Briefing on MRTU pricing results

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ISO Board of Governor Meeting

General Session

October 28-29, 2008

# Process of reviewing and analysis of prices

- Since early August CAISO runs LECG Analysis Tool to validate Day Ahead market results

- Provide daily LAP and PNode, average, min/max. price summary

- Provide daily report of Summary of results to participants

- On weekly basis conduct pricing discussion with participants

- Starting week of October 6, CAISO provide additional insight into causes for price excursions

- Provide data regarding RUC procurement and prices

- Reviews results to ensure results are consistent with recommended parameters for non economic adjustments

- Department of Market Monitoring performs independent review of market simulation results

Price results overview

- There are approximately 3000 Nodal prices per hour

- There are 288 5-minute Real-Time intervals per day

- Real-Time Market relies on data flow from at least 6 other systems every 5 minutes

  - Including integration with EMS simulator which simulates resource response, external interchange control with neighboring balancing authorities and produces simulator results

- During simulation, especially in RTM most days produce a relatively very small quantity of outlier prices

Day Ahead LAP price distribution for September 2008 market simulation
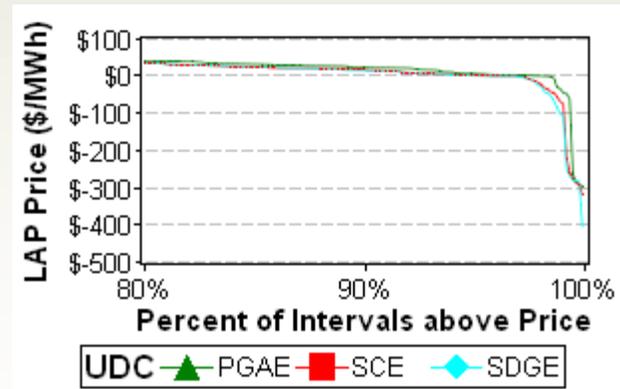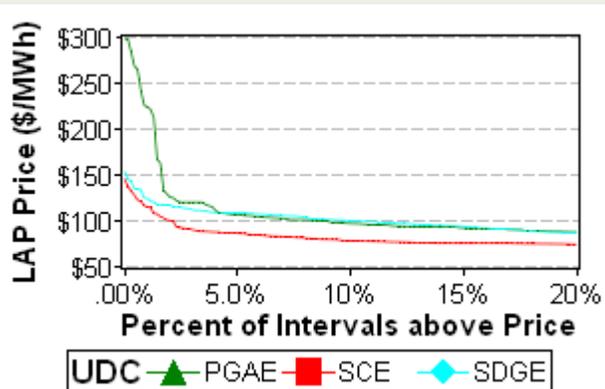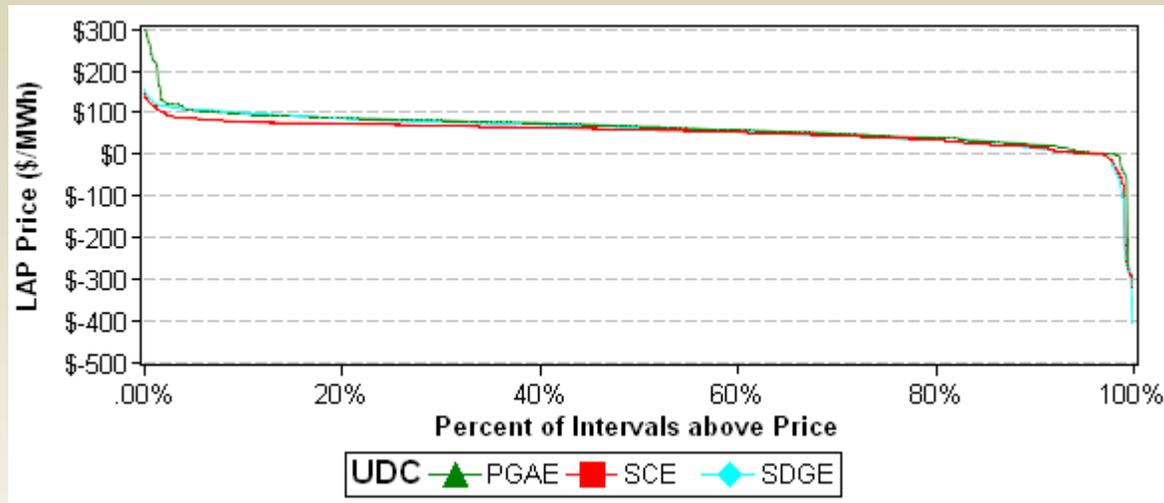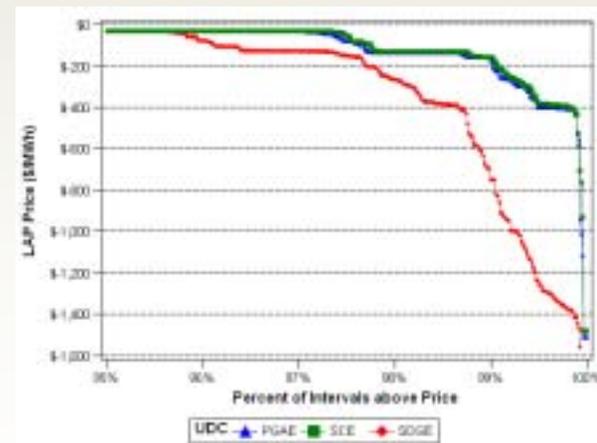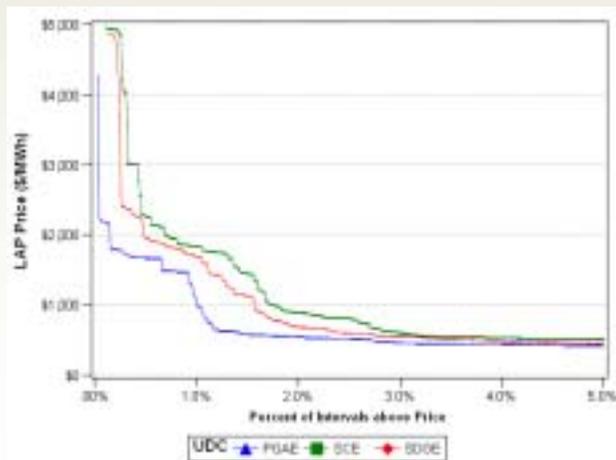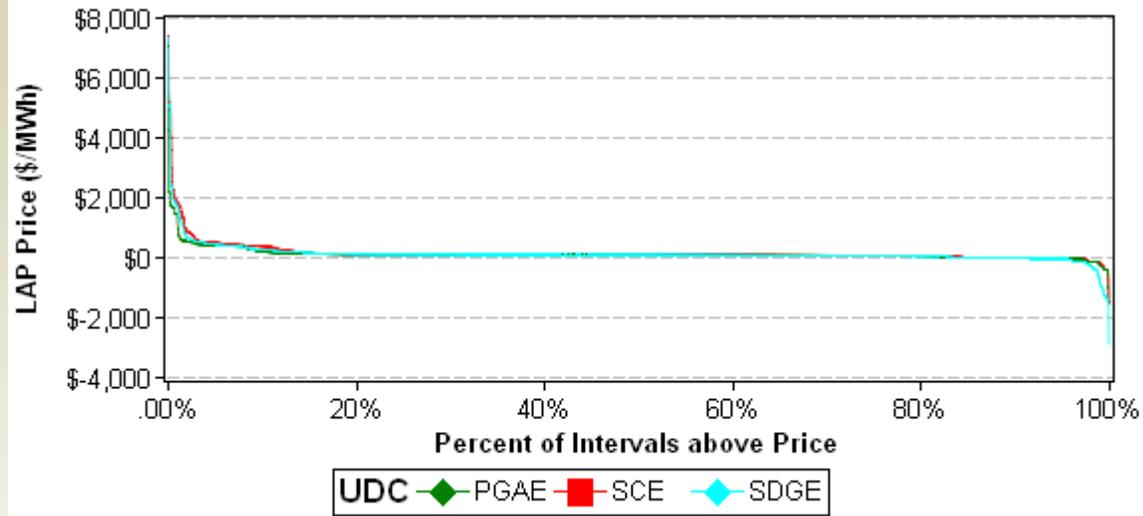
# Real Time LAP price distribution for September 2008 market simulation

Real-Time nodal price distribution

**PNode Price Frequency Distribution
(Sept. 11, 2008-Oct. 10, 2008)**
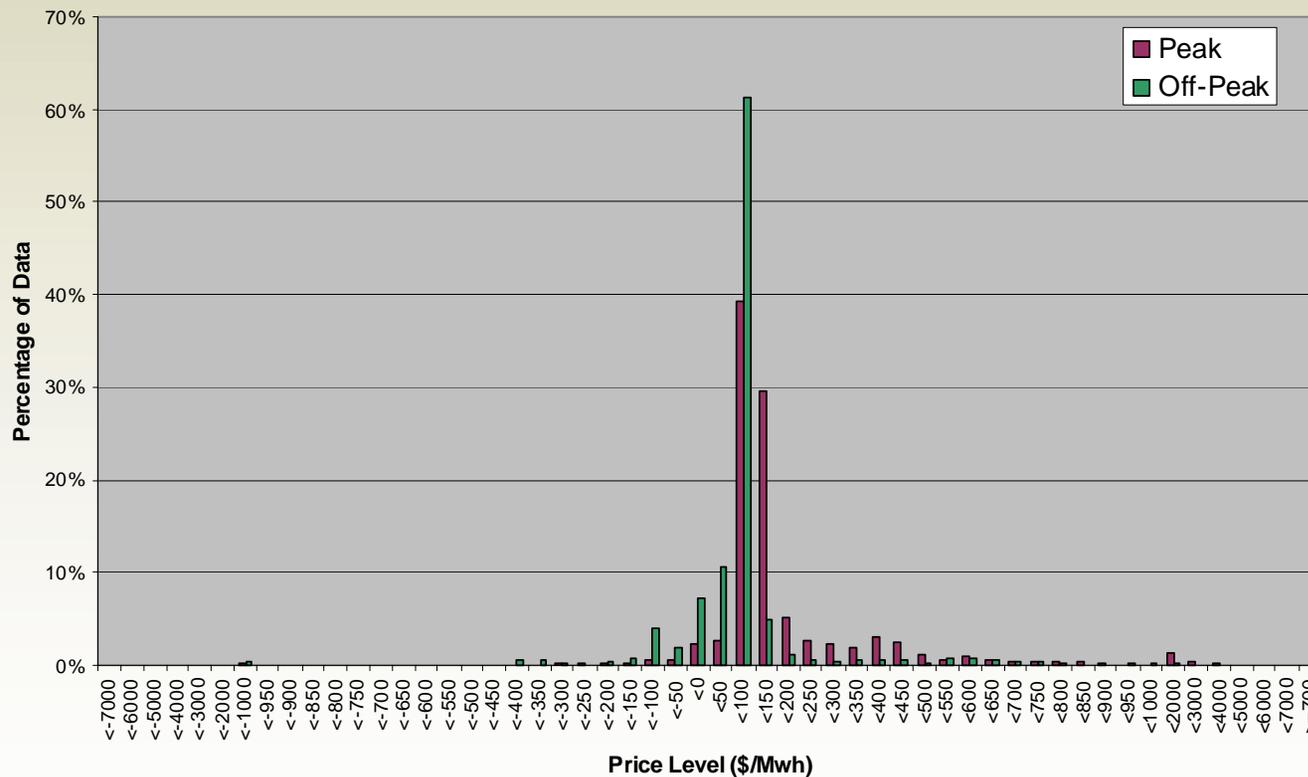
Real Time LAP price distribution

LAP Hourly Price Distribution
(Sept 11, 2008-Oct 10, 2008)

Legend:
- SDG&E-LAP
- SCE-LAP
- PG&E LAP

Y-axis: Percentage of Data
X-axis: Price level ($/Mwh)
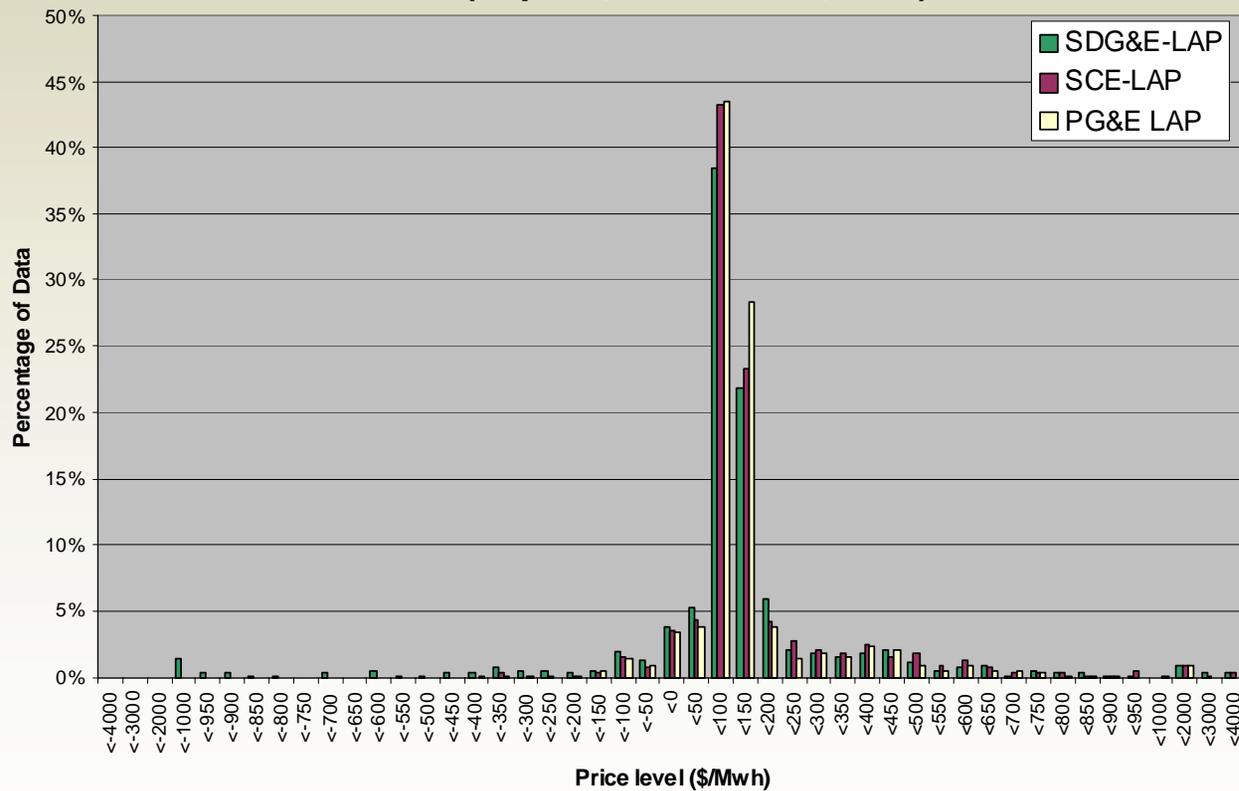
Issues contributing to pricing excursion

- Simulation Related Issues

    - EMS Simulator stability and data flow
    - Interchange Scheduler data
    - SIBR Bid / Schedule data

- Congestion and Model

    - North of SONGS constraint exacerbated by EMS simulation performance
    - Other: nomograms, load distribution factors, seasonal switching

- Load prediction

    - Tuning for better converge of short-term and mid-term load prediction
    - Observed load prediction oscillations

- Bidding behavior and schedules

    - Quantity of load that does not clear Day Ahead
    - Self-schedules with no bid to reduce can result in local low negative prices
    - Fixed intertie modeling rounding after HASP causes RT intertie price spike

Pricing Evaluation RTM LAP

Real-Time LAP Price Population (10/3/08-10/9/08)
(Hourly RTM LAP)
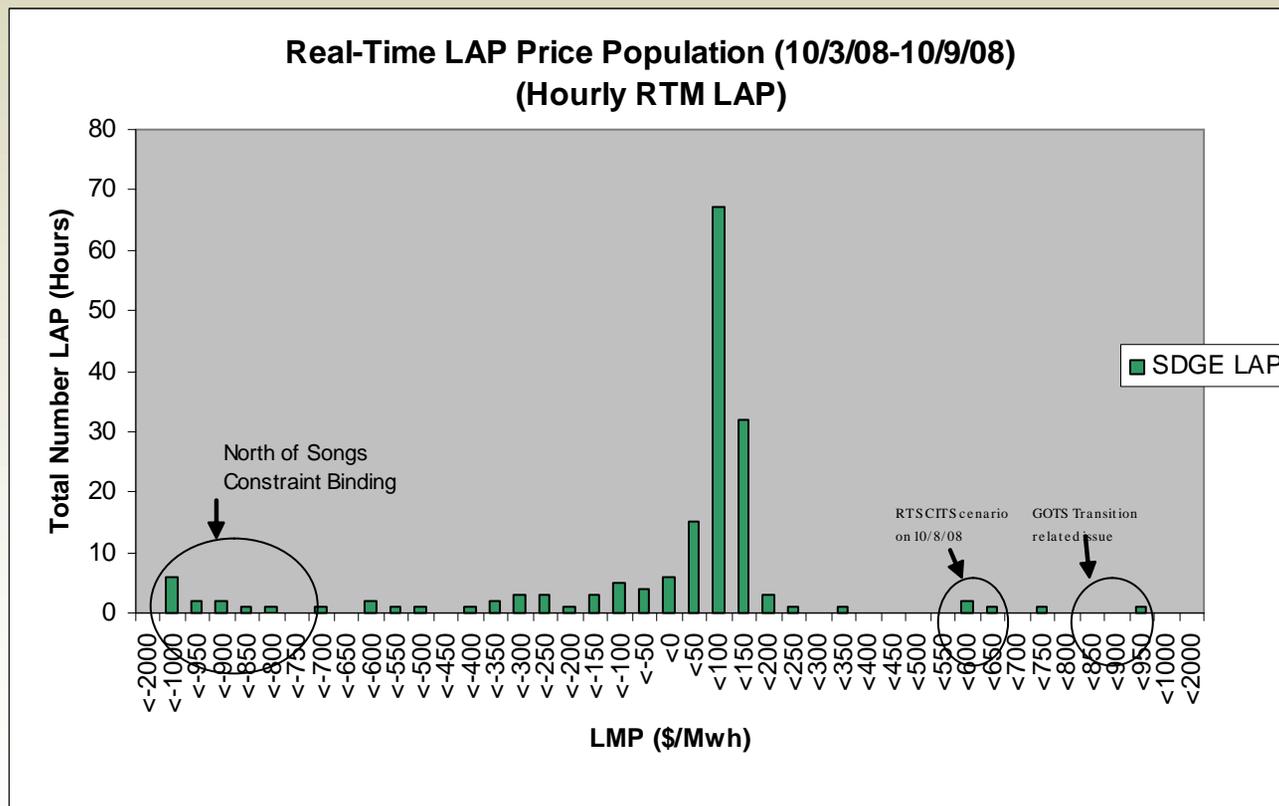
Pricing evaluation max/min LAP and Trading Hub

Min / Max LAP and Trading Hub Prices 10/1-10/7

GOTS data integration issue causing abnormal high forecast that was +18,000 MW off

- ◆ MAX LAP / Trading Hub
- ■ MIN LAP / Trading Hub

Data issue during transition to GOTS

Congestion in SP26 causing generaiton in SP26 to increase

North of Songs constraint is binding with very little effective resource to move

LMP ($/Mwh)

Date
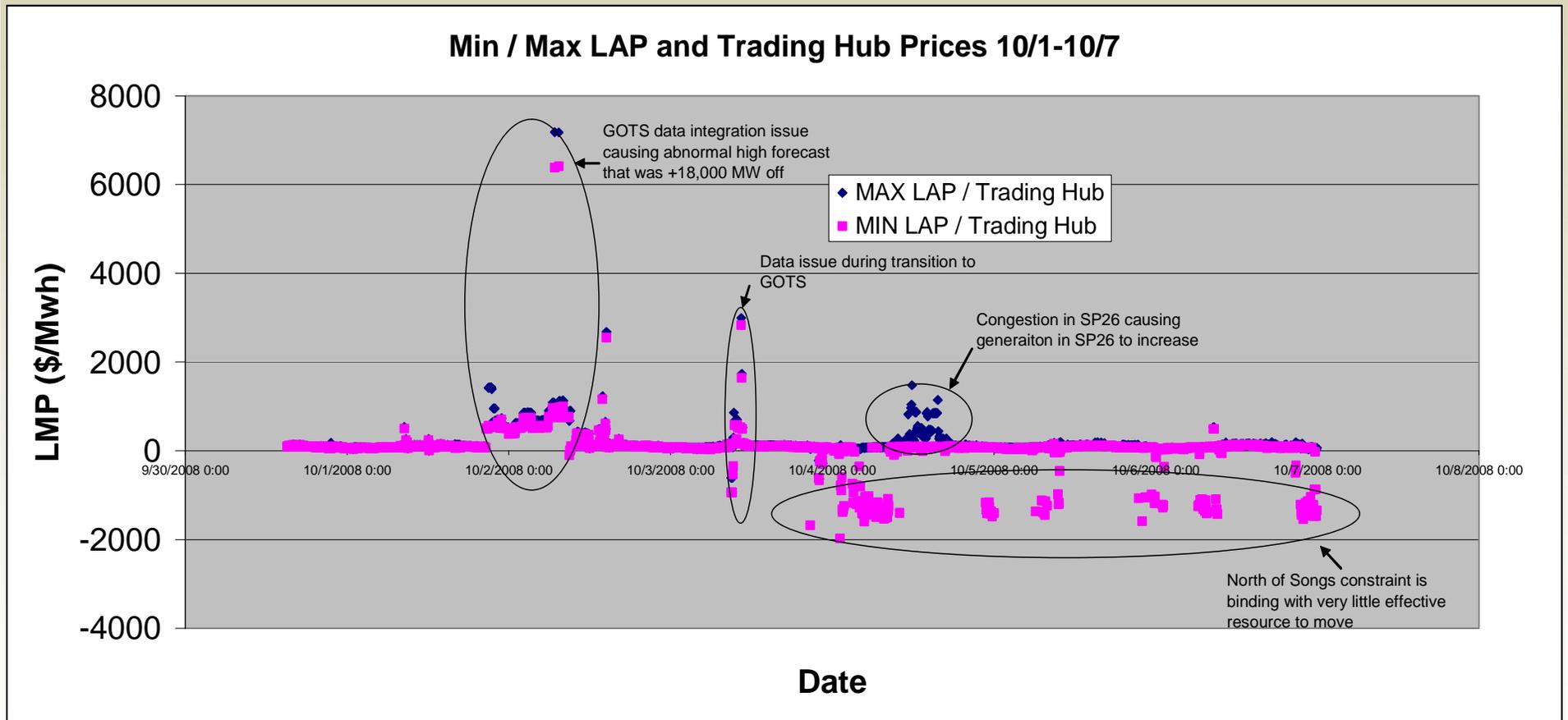
Pricing volatility caused by simulation conditions

RTD Data
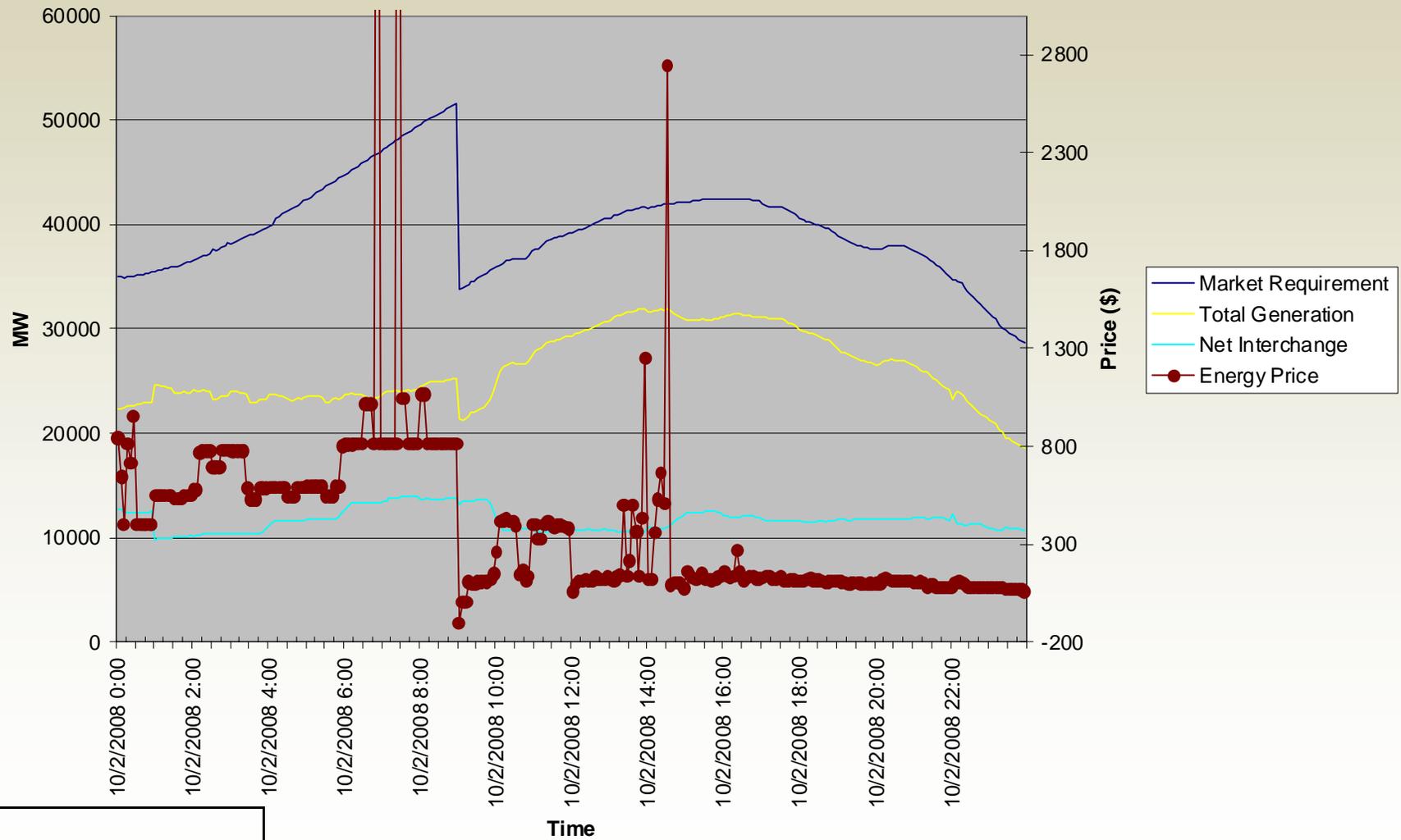
Intertie pricing excursion issue resolved

Silver Peak and Capt Jack

Implemented modification to how intertie are modeled after HASP
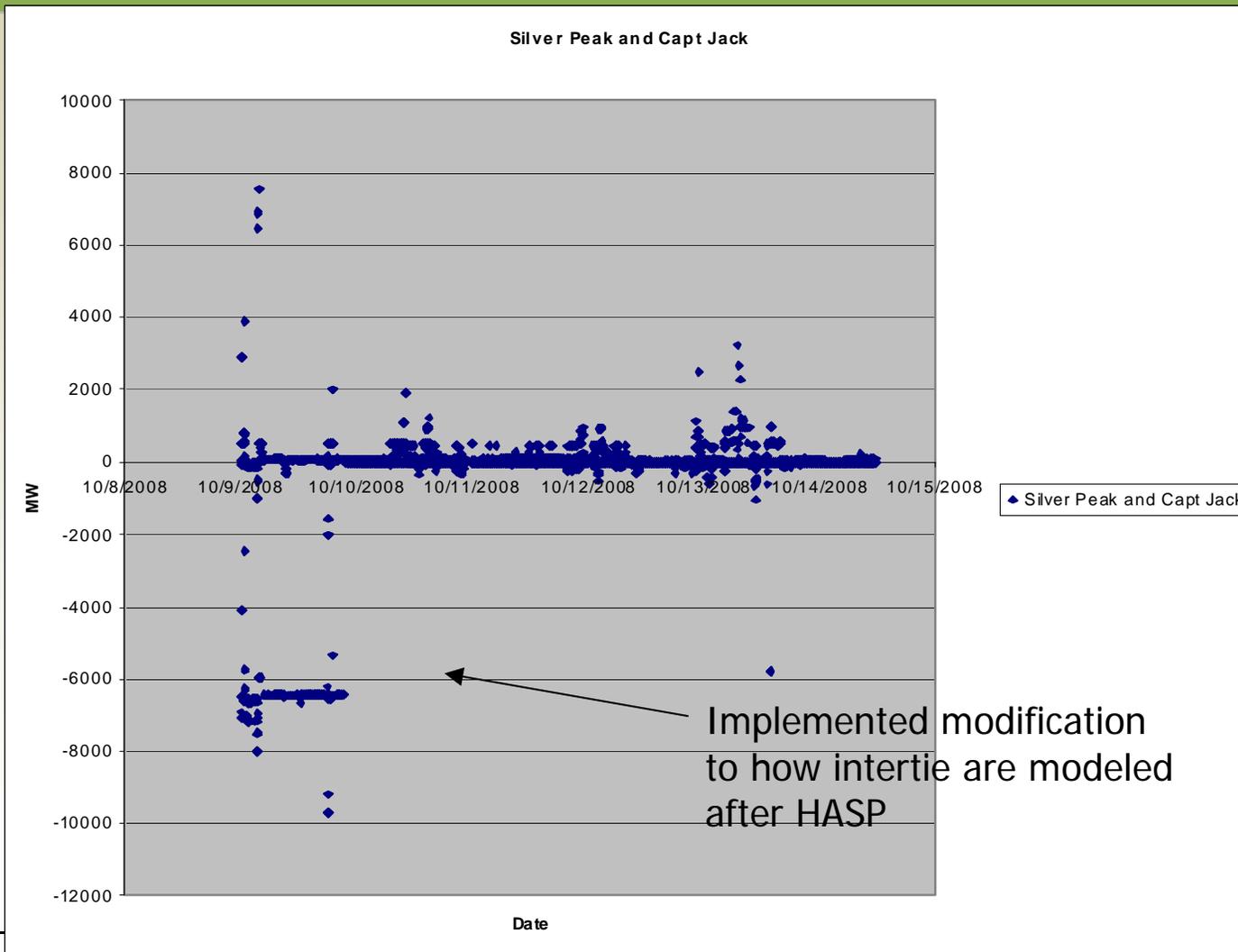
# Residual Unit Commitment (RUC) prices and procurement

- Causes for RUC Prices
  - Market Simulation is modeling a Peak Load period
  - 5%-10% Forecast Adjustment (2000MW-4000MW): Due to losses double counted in EMS simulator and accounting for pump load
  - Not all Resource Adequacy Capacity offering to RUC
  - Scenarios being run contributing to high RUC prices
  - Use-limited resources
  - Congestion conditions
- Context around RUC Capacity, Award, Prices and Costs
  - During September – October approximately 4% of RUC Capacity is awarded to non RA capacity
  - While RUC Prices for RUC Award were at times $250+, the average cost of RUC award to under-scheduled demand was generally less than $15/Mwh
- Trade Date 10/28/08: RUC prices are $0 for entire day as a result of no adjustment to forecast

RUC capacity and award review

RUC Capacity / Award (Market Simulation due to Adjusted Forecast)
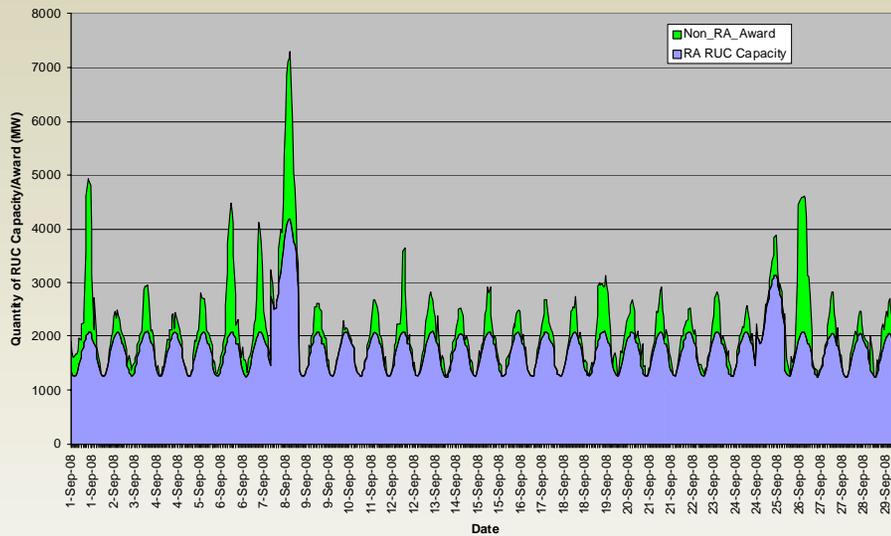
RUC capacity and award original
Market Simulation with load
forecast adjustment

RUC Award to non-RA reduced
significantly when half of load
forecast adjustment is eliminated

RUC Capacity Award
(Assuming no adjustment to forecast cut in half)
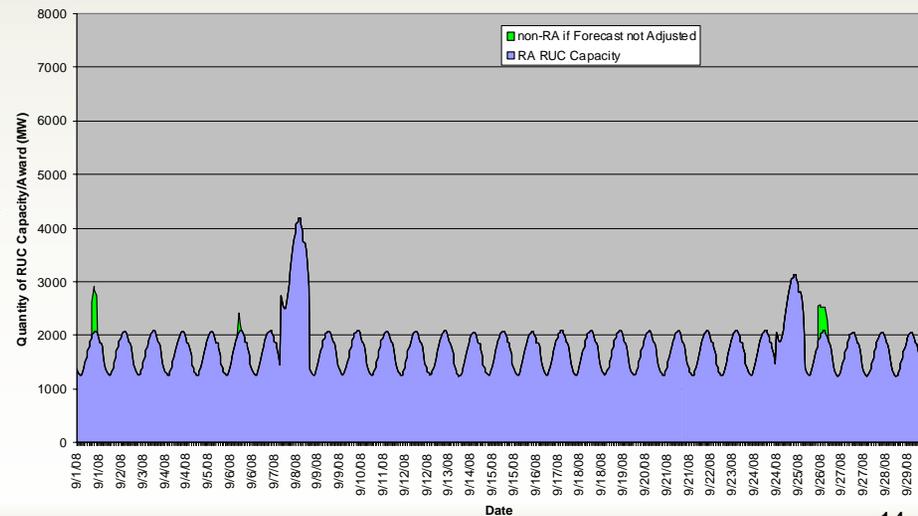
RUC price review – October 10, 2008

RUC Awards and Avg. Prices Trade Day 10/10/2008

Legend:
- Total RUC Award
- Total RUC Capacity
- Average RUC Price
- RUC Cost to Underscheduled Load
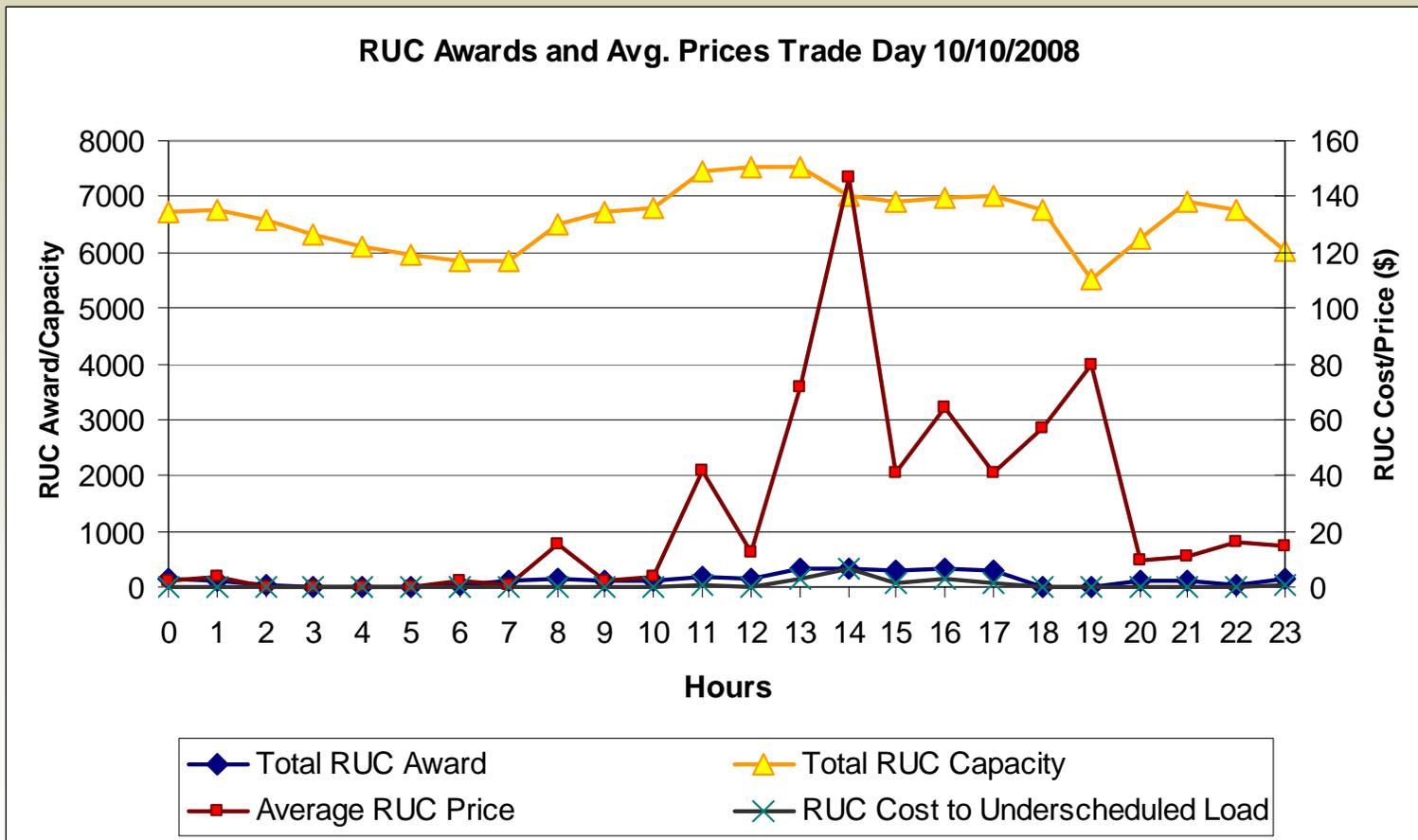
RUC price review – October 28, 2008

RUC Awards and Avg. Prices Trade Day 10/17/2008
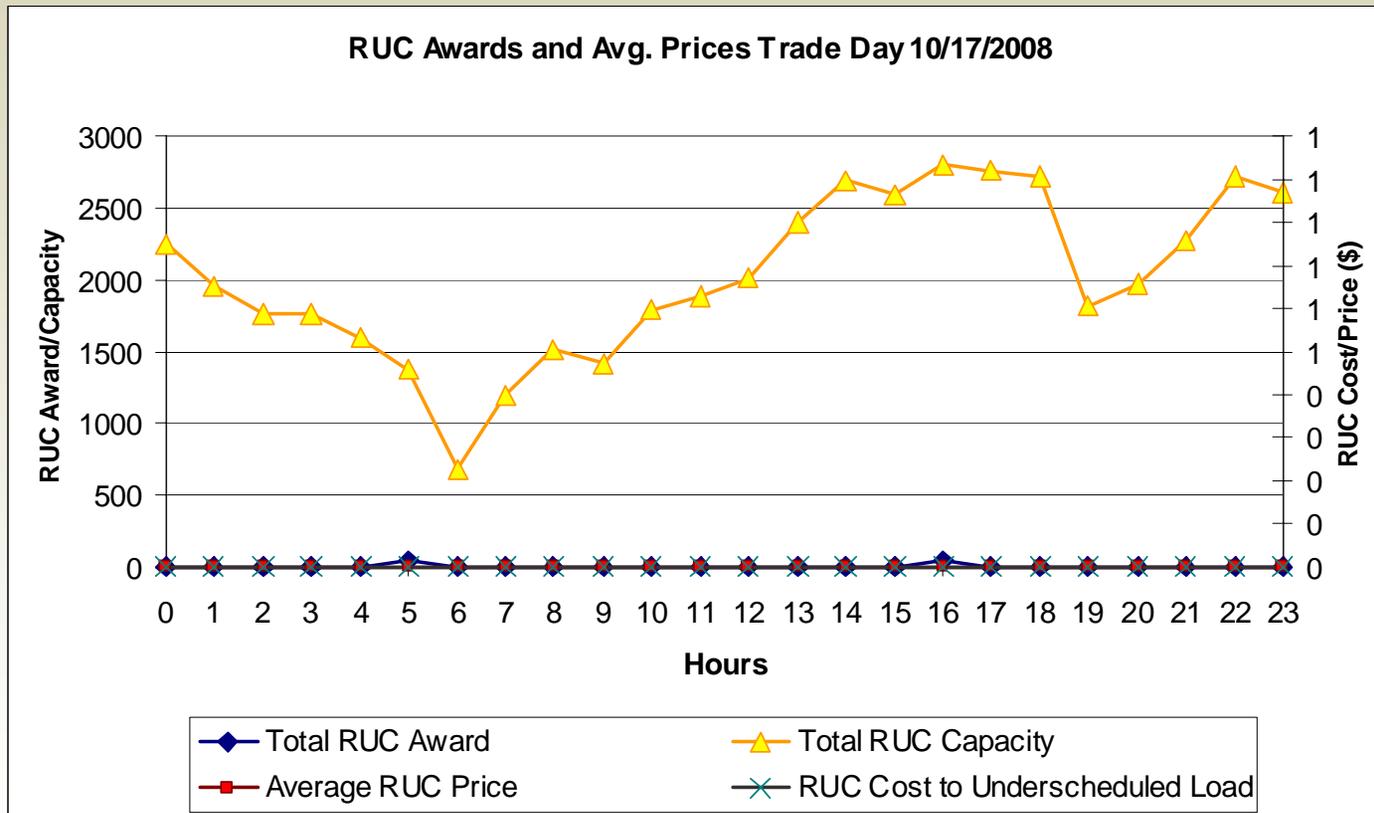
Going forward

- Continue to perform weekly and, if necessary, more frequent pricing review and explanation of causes of price excursions

- Continue to perform validation and analysis of results using LECG tools and processes

- Perform a multi-day controlled simulation to evaluate prices under controlled conditions

- Analyze operational conditions and options to address cases of high priced binding congestion

- Ensure all available resource adequacy capacity is offering into RUC consistent with obligations

- Improve convergence of forecast and modeled conditions between HASP and RT dispatch

- Address Department of Market Monitoring's recommendations