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## **Technical Bulletin**

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# **Analysis of Incorrect Trading Hub Weighting Factors in the ISO Markets, April 1 – May 30, 2009**

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## Acronyms

CRR	Congestion Revenue Right
FROM	Label used to identify the party on the supplier side of a bilateral trade, who will be charged by the ISO for energy transacted under an IST
IFM	Integrated Forward Market
IST	Inter Scheduling Coordinator Trade
LMP	Locational Marginal Price
MCC	Marginal Congestion Component of an LMP
SC	Scheduling Coordinator
SFT	Simultaneous Feasibility Test
TH	Trading Hub
TOU	Time of Use

## **Analysis of Incorrect Trading Hub Weighting Factors in the ISO Markets, April 1 – May 30, 2009**

### **1. Introduction**

In preparation for the annual Congestion Revenue Rights (CRRs) release process for 2009 conducted in the summer of 2008, the ISO developed weighting factors, on a season and time-of-use (TOU) basis, for each of the Trading Hub (TH) locations (NP15, ZP26 and SP15) based on historical generator output for the year 2007.<sup>1</sup> The weights used to run the TH nominations and bids through the 2009 CRR processes are the same weights used for the purpose of determining TH prices for each market interval of the Day-Ahead and Real-Time Markets that began on April 1, 2009.

During this process in calculating the weighting factors for resources that were part of an aggregated Resource ID, the ISO incorrectly applied the gross output at the aggregated resource level to each of the underlying generating units that comprise the aggregated resource. For example, if an aggregated resource GEN\_AGG was comprised of three underlying generating units, Gen1, Gen2 and Gen3 and the aggregated output for a particular season and time-of-use during the year was 500MW (made up of Gen1-100, Gen2-150, Gen3-250) each of the underlying resources was assigned an output of 500 MW instead of the respective output at the individual resource level. As a result, aggregated resources received excessive weights in the TH formulation that would also be reflected in the TH price.

This weighting error affected the settlement of two financial instruments settled on the basis of TH prices, namely CRRs and Inter Scheduling Coordinator Trades (ISTs). The weighting error discussed above does not affect the ISO Day-Ahead and Real-Time Market optimization clearing results, neither in terms of the schedules and dispatches nor in terms of the LMPs calculated by the market clearing processes. Rather, the error affects the prices at each of the THs through the use of incorrect weighting of constituent LMPs comprising each TH price.<sup>2</sup> The error also affects the settlement of CRRs that are defined at THs because such CRRs are settled based on the TH prices. This paper discusses the estimated impacts of using the erroneous TH weights as compared to using the corrected TH weights on the settlement of CRRs and ISTs through the ISO settlement system, for the period April 1 through May 30 when the incorrect weights were used for calculating TH prices.

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<sup>1</sup> The THs are comprised of an aggregation of generation PNodes within the three corresponding Existing Zones. The LMPs of the constituent PNodes are used to establish the TH price, which is a weighted average of the LMPs paid to the units within the Existing Zone. The weights used in determining the weighted average are based on the ratio of the prior year's total output at the constituent PNodes to the total generation output in the Existing Zone, for the corresponding season and time-of-use, *i.e.*, peak or off-peak.

<sup>2</sup> The error also affects the definition of the CRRs released through the CRR auction in 2008 based on the TH weights as well as the market clearing price of the CRRs.

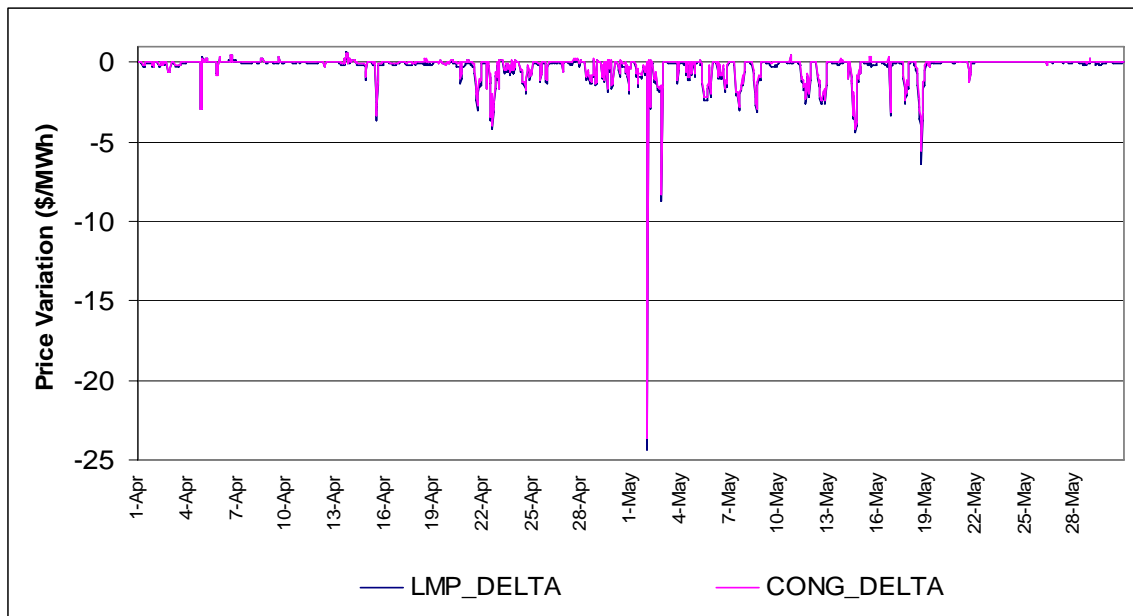
On May 30, 2009, the ISO corrected this error and adopted the proper TH definitions with the corrected weights, to be effective starting with the IFM run for Trade Date May 31. Consequently, the TH prices effective for May 31, 2009 Trade Date have contained the proper TH weights. In addition, the CRR monthly auction and allocation for the month of July will be based on the corrected weights.

Based solely on the information the ISO has, the estimated error had an approximate settlement impact of 2.8 percent and 1.8 percent on CRRs and ISTs, respectively. This estimated impact is based on the total settlement value of these market elements in the IFM for the 60-day period of the error.

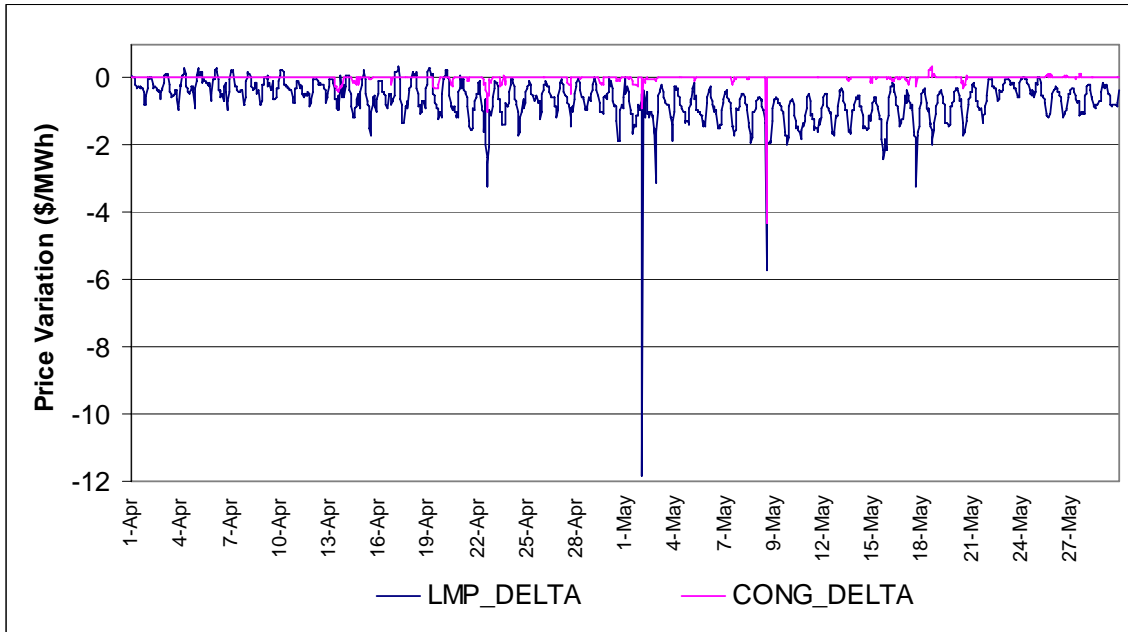
## 2. Impact on TH Prices

Figure 1 through Figure 3 show the hourly values for the IFM price differences for both LMPs and marginal cost of congestion components (MCCs), which are computed as original TH prices minus corrected TH prices. A negative difference indicates the price with the incorrect TH factors is lower. Price differences at both NP15 and SP15 are consistently negative with most of the differences falling in the range of -1 to 1 \$/MWh. A more detailed representation of the frequency of price difference for LMPs is provided in Figure 6 through Figure 8 in the appendix of this document.

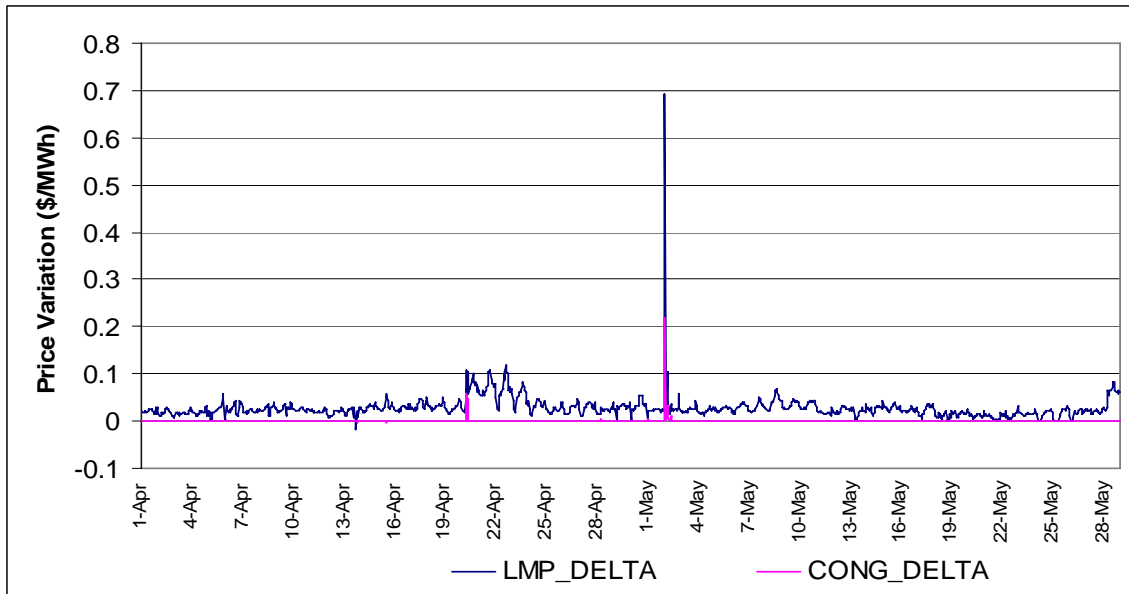
**Figure 1: Variation of LMPs and MCCs at NP15**



**Figure 2: Variation of LMPs and MCCs at SP15**



**Figure 3: Variation of LMPs and MCCs at ZP26**



For IFM TH prices, the averages of the original and the corrected LMPs over the entire period of the error are summarized in Table 1 below.

**Table 1: Average IFM Prices at Trading Hubs  
from April 1<sup>st</sup> through May 30th**

	Original	Corrected
NP15	27.138	27.450
SP15	25.456	26.112
ZP26	26.291	26.262

On a net basis, the use of the incorrect weighting factors for THs has resulted in moderately lower prices at NP15 and SP15, and marginally higher prices at ZP26. The average variation on LMPs by TH and TOU are in the range of 0.034 to -1.1 \$/MWh, with a negative variation indicating that prices are lower with the miscalculated factors. More detailed information by specific TH, month, and TOU is provided in the appendix of this document. The data provided in the Appendix demonstrates that the most volatile price differences occurred at NP15 during the month of May because a few prices in early May exceeded \$200/MWh, and these prices make the differences more extreme, reaching a value as large as \$25/MWh on occasion. The least volatile price differences occurred at ZP26, also during the month of May.

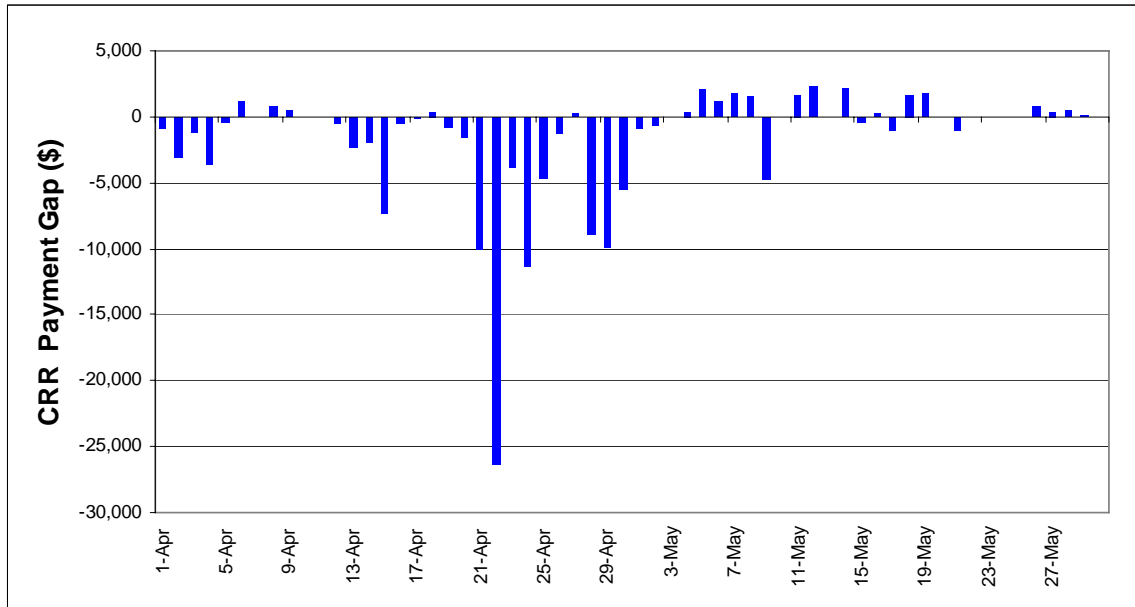
These IFM TH price differences impact the settlement of CRRs released in 2008 for the 2009 annual auction process as well as those released for the months of April and May 2009 in the monthly auction thus far. The price differences impact only those CRRs that were based on a TH as a source or sink and that were awarded through the auctions. An average hourly volume of 2710 MW and 2470 MW in April and May respectively, were awarded through the different CRR auction processes. CRRs awarded through the allocation are not affected by the TH price calculation error because allocated CRRs are disaggregated into the underlying generator PNodes that comprise each TH. These disaggregated CRRs are then settled based on the individual nodal LMPs rather than on TH LMPs.

The TH price differences also impact the settlement of ISTs. For the ISTs submitted to the IFM and settled through the ISO system, the ISO has recalculated the TH LMPs to determine the impact on settlements of those ISTs.

### 3. Impact on CRR Settlements

Figure 4 shows the total net CRR payment difference for CRRs released through the CRR annual and monthly auctions for April 1 through May 30 between using the TH prices based on the erroneous weights as compared to the TH prices using the corrected weights. A negative value indicates the net CRR payments to CRR holders are lower with the incorrect factors. The values are aggregated at a daily frequency and comprise all CRR holders.

**Figure 4: Daily Variation of Net CRR Payments**



April’s differential is markedly greater than May’s, in a proportion of 10 to 1. Table 2: summarizes the impact of the CRR payments for CRRs settled at THs.

**Table 2: Impact of Incorrect TH Prices on CRR Settlements**

Month	Original CRR Settlement	Adjusted CRR Settlement	Variation	Percentage of Variation
April	\$1,154,495.09	\$1,258,301.21	-\$103,806.12	-8.99%
May	\$2,178,946.75	\$2,169,305.19	\$9,641.56	0.44%
Total	\$3,333,441.84	\$3,427,606.40	-\$94,164.56	-2.82%

With the miscalculated TH prices, approximately \$94,000 less will be paid to CRR holders. This will also impact CRR revenue adequacy in April and May by the net dollars shown in Table 2. In April, for instance, CRR revenue deficiency has been calculated and reported to be \$103,806 less by using the incorrect TH factors. Furthermore, 13 CRR holders will receive higher payments, and eight participants will receive lower payments by using TH prices based on the incorrect factors.

In assessing the impact of this error on Scheduling Coordinators (SCs) who hold CRRs to hedge their energy schedules, it is important to recognize that throughout the period of the error the same incorrect TH prices were used for both CRR settlements and for energy settlements in the ISO markets. Thus an SC that had a cleared IFM energy schedule having the same source and sink as a CRR it held would have been fully hedged for the congestion cost of its energy schedule, on a MW for MW basis.

### 4. Impact on Inter-SC Trades

The IST functionality is a service the ISO offers to market participants to assist in the settlement of their bilateral contracts, but there is no requirement or necessity for market participants to use the IST. Parties may choose to accomplish the same financial results between themselves without ever using the IST. This analysis only captures the cost impact of the erroneous weights on the ISTs settled through the ISO settlements process because the bilateral transactions settled outside the ISO settlements that might have used the TH price are unknown to the ISO.

Based on the ISTs settled through ISO in the IFM, the use of the miscalculated TH factors has impacted, on average per hour, volumes of 9500 MW, 7200 MW and 270 MW traded at NP15, SP15 and ZP26, respectively. This also resulted in lower charges to participants on the supplier side of the IST (FROM side) and in lower payments to participants on the buyer side of the IST (TO side), as prices were on average lower. For comparison, the average daily charge to load in the new market is approximately \$4 million. The settlement difference if price corrections were made to THs is shown in Figure 5. These variations are relatively small with respect to the total settlements of ISTs.

**Figure 5: Daily Extra Settlement for IST Due to Price Corrections versus Total Original Settlement**

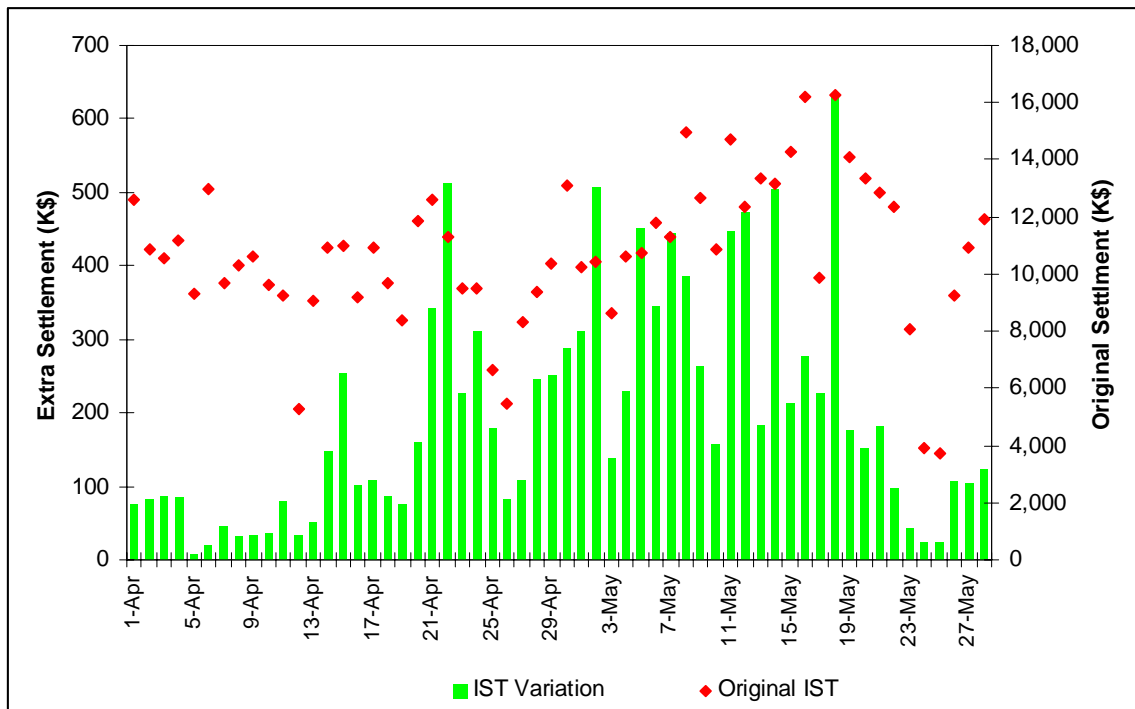


Table 3 lists the settlement variations of ISTs for each month. In percentage terms, the impact for May has been approximately 74% more than in April, with May 29<sup>th</sup> and May 30<sup>th</sup> not fully processed at this time. Overall, the impact for having the TH factors

miscalculated amounts to \$11.37 million across all Scheduling Coordinators for the 60-day period, which represents 1.83 percent of the total dollars of ISTs settled at the LMP.

**Table 3: Impact on ISTs from April 1<sup>st</sup> through May 28<sup>th</sup><sup>3</sup>**

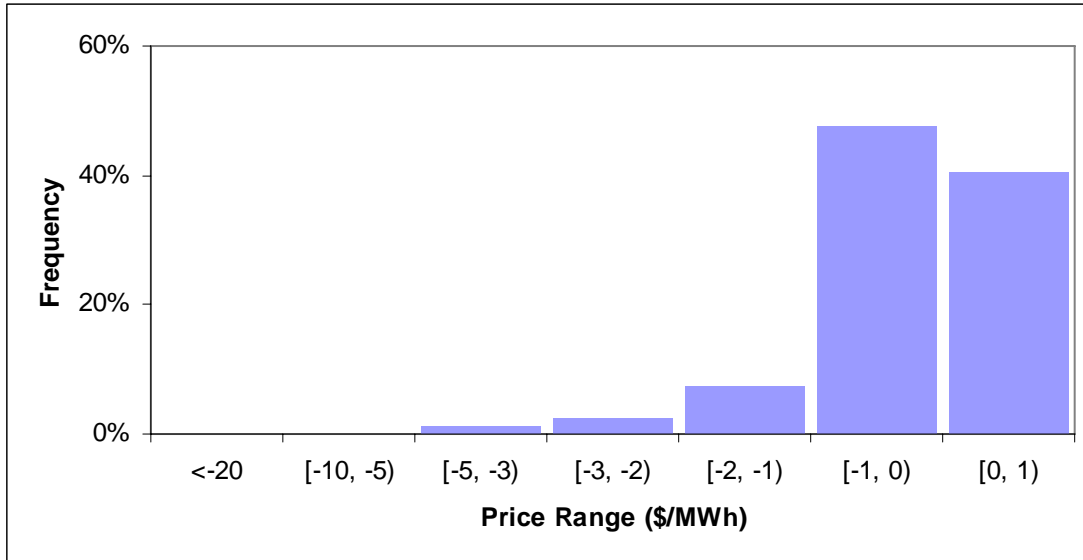
Month	Original Dollars of ISTs	Variation of ISTs	Percentage of Variation
April	\$299,110,844.12	\$4,146,402.36	1.39%
May	\$322,764,683.69	\$7,225,972.03	2.24%
Total	\$621,875,527.81	\$11,372,374.39	1.83%

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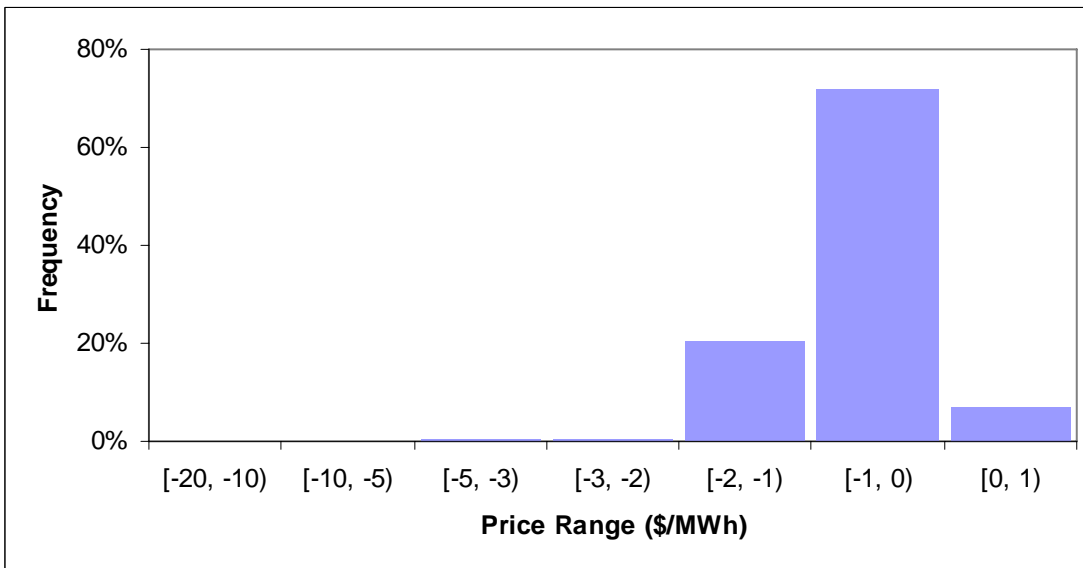
<sup>3</sup> Both the total settlement dollars and the variation of ISTs are computed only with respect to the side that originates the trade (the FROM side of the IST) at the full LMP.

**5. Appendix –Supplemental Data**

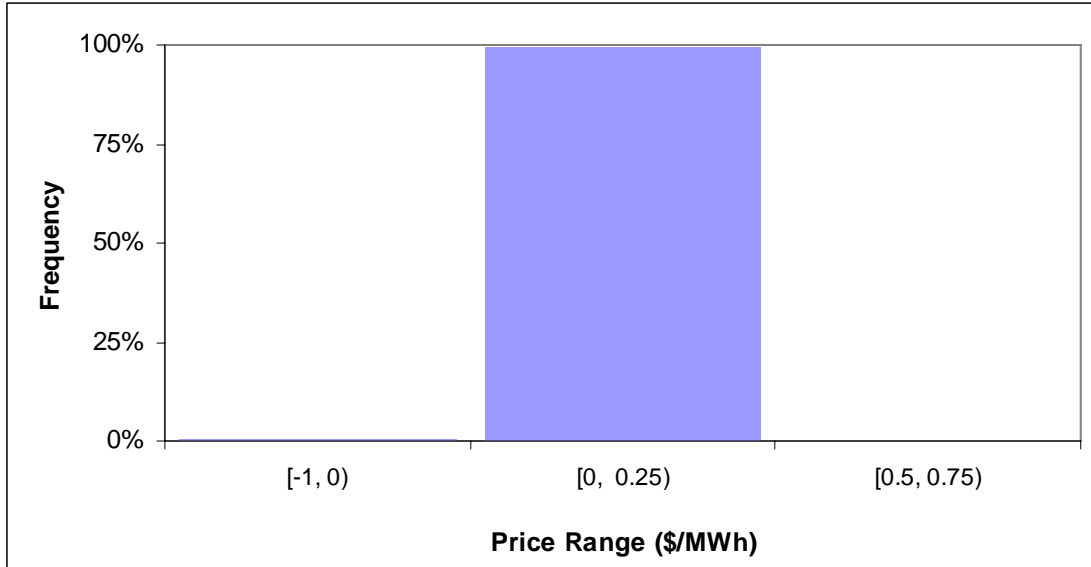
**Figure 6: Frequency of Price Differences of LMPs at NP15 –April and May**



**Figure 7: Frequency of Price Differences of LMPs at SP15 –April and May**



**Figure 8: Frequency of Price Differences of LMPs at ZP26 –April and May**



**Table 4: Summary Statistics of Price Variations –April 2009<sup>4</sup>**

TH_APNODE	Variable	Mean	Std Dev	Minimum	Maximum
TH_NP15_GEN_OFFPEAK-APND	LMP	-0.110	0.206	-1.690	0.410
	MCC	-0.028	0.195	-1.639	0.399
TH_NP15_GEN_ONPEAK-APND	LMP	-0.351	0.669	-4.171	0.668
	MCC	-0.248	0.621	-3.972	0.606
TH_SP15_GEN_OFFPEAK-APND	LMP	-0.165	0.297	-1.207	0.336
	MCC	-0.008	0.047	-0.316	0.000
TH_SP15_GEN_ONPEAK-APND	LMP	-0.668	0.420	-3.247	0.179
	MCC	-0.031	0.096	-0.989	0.067
TH_ZP26_GEN_OFFPEAK-APND	LMP	0.025	0.012	0.000	0.078
	MCC	0.000	0.000	0.000	0.002
TH_ZP26_GEN_ONPEAK-APND	LMP	0.034	0.021	-0.018	0.119
	MCC	0.000	0.004	-0.002	0.059

<sup>4</sup> A negative value in the statistics indicates that the original figures with the incorrect TH factors are lower than those based on the corrected TH factors.

**Table 5: Summary Statistics of Price Variations –May 1<sup>st</sup>-30<sup>th</sup>, 2009**

<b>TH_APNODE</b>	<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Minimum</b>	<b>Maximum</b>
TH_NP15_GEN_OFFPEAK-APND	LMP	-0.119	1.403	-24.385	0.454
	MCC	-0.123	1.355	-23.654	0.489
TH_NP15_GEN_ONPEAK-APND	LMP	-0.656	1.046	-8.758	0.12
	MCC	-0.535	0.964	-8.25	0.397
TH_SP15_GEN_OFFPEAK-APND	LMP	-0.550	0.725	-11.844	0
	MCC	-0.008	0.054	-0.897	0.003
TH_SP15_GEN_ONPEAK-APND	LMP	-1.102	0.495	-5.735	-0.134
	MCC	-0.013	0.223	-4.312	0.374
TH_ZP26_GEN_OFFPEAK-APND	LMP	0.025	0.039	0	0.693
	MCC	0.001	0.012	0	0.218
TH_ZP26_GEN_ONPEAK-APND	LMP	0.027	0.017	0	0.091
	MCC	0	0.001	-0.001	0.013