PJM/MISO Cost Allocation For Economic Upgrades



Stakeholder Meeting Wilmington, DE

July 24, 2008





Topics for Discussion

- Motion for Extension of Time
- Define Economic Cross-Border Economic Project
- Review Examples
- Stakeholder Discussion/Proposals
- Cross-Border Settlements (Midwest ISO)
- Next Steps

(RTO Staffs) (RTO Staffs) (RTO Staffs) (All) (Midwest ISO) (All)





RTOs' proposed the following 180 day timeline to justify extension request until 1/28/2009:

8/2008 – 9/2008 – develop threshold test methodology; run a series of hypothetical test cases, evaluate potential results; and agree upon proposed threshold test.
9/2008 – 12/2008 – develop cost sharing indices; test proposed indices to determine

how costs may be allocated; and agree upon specific cost sharing criteria.





Before 2/1/2009:

- If consensus is reached on both the threshold test and cost sharing indices, prepare filing letter, revisions to JOA and supporting documentation.
- If consensus cannot be reached on the threshold test and/or cost sharing indices, the RTOs will make an informational filing:
 - 1. Issues agreed upon by the stakeholders;
 - 2. Issues that remain outstanding; and
 - Likelihood of achieving consensus on disputed issues.





Define Cross-Border Economic Project







- a transmission constraint that is controlled through outof-merit generation dispatch
- economic impacts include higher total system production cost, higher system congestion cost, higher LMPs in receiving-end area and lower LMPs in sending-end area





- a project which eliminates or reduces the out-of-merit generation dispatch cost associated with an economic constraint or group of economic constraints having similar electrical characteristics
- economic impacts include reduced system production cost, lower system congestion cost, lower LMPs in receiving-end area and higher LMPs in sending-end area
 economic projects include:
 - acceleration of a reliability-driven project
 - enhancement of a reliability-driven project
 - a project for which no reliability-driven need has been identified





- a transmission constraint that is controlled through out-ofmerit generation dispatch in both markets
- Reciprocal Coordinated Flowgates (RCFs) used in the PJM/MISO interregional congestion coordination process are examples of MISO/PJM cross-border economic constraints
- RCFs are transmission constraints that are jointly managed in the security-constrained economic dispatch of both RTOs thus providing a more efficient, lower cost transmission congestion management solution
- Like RCFs, cross-border economic constraints should be limited to those constraints that are significantly impacted by generation redispatch in both markets and for which at least one dispatchable generator in the adjacent market has a generation-to-load distribution factor (GLDF) of greater than 5% with respect to serving load in that adjacent market





What is a MISO-PJM Cross-Border Economic Project?

- a project which eliminates or reduces the out-of-merit generation dispatch cost associated with a MISO-PJM cross-border economic constraint or group of economic constraints having similar electrical characteristics
- since only out-of-merit generation dispatch of MISO and/or PJM resources is used to control such constraints, only the costs and other economic impacts of MISO and PJM generation shifts needed to control such constraints should be considered when evaluating the benefits of such a project





Planning Criteria for a MISO-PJM Cross-Border Economic Project?

- Simple Answer compare project benefit to project cost and approve project if benefits exceed costs
- Hard Answer compare project benefit to project cost and approve project if benefits exceed costs

What is the project benefit ?





Cost Allocation for a MISO-PJM Cross-Border Economic Project?

- <u>Simple Answer</u> allocate costs to beneficiaries in proportion to benefit received
- Hard Answer allocate costs to beneficiaries in proportion to benefit received

What is the project benefit ?





5-Bus Example Cross-Border Economic Project











	West				Eas	t	
			Gross				
			Load				Gross Load
Zone	M	<u>LMP</u>	Payment	Zone	MM	LMP	Payment
Zone B	292.3	\$36.95	\$10,800.49	ZoneC	292.6	\$45.39	\$13,281.11
Zone E	400.0	\$10.00	\$4,000.00	Zone D	292.6	\$68.59	\$20,069.43
Total RTO	692.3	\$21.38	\$14,800.49	Total RTO	585.2	\$56.99	\$33,350.55

Generation Revenue

West			East				
Gen	MA	, IWB	Gross Gen Revenue	Gen	MA	′ LMP	Gross Gen Revenue
Sa	3325	\$15.00	\$4,987.50	Sc	150.0	\$45.39	\$6,808.50
Se	645.1	\$10.00	\$6,451.00	Sd	150.0	\$68.59	\$10,288.50
Total RTO	977.6	\$11.70	\$11,438.50	Total RTO	300.0	\$56.99	\$17,097.00





	West	East	Total System
Implicit Congestion (Gen-to-Load)	\$6,700.16	\$0.00	\$6,700.16
Estimated Interchange Congestion	\$7,415.24	\$5,503.90	\$12,919.14
Total Congestion	\$14,115.40	\$5,503.90	\$19,619.30

- Implicit congestion is congestion associated with delivering own resources to own load congestion
- Interchange congestion estimated for interchange sales/purchases using total system load as delivery/receipt point
- we will assume that implicit congestion is rebated back to load as FTR credits





	West	East	Total System
Generation MW	977.6	300.0	1277.6
Gross Gen Revenue (GGR)	\$11,438.50	\$17,097.00	\$28,535.50
Gen Production Cost	\$11,438.50	\$9,000.00	\$20,438.50
Net Gen Revenue (NGR)	\$0.00	\$8,097.00	\$8,097.00
Load MW	692.3	585.2	1277.5
Gross Load Payment (GLP)	\$14,800.49	\$33,350.55	\$48,151.03
FTR Credits	\$6,700.16	\$0.00	\$6,700.16
Net Load Payment (NLP)	\$8,100.32	\$33,350.55	\$41,450.87
Net Payment (NLP - GGR)	-\$3,338.18	\$16,253.55	\$12,915.37
Net Cost (NLP - NGR)	\$8,100.32	\$25,253.55	\$33,353.87

Adjusted Production Cost	\$8,100.32	\$25,253.55	\$33,353.87
70%(Gen Prod Cost) + 30%(NLP)	\$10,437.05	\$16,305.16	\$26,742.21
70%(Adjusted Prod Cost) + 30%(GLP)	\$10,110.37	\$27,682.65	\$37,793.02









Load Payments

West			East				
			Gross				
			Load				Gross Load
Zone	MW	LMP	Payment	Zone	MW	LMP	Payment
Zone B	292.3	\$21.10	\$6,167.53	Zone C	292.6	\$23.51	\$6,879.03
Zone E	400.0	\$10.44	\$4,176.00	Zone D	292.6	\$30.00	\$8,778.00
Total RTO	692.3	\$14.94	\$10,343.53	Total RTO	585.2	\$26.76	\$15,657.03

Generation Revenue

West				Eas	t		
			Gross Gen				Gross Gen
Gen	M	LMP	Revenue	Gen	MW	LMP	Revenue
Sa	168.1	\$15.00	\$2,521.50	Sc	0.0	\$23.51	\$0.00
Se	1000.0	\$10.44	\$10,440.00	Sd	109.5	\$30.00	\$3,285.00
Total RTO	1168.1	\$11.10	\$12,961.50	Total RTO	109.5	\$30.00	\$3,285.00





	West	East	Total System
Generation MW	1168.1	109.5	1277.6
Gross Gen Revenue (GGR)	\$12,961.50	\$3,285.00	\$16,246.50
Gen Production Cost	\$12,521.50	\$3,285.00	\$15,806.50
Net Gen Revenue (NGR)	\$440.00	\$0.00	\$440.00
Load MW	692.3	585.2	1277.5
Gross Load Payment (GLP)	\$10,343.53	\$15,657.03	\$26,000.56
FTR Credits	\$2,661.61	-\$1,898.97	\$762.64
Net Load Payment (NLP)	\$7,681.92	\$17,556.00	\$25,237.92
Net Payment (NLP - GGR)	-\$5,279.58	\$14,271.00	\$8,991.42
Net Cost (NLP - NGR)	\$7,241.92	\$17,556.00	\$24,797.92

Adjusted Production Cost	\$7,241.92	\$17,556.00	\$24,797.92
70%(Gen Prod Cost) + 30%(NLP)	\$11,069.62	\$7,566.30	\$18,635.92
70% (Adjusted Prod Cost) + 30% (GLP)	\$8,172.40	\$16,986.31	\$25,158.71







Load Payments

West			East				
Zono	540		Gross Load	7000	R A A/		Gross Load
			Гаупык				
Zone B	0.0	-\$15.85	-\$4,632.96	Zone C	0.0	-\$21.88	-\$6,402.09
Zone E	0.0	\$0.44	\$176.00	Zone D	0.0	-\$38.59	-\$11,291.43
Total RTO	0.0	-\$6.44	-\$4,456.96	Total RTO	0.0	-\$30.24	-\$17,693.52

Generation Revenue

West			East				
			Gross Gen				Gross Gen
Gen	M	LMP	Revenue	Gen	M	LMP	Revenue
Sa	-164.4	\$0.00	-\$2,466.00	Sc	-150.0	-\$21.88	-\$6,808.50
Se	354.9	\$0.44	\$3,989.00	Sd	-40.5	-\$38.59	-\$7,003.50
Total RTO	190.5	-\$0.60	\$1,523.00	Total RTO	-190.5	-\$26.99	-\$13,812.00





5 Bus Example – Delta due to Project

	West	East	Total System
Generation MW	190.5	-190.5	0.0
Gross Gen Revenue (GGR)	\$1,523.00	-\$13,812.00	-\$12,289.00
Gen Production Cost	\$1,083.00	-\$5,715.00	-\$4,632.00
Net Gen Revenue (NGR)	\$440.00	-\$8,097.00	-\$7,657.00
Load MW	0.0	0.0	0.0
Gross Load Payment (GLP)	-\$4,456.96	-\$17,693.52	-\$22,150.48
FTR Credits	-\$4,038.55	-\$1,898.97	-\$5,937.52
Net Load Payment (NLP)	-\$418.40	-\$15,794.55	-\$16,212.95
Net Payment (NLP - GGR)	-\$1,941.40	-\$1,982.55	-\$3,923.95
Net Cost (NLP - NGR)	-\$858.40	-\$7,697.55	-\$8,555.95

Adjusted Production Cost	-\$858.40	-\$7,697.55	-\$8,555.95
70%(Gen Prod Cost) + 30%(NLP)	\$632.58	-\$8,738.86	-\$8,106.29
70% (Adjusted Prod Cost) + 30% (GLP)	-\$1,937.97	-\$10,696.34	-\$12,634.31





5 Bus Example – Who Benefits?

	West	East	Total System
Generation MW	190.5	-190.5	0.0
Gross Gen Revenue (GGR)	\$1,523.00	-\$13,812.00	-\$12,289.00
Gen Production Cost	\$1,083.00	-\$5,715.00	-\$4,632.00
Net Gen Revenue (NGR)	\$440.00	-\$8,097.00	-\$7,657.00
Load MW	0.0	0.0	0.0
Gross Load Payment (GLP)	-\$4,456.96	-\$17,693.52	-\$22,150.48
FTR Credits	-\$4,038.55	-\$1,898.97	-\$5,937.52
Net Load Payment (NLP)	-\$418.40	-\$15,794.55	-\$16,212.95
Net Payment (NLP - GGR)	-\$1,941.40	-\$1,982.55	-\$3,923.95
Net Cost (NLP - NGR)	-\$858.40	-\$7,697.55	-\$8,555.95

Adjusted Production Cost	-\$858.40	-\$7,697.55	-\$8,555.95
70%(Gen Prod Cost) + 30%(NLP)	\$632.58	-\$8,738.86	-\$8,106.29
70% (Adjusted Prod Cost) + 30% (GLP)	-\$1,937.97	-\$10,696.34	-\$12,634.31





5 Bus Example – Various Benefit Metrics

	West	East	Total System
Net Gen Revenue (NGR)	\$440.00	-\$8,097.00	-\$7,657.00
	100.0%	0.0%	
Net Load Payment (NLP)	-\$418.40	-\$15,794.55	-\$16,212.95
	2.6%	97.4%	
Sum of Beneficiary Benefits	\$858.40	\$15,794.55	\$16,652.95
	5.2%	94.8%	
Gen Production Costs	\$1,083.00	-\$5,715.00	-\$4,632.00
	0.0%	100.0%	
Gross Load Payment (GLP)	-\$4,456.96	-\$17,693.52	-\$22,150.48
	20.1%	79.9%	
Net Payment (NLP - GGR)	-\$1,941.40	-\$1,982.55	-\$3,923.95
	49.5%	50.5%	
Net Cost (NLP - NGR)	-\$858.40	-\$7,697.55	-\$8,555.95
	10.0%	90.0%	
Adjusted Production Cost	-\$858.40	-\$7,697.55	-\$8,555.95
	10.0%	90.0%	
70% (Gen Prod Cost) + 30% (NLP)	\$632.58	-\$8,738.86	-\$8,106.29
(East Internal Criteria)	0.0%	100.0%	
70% (Adjusted Prod Cost) + 30% (GLP)	-\$1,937.97	-\$10,696.34	-\$12,634.31
(West Internal Criteria)	15.3%	84.7%	
Max Acceptable Cost using Internal Criteria	-\$968.98	-\$6,991.09	-\$7,960.08
(In-Service date 5 years out)	12.2%	87.8%	





Actual System Example Cross-Border Economic Project







Pana-Mt.Zion-Kansas Example



- Annual PROMOD simulation made to determine economic impact of a Pana-Mt Zion-Kansas 345 kV project
- Project fits description of cross-border economic project
 - Relieves redispatch costs associated with controlling Pana transformer flows
 - Pana transformer is an economic constraint that is significantly impacted by generation redispatch in both markets
 - at least one dispatchable generator in the adjacent market has a generation-to-load distribution factor (GLDF) of greater than 5% with respect to serving load in that adjacent market





- 2 PROMOD simulations compared
- Simulation without project and simulation with project
- MISO/PJM only model used to measure redispatch costs associated with MISO-PJM generation redispatch
- Implicit congestion calculated for each RTO and assumed to be rebated back to load as FTR credits





Actual System Example – Delta due to Project

Change due to Project	MSO	PJM	Total System
Generation MW	85,318.7	-85,048.2	270.5
Gross Gen Revenue (GGR)	\$21,064,972	-\$1,097,106	\$19,967,866
Gen Production Cost	\$285,792	-\$4,319,389	-\$4,033,597
Net Gen Revenue (NGR)	\$20,779,180	\$3,222,283	\$24,001,463
Load MW	0.0	0.0	0.0
Gross Load Payment (GLP)	5,772,255	2,157,682	7,929,937
FTROedits	-11,915,782	-880,176	-12,795,958
Net Load Payment (NLP)	17,688,037	3,037,858	20,725,895
Net Payment (NLP-GGR)	-3,376,935	4,134,964	758,029
Net Cost (NLP-NGR)	-3,091,143	-184,425	-3,275,568

Adjusted Production Cost	-3,081,186	-199,047	-3,280,233
70% (Gen Prod Cost) + 30% (NLP)	5,506,465	-2,112,215	3,394,250
70% (Adjusted Prod Cost) + 30% (GLP)	-425,154	507,972	82,818





Actual System Example – Who Benefits?

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Change due to Project	MSO	PJM	Total System
Generation MA	85,318.7	-85,048.2	270.5
Gross Gen Revenue (GCR)	\$21,064,972	-\$1,097,106	\$19,967,866
Gen Production Cost	\$285,792	-\$4,319,389	-\$4,033,597
Nat Gen Revenue (NGR)	\$20,779,180	\$3,222,283	\$24,001,463
LoædMA	0.0	0.0	0.0
Gross Load Payment (GLP)	5,772,255	2,157,682	7,929,937
FTROrectits	-11,915,782	-880,176	-12,795,958
Net Load Payment (NLP)	17,688,037	3,037,858	20,725,895
Net Payment (NLP-GCR)	-3,376,935	4,134,964	758,029
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70%(Gen Prod Cost) + 30%(NLP)	5,506,465	-2,112,215	3,394,250
70% (Adjusted Prod Cost) + 30% (CLP)	-425,154	507,972	82,818





Actual System Example – Various Benefit Metrics

	MISO	PJM	Total System
Net Gen Revenue (NGR)	\$20,779,180 86.6%	\$3,222,283 13.4%	\$24,001,463
Net Load Payment (NLP)	\$17,688,037 0.0%	\$3,037,858 0.0%	\$20,725,895
Sum of Beneficiary Benefits	\$20,779,180 86.6%	\$3,222,283 13.4%	\$24,001,463
Gen Production Costs	\$285,792 0.0%	-\$4,319,389 100.0%	-\$4,033,597
Gross Load Payment (GLP)	\$5,772,255 0.0%	\$2,157,682 0.0%	\$7,929,937
Net Payment (NLP - GGR)	-\$3,376,935 100.0%	\$4,134,964 0.0%	\$758,029
Net Cost (NLP - NGR)	-\$3,091,143 94.4%	-\$184,425 5.6%	-\$3,275,568
Adjusted Production Cost	-\$3,081,186 93.9%	-\$199,047 6.1%	-\$3,280,233
70%(Gen Prod Cost) + 30%(NLP) (PJM Internal Criteria)	\$5,506,465 0.0%	\$2,112,215- 100.0%	\$3,394,250
70%(Adjusted Prod Cost) + 30%(GLP) (MISO Internal Criteria)	-\$425,154 100.0%	\$507,972 0.0%	\$82,818
Max Acceptable Cost using Internal Criteria (In-Service date 5 years out)	-\$212,577 12.2%	-\$1,689,772 87.8%	-\$1,902,349





Actual System Example – Zonal GLP

		Delta I d-	
	Delta Gross Load	weighted	Delta Gross Load
Company	Payment	IMP	Payment
ALWST	¢1 504 210	0.08	¢0
ALWST	\$7,094,210 \$7,001,637	0.08	00 0
	-\$1 255 169	-0.03	φυ -\$1 255 160
CGE	-\$1,233,103	-0.05	-\$1,200,100
	-\$1,008,007	-0.10	-\$1,000,007
	-\$450,138	-0.02	-\$450 138
DETED	-\$1.839.279	-0.03	-\$1.839.279
FE	-\$2,147,134	-0.03	-\$2,147,134
GRE	\$907,023	0.07	\$0
HEC	-\$394.022	-0.05	-\$394.022
нис	\$19.968	0.06	\$0
ILPC	-\$446,073	-0.02	-\$446,073
IP&L	-\$1,235,277	-0.07	-\$1,235,277
LBWL	-\$78,216	-0.03	-\$78,216
MDU	\$158,869	0.07	\$0
MGE	\$105,372	0.03	\$0
MPL	\$785,111	0.06	\$0
NIPS	-\$596,787	-0.03	-\$596,787
NSP	\$3,726,587	0.07	\$0
ΟΤΡ	\$450,310	0.07	\$0
PSI	-\$3,733,156	-0.09	-\$3,733,156
SIGE	-\$508,045	-0.04	-\$508,045
SIPC	\$169,674	0.08	\$0
SMMP	\$616,867	0.17	\$0
SPRIL	\$1,013,237	0.49	\$0
WEP	\$1,855,289	0.05	\$0
WPL	\$776,869	0.05	\$0
WPPI	\$166,030	0.03	\$0
WPS	\$904,465	0.06	\$0
WPSC	-\$78,300	-0.02	-\$78,300
TOTAL MISO	\$5,772,256		-\$15,379,261

Company	Delta Gross Load Payment	Delta Ld- weighted LMP	Delta Gross Load Payment
AEP	-\$5,296,470	-0.03	-\$5,296,470
COED	\$2,363,057	0.02	\$0
DP&L	-\$800,315	-0.05	-\$800,315
DQE	-\$290,598	-0.02	-\$290,598
PJME	\$2,605,316	0.02	\$0
PJMS	-\$278,140	0.00	-\$278,140
PJMW	\$521,008	0.00	\$0
VP	\$3,333,825	0.03	\$0
TOTAL PJM	\$2,157,682		-\$6,665,523
TOTAL SYSTEM	7,929,938		-22,044,784







- Schedule Next Meeting
- Material needed for next meeting



