California ISO
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Technical Bulletin

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Disconnected Pricing Node Process

Market Issue

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Introduction

As of the August 1, 2009 trading day, the ISO has adopted a new procedure for pricing locations when the market model has identified a pricing node that is electrically disconnected. This process change came after market participants expressed a concern with the ISO's prior procedure, in which the ISO used the zero dollar value ($0) as the marginal cost of congestion component (MCC) of the Locational Marginal Price (LMP) when a pricing node was identified as electrically disconnected.[1] Market participants expressed a concern that the use of the $0 MCC could result in inappropriate settlement of energy and congestion revenue rights (CRRs). The new procedure implemented as of the August 1, 2009 trading day requires the substitution of the MCC at an electrically disconnected pricing node with the MCC at the closest electrically connected pricing node.

Subsequently, in March 2010 the ISO identified the following two issues with the application of its new procedure.

1.   Whenever a point-of-delivery (POD) aggregate pricing node (APNode) was disconnected from the system but a member pricing node was connected to the grid, the disconnected pricing node process failed to recalculate the MCC based on the closest electrically connected pricing node for the POD. As a result, CRRs that had a source or sink associated with these PODs affected by a disconnected pricing node were not settled based on the MCC from the closest electrically connected pricing node.

2.   LMPs at pricing locations affected by the disconnection of pricing nodes were not used in the calculation of resource-specific LMPs calculated specifically for the settlement of energy supply. For resources that are not settled at POD locations, this had no actual financial impact because these resources have a one-to-one generator to pricing node relationship and therefore would not have

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[1]   Additional background on the disconnected pricing node issue can be found on the ISO website. The ISO published a paper "Issue Paper on How to Address Disconnected PNodes" at the following webpage http://www.caiso.com/23e4/23e49fd54bbb0.pdf. The ISO also sought and obtained approval from the Federal Energy Regulatory Commission for change in its processes that permitted the ISO to establish an LMP based on the closest electrically connected PNode when a PNode becomes disconnected. *See* Section 27.1.1 of the ISO FERC Electric Tariff, the ISO's filing at http://www.caiso.com/23fc/23fcb61b29f50.pdf and the Commission's order accepting the ISO's filing at http://www.caiso.com/2439/243974b716500.pdf.

been scheduled or dispatched at electrically disconnected locations of the ISO controlled grid. However, because resources settled at PODs could have obtained a schedule or dispatch via a different electrically connected path, this issue could have impacted the settlement of schedules or dispatches at POD locations. This did not impact the settlement of CRRs and inter-scheduling coordinator trades (Inter-SC Trades), which are both based on LMPs at the specific pricing locations and not POD locations.

It is important to note, that both these issues affect only settlement of instruments at the PODs and do not affect other aggregate pricing nodes such as load aggregation points (LAPS) and trading hubs.[2]

In addition, the disconnected pricing node procedure implemented last year required the adoption of the presumption that pricing nodes disconnected in the day-ahead would continue to be disconnected in the real-time. At the time, this presumption was reasonable given that the difference between the disconnection of the pricing nodes between the day-ahead and real-time was believed to be minimal. However, on April 15, 2010, the ISO attempted to adopt an enhancement to its procedure that evaluated the disconnections for the real-time market closer to the real-time to capture incremental disconnections after the day-ahead. The implementation of this enhancement proved problematic and was removed after only 10 days of operation on April 26, 2010. The ISO continues to seek an enhancement to better define the closer to real-time disconnection.

Because of the minimal financial impact discussed further below, the ISO will not make any further changes to published prices or resettle cleared amounts.

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[2]   LAPS were not affected by these issues because all LAPs have dynamic distribution factors. Therefore, any time a pricing node associated with the LAP is disconnected, the distribution factor associated with that pricing node is set to zero thereby having no impact on the LAP LMP. Trading hubs have a static set of distribution factors, and were also not impacted by this issue because the disconnected pricing node processes recalculates the trading hub LMPs whenever a pricing node associated with the trading hub is modified.

Impact Analysis

Day-Ahead Market

To analyze the impact of these two issues identified above, the ISO performed an analysis for the day-ahead market using a representative sampling period of March 1, 2010 until May 31, 2010.   For this period the ISO calculated the differences in LMPs between the original POD LMP calculated a methodology that did not substitute the disconnected pricing node LMP, and the re-calculated POD LMP that did replace the LMP at the disconnected pricing node with the LMP at the closest electrically connected pricing node. The ISO found that, on average and per hour, two percent of PODs were priced incorrectly. In other words, on average and per hour, six PODs out of a total of 287 PODs were not priced using the MCC at the closest electrically connected pricing node. On average, the absolute difference between the MCC of the original LMP and the recalculated MCC of the LMP was nine cents. This average difference between the original MCC and the recalculated MCC indicates the minimal potential impact on the CRR settlements. The maximum and minimum differences were $8.5 and zero dollars, respectively. The average difference between the original LMP and the recalculated LMP at these effected locations was seven cents. This average difference between the original LMP and the recalculated LMP indicates the minimal possible impact on the day-ahead energy settlements. The maximum and minimum differences were $38 and $0, respectively.

Impact on CRR

CRR holders either receive a payment or are charged an amount equal to the product of CRR megawatt entitlement and the difference between the sink congestion component of LMP and the source congestion component of LMP. As mentioned previously, the issue with the disconnected pricing node impacted CRR holders that had either their source or sink at a POD location.

The impact on the CRR market was analyzed for a period of March 1, 2010 through May 31, 2010 on a monthly basis. For this period the settlement amount for each market participants was calculated with the original set of MCC and the recalculated MCC. These two sets of results were compared to determine whether the difference yielded an overpayment or an underpayment for the given month.   The following average and overpayments by CRR holders were calculated:

	Overpayments		Underpayments
March holders)	$2,042	(5 out of 56 holders)	$4,100 (5 out of 56
April holders)	$4,221	(8 out of 11 holders)	$1,231 (3 out of 11
May	$660 (4 out of 7 holders)		$688 (3 out of 7 holders)

Impact on Energy Market

As mentioned in the previous section, for most resources there was no market impact on of energy when a POD is disconnected and the physical resource is likewise disconnected from the system. For the March to May time period studied, the ISO has estimated that of the total 287 PODs, on average only 7 PODs were affected by disconnection and of which 1.68 percent (about 5) were affected. In those instances where, despite the electrical disconnection of a specific POD location the resource remained connected to the grid and was therefore was able to supply energy pursuant to a schedule or dispatch, the issues discussed above did impact the energy settlement. On average, 2 out of 7 of PODs were affected (0.86 percent). The average hourly absolute difference between the original cost and the recalculated costs was $95 with a maximum cost difference of $12,942 over a four day period averaging $3000 per day.

Impact on Inter-SC Trades

As per the CAISO market rules all Inter-SC Trades are permitted to be scheduled only at the trading hubs. Since, this issue had no impact on trading hub LMPs, none of the Inter-SC trades were affected by this issue. Furthermore, for the time studied, from March 2010 to May 2010, there were no physical trades at the disconnected pricing node locations in the day-ahead market.

Real-Time Market

The ISO also analyzed a the data over the period of March 1, 2010 through May 31, 2010 to evaluate the potential impact on the real-time market of the issues identified above

Impact on Energy Market

For certain representative intervals, the ISO calculated the differences between the original POD LMPs without the disconnected pricing node price substitution and the re-calculated POD LMPs after the application of the disconnected pricing node replacement. This recalculation was performed for only those PODs in which there was also an underlying disconnected pricing node. On average 287 POD LMPs were calculated for each interval and of those PODs seven were not priced using the closest electrically connected pricing node. The average difference between the MCC of the original LMP and the recalculated LMP was five cents. The maximum and minimum differences were $1605 and zero dollars, respectively. The average difference between the original LMP and the recalculated LMP price was $1.20. The maximum and minimum differences were $1613 and $0, respectively.

As mentioned before, the presumption that if a pricing node is disconnected in the day-ahead market is also disconnected in the real-time is limiting because of the ISO's recent findings that in the real-time pricing nodes disconnect more frequently. On average, by the ISO's current estimates, pricing nodes disconnect three times as much in the real-time as they do in the day-ahead. In addition, the ISO has observed that most of the disconnected pricing nodes in the real-time market that were connected in the day-ahead market were load pricing nodes. Because load is settled at LAPs and the distribution factor associated with LAPs are dynamic, as discussed above, the disconnection has no financial impact. The minimal impact this presumption has on the financial outcome of the market, does not warrant additional post-process procedures that would reduce the delta between the day-ahead and real-time disconnected pricing nodes definitions. The ISO's prior attempt to implement such a post-process procedure proved to create additional complications that may lead to greater discrepancies. The ISO is awaiting a software enhancement from its vendor that will provide better estimates of the real-time pricing node disconnection.

Resolution of Problem

As of June 1, 2010 the ISO adopted a short-term solution that resolves the two problems identified above. First, the ISO now recalculates the POD LMPs after the LMPS associated with the POD is replaced by the disconnected pricing node process. Second, for all POD resources any change in the POD LMP is reflected back to the resource level LMP. As a result, both the CRRs and the energy settlement calculations are performed using the LMPs that reflect the MCC at the closest electrically connected pricing node.

Price Corrections

As discussed above, the ISO has estimated that the issues related to the POD prices had minimal financial impact on the CRR, day-ahead and real-time market settlements. Therefore, the ISO will not be seeking any retroactive changes to prices published prior to June 1, 2010, and will not be making any retroactive changes to the settlement of CRRs or energy supply affected by the POD issues identified above.