

Price Correction Examples

Billing and Price Correction Task Force
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Price Correction Examples

- Data Input Errors
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Data Input Errors

- Data input errors are those errors that result when a price is computed correctly, but based on erroneous data inputs. This includes most data transfer errors, modeling errors, telecommunications errors, and operator data input errors. Such errors can cause the system to be dispatched in a sub-optimum manner and to deviate from the intended least-cost dispatch. The NYISO has corrected prices in these circumstances to reflect the true marginal resource, even when the system was actually dispatched differently.

Data Input Errors: Bad Generator Input Data

- A unit's meter shows it to have tripped and as having a 0MW output but the next interval the unit is back on at 350MW.

Original Zonal LBMPs

TIME (EST)	WEST	HUD VL	NYC	LONGIL
3/10/2005 14:10	50.47	59.63	84.42	79.32
3/10/2005 14:15	51.02	60.08	78.79	79.38
3/10/2005 14:20	56.28	66.76	635.66	68.35
3/10/2005 14:25	47.59	55.70	57.54	67.84
3/10/2005 14:30	51.23	60.08	62.12	67.88
3/10/2005 14:35	51.29	60.03	65.64	67.42

Corrected Zonal LBMPs

Time Stamp	WEST	HUD VL	N.Y.C.	LONGIL
3/10/2005 14:10	50.47	59.63	84.42	79.32
3/10/2005 14:15	51.02	60.08	78.79	79.38
3/10/2005 14:20	49.31	57.90	68.17	73.62
3/10/2005 14:25	47.59	55.70	57.54	67.84
3/10/2005 14:30	51.23	60.08	62.12	67.88
3/10/2005 14:35	51.29	60.03	65.64	67.42

Price Change (Corrected LBMP-Original LBMP)

Time Stamp	WEST	HUD VL	N.Y.C.	LONGIL
3/10/2005 14:10	0.00	0.00	0.00	0.00
3/10/2005 14:15	0.00	0.00	0.00	0.00
3/10/2005 14:20	-6.97	-8.86	-567.49	5.27
3/10/2005 14:25	0.00	0.00	0.00	0.00
3/10/2005 14:30	0.00	0.00	0.00	0.00
3/10/2005 14:35	0.00	0.00	0.00	0.00

Data Input Errors: Bad Load Metering Data

- Erroneous load metering is used as inputs to the load forecasting model.
- Typically, these errors are discovered through the investigation of and explanation of price changes from one RTD dispatch to the next. Subsequent review of surrounding RTD intervals and reviews of the load forecasting model outputs provide a basis for reserving the prices and following a review of the data by the load forecasting group potentially the correction of the prices.
- These load-metering errors affect both the physical and pricing dispatches but within the 5-minute dispatch cycle the AGC package will adjust generation to reflect the actual level of load in 6-second basepoints sent to the regulating units.
- No specific cause has been identified for the meter failures.

Data Input Errors: Bad Load Metering Data

- Example: 4/8/05 13:40-14:05 RTD
 - Intervals 13:40 – 14:05 were corrected in RTD.
 - All intervals were corrected because a metering issue in the Capital zone created ~\$1000 price spikes during this period.

Original Zonal LBMPs			
Time	WEST	CAPITL	NYC
4/8/05 13:30:00	61.30	67.65	85.41
4/8/05 13:35:00	61.30	68.01	99.51
4/8/05 13:40:00	907.42	1058.99	1132.30
4/8/05 13:45:00	725.92	837.24	893.68
4/8/05 13:55:00	1000.59	1068.04	1159.01
4/8/05 14:00:00	1007.62	1068.04	1158.15
4/8/05 14:05:00	1015.71	1069.06	1157.29
4/8/05 14:10:00	140.66	151.38	164.13
4/8/05 14:15:00	23.83	25.59	27.53

Corrected Zonal LBMPs			
Time	WEST	CAPITL	NYC
4/8/05 13:30:00	61.3	67.65	85.41
4/8/05 13:35:00	61.3	68.01	99.51
4/8/05 13:40:00	100.98	109.7	131.83
4/8/05 13:40:25	100.98	109.7	131.83
4/8/05 13:45:00	100.98	109.7	131.83
4/8/05 13:50:03	100.98	109.7	131.83
4/8/05 13:55:00	100.98	109.7	131.83
4/8/05 14:00:00	100.98	109.7	131.83
4/8/05 14:05:00	100.98	109.7	131.83
4/8/05 14:10:00	140.66	151.38	164.13
4/8/05 14:15:00	23.83	25.59	27.53

Data Input Errors: TLRs

- The external bus prices at Ontario (O.H. Gen Bruce) were corrected in RTC and RTD for HB 14 because a TLR and the subsequent derating of HAM and DAM transactions created congestion between OH-NY in RTC that should not have existed.
- These incorrect prices then flowed into RTD.
- The OH congestion was removed from the RTC prices and the RTD prices were corrected by ensuring that they were not overwritten by RTC during the posting process.

Time	Name	PTID	Original LBMP	Corrected LBMP	Difference (Corrected LBMP minus Original LBMP)
4/24/2005 13:55	O.H._GEN_BRUCE	24063	56.47	56.47	0
4/24/2005 14:00	O.H._GEN_BRUCE	24063	57.87	57.87	0
4/24/2005 14:05	O.H._GEN_BRUCE	24063	-999.7	58.04	1057.74
4/24/2005 14:10	O.H._GEN_BRUCE	24063	-999.7	58.69	1058.39
4/24/2005 14:15	O.H._GEN_BRUCE	24063	-999.7	58.1	1057.8
4/24/2005 14:20	O.H._GEN_BRUCE	24063	-999.7	58.1	1057.8
4/24/2005 14:25	O.H._GEN_BRUCE	24063	-999.7	57.57	1057.27
4/24/2005 14:30	O.H._GEN_BRUCE	24063	-999.7	60.13	1059.83
4/24/2005 14:35	O.H._GEN_BRUCE	24063	-999.7	58.01	1057.71
4/24/2005 14:40	O.H._GEN_BRUCE	24063	-999.7	56.76	1056.46
4/24/2005 14:45	O.H._GEN_BRUCE	24063	-999.7	52.26	1051.96
4/24/2005 14:50	O.H._GEN_BRUCE	24063	-999.7	42.05	1041.75
4/24/2005 14:55	O.H._GEN_BRUCE	24063	-999.7	42.09	1041.79
4/24/2005 15:00	O.H._GEN_BRUCE	24063	-999.7	42.09	1041.79
4/24/2005 15:05	O.H._GEN_BRUCE	24063	35.04	35.04	0
4/24/2005 15:10	O.H._GEN_BRUCE	24063	38.04	38.04	0

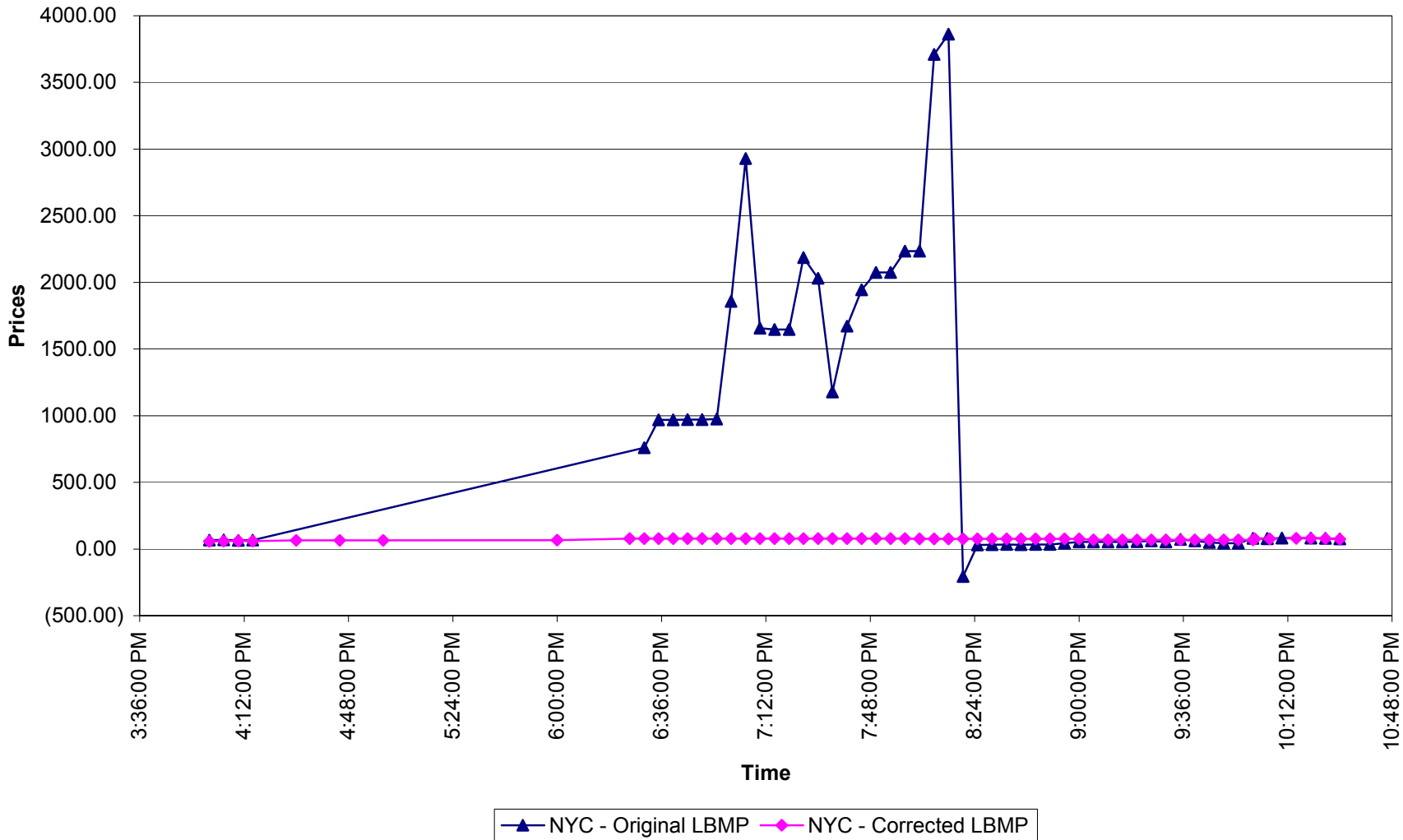
Process Errors

- Process errors are those errors that result when a failure of one or more processes involved in the determination of prices results in a failure to produce or post correct prices. This includes most failures of software systems and supporting infrastructure as well as major electric system emergencies.

Process Errors: System Outage

- March 26, HB 16-22:
 - Total failure of the EMS systems from 16:10.
 - 16:15 prices still OK
 - Used SCUC prices as replacements.
 - Replaced RTC internal prices from 16:45 through 22:15 posted RTC times with SCUC prices

**March 26: Price correction due to a Process Failure/ Missing Data/ System Outage
Original and Corrected Prices for NYC**



Process Errors: Web posting issues (RTC and RTD)

- At the time of the reservation, posted prices on the website do not match the prices contained in the RTC and RTD outputs.
- Often times no action is required other than to repost the prices as the original price posting process may have received incomplete or outdated data as inputs.
- The hour is reserved so that the reposting process can occur and any other causes for the price discrepancy can be investigated.
- The NYISO has made changes to the posting logic and these types of corrections have been greatly reduced.

Process Errors: Web posting issues (RTC and RTD) (cont.)

- Example: March 26, RTD prices for 1:00 were re-posted for price posting issues .

Originally Posted LBMPs			
Time Stamp	Name	PTID	LBMP (\$/MWhr)
3/26/05 1:00:00	59TH STREET_GT_1	24138	67.46
3/26/05 1:00:00	59TH STREET_GT_1	24138	91.61
3/26/05 1:00:00	74TH STREET_GT_1	24260	67.46
3/26/05 1:00:00	74TH STREET_GT_1	24260	91.69
3/26/05 1:00:00	74TH STREET_GT_2	24261	67.46
3/26/05 1:00:00	74TH STREET_GT_2	24261	91.69
3/26/05 1:00:00	ADK HUDSON__FALLS	24011	64.77
3/26/05 1:00:00	ADK HUDSON__FALLS	24011	88.14
3/26/05 1:00:00	ADK RESOURCE__RCVRY	23798	64.77
3/26/05 1:00:00	ADK RESOURCE__RCVRY	23798	88.14
3/26/05 1:00:00	ADK S GLENS__FALLS	24028	64.77
3/26/05 1:00:00	ADK S GLENS__FALLS	24028	88.14
3/26/05 1:00:00	ADK_NYS__DAM	23527	64.52
3/26/05 1:00:00	ADK_NYS__DAM	23527	87.71
3/26/05 1:00:00	AIR_PRODUCTS__DRP	24190	64.84
3/26/05 1:00:00	AIR_PRODUCTS__DRP	24190	87.97
3/26/05 1:00:00	ALBANY__1	23571	64.84
3/26/05 1:00:00	ALBANY__1	23571	87.97
3/26/05 1:00:00	ALBANY__2	23572	64.84
3/26/05 1:00:00	ALBANY__2	23572	87.97
3/26/05 1:00:00	ALBANY__3	23573	64.84
3/26/05 1:00:00	ALBANY__3	23573	87.97
3/26/05 1:00:00	ALBANY__4	23574	64.84
3/26/05 1:00:00	ALBANY__4	23574	87.97

Corrected LBMPs			
Time Stamp	Name	PTID	LBMP (\$/MWhr)
3/26/05 1:00:00	59TH STREET_GT_1	24138	67.46
3/26/05 1:00:00	74TH STREET_GT_1	24260	67.46
3/26/05 1:00:00	74TH STREET_GT_2	24261	67.46
3/26/05 1:00:00	ADK HUDSON__FALLS	24011	64.77
3/26/05 1:00:00	ADK RESOURCE__RCVRY	23798	64.77
3/26/05 1:00:00	ADK S GLENS__FALLS	24028	64.77
3/26/05 1:00:00	ADK_NYS__DAM	23527	64.52
3/26/05 1:00:00	AIR_PRODUCTS__DRP	24190	64.84
3/26/05 1:00:00	ALBANY__1	23571	64.84
3/26/05 1:00:00	ALBANY__2	23572	64.84
3/26/05 1:00:00	ALBANY__3	23573	64.84
3/26/05 1:00:00	ALBANY__4	23574	64.84

Calculation Errors

- Calculation errors are those errors that result when a price is computed incorrectly, notwithstanding correct data inputs. This includes most software errors.

Calculation Errors: Generator Bus Modeling Anomaly

- Generator Bus Modeling Anomaly. A generator bus can get “islanded” (isolated from the grid for price setting purposes) during the Real-Time Dispatch solution process under a certain set of outage conditions. “Islanding” results in the loss of the loss and congestion components of the price for the generator.
 - A bus that somehow becomes disconnected from the system will have penalty and shift factors such that it appears like the bus is located at the reference bus. Typically this will occur due to either a transmission or generator outage of some kind.
 - We have price reservation screens that look for locations where prices are identical to the reference bus price.
 - In instances where the cause is an islanded bus we reserve and correct the single bus location price.

Calculation Errors: Generator Bus Modeling Anomaly (Cont.)

- We correct the affected bus (or buses) by using an electrically equivalent location as supplied by NYISO operations.
- This does not affect the zonal load prices or any other generator prices. It also does not impact either the physical or pricing dispatch solution in any way. The only other prices that may be affected are the hub prices that are based off the old generator bus weighted zonal prices. These are only affected if the location in question has a non-zero weight in the makeup of the hub price.
- There is a software fix in progress. In addition operations has instituted additional screens that allow them to identify and correct any error that occur quickly.
- We have not had to correct for this reason since July 11

Calculation Errors: Generator Bus Modeling Anomaly Example

Original Prices at the PTID in question				Corrected Prices at the PTID in question				Corrected minus Original LBMP
Time Stamp	LBMP (\$/MWhr)	Marginal Cost Losses (\$/MWhr)	Marginal Cost Congestion (\$/MWhr)	Time Stamp	LBMP (\$/MWhr)	Marginal Cost Losses (\$/MWhr)	Marginal Cost Congestion (\$/MWhr)	
4/1/2005 8:50	168.67	0	0	4/1/2005 8:50	182.83	14.17	0	14.16
4/1/2005 8:55	169.29	0	0	4/1/2005 8:55	183.68	14.39	0	14.39
4/1/2005 9:00	372.09	0	0	4/1/2005 9:00	402.98	30.88	0	30.89
4/1/2005 9:05	91.97	0	0	4/1/2005 9:05	178.06	7.63	-78.46	86.09
4/1/2005 9:10	73.59	0	0	4/1/2005 9:10	176.87	6.25	-97.03	103.28
4/1/2005 9:15	107.51	0	0	4/1/2005 9:15	179.38	8.82	-63.05	71.87
4/1/2005 9:20	170.88	0	0	4/1/2005 9:20	184.89	14.01	0	14.01
4/1/2005 9:25	170.56	0	0	4/1/2005 9:25	184.55	13.99	0	13.99
4/1/2005 9:30	100.83	0	0	4/1/2005 9:30	109.3	8.47	0	8.47

NYISO Reference Bus LBMP			
Time Stamp	LBMP (\$/MWhr)	Marginal Cost Losses (\$/MWhr)	Marginal Cost Congestion (\$/MWhr)
4/1/2005 8:50	168.67	0	0
4/1/2005 8:55	169.29	0	0
4/1/2005 9:00	372.09	0	0
4/1/2005 9:05	91.97	0	0
4/1/2005 9:10	73.59	0	0
4/1/2005 9:15	107.51	0	0
4/1/2005 9:20	170.88	0	0
4/1/2005 9:25	170.56	0	0
4/1/2005 9:30	100.83	0	0

Calculation Errors: OOM Corrections

- When a Combustion Turbine (“CT”) is dispatched “Out of Merit” (“OOM”), the unit should be flagged as a “block loaded” generator that is not ordinarily eligible to set price. Instead, the OOM committed CTs were being incorrectly flagged as flexible and eligible to set price.
 - The error is caused by the failure of RTD to distinguish between different types of OOM classifications.
 - RTD has assumed that all resources are eligible to set price regardless of OOM classification unless otherwise limited by the hybrid dispatch.
 - The software fix ensures that OOM resources are not eligible to set LBMP.
 - The majority of the July and August corrections have been for OOM CTs on Long Island.
- Fixed with the August 16 deployment
 - The OOM software issue led to 172 additional hours reserved and 156 additional hours corrected. In addition 21 hours already reserved for other issues were also corrected for OOM issues.

Hours that were reserved and corrected *only* for the Out Of Merit software issue
 (Note that these are only the additional hours reserved and corrected due to the Out of Merit software issue)

Date	Reserved for OOM and corrected																							Hours Reserved	Hours Corrected	Hours Released	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22				23
6/28/2005																									3	3	0
6/29/2005																									1	1	0
6/30/2005																									3	3	0
7/1/2005																									4	4	0
7/2/2005																									2	2	0
7/5/2005																									3	2	1
7/7/2005																									2	2	0
7/11/2005																									6	6	0
7/14/2005																									3	3	0
7/15/2005																									9	9	0
7/17/2005																									1	0	1
7/18/2005																									10	9	1
7/19/2005																									4	4	0
7/20/2005																									8	7	1
7/21/2005																									7	7	0
7/22/2005																									3	2	1
7/23/2005																									0	0	0
7/25/2005																									3	3	0
7/26/2005																									1	1	0
7/27/2005																									5	5	0
7/29/2005																									2	2	0
8/1/2005																									5	5	0
8/2/2005																									10	10	0
8/3/2005																									6	6	0
8/4/2005																									6	6	0
8/5/2005																									6	6	0
8/6/2005																									3	0	3
8/7/2005																									1	0	1
8/8/2005																									7	7	0
8/9/2005																									1	1	0
8/10/2005																									10	10	0
8/11/2005																									13	10	3
8/12/2005																									13	13	0
8/13/2005																									6	4	2
8/14/2005																									5	3	2
Totals																							172	156	16		

This data represents only hours that were reserved *solely* for OOM issues

Calculation Errors: OOM Correction Example

- July 26 RTD 11:05
 - Screen for CTs that are OOM and affected price (dispatched below UOL in ideal dispatch).
 - Reserve the appropriate hour(s)- HB 11 in this case
 - Correct
 - The MW of the CT in question are forced into the ideal dispatch solution
 - This is done manually if there are no complicated congestion patterns or tradeoffs.
 - Alternately, we rerun the RTD interval.

Calculation Errors: OOM Correction

Example (cont.)

Original Zonal LBMPs				Corrected Zonal LBMPs			Corrected minus Original LBMP		
TIME (EDT)	WEST	CAPITL	NYC	WEST	CAPITL	NYC	WEST	CAPITL	NYC
7/26/2005 11:00	78.07	83.99	116.60	78.07	83.99	116.6	0.00	0.00	0.00
7/26/2005 11:05	82.74	86.56	118.69	82.74	86.56	118.68	0.00	0.00	(0.01)
7/26/2005 11:10	82.23	87.32	119.56	82.23	87.32	119.56	0.00	0.00	0.00
7/26/2005 11:15	86.31	92.10	123.53	86.31	92.1	123.52	0.00	0.00	(0.01)
7/26/2005 11:20	86.93	93.41	124.60	86.93	93.41	124.59	0.00	0.00	(0.01)
7/26/2005 11:25	88.52	95.14	115.59	88.53	95.13	115.58	0.01	(0.01)	(0.01)
7/26/2005 11:30	102.52	110.40	130.08	102.52	110.39	130.07	0.00	(0.01)	(0.01)
7/26/2005 11:35	102.92	110.49	130.08	102.92	110.49	130.07	0.00	0.00	(0.01)
7/26/2005 11:40	104.72	113.33	132.87	104.72	113.32	132.86	0.00	(0.01)	(0.01)
7/26/2005 11:45	96.22	103.30	132.30	96.22	103.3	132.3	0.00	0.00	0.00
7/26/2005 11:50	110.23	119.29	138.34	110.23	119.29	138.34	0.00	0.00	0.00
7/26/2005 11:55	112.41	122.39	147.55	112.41	122.39	147.55	0.00	0.00	0.00
7/26/2005 12:00	97.05	103.97	132.95	97.05	103.97	132.95	0.00	0.00	0.00

Calculation Errors: Unexplained model solution and Non-Convergence

- In these cases the posted prices were inconsistent with the dispatch of one or more generators. In some instances the inconsistency was limited to the dispatch of a single resource. In these cases prices were not reserved or corrected as the prices were consistent with all other units in the system. In other cases there appeared to be a complete failure to converge to an equilibrium dispatch solution where all least cost dispatch instructions are consistent with the resources bids and the posted prices for that interval. In these cases the prices are corrected.
- At the time reservations are made we do not know the cause. After reserving the intervals we send emails to NYISO Operations to have the solutions reviewed to determine if the dispatch anomalies are associated with the known software error or might be caused by something else.
- Many of the observations initially categorized as unexplained have been identified to have been caused by dispatch status anomalies in the software (Covered in the 8/29 FERC filing). Fixes for this were implemented August 16th.

Calculation Errors: Unexplained model solution and Non-Convergence (cont.)

- Reserved HB 23 EDT for investigation of \$0 prices from 23:30 - 23:55.
 - In the 6 RTD runs covering 23:30 - 23:55 EDT on 7/17 all of the LBMPs for all locations are \$0.
 - RT prices from 23:30 – 23:55 were replaced because RTD did not converge to a solution during this period
 - The correction:
 - Set the 23:30 price to the 23:30 price from the 23:25 run
 - Set the 23:35, 23:40, 23:45, 23:50 and 23:55 price to the 23:45 price from the 23:25 run

Original Zonal Prices

Time Stamp	HUDVL	NYC
7/17/2005 23:30	\$0.00	\$0.00
7/17/2005 23:35	\$0.00	\$0.00
7/17/2005 23:40	\$0.00	\$0.00
7/17/2005 23:45	\$0.00	\$0.00
7/17/2005 23:50	\$0.00	\$0.00
7/17/2005 23:55	\$0.00	\$0.00

Corrected Zonal Prices

Time Stamp	HUDVL	NYC
7/17/2005 23:30	\$82.72	\$117.07
7/17/2005 23:35	\$78.20	\$115.45
7/17/2005 23:40	\$78.20	\$115.45
7/17/2005 23:45	\$78.20	\$115.45
7/17/2005 23:50	\$78.20	\$115.45
7/17/2005 23:55	\$78.20	\$115.45