

Midwest ISO and PJM Real Time



Border Bus Price Analysis

**Joint Stakeholder Meeting
June 6, 2008**



PJM and Midwest ISO Real Time Price Analysis

- In June 2007, PJM and Midwest ISO presented analysis of real time proxy bus prices, concluding that the proxy buses were performing well as defined
- PJM and Midwest ISO have continued with analysis on individual border bus prices to further evaluate convergence of the two markets, particularly considering the impact of PJM's implementation of marginal losses
- The following data is presented as preliminary results - insufficient data exists to draw affirmative conclusions and the analysis will continue
- LMP data utilized are hourly integrated values
- The buses chosen for the analysis are those that are electrically close (or identical) and representatively spread across the PJM/Midwest ISO border

Individual Bus Price Differences

Buses	Average (PJM-MISO) 2006	Average (PJM-MISO) Jan-May 2007	Average (PJM-MISO) Jun-Dec 2007	Average (PJM-MISO) Jun 2007-Apr 2008
Kincaid (PJM) vs. Coffeen (Midwest ISO)	5.87	4.31	5.76	5.76
Beaver Valley (PJM) vs. Mansfield (Midwest ISO)	2.28	-2.64	0.55	0.68
Miami Fort (PJM and Midwest ISO)	1.95	-1.30	-0.95	-0.83
Stuart (PJM and Midwest ISO)	2.09	-0.81	-0.64	-0.87
Cook (PJM) vs. Palisades (Midwest ISO)	N/A	-1.03	0.90	1.06

- Analysis will continue as:
 - PJM experience with marginal losses continues
 - Constraint Relaxation, Midwest ISO ASM and other initiatives are implemented
- Other buses representative of the PJM/Midwest ISO border could be added – suggestions are always welcome

Kincaid (PJM) vs. Coffeen (Midwest ISO)

2006	Kincaid (PJM) and Coffeen (MISO) Hourly LMP 2006				Kincaid (PJM) and Coffeen (MISO) LMP Difference Sign Changes		
	PJM_LMP	MISO_LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
	AVG	41.11	35.23	5.87	13.88	4.96	1.98
	STDEV	25.06	27.58	25.61	22.31	5.96	1.61
	MAX	740.50	457.28	662.80	662.80	51.00	15.00
	MIN	-51.26	-249.88	-323.22	0.01	1.00	1.00
					COUNT	1261	1260

Pre-MIL 2007	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JAN-MAY 2007				Kincaid (PJM) and Coffeen (MISO) LMP Difference Sign Changes		
	PJM_LMP	MISO_LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
	AVG	45.44	41.14	4.31	16.71	3.31	2.26
	STDEV	27.64	38.80	36.67	32.92	3.68	1.91
	MAX	405.88	204.31	928.98	928.98	41.00	16.00
	MIN	-73.05	-830.90	-131.24	0.01	1.00	1.00
					COUNT	650.00	650.00

Post-MIL 2007	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JUN-DEC 2007				Kincaid (PJM) and Coffeen (MISO) LMP Difference Sign Changes		
	PJM_LMP	MISO_LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
	AVG	42.22	36.46	5.76	17.92	4.25	1.88
	STDEV	27.02	34.90	31.54	26.59	4.89	1.46
	MAX	450.49	631.46	485.84	485.84	47.00	13.00
	MIN	-223.71	-459.65	-408.14	0.01	1.00	1.00
					COUNT	837.00	838.00

Post-MIL 2007-2008	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JUN 2007-APR 2008				Kincaid (PJM) and Coffeen (MISO) LMP Difference Sign Changes		
	PJM_LMP	MISO_LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
	AVG	44.87	39.12	5.76	19.35	3.86	1.92
	STDEV	27.39	38.27	34.05	28.60	4.45	1.55
	MAX	450.49	631.46	485.84	485.84	52.00	14.00
	MIN	-223.71	-459.65	-408.14	0.01	1.00	1.00
					COUNT	1389.00	1389.00

Cook (PJM) vs. Palisades (Midwest ISO)

Pre-ML 2007

Cook (PJM) and Palisades (MISO) Hourly LMP JAN-MAY 2007					Cook (PJM) and Palisades (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	45.63	46.66	-1.03	14.79	2.91	2.54
STDEV	27.78	29.45	23.49	18.28	2.99	2.30
MAX	405.24	296.10	278.97	278.97	26.00	18.00
MIN	-72.17	-39.16	-267.15	0.00	1.00	1.00
COUNT					664.00	664.00

Post-ML 2007

Cook (PJM) and Palisades (MISO) Hourly LMP JUN-DEC 2007					Cook (PJM) and Palisades (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	45.62	44.73	0.90	15.65	3.75	1.96
STDEV	27.81	34.14	27.14	22.19	4.14	1.52
MAX	468.71	780.33	338.45	544.98	45.00	13.00
MIN	-87.06	-14.53	-544.98	0.00	1.00	1.00
COUNT					900.00	901.00

Post-ML 2007-2008

Cook (PJM) and Palisades (MISO) Hourly LMP JUN 2007-APR 2008					Cook (PJM) and Palisades (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	48.52	47.46	1.06	16.36	3.48	1.98
STDEV	27.93	33.44	26.69	21.11	3.75	1.58
MAX	468.71	780.33	338.45	544.98	45.00	14.00
MIN	-87.06	-14.53	-544.98	0.00	1.00	1.00
COUNT					1473.00	1473.00

Beaver Valley (PJM) vs. Mansfield (Midwest ISO)

2006

Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP 2006					Beaver Valley (PJM) and Mansfield (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	39.22	36.94	2.28	12.25	4.07	2.14
STDEV	26.70	26.27	22.01	18.42	4.55	1.81
MAX	740.45	449.68	626.84	626.84	35.00	15.00
MIN	-115.29	-176.52	-323.51	0.00	1.00	1.00
COUNT					1411	1410

Pre-MIL 2007

Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JAN-MAY 2007					Beaver Valley (PJM) and Mansfield (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	41.25	43.89	-2.64	17.56	3.00	2.67
STDEV	34.07	27.76	29.09	23.35	2.99	2.66
MAX	414.06	209.37	284.66	284.66	26.00	34.00
MIN	-240.47	-65.84	-265.09	0.00	1.00	1.00
COUNT					640.00	640.00

Post-MIL 2007

Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JUN-DEC 2007					Beaver Valley (PJM) and Mansfield (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	41.75	41.20	0.55	16.39	3.78	2.09
STDEV	31.44	33.11	28.34	23.13	4.00	1.77
MAX	472.47	769.43	398.15	531.84	45.00	13.00
MIN	-320.60	-120.92	-531.84	0.00	1.00	1.00
COUNT					874.00	875.00

Post-MIL 2007-2008

Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JUN 2007-APR 2008					Beaver Valley (PJM) and Mansfield (MISO) LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	44.86	44.18	0.68	17.22	3.48	2.07
STDEV	32.09	33.10	28.01	22.10	3.68	1.71
MAX	472.47	769.43	398.15	531.84	45.00	14.00
MIN	-320.60	-120.92	-531.84	0.00	1.00	1.00
COUNT					1449.00	1449.00

Miami Fort (PJM and Midwest ISO)

2006

MiamiFort Hourly LMP 2006					MiamiFort LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	41.17	39.22	1.95	11.29	3.97	2.13
STDEV	25.89	25.84	20.24	16.91	4.53	1.85
MAX	729.61	456.95	613.95	613.95	41.00	20.00
MIN	-53.15	-55.51	-323.16	0.00	1.00	1.00
COUNT					1438	1437

Pre-MIL 2007

MiamiFort Hourly LMP JAN-MAY 2007					MiamiFort LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	45.38	46.68	-1.30	14.53	2.72	2.54
STDEV	27.96	28.78	22.49	17.22	2.78	2.21
MAX	404.61	223.35	276.95	276.95	24.00	16.00
MIN	-75.17	-39.76	-146.54	0.00	1.00	1.00
COUNT					689.00	689.00

Post-MIL 2007

MiamiFort Hourly LMP JUN-DEC 2007					MiamiFort LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	44.29	45.24	-0.95	15.10	3.36	2.14
STDEV	27.03	35.40	27.18	22.61	3.55	1.75
MAX	460.01	782.48	349.35	553.11	24.00	15.00
MIN	-88.01	-13.64	-553.11	0.00	1.00	1.00
COUNT					933.00	934.00

Post-MIL 2007-2008

MiamiFort Hourly LMP JUN 2007-APR 2008					MiamiFort LMP Difference Sign Changes	
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs
AVG	47.19	48.02	-0.83	15.96	3.16	2.12
STDEV	27.34	34.76	26.98	21.76	3.27	1.73
MAX	460.01	782.48	349.35	553.11	24.00	15.00
MIN	-88.01	-13.64	-553.11	0.00	1.00	1.00
COUNT					1520.00	1520.00

Stuart (PJM and Midwest ISO)

2006

Stuart Hourly LMP 2006					Stuart LMP Difference Sign Changes		
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
AVG	40.83	38.73	2.09	11.44	3.94	2.14	
STDEV	25.77	25.52	20.09	16.64	4.39	1.91	
MAX	716.68	455.03	601.81	601.81	34.00	24.00	
MIN	-53.34	-55.51	-318.29	0.00	1.00	1.00	
COUNT					1443	1442	

Pre-MIL 2007

Stuart Hourly LMP JAN-MAY 2007					Stuart LMP Difference Sign Changes		
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
AVG	45.34	46.15	-0.81	14.50	2.77	2.52	
STDEV	27.93	28.10	22.39	17.08	2.82	2.17	
MAX	404.47	220.20	278.11	278.11	24.00	16.00	
MIN	-75.80	-39.66	-142.67	0.00	1.00	1.00	
COUNT					685.00	685.00	

Post-MIL 2007

Stuart Hourly LMP JUN-DEC 2007					Stuart LMP Difference Sign Changes		
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
AVG	43.41	44.06	-0.64	14.56	3.29	2.14	
STDEV	26.55	33.35	25.53	20.98	3.41	1.75	
MAX	455.25	771.22	350.18	544.04	24.00	15.00	
MIN	-87.34	-13.56	-544.04	0.00	1.00	1.00	
COUNT					946.00	947.00	

Post-MIL 2007-2008

Stuart Hourly LMP JUN 2007-APR 2008					Stuart LMP Difference Sign Changes		
	PJM_LMP	MISO LMP	PJM-MISO	ABS (PJM-MISO)	Duration (after PJM LMP went Higher), Hrs	Duration (after MISO LMP went Higher), Hrs	
AVG	46.33	47.20	-0.87	15.54	3.08	2.16	
STDEV	26.91	33.26	25.68	20.46	3.15	1.81	
MAX	455.25	771.22	350.18	544.04	24.00	15.00	
MIN	-87.34	-13.56	-544.04	0.00	1.00	1.00	
COUNT					1534.00	1534.00	