Pre-Regulation Energy Management Markets Overview

Client Training
Customer Services Department
Agenda

• Scheduling Coordinator process
• Day-Ahead & Real-Time Market Timeline and Process
• Locational Marginal Price
• Key Application Systems
• Settlements Timeline and Processes
New Scheduling Coordinator Information
New SC Information

California ISO
Shaping a Renewed Future

ABOUT US  PARTICIPATE  STAY INFORMED  PLANNING  MARKET & OPERATIONS  RULES

Working hard around the clock to keep the lights on for 30 million Californians

Today’s Outlook  Tue Nov 29 10:31:39 2011
Current Demand:  Forecast Peak:
28,160 MW  30,442 MW

Welcome to our site
Learn how to find the information you need

Calendar  News Releases  Recent Documents  Market Notices

TUESDAY, 11/29/2011
CAISO Markets

DAM – Day-Ahead Market
Day-Ahead Market (DAM) Timeline

- **DAM Process Begins**: Pull data from external sources, including: SIBR, Master File, Outage FNM.
- **Run MPM-RRD**: Evaluate Bids for Market Power based on the Full Network Model and mitigate Bids that are deemed to have Market Power.
- **Run IFM**: Will clear bid-in Supply with bid-in Demand plus procure 100% of the Ancillary Service requirement.
- **Run RUC**: Will procure additional capacity, based on CFCD as required to meet locational requirement.
- **Publish Results**: DAM Results published to CAISO Market Results Interface.
Day-Ahead Market Processes

- Self-Scheduled Demand (Price Taker)
- Supply Bids
- Demand Bids
- Total Cleared Demand
- Total Forecasted Demand

- Energy $/MWh
- Market Clearing Price

- MW

CAISO Markets

RTM – Real-Time Market
The Real Time Market (RTM) Timeline

Real Time is a continuous process:
Looking at a single hour:

- **T-75**
  - RT Market Closes:
  - Gather Data and Bids for the New Trade Hour

- **T-67.5**
  - RT MPM is run
  - HASP is run

- **T-52.5**
  - STUC run

- Every 15 min:
  - RTUC runs

- Every 5 min:
  - RTED runs

**New Trade Hour**
Locational Marginal Pricing
Locational Marginal Price: (LMP)

**DEFINITION:**
- The marginal cost of serving the next increment of Demand at that PNode consistent with existing transmission facility constraints and the performance characteristics of resources. (CAISO Tariff definition)

**IN GENERAL:**
- Supply resources will be paid the LMP at the Pnode they reside at
- Demand resources will pay the LMP at the LAP level
If the need for Energy is 300 MW and two generators are offering at $40 and $60, what is the least cost solution? (Assume no losses or Congestion)
The most economic choice is 300 MW at $40 from G1.
If the need for Energy is 300 MW and two generators are offering at $40 and $60, EXCEPT the transmission line between G1 and the Demand is limited to 150MW, what is the most economic solution? (Assume no losses)

Node 1

G1

Demand: 0 MW

Bid: 500 MW @ $40

Limit = 150 MW

Node 2

G2

Bid: 500MW @ $60

Demand: 0 MW

Node 3

Demand: 300 MW

LMP: Energy Example #2
The most economic solution, that honors the line limit: 150 MW from G1 and 150 MW from G2. The LMP at G1 = $40, the LMP at Node 3 = $60 (assuming no losses).
If the need for Energy is 300 MW and three generators are offering at $40, $50 and $60, and the transmission line between G1 and the Demand is limited to 150 MW, what is the most economic solution? (Assume no losses)
If the need for Energy is 300 MW and three generators are offering at $40, $50 and $60, and the transmission line between G1 and the Demand is limited to 150MW, what is the most economic solution? (Assume no losses)
If the need for Energy is 400 MW and three generators are offering at $40, $50 and $60, and the transmission line between G1 and the Demand is limited to 150 MW, what is the most economic solution? (Assume no losses)
If the need for Energy is 400 MW and three generators are offering at $40, $50 and $60, and the transmission line between G1 and the Demand is limited to 150 MW, what is the most economic solution? (Assume no losses)
Three (3) Components of LMP
(Tariff Definitions)

• The System Marginal Energy Cost (SMEC)
  – The component of the LMP that reflects the marginal cost of providing Energy from a designated reference location. (The CAISO will utilize a distributed Reference Bus whose constituent PNodes are weighted throughout the system.)

• The Marginal Cost of Congestion (MCC)
  – The component of LMP at a PNode that accounts for the costs of congestion, as measured between that Node and a Reference Bus

• The Marginal Cost of Losses (MCL)
  – The component of LMP at a PNode that accounts for the marginal real power losses as measured between that Node and a Reference Bus
Actual losses are calculated by the use of the Full Network Model and the optimal power flow solution and will affect the LMP calculated by the IFM program.

The loss component of the LMP is based on the MARGINAL losses. That is, the amount of losses incurred when serving an additional MW of load at a Node.

The marginal losses are based on loss sensitivity factors produced by the IFM program.
• LMP consists of 3 components: Energy, Congestion and Losses
  – The energy component is the same at all network nodes
  – Congestion will change where the MW are coming from, but not the dispatch amount.
  – Losses will change the amount of MW dispatched
Key Application Systems
Settlements Timeline and Processes
Settlements Process

All Energy Scheduled in the Day-Ahead Market will be paid or charged the Locational Marginal Price (LMP) at the location where the resource Bid/scheduled

- Generator will be paid the LMP at the Pnode
- Imports will be paid the LMP at the Scheduling Point
- Export will be charged the LMP at the Scheduling Point
- Non-Participating Demand will be charged the LMP at the Default LAP

All Ancillary Services Awards from the DAM will be paid the resource specific ASMP
Settlements Process

- Day-Ahead results are financially binding: resources will be paid/charged based on the results of the Day-Ahead Market – REGARDLESS of Real-Time performance.
- If a resource does not deliver on the Day-Ahead energy schedule in Real-Time, the resource will be subject to Real-Time charges.
- Resources that do not honor Day-Ahead Ancillary Services Awards in Real-Time will be subject to No-Pay.
Settlements Timeline

- Initial Settlement Statement – T+3B
  - ISO ESQMD Only

- Recalculation Settlement Statement – T+12B
  - SC ESQMD, SC ASQMD submit by T+8B
    - If no SC data submitted, ISO ESQMD will be input
    - ISO ME data (ISO polled data) will be actual

- Recalculation Settlement Statement – T+55B
  - SC ASQMD data must be submitted by T+48B
    - If no data is submitted and there is no SC ESQMD then
      ISO ESQMD data will be changed to zero
Settlements Timeline

- Recalculation Settlement Statement T+9M thru T+36M
  - SC ASQMD submittal window (T+168B to T+172B)
- Unscheduled Recalculation Settlements Statements - T+9M, T+18M, and T+35M will be published in the event the following criteria is met:
  - $1,000,000 per day fiscal impact to market
  - Result of CAISO processing error
  - Identified within the respective settlement dispute window
Settlements Invoicing

- Published on a weekly basis – Every Wednesday
  ➢ To the extent the Wednesday is a CAISO holiday, invoices are published on the next business day.

- Includes market transactions from Trading Days Monday through Sunday of the week preceding the invoice.
### Settlements Invoicing

#### CAISO Payments Calendar

**DRAFT Transition from Payment Acceleration Timeline to Credit Reform and Settlement Process Timeline Change**

**October 1, 2011 through January 31, 2012**

<table>
<thead>
<tr>
<th>Calendar Date</th>
<th>Day</th>
<th>Credit Reform: Publish Daily Initial T+3B</th>
<th>Proposed: Publish Recalculation Statement T+12B</th>
<th>Proposed: Publish Recalculation Statement T+55B</th>
<th>Proposed: Publish Recalculation Statement T+9M (as T+194B) - optional (as needed)</th>
<th>Credit Reform: Weekly Invoice by Billing Period (each Wednesday)</th>
<th>Credit Reform: Weekly Invoice Due by 10:00am for Disbursement at 2:00pm T+4B</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-Oct-11</td>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02-Oct-11</td>
<td>Sunday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03-Oct-11</td>
<td>Monday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04-Oct-11</td>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-Oct-11</td>
<td>Wednesday</td>
<td>10/01-10/02/2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T+3B Initial: 10/01-10/02/2011, T+18M Recalc: 03/01-03/31/2010</td>
</tr>
<tr>
<td>06-Oct-11</td>
<td>Thursday</td>
<td>10/03/2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07-Oct-11</td>
<td>Friday</td>
<td>10/04/2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Oct-11</td>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09-Oct-11</td>
<td>Sunday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-Oct-11</td>
<td>Monday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-Oct-11</td>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T+3B Initial: 10/01-10/02/2011, T+18M Recalc: 03/01-03/31/2010</td>
</tr>
<tr>
<td>13-Oct-11</td>
<td>Thursday</td>
<td>10/10/2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Settlements Dispute Timeline

- Disputes may be submitted through the **Settlement Dispute System**:

<table>
<thead>
<tr>
<th>Statement Publication</th>
<th>Settlement Dispute Deadline</th>
<th>Settlement Dispute Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>T+12B</td>
<td>T+26B</td>
<td>All but ESQMD</td>
</tr>
<tr>
<td>T+55B</td>
<td>T+77B</td>
<td>All</td>
</tr>
<tr>
<td>T+9M (T+194B)</td>
<td>T+10M (T+216B)</td>
<td>Incremental Changes Only</td>
</tr>
</tbody>
</table>

- Disputes may be submitted for errors not related to Estimated Settlement Quality Meter Data
Thank You for Attending!!

Please send additional questions to:
MarketTraining@caiso.com