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2016 Economic Planning Study Results

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Introduction

- MISO MTEP16 Futures Assumptions
- Janesville-Beloit Results
- Butler-Bluemound Results
- Next Steps

Process Overview and Timeline

- ATC Economic Project Planning
  - **During February,** we hold an initial stakeholder meeting to review the market congestion summary and potential fixes and to discuss economic study scenarios, drivers, ranges, and assumptions.
  - **By March 1**, we work with stakeholders to request and prioritize new/other economic studies and recommend study assumptions.
  - **By April 15** – we identify preliminary areas of economic study, study assumptions and models and solicit further comments from stakeholders.
  - **By May 15** – we finalize areas of economic study, study assumptions and models to be used in analysis.
  - **By November 15** – we provide a summary of the results of the economic analyses to our stakeholders.

MISO MTEP16 Futures Definitions

Future	Narrative
Business As Usual	*The baseline, or Business as Usual, future captures all current policies and trends in place at the time of futures development and assumes they continue, unchanged, throughout the duration of the study period. Demand and energy growth rates are modeled at a level equivalent to the 50/50 forecasts submitted into the Module E Capacity Tracking (MECT) tool. All current state-level Renewable Portfolio Standard (RPS) and Energy Efficiency Resource Standard (EERS) mandates are modeled. All applicable and enforceable EPA regulations governing electric power generation, transmission and distribution (NAICS 2211) are modeled. To capture the expected effects of environmental regulations on the coal fleet, a total of 12.6 GW of coal unit retirements are modeled, including units which have either already retired or publicly announced they will retire.*
Low Demand	*The Low Demand future is designed to capture the effects of reduced economic growth resulting in lower energy costs and medium – low gas prices. The magnitude of demand and energy growth is determined by using the lower bound of the Load Forecast Uncertainty metric. All current state-level Renewable Portfolio Standard (RPS) and Energy Efficiency Resource Standard (EERS) mandates are modeled. All applicable EPA regulations governing electric power generation, transmission and distribution (NAICS 2211) are modeled. To capture the expected effects of environmental regulations on the coal fleet, 12.6 GW of coal unit retirements are modeled, including units which have either already retired or publicly announced they will retire. Additional, age-related retirements are captured using 60 years of age as a cutoff for non-coal, non-nuclear thermal units and 100 years for conventional hydroelectric.*
High Demand	*The High Demand future is designed to capture the effects of increased economic growth resulting in higher energy costs and medium – high gas prices. The magnitude of demand and energy growth is determined by using the upper bound of the Load Forecast Uncertainty metric and also includes forecasted load increases in the South region. All current state-level Renewable Portfolio Standard (RPS) and Energy Efficiency Resource Standard (EERS) mandates are modeled. All existing EPA regulations governing electric power generation, transmission and distribution (NAICS 2211) are incorporated. To capture the expected effects of environmental regulations on the coal fleet, 12.6 GW of coal unit retirements are modeled, including units which have either already retired or publicly announced they will retire. Additional, age-related retirements are captured using 60 years of age as a cutoff for non-coal, non-nuclear thermal units and 100 years for conventional hydroelectric.*
Regional Clean Power Plan Compliance	*The Regional Clean Power Plan future focuses on several key items from a footprint wide level which in combination result in significant carbon reductions over the course of the study period. Assumptions are consistent with MISO CPP Phase I & II analyses, and include the following:* • *To capture the expected effects of existing environmental regulations on the coal fleet, 12.6 GW of coal unit retirements are modeled, including existing or announced retirements.* • *14 GW of additional coal unit retirements, coupled with a $25/ton carbon cost, state mandates for renewables, and half of the EE annual growth used by the EPA, result in a significant reduction in carbon emissions by 2030.* • *Additional, age-related retirements are captured using 60 years of age as a cutoff for noncoal, non-nuclear thermal units and 100 years for conventional hydroelectric.* • *Solar and wind include an economic maturity curve to reflect declining costs over time.* • *Demand and energy growth rates are modeled at levels as reported in Module E.*
Sub-Regional Clean Power Plan Compliance	*"The Sub-Regional Clean Power Plan future focuses on several key items from a zonal or state level which combine to result in significant carbon reductions over the course of the study period. Assumptions are consistent with MISO CPP Phase I & II analyses, and include the following:* • *To capture the expected effects of existing environmental regulations on the coal fleet, 12.6 GW of coal unit retirements are modeled, existing or announced retirements.* • *20 GW of additional coal unit retirements, coupled with a $40/ton carbon cost, state mandates for renewables, and half of the EE annual growth used by the EPA, result in a significant reduction in carbon emissions by 2030.* ◦ *These increased retirements and carbon cost levels from the Regional CPP Future are consistent with regional/subregional CPP assessments performed by MISO and other organizations since the CPP's introduction* • *Additional, age-related retirements are captured using 60 years of age as a cutoff for non-coal, nonnuclear thermal units and 100 years for conventional hydroelectric.* • *Solar and wind include an economic maturity curve to reflect declining costs over time.* • *Demand and energy growth rates are modeled at levels as reported in Module E.*

Source: MISO 3-18-2015 Planning Advisory Committee Meeting (https://www.misoenergy.org/Events/Pages/PAC20150318.aspx)

MISO MTEP16 Future Matrix

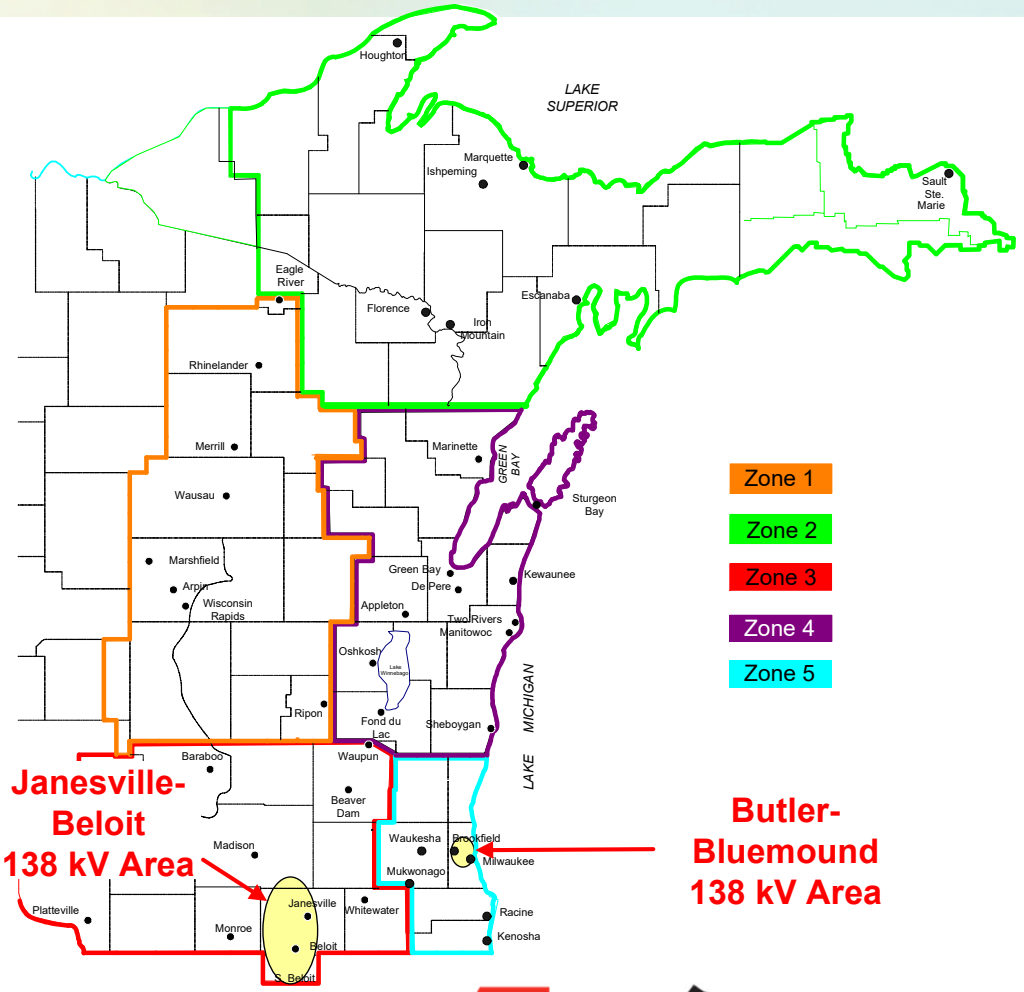
Future	Baseline Demand / Energy Growth (20-year)	Retirements Level* (GW)	Natural Gas Price (2015$/MMBTu)	Incremental Renewables (GW) N/C: North/Central MISO S: South MISO	CO_2 Cost (2015$/ton)
Business as Usual	0.75% / 0.82%	No Additional	$4.11	N/C: 4.2 Wind/ 1.4 Solar S: 0 Wind/ 0 Solar	None
Low Demand	0.11% / 0.19%	Age-Related	$3.29	N/C: 2.4 Wind/ 1.3 Solar S: 0 Wind/ 0 Solar	None
High Demand	1.55% / 1.61%	Age-Related	$4.11	N/C: 7.2 Wind/ 1.6 Solar S: 0 Wind/ 0 Solar	None
Regional CPP Compliance	0.75% / 0.82%	14 GW coal + Age-Related	$4.93	N/C: 4.2 Wind/ 1.4 Solar S: 0 Wind/ 0 Solar + cost maturity curves	$25 / ton
Sub-Regional CPP Compliance	0.75% / 0.82%	20 GW coal + Age-Related	$4.93	N/C: 4.2 Wind/ 1.4 Solar S: 0 Wind/ 0 Solar + cost maturity curves	$40 / ton

12 GW of MATS related coal-retirements are assumed in all futures
Age-related retirement assumption applies to non-coal generation only

Source: MISO 7-29-2015 MTEP16 EGEAS Results (https://www.misoenergy.org/Events/Pages/PAC20150729.aspx)

ATC 2016 Economic Planning Analysis – Proposed Study Areas

Constrained Area
Butler-Bluemound 138 kV Area
Janesville-Beloit 138 kV Area



Janesville-Beloit Area Project

- Coordination between reliability and economic planning
- MISO criteria for Riverside interconnection impact is 20%
- Impacts below 20% may require ATC to address issues
- Results in this study evaluate non-Riverside interconnection project alternatives
- A 5 ohm series reactor identified as potential solution
- Reactor placed on Paddock-NW Beloit 138 kV line

5 ohm Reactor Project – Econ Results

Future	Total Annual Savings (2019 – M$)	40-Year Savings (2016 - M$)
BAU	$8.46	$157.05
HD	$2.76	$51.35
LD	$0.96	$17.81
RCPP	($0.10)	($1.83)
SRCPP	$1.04	$19.24

5 ohm Reactor Project - Congestion Change

Annual Hours Change	Blackhawk – Colley Rd 138 kV	Paddock – NW Beloit 138 kV	Rock River – Townline 138 kV	Rock River – Marine 138 kV	North Lake Geneva – Elkhart 138 kV
BAU	-223	-40	N/A	N/A	N/A
HD	-49	-201	N/A	N/A	N/A
LD	-72	-26	N/A	N/A	N/A
RCPP	-181	-203	42	219	19
SRCPP	-274	-265	41	277	25

5 ohm Reactor Project - Congestion Change

Annual Shadow $ Change	Blackhawk – Colley Rd 138 kV	Paddock – NW Beloit 138 kV	Rock River – Townline 138 kV	Rock River – Marine 138 kV	North Lake Geneva – Elkhart 138 kV
BAU	-$135.4	-$7.80	N/A	N/A	N/A
HD	-$14.68	-$50.54	N/A	N/A	N/A
LD	-$4.88	-$2.00	N/A	N/A	N/A
RCPP	-$30.45	-$21.83	$3.26	$39.76	$0.31
SRCPP	-$39.11	-$43.30	$3.35	$56.42	$1.65

Butler–Bluemound – Econ Results

Future	Total Annual Savings (2020 – M$)	40-Year Savings (2016 - M$)
BAU	$1.94	$18.30
HD	$1.02	$9.62
LD	$1.02	$9.62
RCPP	($0.37)	($3.49)
SRCPP	$0.22	$2.11

Butler-Bluemound - Congestion Change

Annual Hours Change	Bluemound – Butler 138 kV	St. Rita – Racine 138 kV
BAU	-742	0
HD	-465	-2
LD	-506	0
RCPP	-8	2
SRCPP	-23	-3

Butler-Bluemound - Congestion Change

Annual Hours Change	Bluemound – Butler 138 kV	St. Rita – Racine 138 kV
BAU	-$49.99	-$0.06
HD	-$36.26	-$0.16
LD	-$26.63	$0.00
RCPP	-$0.35	-$0.10
SRCPP	-$1.91	-$0.07

Next Steps

- Project / Analysis Development
  - Stakeholder Feedback
  - Additional review of feasibility of uprate of Butler – Bluemound
  - Continue coordinated analysis with reliability planning on Janesville – Beloit area projects
- Timelines
  - February 2017: Kickoff of new economic study and any follow-up on project development from 2016 study.

Questions?

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Thank You For Your Time!