a 600 MW schedule.

**3.1.3 Option 3:** A variation of Option 2 is using a simple average of a subset of generation nodes. LMPs in this option are not differentially weighted either; every LMP is equally weighted all the time, however the nodes are carefully chosen and the formulation is statistically verified to conform to the average price paid to generation in the zone. Lack of experience with LMPs in California makes it difficult to identify which nodes should be included in developing the hub LMP.

**3.1.4 Option 4:** Use Pmax of all generation at each location as the LMP weight to compute the hub price. For this option weights are fixed for a year and change once a year based on capacity additions and retirements. This approach will produce better representation of the average price paid to generation in the zone than options 2 and 3 above or option 6 below, but will likely bias the results up as peakers that run for short periods will receive the same weighting as a similarly sized base load unit despite the vast difference in their output.

---

<sup>3</sup> Note that option 1a and option 5 represent two extreme sets of weights, namely a single set for option 1a and 8760 sets for option 5. Between these extremes, we have annual peak/off-peak (Option 1b; with two sets), seasonal peak/off-peak (eight sets) and monthly peak/off-peak (24 sets).

**3.1.5 Option 5:** Dynamic weighted average output of all generation LMPs. Under this option the EZ Gen Hub price would be an output weighted average price of all generation LMPs, but the weighting would vary by hour depending on market outcome. The benefit of this approach is that it will accurately capture the true average price paid to generation. However, dynamic weights may affect CRRs revenue adequacy (since the feasible CRRs to or from a hub are based on a fixed set of weights). Moreover, it must be decided if the same or separate weights would apply in the day-ahead and HASP/real-time for hub price computation, and if a single weight for the same hour is to be used whether it should be based on the day-ahead schedule, real-time incremental generation, or metered generation. The dynamic weighting of the nodes may also be problematic if the CAISO were, at some point, to allow virtual bidding at trading hubs, since the weighting factors applied to these virtual bids would be needed prior to running the market. Additionally, this option is not quite consistent with the desired stability of trading hubs over time (compared to the other options it has two degrees of freedom, namely nodal price and nodal weight, rather than one, i.e., nodal price alone).

**3.1.6 Option 6:** Use simple averages of the prices within the existing zones from a subset of all 500 kV nodes and those 230 kV nodes that would not be sensitive to price changes resulting from the outage of nearby generation or transmission. The proponents of this option indicate that the selection of these nodes, rather than generation nodes, load nodes or LAPs provides a middle-ground for balancing price risks between buyers and sellers.

## 3.2 Evaluation Criteria

The following criteria were used to evaluate each of the options:

1. Market Efficiency (facilitate bilateral transactions): accomplished through using a static set of weights. Additionally, each hub contain a sufficient number of nodes to ensure that the unavailability of, or an adjacent line outage to, any one node or set of nodes would have minor impact on the Hub Price.
2. Accuracy with respect to the primary definition of EZ Gen Hubs representing average price paid to generators within the zone.
3. Simplicity. One of the desirable features of hubs is simplicity, allowing the trading parties at a hub to easily verify the hub prices.
4. Consistency with other elements of MRTU design
5. Balancing risk between buyer and seller

## Comparison of alternatives against criteria:

Option	Facilitate Bilateral transactions	Accuracy	Simplicity	Consistency	Balancing risk between buyer and seller
Option 1a: Develop one set of weights based on the weighted average output of all the generators within the zone for the prior year	Yes	Yes to some extent	Yes	Yes to some extent	Yes
Option 1b (CAISO proposal): Use two sets of weights for the entire year, one for peak and one set for off peak periods based on the metered generation output of all generators within the hub.	Yes	Yes (not as accurate as option 5, but more accurate than all other options)	Yes	Yes. Consistent with CRR release	Yes
Option 2: Use simple average of all generation LMPs.	Yes	Not as accurate as Options 1 and 5	Yes	Yes to some extent	Yes
Option 3: A variation of Option 2 is using a simple average of a subset of nodes.	Yes, provided the nodes are appropriately selected to accurately represent the average price paid to all generation within the zone.	Yes, but potentially less than option 1 and option 5	Yes	Yes to some extent	Yes
Option 4: Use P max of the weighted average of all generation LMPs	Yes	Not as accurate as option 1 and option 5	Yes	Yes to some extent	Yes to some extent
Option 5: Use dynamic weighted average output of all generation LMPs.	Dynamic hub weights may be considered too variable and may discourage trading	Most accurate	Simple for the ISO to compute and post; not as simple for the market participants to follow	Mixed (consistent with spot market settlements, not consistent with CRR source distribution factors, Not consistent with hub-based virtual bidding)	Yes
Option 6: Use simple average of prices from all 500 kV nodes and major 230 kV nodes.	Yes	No. Such nodes will likely not reflect the average prices paid to generation within the zone.	Yes, once the nodes are identified	No (Does not meet the definition of EZ Gen Hub)	May provide the strongest risk balance between supplier and buyer