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2018 Economic Planning Study Kickoff

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March 1, 2018

Introduction

- 2017 Study Follow up
- Process Overview and Timeline
- 2018 Futures Development
- Next Steps

ATC 2017 Economic Study Area Alternatives

- Edgewater Alt. 1 – Uprate Edgewater-Saukville 345kV
- Edgewater Alt. 2 – Connect Plymouth-Holland 138 kV and S. Sheboygan Falls-Mullet River 138 kV lines
- Edgewater Alt. 3 – Tap Forest Jct.-Saukville 138kV lines to Mullet River sub

ATC 2017 Economic Study Area Alternatives

- Forest Jct. Alt 1 Xfmr – Add Branch River 345/138 kV and tap Forest Jct.-Howards Grove 138 kV
- Forest Jct. Alt 2 – Uprate Forest Jct.-Elkhart-Saukville 138 kV line
- Forest Jct. Alt 3 – Uprate both Forest Jct.-Saukvillle 138 kV lines
- Forest Jct. Alt 4 – Connect Cypress-Arcadian and SEC-Granville 345 kV lines with new sub
- Forest Jct. Alt 5 – Connect Cypress-Arcadian and Granville-Arcadian 345 kV lines

ATC 2017 Economic Study Results

		MISO MTEP17 Planning Futures		
		EF	PR	AAT
Alternatives	Edgewater Alt1	$1,622,068.89	$4,885,762.87	($2,784,177.76)
	Edgewater Alt2	$3,501,768.78	$5,724,755.28	($5,111,642.18)
	Edgewater Alt3	($23,622.60)	$2,079,708.00	($59,470,806.08)
	FJ Alt1 Xfmr	$4,650,778.76	$17,084,872.27	($33,774.68)
	FJ Alt2	$1,891,495.00	$7,597,284.26	$11,882,599.62
	FJ Alt3	$1,891,516.86	$7,597,291.08	$11,884,741.00
	FJ Alt4	$39,770,834.80	$4,082,061.31	$48,775,028.87
	FJ Alt5	($52,597,116.87)	($31,664,089.18)	($96,711,759.51)

ATC 2017 Economic Planning Study

- Preliminary results from November 2017 show benefits
- Updated FJT Alt 4 modeling shows similar issues to FJT Alt 5 (eliminated solution)
- Edgewater Alt 2 indicative cost estimate much higher than any economic benefits (eliminated solution)
- Edgewater Alt 3 indicative cost estimate much higher than any economic benefits (eliminated solution)
- Forest Junction Alt 1 costs for 138 kV substation are much higher than economic benefits (eliminated solution)

ATC 2017 Economic Planning Study

- ATC Economic Planning requested scope of work for some alternatives
- Significant rebuild may be required for Forest Junction – Elkhart Lake 138 kV (high costs)
  - Only have scope for highest rating, not incremental ratings
- Elkhart Lake – Saukville uprate around $7.5M
  - Not valuable without Forest Junction – Elkhart Lake Uprate
- Edgewater – Saukville 345 kV uprate around $2.5M
  - Not beneficial in all MTEP17 futures
  - Consider impact of expansion generation siting

MTEP17 Next Steps

- More precise study of incremental alternatives in 2018?
  - Work with T-Line engineering to scope incremental uprates
  - Get cost estimates of scope with reasonable indicative costs
  - Move load at Elkhart Lake to higher rated line
- Study alternatives using MTEP18 models?

ATC Process Overview and Timeline

- ATC Economic Project Planning – Per ATC Tariff
  - **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.

2018 Futures Development

- Utilize the MISO MTEP models and futures
- Review MISO models and provide updates as necessary
  - Review generation interconnection request in MISO Queue
  - Review load profiles and demand and energy growth
  - Better modeling of time of use industrial customers
  - Most updated transmission topology
- Ensures greater alignment with MISO stakeholder process

MISO MTEP18 Futures

- Limited Fleet Change – (LFC)
- Continued Fleet Change – (CFC)
- Accelerated Fleet Change – (AFC)
- Distributed & Emerging Technology – (DET)

Limited Fleet Change

- Largely unchanged generation fleet
- Lower demand and energy growth rates
- No carbon emission regulations
- Age related coal retirements
- Lower renewable development targets
- Lower fuel costs

Continued Fleet Change

- Continued coal and age related retirements
- Transitioning of generation fleet to natural gas
- Mid level demand and energy growth rates
- Return to mid level fuel prices
- Current trend of renewable investment continues

Accelerated Fleet Change

- Policy/Regulation targeting reduction in CO^2 emissions
- CO^2 reduction goal set at 20% lower than 2005 levels
- Increased demand on NG drives prices higher
- Increased retirement of coal to meet CO^2 target
- Robust economy drives more technology advancement, resulting in more energy efficiency, distributed generation, and demand response
- Higher gross demand and energy, offset by tech advancement

Distributed & Emerging Technology

- Continued coal and age related retirements
- Higher energy usage driven by electric vehicles
- Electric Vehicles shift time of use for energy
- Return to mid level fuel prices
- Renewable siting is much more localized and urban

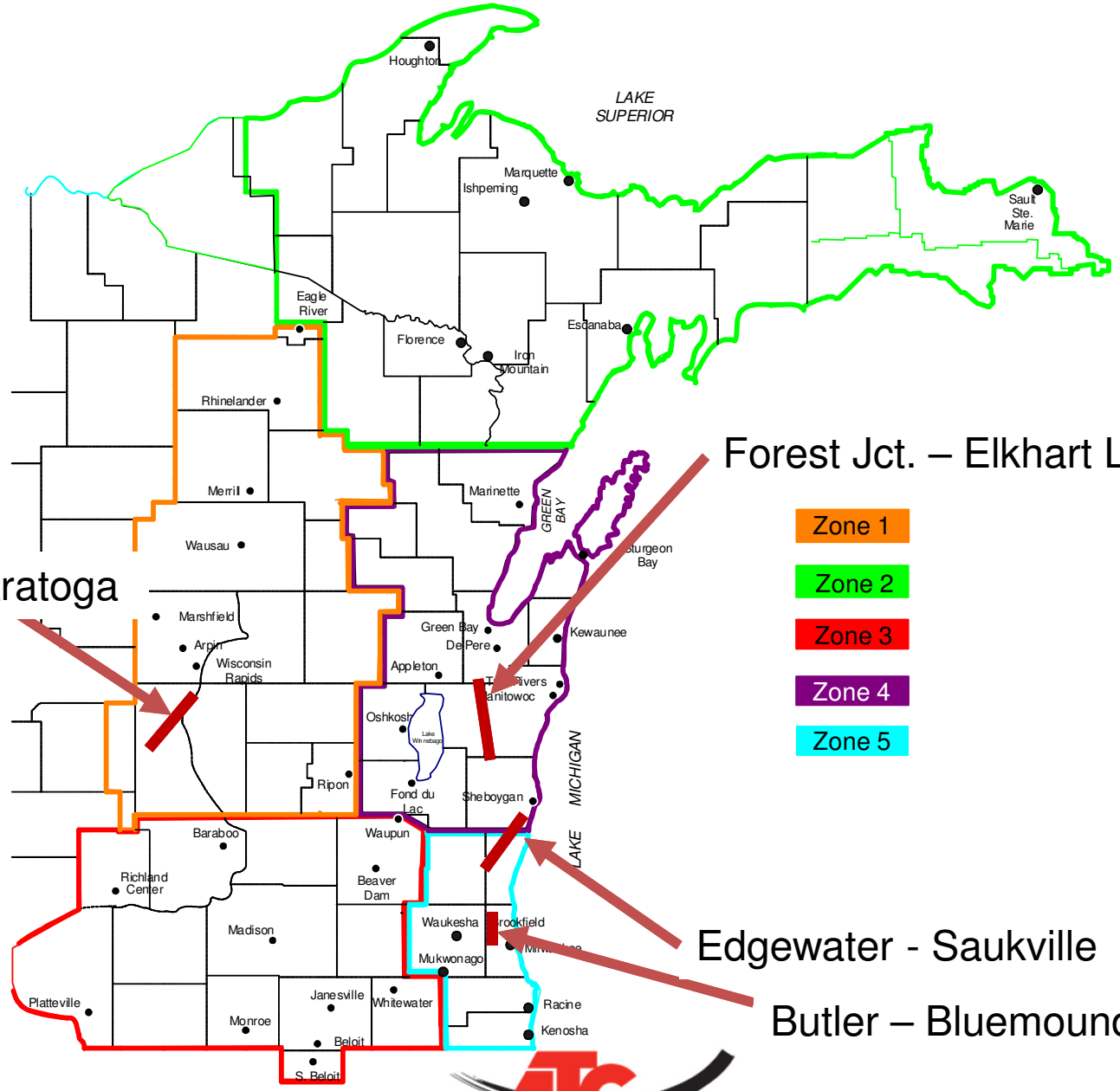
MISO MTEP18 Key Assumptions

Future	Limited Fleet Change	Continued Fleet Change	Accelerated Fleet Change	Distributed & Emerging Tech
Net Demand & Energy Growth Rates	Low (10/90)	Base (50/50)	High (90/10)	Base + EV Energy = 1.1% Demand = 0.6%
Natural Gas Price Forecast	Gas: Base -30% Coal: Base -3%	Base	Gas: Base +30% Coal: Base	Base
Max DR/EE/DG Tech Potential	EE: - DR: 3 GW	EE: 1 GW DR: 4 GW	EE: 7 GW DR: 7 GW	EE: 1+ GW DR: 4+ GW + 2 GW storage
Renewables ***By Year 2031*** **(% Wind and Solar Energy)**	10%	15%	26%	20%
Retirement	Coal: 9 GW Gas/Oil: 17 GW	Coal: 16 GW Gas/Oil: 17 GW	Coal: 24 GW Gas/Oil: 17 GW	Coal: 17 GW Gas/Oil: 17 GW Nuclear: 2.5 GW
CO2 Reduction Constraint ***From Current Levels by 2032***	None	None	20%	None
Siting Methodology	MTEP Standard	MTEP Standard	MTEP Standard	Localized

Source: MISO September 27, 2017 Planning Advisory Committee
https://cdn.misoenergy.org/20170927%20PAC%20Item%2003d%20MTEP18%20Futures%20Results%20Review89925.pdf

Notable MTEP18 Congestion

- Forest Junction – Elkhart Lake 138 kV
- Butler – Bluemound 138 kV
- Edgewater – Saukville 345 kV
- Petenwell – ACEC Badger – Saratoga 138 kV
  - This has an SPS that mitigate constraint


Houghton
LAKE SUPERIOR
Marquette
Ishpeming
Sault Ste. Marie
Eagle River
Florence
Iron Mountain
Escanaba
Rhinelander
Merrill
Marinette
GREEN BAY
Wausau
Sturgeon Bay
Marshfield
Green Bay
De Pere
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Arpin
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Appleton
Two Rivers
Manitowoc
Oshkosh
Lake Winnebago
MICHIGAN
Ripon
Fond du Lac
Sheboygan
LAKE
Baraboo
Waupun
Richland Center
Beaver Dam
Madison
Waukesha
Brookfield
Mukwonago
Platteville
Janesville
Whitewater
Racine
Monroe
Kenosha
Beloit
S. Beloit
Forest Jct. – Elkhart Lake
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Petenwell-Saratoga
Edgewater - Saukville
Butler – Bluemound

Stakeholder and Customer Feedback

- ATC is soliciting stakeholders and customers for new/other economic studies, recommended study assumptions changes, and study areas for our 2018 study
- ATC also requests feedback in areas where Public Policy Requirements may drive transmission needs.
  - Public Policy Requirements are enacted statutes (i.e., passed by the legislature and signed by the executive) and regulations promulgated by a relevant jurisdiction, whether within a state or at the federal level, including duly enacted laws or regulations passed by a local governmental entity, such as a municipal or county government. Stakeholders are encouraged to provide ATC with Public Policy Requirements. ATC utilizes transmission needs driven by Public Policy Requirements in its assumptions when performing economic analysis of study areas. The transmission needs driven by Public Policy Requirements that will be included in ATC's finalized assumptions will be posted prior to May 15th.

Next Steps

- Project / Analysis Development
  - Review of Congestion
  - Investigate impacts of generation expansion and retirement on congestion
  - Stakeholder Feedback
- 2018 Futures Development
  - Continued Review of MISO MTEP18 Development
  - Review of MISO PROMOD Models
    - Discuss expansion generation siting impacts with MISO
  - Update model with interconnection projects that may impact congestion
- Analysis of Projects
  - Study Years – 2027 and 2032
  - Futures – All MISO MTEP18 Futures
- Timelines
  - April 15: Define Preliminary Assumptions
  - May 15: Finalize Assumptions
  - November 15: Provide Analysis Update

Detailed MISO Futures Information

- MTEP18 Futures Development Summary
  - June Planning Advisory Presentation
- MTEP18 Resource Expansion and Siting Results
  - September Planning Advisory Presentation

Questions?

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Thank You For Your Time!