

Midwest ISO and PJM Real Time

Border Bus Price Analysis

**Joint Stakeholder Meeting
October 5, 2007**



PJM and MISO 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 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-Aug 2007
Kincaid (PJM) vs. Coffeen (Midwest ISO)	5.87	4.31	3.28
Beaver Valley (PJM) vs. Mansfield (Midwest ISO)	2.28	-2.64	-0.75
Miami Fort (PJM and Midwest ISO)	1.95	-1.30	-1.08
Stuart (PJM and Midwest ISO)	2.09	-0.81	-1.15

- Analysis will continue as:
 - PJM experience with marginal losses continues
 - Constraint Relaxation and other initiatives are implemented
- 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					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	

07 pre-Misses	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	650	

JUN-JUL w/ML	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JUN-JUL 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	37.81	35.17	2.64	17.85	3.82	2.05	
STDEV	25.68	35.81	34.11	29.18	4.36	1.62	
MAX	153.58	228.95	485.84	485.84	27.00	11.00	
MIN	-157.11	-459.65	-287.32	0.01	1.00	1.00	
	COUNT				249	250	

JUN-AUG w/ML	Kincaid (PJM) and Coffeen (MISO) Hourly LMP JUN-AUG 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	43.07	39.79	3.28	18.56	4.10	2.05	
STDEV	28.26	37.28	32.67	27.09	4.41	1.61	
MAX	209.58	253.03	485.84	485.84	27.00	11.00	
MIN	-157.11	-459.65	-287.32	0.01	1.00	1.00	
	COUNT				359	359	

Appendix – Statistical Data

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	

07 pre-Miosses	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	640	

JUN-JUL w/ML	Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JUN-JUL 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	35.67	37.84	-2.17	17.56	3.65	2.22
	STDEV	32.52	33.34	30.42	24.93	4.01	1.75
	MAX	157.91	316.65	141.37	335.89	23.00	10.00
	MIN	-320.60	-120.92	-335.89	0.00	1.00	1.00
	COUNT				249	250	

JAN-AUG w/ML	Beaver Valley (PJM) and Mansfield (MISO) Hourly LMP JUN-AUG 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	40.83	41.58	-0.75	17.63	3.79	2.19
	STDEV	33.30	34.58	29.21	23.31	3.96	1.75
	MAX	211.76	316.65	141.37	335.89	23.00	12.00
	MIN	-320.60	-120.92	-335.89	0.00	1.00	1.00
	COUNT				369	369	

Appendix – Statistical Data

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

07 pre-Misses	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	689

JUN-JUL w/ML	MiamiFort Hourly LMP JUN-JUL 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	39.71	42.34	-2.63	14.82	3.20	2.30
	STDEV	25.19	32.41	24.78	20.03	3.52	1.86
	MAX	154.22	328.86	120.20	258.26	24.00	15.00
	MIN	-88.01	-13.64	-258.26	0.00	1.00	1.00
	COUNT					266	267

JUN-AUG w/ML	MiamiFort Hourly LMP JUN-AUG 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	45.24	46.31	-1.08	15.68	3.49	2.26
	STDEV	28.56	34.81	25.27	19.85	3.69	1.83
	MAX	210.68	328.86	120.20	258.26	24.00	15.00
	MIN	-88.01	-13.64	-258.26	0.00	1.00	1.00
	COUNT					384	384

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	

07 pre-Misses	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	2.19	2.63
	STDEV	27.93	28.10	22.39	17.08	1.57	2.20
	MAX	404.47	220.20	278.11	278.11	7.00	16.00
	MIN	-75.80	-39.66	-142.67	0.00	1.00	1.00
	COUNT				685	640	

JUN-JUL w/ML	Stuart Hourly LMP JUN-JUL 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	38.90	41.93	-3.03	14.51	3.07	2.34
	STDEV	24.79	32.00	24.15	19.54	3.33	1.93
	MAX	152.28	325.48	86.67	256.76	24.00	15.00
	MIN	-87.34	-13.56	-256.76	0.06	1.00	1.00
	COUNT				270	271	

JUN-AUG w/ML	Stuart Hourly LMP JUN-JUL 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	44.28	45.43	-1.15	15.32	3.38	2.24
	STDEV	27.96	33.75	24.70	19.40	3.56	1.81
	MAX	206.54	325.48	98.27	256.76	24.00	15.00
	MIN	-87.34	-13.56	-256.76	0.03	1.00	1.00
	COUNT				393	393	