



# MISO –PJM Cross-Border Planning

May 28, 2014  
MISO-PJM JCM

- **At the previous JCM meeting NIPSCo raised several issues related to planning coordination. The issues were related to:**
  - Market Efficiency Planning criteria, thresholds, and process
  - Generation interconnection process
  - Generator deactivation/retirement process
  - General coordinated planning processes and procedures (models, assumptions, criteria)

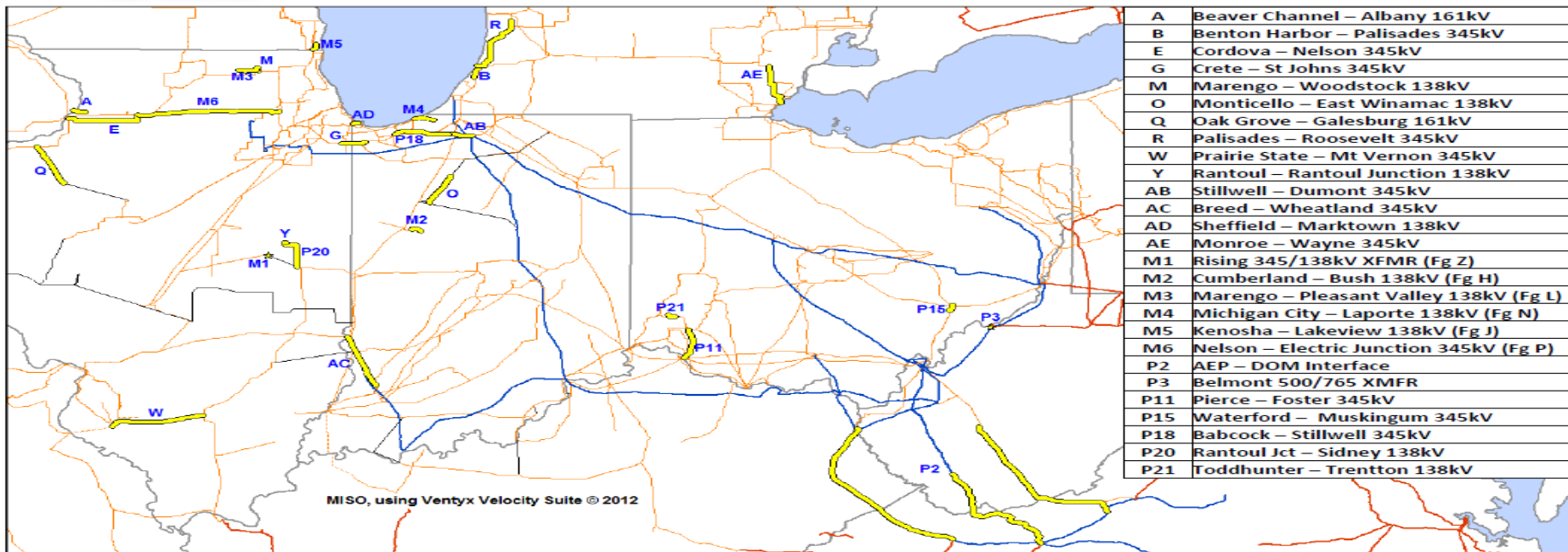
- **Todays Discussion**
  - Status update on Cross Border Market Efficiency Study in progress
  - Initial discussion of process and metric issues associated with CBMEP study
- **Future JCM Discussions**
  - Further discussion of CBMEP
  - Review and status of Generator interconnection Process improvements implemented
    - Update also provided at todays JCM meeting
  - Alignment of planning assumptions and models in general
  - Generator deactivation / retirement coordination

- **Study Background**

- This type of study is provided for in the existing MISO PJM JOA – and is also compatible with the revised JOA pending at FERC for Order 1000
  - Existing Version (Section 9.3.5.2.a) - Every three years, the Parties shall perform a comprehensive, coordinated regional transmission expansion planning study.
  - Pending Order 1000 Version (Section 9.3.5.2) - Coordination of studies required for the development of the Coordinated System Plan will include the following: 1) annual issues review to determine the need for a Coordinated System Plan study described in Section 9.3.5.2.a; and 2) Coordinated System Plan study described in Section 9.3.5.2.b.
- The existing JOA requires study every three years and the proposed Order 1000 process will require an annual evaluation of identified transmission issues to be reviewed with stakeholders through the IPSAC.
- The current study began in October 2012 and the last meeting targeted for late June 2014

# Update on Cross-Border MEP Study

- Study focused on identifying solutions to address the current congestion at the MISO and PJM seam
- Identified Historical Top Congested Flowpaths



- Analyzed 75+ proposed transmission solutions against the cross-border
- 19 transmission solutions show benefits for both PJM and MISO in at least one future
- 29 transmission solutions show benefits for MISO but not PJM in at least one future
- 29 transmission solutions show benefits for PJM but not MISO in at least one future
- 3 projects, 1 in each future, have B/C ratios greater than 1.25 and are under further review to determine appropriate project referral to regional planning processes (see appendix with more detail on each project)
  - Ameren 2: Big Stone – Blair 230kV (Minnesota / S. Dakota Border, Future 3)
  - Ameren 16 : Zion – Pl. Prairie 345kV (Wisconsin/Illinois Border, Future 1)
  - Transource A #2-2: Big Stone – Morris (Minnesota / S. Dakota Border, Future 2)

- Models and Development Process
- Metrics
- Multi-step metric testing process

- Models and Development Process
  - Parties agree on a set of models to use for the Coordinated System Plan (CSP)
  - Common model development challenging because of different model development philosophies
  - Resulting CSP models are different than either RTOs internal models used for planning RTO expansions
  - Benchmarking economic models to current system is a necessary but time consuming process
    - Objective is to create models that reflect real world conditions as accurately as possible
    - Models are periodically evaluated against actual data for reasonableness



## Process requires success against multiple metrics

- **Benefit/Cost Thresholds**
  - Cross border
  - MISO
  - PJM
- **Components**
  - Net Load Cost
    - Gross Load Payments
    - Congestion Hedge adjustment
  - Adjusted Production Cost
    - Production Cost
    - Adjustment for purchases/sales
- **Multi-step metric testing process**
  - Cross Border Metrics applied to joint models
  - MISO metrics applied to MISO models
  - PJM metrics applied to PJM models

# Metrics Differences

- A Cross Border Project must meet three B/C hurdles in order to be approved: JOA, PJM, and MISO
- Some JOA Metrics are more restrictive than regional metrics (see e.g. Cost Threshold, Benefit Years)

	JOA	PJM	MISO
B/C	1.25	1.25	1.25
Metric	70% APC + 30% NLP	50% APC + 50% NLP*	100% APC
Cost Threshold	\$20M	No Minimum	\$5M
Benefit Years	10+ Year NPV**	15 Year NPV	20 Year NPV***
Voltage	> 100kV	> 100kV	> 300kV

\* Lower voltage projects are allocated based on 100% NLP

\*\* Not to exceed 20 years from study year

\*\*\* Not to exceed 25 years from study year

# Metrics Drive the Conclusions

(Data Pending)

Projects Passing Combined-System Metrics	Metric				
	70/30	Net	70/30 Gross	100% APC	100% LMP Gross
Ameren 2: Big Stone – Blair 230kV		X			
Ameren 16 : Zion – Pl. Prairie 345kV		X			
Transource A #2-2: Big Stone – Morris		X			
P4			X		
P5				X	
P6					X
P7					
P8					
P9					
P10					
P11					
P12					
P13					
P14					
P15					
P16					
P17					
P18					
P19					
P20					

- 75 Total Projects Evaluated
- CBMEP benefit metric: 70% APC + 30% Net Load Payments
- Components: Production Cost, Adjusted Production Cost, Gross Load Payments, Financial Rights, Net Load Payments



Cross-Border MEP Study

# Lessons Learned

As discussed at May 16, 2014 IPSAC

- **Better alignment between regional and interregional processes**
- **Define the scope of work clearly**
  - Start with annual need assessment in the third quarter of a given year
  - Define the scope and schedule of the joint study based on the issues identified if a joint study is determined

- **Need better clarity and up front definition of joint futures and their roles in CSP model creation**
- **Need better alignment between regional and interregional study assumptions**
- **Joint model development requires significant coordination, effort and time**
- **Need greater lead-time to vet models to ensure sufficient stakeholder review**



- **Threshold**

- \$ 20 million threshold may hinder development of quick-hit solutions and drive larger, less targeted, and less economic projects
- Is it appropriate to require all three B/C criteria be met (each region plus joint?)

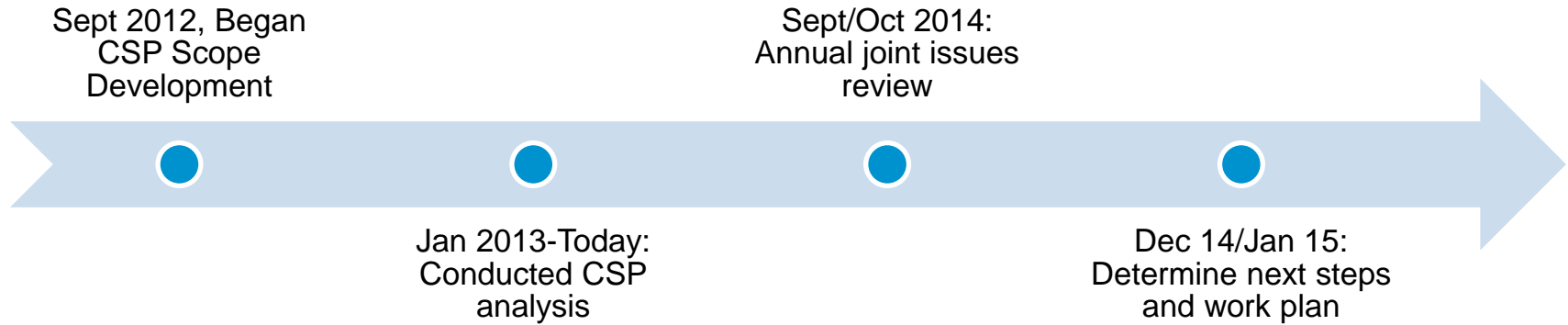
- **Metric Calculation**

- Should APC adjustments for purchases and sales be valued at market LMP's or production cost?
- Current project benefit calculation does not account for projects that increase congestion
- Is current 100% congestion hedge appropriate?
- Is 70%APC , 30% NLP split still appropriate?

- **NPV Calculation**

- The JOA protocols do not provide sufficient clarity on how many years to use for the NPV calculation
  - Change number of years, number of simulations, use earlier years?
- Extrapolation of the curve is largely dependent on assumptions

# Indicative Coordinated Study Timeline





- **MISO and PJM are continuing to evaluate the three most favorable projects from the existing process**
  - Expect to complete by July, 2014
- **Model improvement and synchronization effort to be undertaken prior to initiating the next round of joint analysis**
  - An update will be provided at the annual issues review in the fall

- **MISO and PJM staff support continuing discussion with stakeholders on the lesson learned items identified in the CBMEP study**
  - NIPSCO's request for action presented at the March JCM, in part, included items similar to those identified in the lessons learned from the CBMEP study
  - Open to creating a separate work group (or IPSAC) to focus on the CBMEP improvement items that regularly reports back to the JCM
  - Evaluation could result in process, JOA, or Tariff changes
- **Staffs can provide additional information and a more detailed work plan at the July 24<sup>th</sup> JCM meeting**

# Appendix

**Set report type drop-down menu to “Market to Market” to access reports**

**<https://www.misoenergy.org/Library/MarketReports/Pages/MarketReports.aspx>**

- **Projects must meet the following Criteria:**
  - Evaluated as part of a Coordinated System Plan or joint study process
  - Minimum project cost of \$20 million or greater
  - Meet the benefit to cost ratio threshold 1.25
    - Cross Border: 70% Adjusted Production Cost Savings (APCS) + 30% Net Load Payment Savings
    - Present Value of benefit metrics calculated over first 10 years of project life at a minimum with a maximum planning horizon of 20 years from the planning year.
  - Meet the benefit to cost ratio threshold 1.25 under MISO tariff for MEP
    - MISO: 100% APCS over first 20 year of project life
  - Meet the benefit cost ratio threshold under PJM tariff for MEP
    - PJM: 50% Production Cost Savings + 50% Net Load Payment Savings over first 15 years of project life\*
  - Addresses one or more constraints for which at least one dispatchable generator in the adjacent market has a Generation to Load Distribution Factor (GLDF) of 5% or greater with respect to serving load in that adjacent market
- \* Lower voltage projects are allocated based on 100% NLP

- JOA Benefit Metric = (70% of change in APC + 30% of change in NLP)
- Adjusted Production Cost (APC)
  - The APC for each RTO represents each RTO's production costs adjusted for interchange purchases and sales on an hourly basis.
  - Product costs include fuel cost, emission cost , O&M.
- Net Load Payments (NLP)
  - The NLP benefit for each RTO represents each RTO's gross load payment minus the estimated value of congestion-hedging transmission rights in each RTO.
- The JOA Benefit Metric is calculated for each RTO for each year of simulation.
- Benefits for intermediate years between simulated years are based on interpolation.
- The total project benefit will be determined by calculating the present value of annual benefits for, at a minimum, the first ten years of project life after the projected in-service year, with a maximum planning horizon of 20 years from the current year.

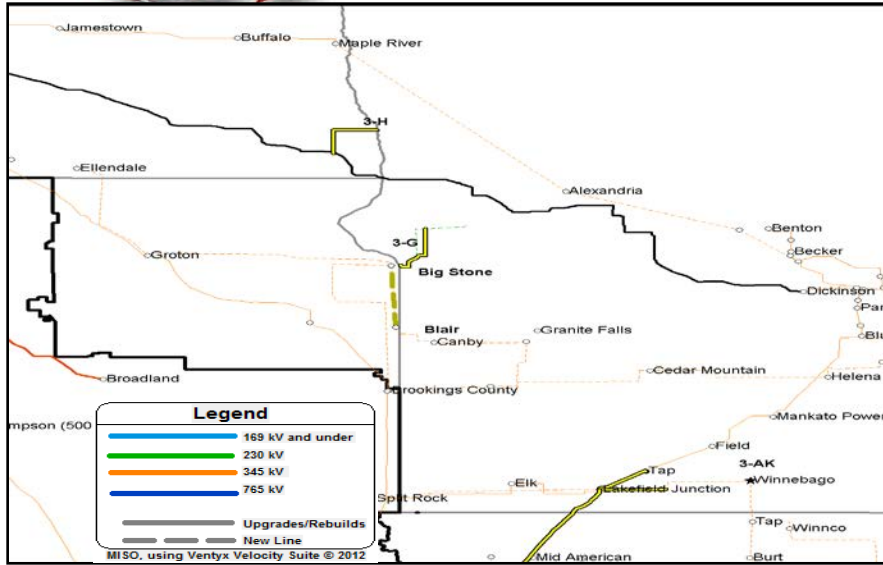
- **MISO economic benefit metric, is derived from Adjusted Production Cost savings, or savings in the costs to operate the fleet of generators that comprise the footprint**
- **Adjusted Production Cost is the total generation production costs with adjustments for purchases and sales**
  - $APC = \text{generation production cost} + \text{purchase payment} - \text{sale revenue}$
- **APC benefit, a direct benefit of transmission upgrade, is equal to the change in APC between two cases**
  - Base Case: system as-is
  - Project Case: proposed transmission upgrades
- **APC savings is achieved through the reduction of transmission congestion costs and more efficient generation resource access and utilization**

# PJM Regional Benefit Calculation

	Total Benefit = Energy + Capacity Benefit
Regional Projects (Double Circuit 345kV and up)	Energy Benefit: 50% change in production costs + 50% change in net load payments (only zones with decrease in net load payments)
	Capacity Benefit: 50% change in capacity costs + 50% change in net capacity payments (only zones with decrease in net load payments)
Lower Voltage Projects	Energy Benefit: 100% change in net load payments (only zones with decrease in net load payments)
	Capacity Benefit: 100% change in net capacity payments (only zones with decrease in net load payments)



# Ameren 2: Big Stone – Blair 230kV



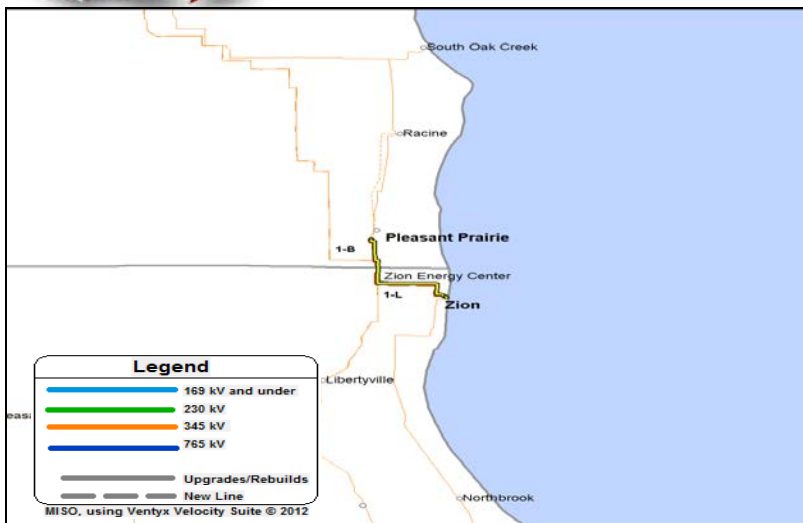
- **Description:**
  - New 230 kV line from Big Stone to Blair
  - Minnesota / S. Dakota Border
- **Project Details:**
  - Proposed by: AMEREN
  - Expected ISD: 12/31/2018
  - Estimated Project Cost: \$65M
  - Mileage: 33 miles
- **Summary of preliminary economic analysis:**
  - Reduced congestion on:
    - Johnson Jct. – Ortonville
    - Blue Earth – Winnebago

	COST (\$M)*	FUTURE 1 Benefit (\$M)*				FUTURE 2 Benefit (\$M)*				FUTURE 3 Benefit (\$M)*			
		APC	NLP	JOA	B/C	APC	NLP	JOA	B/C	APC	NLP	JOA	B/C
<b>MISO</b>		3.9	9.6	5.6		5.5	43.2	16.8		7.7	90.1	32.4	
<b>PJM</b>		(0.7)	28.1	8.0		(0.8)	24.0	6.6		54.1	22.3	44.5	
<b>Tot (10yr NPV)</b>	54.2	3.2	37.7	13.6	<b>0.25</b>	4.7	67.2	23.4	<b>0.43</b>	61.8	112.4	76.9	<b>1.42</b>
<b>Tot (20yr NPV)</b>	66.8	1.0	57.3	17.9	<b>0.27</b>	6.6	78.2	28.1	<b>0.42</b>	114.5	211.9	143.7	<b>2.15</b>

\*\*Lines are for illustrative purposes only, actual line routing may differ

# Benefit Calculation – Ameren 2

	Year	MISO Benefit						PJM Benefit						MISO + PJM Benefit		
		Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC+ 0.3NLP	0.7APC+ 0.3GLP	Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC+ 0.3NLP	0.7APC+ 0.3GLP	100% APC	0.7APC+ 0.3NLP	0.7APC+ 0.3GLP
F1	2018	1.4	0.7	19.5	13.8	4.6	6.3	(0.9)	(0.2)	6.5	6.0	1.6	1.8	0.5	6.2	8.2
	2023	4.2	2.9	(19.9)	(9.8)	(0.9)	(3.9)	(0.4)	(0.7)	4.2	3.9	0.7	0.8	2.2	(0.2)	(3.2)
	2028	(7.2)	(3.5)	27.6	15.3	2.1	5.8	6.4	1.1	10.1	10.8	4.1	3.8	(2.4)	6.2	9.6
	10 yr. NPV		3.9		9.6	5.6	4.3		(0.7)		28.7	8.0	8.2	3.2	13.6	12.5
	10 yr. B/C													0.1	0.3	0.2
	20 yr. NPV		0.5		17.8	5.7	6.9		0.5		39.4	12.2	12.1	1.0	17.9	19.0
	20yr. B/C													0.0	0.3	0.3
F2	2018	1.4	0.7	19.5	13.8	4.6	6.3	(0.9)	(0.2)	6.5	6.0	1.6	1.8	0.5	6.2	8.2
	2023	1.0	1.1	13.5	10.8	4.0	4.8	(0.4)	(0.1)	2.8	1.6	0.4	0.8	1.0	4.4	5.6
	2028	0.6	1.8	(2.2)	1.0	1.6	0.6	1.4	(0.3)	15.0	12.2	3.4	4.3	1.5	5.0	4.9
	10 yr. NPV		5.5		43.2	16.8	19.8		(0.8)		24.1	6.6	8.6	4.7	23.4	28.3
	10 yr. B/C													0.1	0.4	0.5
	20 yr. NPV		7.7		42.1	18.1	19.5		(1.2)		36.1	10.0	13.0	6.5	28.1	32.5
	20yr. B/C													0.1	0.4	0.5
F3	2018	1.4	0.7	19.5	13.8	4.6	6.3	(0.9)	(0.2)	6.5	6.0	1.6	1.8	0.5	6.2	8.2
	2023	4.0	3.1	25.2	11.2	5.5	9.7	1.6	2.7	(11.7)	(16.9)	(3.2)	(1.6)	5.8	2.3	8.1
	2028	18.7	(0.4)	54.5	43.5	12.8	16.1	19.7	44.1	25.1	51.5	46.3	38.4	43.7	59.1	54.5
	10 yr. NPV		7.7		90.1	32.4	48.1		54.1		9.7	44.5	39.9	61.8	76.9	88.0
	10 yr. B/C													1.1	1.4	1.6
	20 yr. NPV		8.1		138.5	47.2	67.5		106.4		73.4	96.5	83.2	114.5	143.7	150.6
														1.7	2.2	2.3



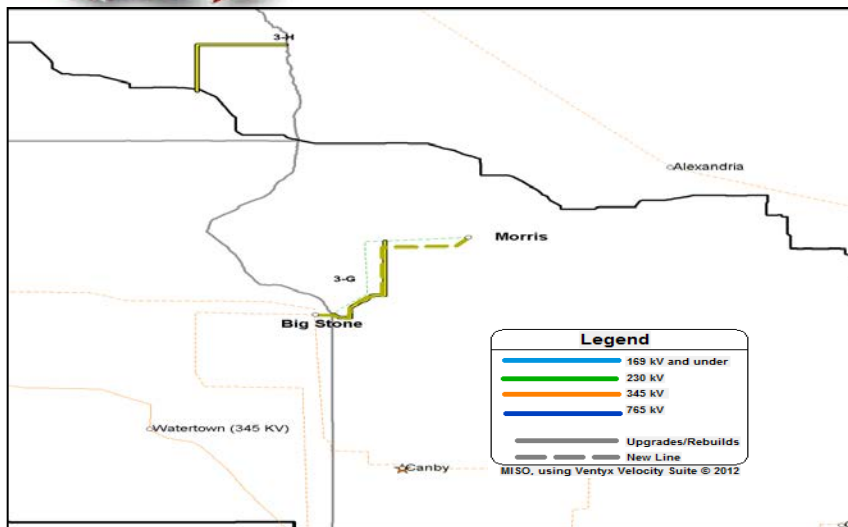
- **Description:**
  - New Zion – Pleasant Prairie 345 kV line
  - Wisconsin/Illinois Border
- **Project Details:**
  - Proposed by: AMEREN
  - Expected ISD: 12/31/2018
  - Estimated Project Cost: \$66M
  - Mileage: 12 miles
- **Summary of preliminary economic analysis:**
  - Reduced congestion on:
    - Zion Energy Center – Pl. Prairie
    - E. Winamac - Monticello

	COST (\$M)*	FUTURE 1 Benefit (\$M)*				FUTURE 2 Benefit (\$M)*				FUTURE 3 Benefit (\$M)*			
		APC	NLP	JOA	B/C	APC	NLP	JOA	B/C	APC	NLP	JOA	B/C
MISO		18.6	(17.3)	7.8		4.8	(54.4)	(13.0)		16.2	(112.9)	(22.5)	
PJM		2.6	199.0	61.5		1.8	90.2	28.3		6.8	169.4	55.6	
<b>Tot (10yr NPV)</b>	56.3	21.2	181.7	69.3	<b>1.23</b>	6.6	35.8	15.3	<b>0.27</b>	23.0	56.5	33.0	<b>0.59</b>
<b>Tot (20yr NPV)</b>	69.3	24.6	330.1	116.2	<b>1.68</b>	9.6	37.8	18.0	<b>0.26</b>	31.2	106.8	53.9	<b>0.78</b>

# Benefit Calculation – Ameren 16

	Year	MISO Benefit						PJM Benefit						MISO + PJM Benefit		
		Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC + 0.3NLP	0.7APC + 0.3GLP	Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC + 0.3NLP	0.7APC + 0.3GLP	100% APC	0.7APC + 0.3NLP	0.7APC + 0.3GLP
F1	2018	(1.8)	3.0	7.6	(1.5)	1.6	4.4	4.4	(0.1)	10.8	8.1	2.4	3.2	2.9	4.0	7.6
	2023	(2.0)	6.4	2.9	(8.1)	2.0	5.4	9.6	0.1	33.4	24.2	7.3	10.1	6.5	9.3	15.4
	2028	(27.3)	(0.1)	25.2	3.7	1.0	7.5	26.5	2.2	139.9	121.5	38.0	43.5	2.1	39.0	51.0
	10 yr. NPV		18.6		(17.3)	7.8	26.0		2.6		199.0	61.5	75.0	21.2	69.3	101.0
	10 yr. B/C													0.4	1.2	1.8
	20 yr. NPV		19.4		(15.3)	9.0	34.6		5.2		345.3	107.2	127.8	24.6	116.2	162.4
	20yr. B/C												0.4	1.7	2.3	
F2	2018	(1.8)	3.0	7.6	(1.5)	1.6	4.4	4.4	(0.1)	10.8	8.1	2.4	3.2	2.9	4.0	7.6
	2023	(8.2)	(0.5)	1.1	(5.6)	(2.0)	(0.0)	8.3	0.1	18.4	17.0	5.1	5.6	(0.4)	3.1	5.6
	2028	(8.9)	2.2	(38.4)	(36.3)	(9.3)	(10.0)	11.9	1.6	48.2	36.9	12.2	15.6	3.8	2.9	5.6
	10 yr. NPV		4.8		(54.4)	(13.0)	(5.6)		1.8		90.2	28.3	33.9	6.6	15.3	28.3
	10 yr. B/C													0.1	0.3	0.5
	20 yr. NPV		5.9		(97.9)	(25.2)	(19.1)		3.6		135.7	43.2	52.6	9.5	18.0	33.5
	20yr. B/C												0.1	0.3	0.5	
F3	2018	(1.8)	3.0	7.6	(1.5)	1.6	4.4	4.4	(0.1)	10.8	8.1	2.4	3.2	2.9	4.0	7.6
	2023	(4.1)	4.6	(8.3)	(21.1)	(3.1)	0.7	9.8	0.7	32.3	20.6	6.7	10.2	5.3	3.6	10.9
	2028	(42.4)	1.6	(20.2)	(56.1)	(15.7)	(4.9)	46.7	4.8	125.5	102.1	34.0	41.0	6.4	18.3	36.1
	10 yr. NPV		16.2		(112.9)	(22.5)	1.5		6.8		169.4	55.6	72.5	23.0	33.1	74.0
	10 yr. B/C													0.4	0.6	1.3
	20 yr. NPV		18.5		(185.0)	(42.6)	(5.9)		12.7		291.8	96.4	122.4	31.2	53.8	116.6
	20yr. B/C												0.5	0.8	1.7	

# Transource A #2-2: Big Stone – Morris



- **Description:**
  - New 345/230/161 station near Canby. Connect to new taps on: Big Stone – White 345 kV, Watertown – Granite Falls 230 kV
  - Minnesota / S. Dakota Border
- **Project Details:**
  - Proposed by: Transource
  - Expected ISD: 2024
  - Estimated Project Cost: \$25M

	COST (\$M)	FUTURE 1 Benefit (\$M)				FUTURE 2 Benefit (\$M)				FUTURE 3 Benefit (\$M)			
		APC	NLP	JOA	B/C	APC	NLP	JOA	B/C	APC	NLP	JOA	B/C
MISO						8.0	28.7	14.2					
PJM						0.6	29.5	9.3					
<b>TOTAL</b>	<b>15.7</b>					<b>8.6</b>	<b>58.2</b>	<b>23.5</b>	<b>1.49</b>				

*\*Lines are for illustrative purposes only, actual line routing may differ*

# Benefit Calculation – Transource A #2-2

	Year	MISO Benefit					PJM Benefit						MISO + PJM Benefit			
		Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC + 0.3NLP	0.7APC + 0.3GLP	Prod. Cost	APC	Gross Load Pay.	NLP	0.7APC + 0.3NLP	0.7APC + 0.3GLP	100% APC	0.7APC + 0.3NLP	0.7APC + 0.3GLP
F1	2018															
	2023															
	2028															
	10 yr. NPV															
	20 yr. NPV															
F2	2018	(1.0)	(0.6)	(1.3)	(5.0)	(1.9)	(0.8)	1.1	0.3	(5.0)	(6.9)	(1.9)	(1.3)	(0.3)	(3.8)	(2.1)
	2023	(1.1)	0.3	23.0	10.9	3.5	7.1	(0.5)	(0.4)	5.2	7.5	2.0	1.3	(0.1)	5.5	8.4
	2028	(6.5)	2.9	13.8	4.8	3.5	6.2	2.4	0.5	9.7	6.3	2.2	3.3	3.4	5.7	9.4
	10 yr. NPV		8.0			14.2	22.6		0.6		29.5	9.3	35.4	8.6	23.5	60.8
	10 yr. B/C													0.6	1.5	3.9
	20 yr. NPV															
	20yr. B/C															
F3	2018															
	2023															
	2028															
	10 yr. NPV															
	20 yr. NPV															