

# ***Midwest ISO and PJM Real Time***

## ***Border Bus Price Analysis***

**Joint Stakeholder Meeting  
February 1, 2008**



# PJM and Midwest ISO Real Time Price Analysis

- 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) June-Dec 2007
Kincaid (PJM) vs. Coffeen (Midwest ISO)	5.87	4.31	5.76
Beaver Valley (PJM) vs. Mansfield (Midwest ISO)	2.28	-2.64	0.55
Miami Fort (PJM and Midwest ISO)	1.95	-1.30	-0.95
Stuart (PJM and Midwest ISO)	2.09	-0.81	-0.64
Cook (PJM) vs. Palisades (Midwest ISO)	XX	-1.03	0.90

# Next Steps

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

# Appendix – Statistical Data

## Kincaid (PJM) vs. Coffeen (Midwest ISO)

2006	Kincaid (PJM) and Coffeen (MISO) Hourly LMP 2006				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-ML 2007	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JAN-MAY 2007				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	650	

Post-ML 2007	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JUN-DEC 2007				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	838	

# Appendix – Statistical Data

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

2006	Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP 2006				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-ML 2007	Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JAN-MAY 2007				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	640	

Post-ML 2007	Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JUN-DEC 2007				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	875	

# Appendix – Statistical Data

## Miami Fort (PJM and Midwest ISO)

2006	MiamiFort Hourly LMP 2006				COUNT	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
					1438	1437		

Pre-ML 2007	MiamiFort Hourly LMP JAN-MAY 2007				COUNT	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
					689.00	689.00		

Post-ML 2007	MiamiFort Hourly LMP JUN-DEC 2007				COUNT	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
					933.00	934.00		

# Appendix – Statistical Data

## 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-ML 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-ML 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

# Appendix – Statistical Data

## Cook (PJM) and Palisades (Midwest ISO)

Pre-ML 2007	Cook (PJM) and Palisades (MISO) Hourly LMP JAN-MAY 2007				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	664

Post-ML 2007	Cook (PJM) and Palisades (MISO) Hourly LMP JUN-DEC 2007				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	901