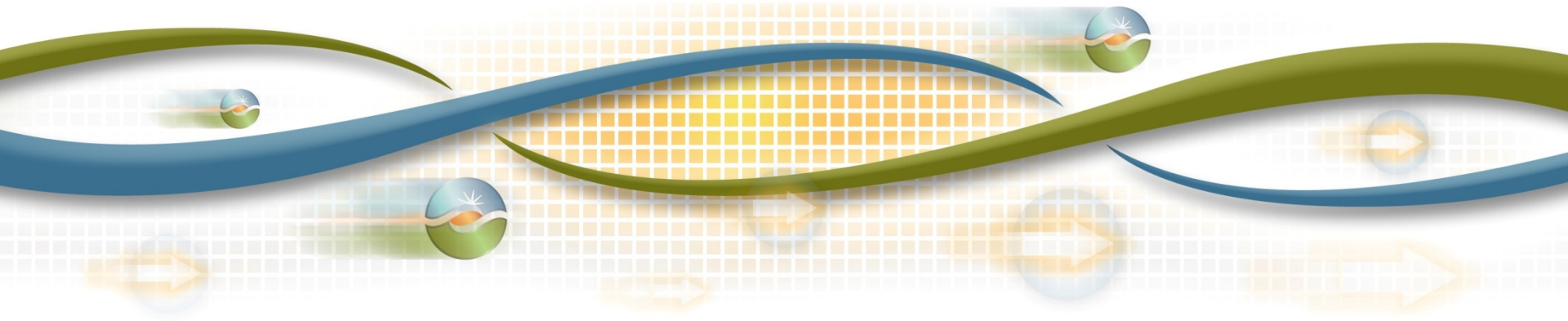


CAISO Experience with Real-Time Congestion Offset and Real-Time Imbalance Energy Offset

Mark Rothleder
V.P. Market Quality and Renewable Integration
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Summary of comments presented to
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CAISO Overview

- ISO operations started with a multi-settlement market 1998.
- Fully nodal locational marginal price (LMP) market since 2009.
- Congestion revenue rights (CRR) (CASIO equivalent to PJM FTRs) are allocated to load serving entities and auctioned to others.
- February 2011, introduced convergence (virtual) bidding.
 - Intertie convergence bids liquidated at the hourly Hour-Ahead Scheduling Process (HASP) LMP.
 - Internal convergence bids liquidated in real-time at 5-minute LMP.

CAISO Real-Time Offset Costs

- Real-time imbalance energy offset costs account for real-time neutrality costs other than congestion costs.
 - Due to different imbalance energy being settled at different prices
 - hourly interties based on hourly LMP
 - Load deviations from day-ahead based on weighted average hourly price,
 - internal resource deviations based on 5-minute LMP
 - Losses
 - Allocated to measured demand (load and exports)
- Real-time congestion offset costs account for unrecovered congestion costs that occur in real-time.
 - Due to changes in congestion in real-time versus day-ahead
 - Allocated to measured demand (load and exports)

CAISO Real-Time Imbalance Energy Offset Costs

- After implementing convergence bidding February 2011, the ISO observed significant increases in the real-time imbalance energy offset costs from \$79 million in 2010 to \$137 million in 2011.
- The increase was in part attributable to volume intertie convergence bidding liquidated hourly price while internal convergence bids being liquidated at real-time 5-minute price.
- September 2011, the ISO filed an amendment to eliminate the intertie bidding at the interties¹.
- . May 1, 2014, in response to FERC Order 764 implemented three settlement system adding 15-minute market settlement to day ahead and real-time 5-minute market; expected to reduce real-time imbalance energy offset costs.

1. CAISO amendment to eliminate convergence bidding on the intertie, ER11-4580-0000, September 21, 2011
http://www.caiso.com/Documents/2011-09-20_CB_Intertie_Amendment.pdf

CAISO Real-Time Congestion Offset Costs

- In 2012, CAISO experienced sharp increase from \$20-\$30 million to \$187 million levels of real-time congestion offset costs (the CAISO equivalent of negative balancing congestion).
- The real-time congestion offset arises when transmission capacity in real-time is less than transmission capacity day-ahead and appears similar to issues being addressed in PJM.
- In response to increased congestion offset costs undertook efforts to better ensure day-ahead modeled constraints anticipated real-time conditions:
 - Modeled additional constraints in day-ahead market
 - Conformed limits to improve consistency of conditions in day-ahead market
- In October 2014, will be implementing full external network model to better forecast and model unscheduled flow effects in the CAISO system.
- As a result of increases in real-time congestion offset costs, the CAISO Department of Market Monitoring (DMM) wrote a paper analyzing the sources of real-time imbalance offset costs which introduced potential new ways to assign a portion of the real-time congestion offset costs to virtual bids².

2. Real-time Revenue Imbalance in CAISO Markets, Ryan Kurlinski, April 24, 2013

http://www.caiso.com/Documents/DiscussionPaper-Real-timeRevenueImbalance_CaliforniaISO_Markets.pdf

CAISO Other

- The Energy Imbalance Market (EIM) will add PacifiCorp to the CAISO's real-time optimization on October 1, 2014 and NV Energy as EIM Entity a year later.
 - Real-time market will also include constraints in PacifiCorp (NV Energy 2015).
 - Day-ahead market will only enforce transmission constraints inside CAISO.
 - To avoid virtual bids from benefiting from congestion in EIM Entity area when they are not paying for congestion in the EIM Entity area day-ahead, congestion offset costs attributable to virtual bids, resulting from constraints in EIM Entity area will be allocated to such virtual bids (approved by FERC in Docket ER14-1386).
- Congestion Revenue Rights (CRRs) (CAISO equivalent of FTRs) are currently fully funded.
 - Currently any shortfall of congestion rents to fund CRRs are first offset by CRR auction revenue and then allocated to measured demand if shortfall remains.
 - To reduce CRR revenue shortages, CAISO may consider new approaches that account for differences in transmission available day-ahead versus when CRR were allocated or auctioned.
 - CRR balancing account funding not affected by real-time congestion offset costs.

Thank you!

Mark Rothleder, Vice President of Market Quality and Renewalbe
Integration.

California ISO

mrothleder@caiso.com

