



California ISO
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California Independent
System Operator Corporation

Price-to-Cost Mark-up for Short Term Energy Purchases
January 2006 – August 2007

Department of Market Monitoring

October 30, 2007

I. Summary

The Department of Market Monitoring reviews two indices to monitor the competitiveness of the short-term wholesale electricity market in California: a monthly average price to cost mark-up and a 12-month rolling average of the same that provides a longer term indication of the competitiveness of the short-term market. These indices have been updated to reflect market activity for January through August of 2007. More information on methodology and historical figures can be found in the Annual Report on Market Issues and Performance.¹

For the first eight months of 2007, the monthly average short-term mark-up was relatively low, indicating a high and consistent degree of competitiveness in the short-term market. Mark-up values ranged from roughly 2% to 12%, with seven of the eight months in the neighborhood of 2% to 5% and average mark-ups for July at 12%. The higher average mark-up for July reflects tighter supply conditions in the short-term market as Load Serving Entities increases spot procurement during high-load days observed during a week-long heat wave in early July.

The longer-term trend across 2006 and 2007, as measured by the 12-month competitive index, has been a pronounced decline in mark-ups across 2006 from \$5.50/MWh to roughly \$3.00/MWh with values stabilizing at around \$3.00/MWh throughout 2007. This trend indicates lower estimated margins in the spot market, with margins stabilizing at low enough levels to indicate a highly competitive short-term market. More moderate summer peak demand in 2007 compared to 2006, particularly in June and July, may contribute to the lower mark-up margins.

II. Price-to-Cost Mark-up for Short Term Energy Purchases

The price-to-cost mark-up for short term energy purchases is an index used to measure market performance in the California wholesale electricity markets. This is the difference between the estimated actual price paid in the market for wholesale electricity and an estimate of the production cost of the most expensive, or marginal, unit of energy needed to serve load. The ratio of the volume-weighted average mark-up to marginal cost is a metric that can be used to identify market performance trends over time.

In the past, the Department of Market Monitoring has implemented several index constructs yielding measures of market competitiveness in the short-term energy markets. Those indices have been based on several price sources that include CAISO market data, information on bilateral forward contracts, and prices from the Department of Water Resources' California Energy Resources Scheduler (CERS) long-term energy contracts. The current methodology is based exclusively on short term procurement data that was previously not available. From 2006 forward, the actual short-term prices paid were obtained from confidential bilateral transactions data of three major IOUs in

¹ The Annual Report on Market Issues and Performance can be found on the CAISO web site at <http://www.caiso.com/1b7e/1b7e71dc36130.html>

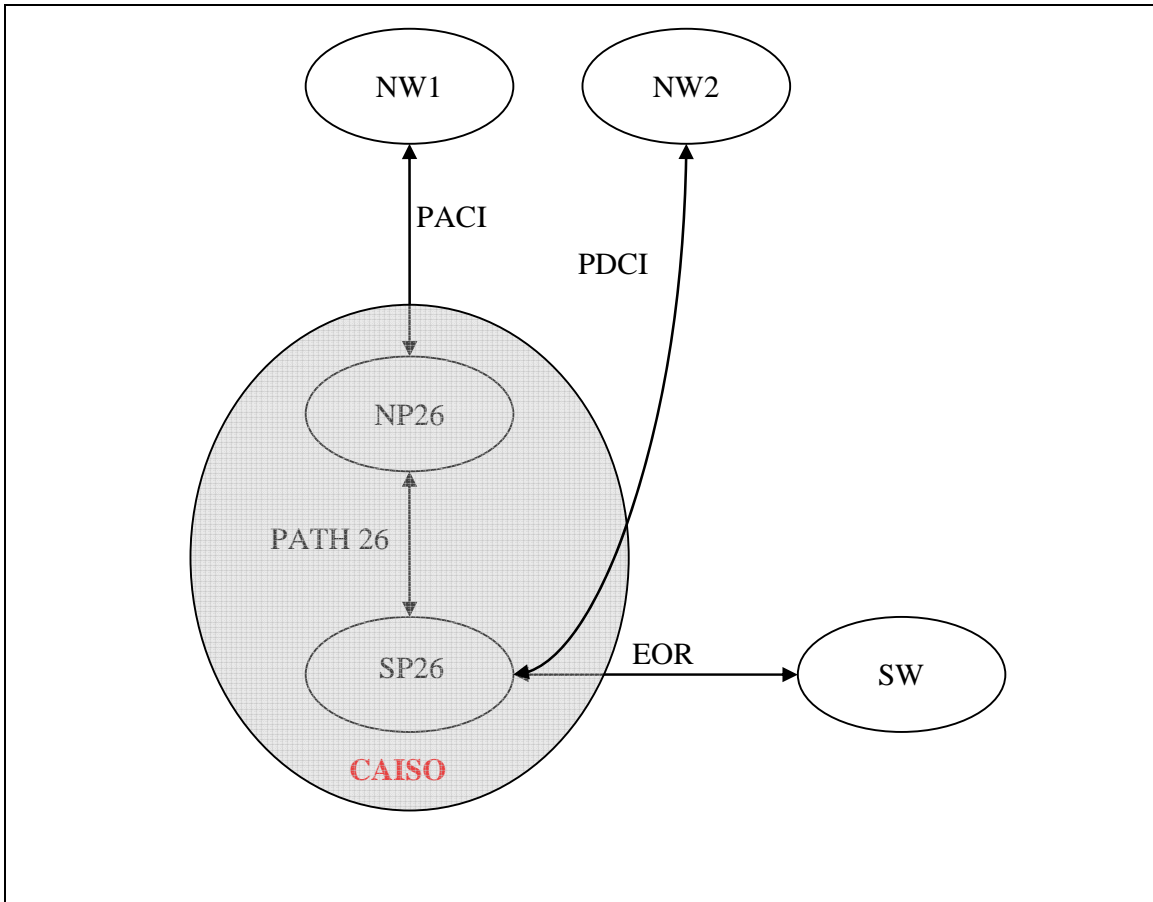
the CAISO markets (PG&E, SCE and SDGE). Only the transactions that occurred 24 hours prior to the operating day were considered “short-term” in the analysis. However, there are still periods in calendar year 2004 for which short-term energy procurement information is not available. During these periods, hourly short-term forward price data purchased from Powerdex is used as a substitute.

The simulation of competitive benchmark prices considers a single-price auction framework and clears offers against hour-ahead scheduled load subject to the following assumptions:

- Simplified five node four line zonal model.
- Import and export bids are fixed in quantity at observed hour-ahead scheduled import levels and priced at the regional spot trading hub price reported from Powerdex at the California-Oregon Border (COB) for imports from the Northwest and at the Palo Verde (PV) hub for imports from the Southwest.
- Internal thermal generators bid in at cost as determined by their incremental heat rate, hourly natural gas price and variable operating and maintenance costs.
- Internal hydroelectric units, nuclear units and the rest of thermal units without heat rate data bid in zero as price and hour-ahead schedule as quantity.
- Remaining internal generators, including biomass, geothermal, Qualified Facility, wind, etc., bid in with a zero-dollar bid price and metered output as quantity.
- Unit commitment decisions (whether or not an internal resource is on and available in any hour) are based on whether or not a unit had a positive historical hour-ahead schedule or metered output.

Figure 1 shows the simplified zonal radial network model used in the simulation.

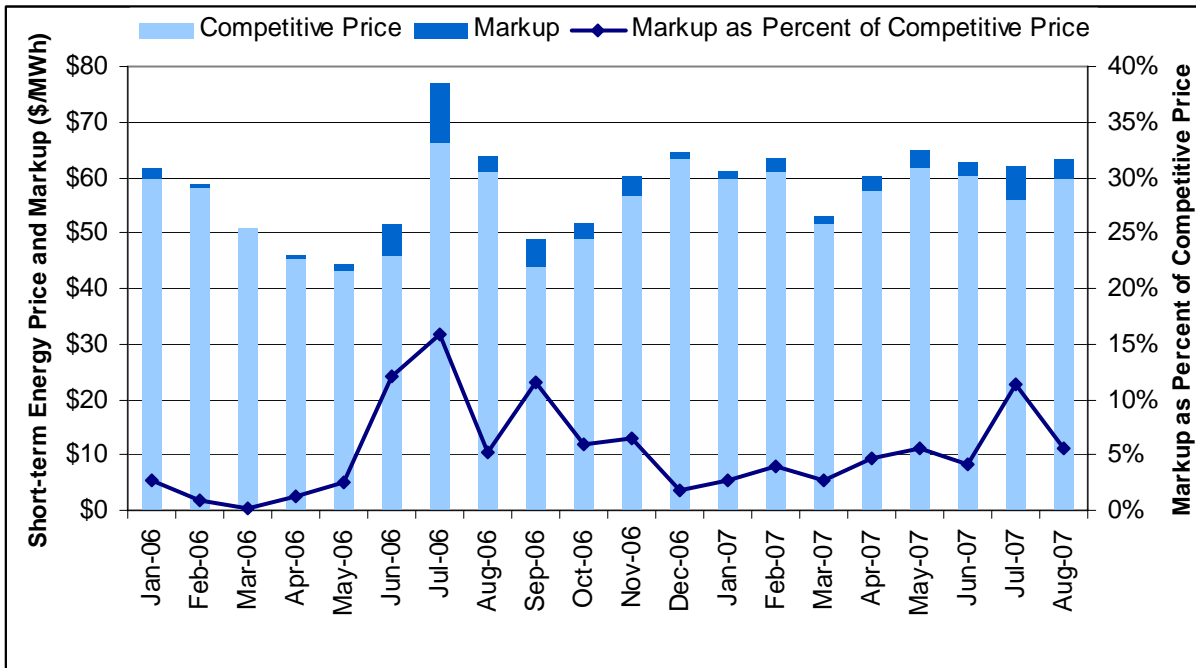
Figure 1. Simplified Network Topology Used in Competitive Price Simulation



The simulation model used to simulate production cost in this study employs a linear programming algorithm based production cost minimization model, which allows for co-optimization with ancillary service markets.

From January to August in calendar year 2007, the CAISO observed monthly short-term mark-ups ranging from 2 to 12 percent, compared to 1 to 16 percent in the prior year. Figure 2 summarizes competitiveness in the short-term forward energy markets. A low hydro runoff season in Spring 2007 resulted in a relatively higher mark-ups compared to Spring 2006. July was the only month where the average price to cost mark-up was greater than 10% in 2007, however this markup is lower than the July 2006 markup due to milder heat-wave conditions and corresponding lower peak loads in July 2007. Markups for the remaining summer months, June and August, are in the neighborhood of 5% reflecting mild market conditions resulting from relatively mild load conditions during these months. On average, spot wholesale electricity markets functioned efficiently during the first eight months of 2007, resulting in competitive pricing in the spot market as indicated by the monthly average price to cost mark-ups seen in Figure 2.

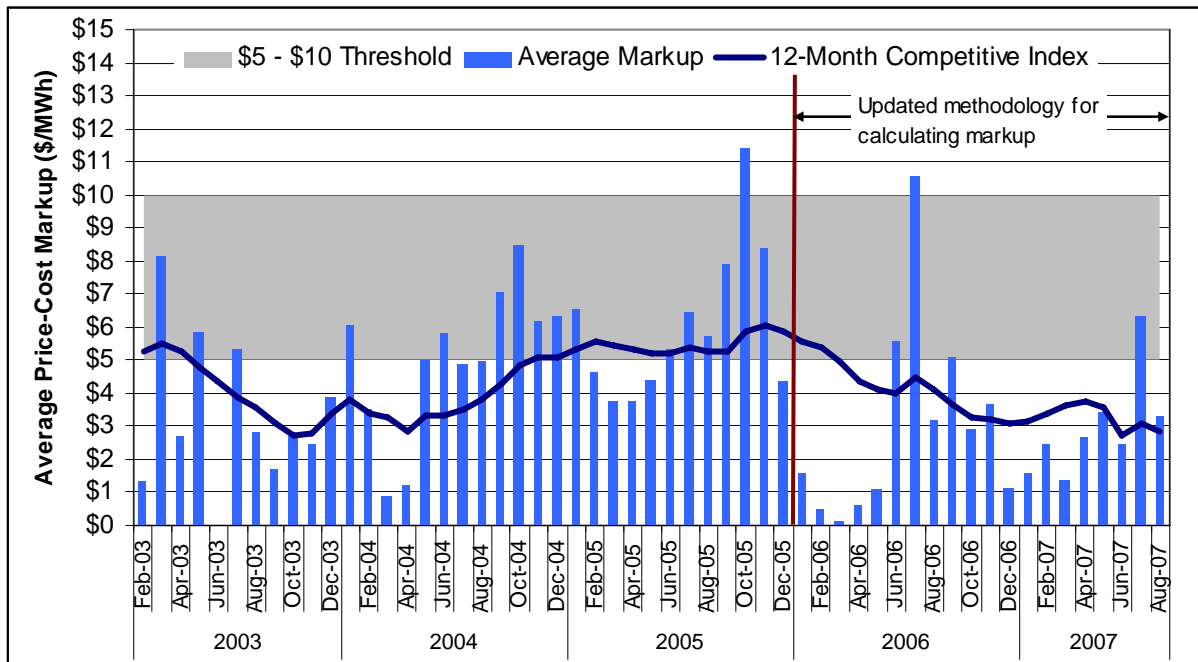
**Figure 2. Monthly Average Short-term Market Competitiveness Index
January 2006 – August 2007**



III. Twelve-Month Competitiveness Index

In addition to monitoring monthly average mark-ups, the Department of Market Monitoring also monitors longer-term indices in spot market competitiveness. The index in Figure 3 serves to measure market outcomes over extended time periods against estimated perfectly competitive market outcomes. This 12-Month Competitiveness Index is a rolling average of the monthly short-term energy mark-up over simulated competitive prices across a twelve month period.

Figure 3. Twelve-Month Competitiveness Index: February 2003 – August 2007



The blue bars in Figure 3 represent the monthly average price to cost mark-up, and the blue line shows the 12-month volume-weighted rolling average of the monthly mark-ups. The CAISO assumes that the short-term energy market is subject to little or no exercise of market power when the index is near or below a \$5 to \$10 per MWh range. The 12-month competitiveness index showed a lower stable level of around \$3 to \$4 throughout 2007 and was considerably lower than 2006. This decrease is primarily due to low mark-ups during the winter and spring months of 2007 and relatively mild conditions during the summer and fall.