



# ATC Energy Collaborative – Michigan Needs Analysis Update

Network Customer Meeting  
February 26, 2009

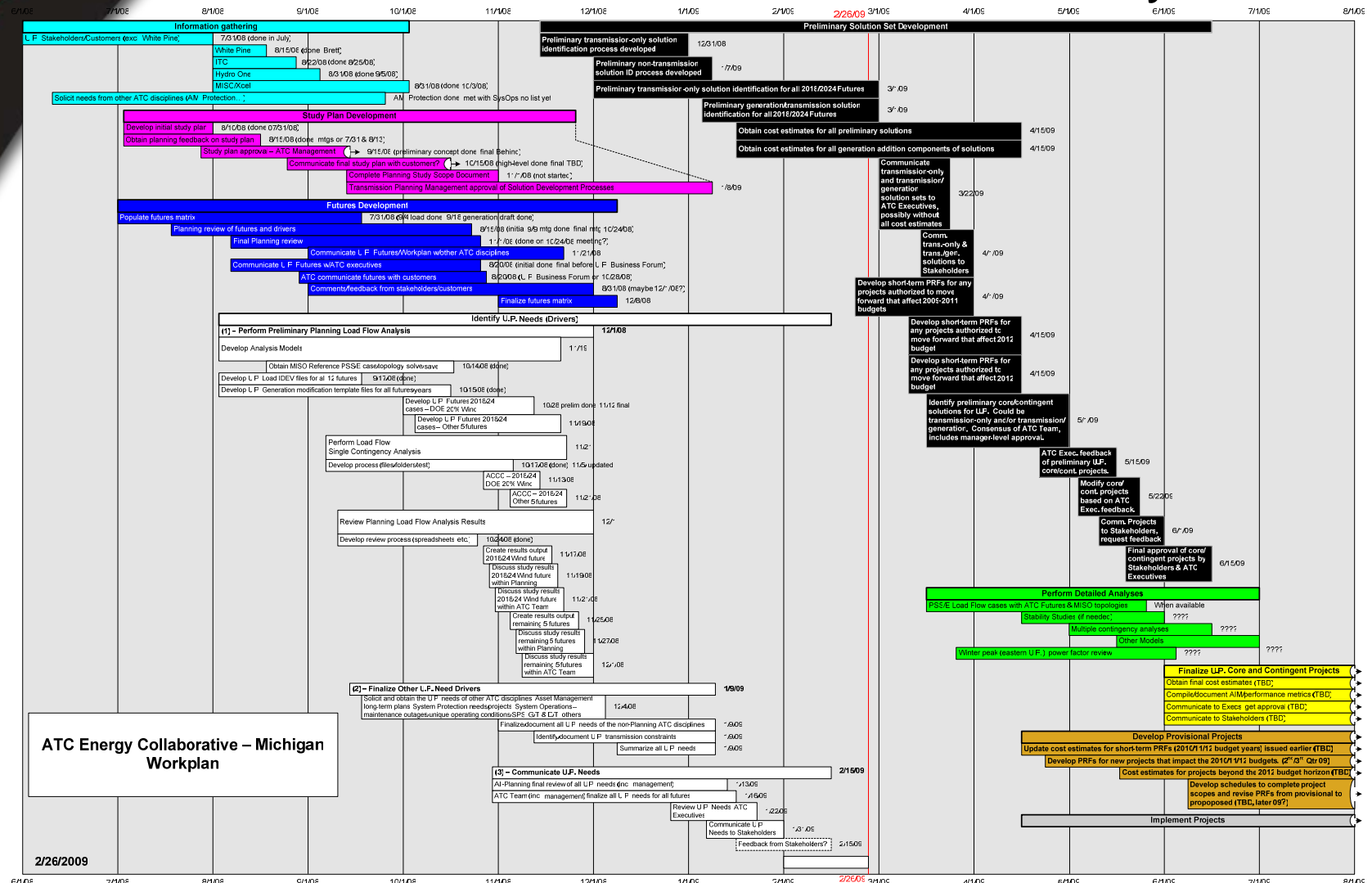


# Summary

- Collaborative Goals and Schedule
- Analysis Technique
  - Strategic Flexibility
- Stakeholder Process
- Needs Update
- Next Steps
  - Solution Screening

# Goals and Schedule

- Goal is to identify medium and long range needs for the UP transmission system





# Analysis Technique

- Used the Strategic Flexibility process introduced in the Paddock – Rockdale study
- Developed six “Futures” based on MISO and ATC models
- Customized the Futures using UP specific drivers



# Definition of Futures

- **Futures are:**

- Robust Economy      -Slow Growth
- Environmental        -High Retirements
- DOE 20% Wind      -Fuel and Investment Limitations

- **Drivers are:**

- Demand and energy growth
  - Scalable and point loads
- Generation
  - Additions, retirements and dispatch of Existing Units
- Market flows

# Stakeholder Process

- Plausible bounds for drivers were developed with Stakeholder input

ATC Futures - ATC Energy Collaborative - Michigan																																																				
January 2, 2009 (ATC Internal Use Only Discussion) (Rev 4.0)																																																				
UP Micro-Drivers	Load Assumptions												Generation Assumptions																																							
	Demand Growth Within UP (Demand MWs)			Energy Growth Within UP (Energy MW/hrs)			Total Point Loads MW added in the UP (2018/2024)			Total UP Growth (2018)	Total UP Growth (2024)	Demand Growth Outside UP (MWs)	Existing UP Generation Profile (Note: U.P. generation on-line only if dictated by merit order dispatch, or unless noted below)						UP Generation Additions			UP Generation retirements			Wind Generation			New Generation in Northern Lower Michigan																								
	West	Central	East	West	Central	East	West	Central	East	U.P.	U.P.		West	Central	East	West	Central	East	West	Central	East	West	Central	East																												
													Fossil (-69MW Total) 'WP Mine1-2-3 (40) + SM-ST (11) + Warden (18)			Fossil (-151MW Total) 'P15-6 Derate (40) + ESC1-2 (26) + Neenah-MUN (5)+NP7 Plus (55) + MBLP (25)			9.4MW Diesel Available			5 MW			116 MW																											
													Hydro 20% of max			Hydro 20% of max			0MW Hydro Available			None			None				9MW Diesel			None			P13-4 (116)			None			Zero			Zero			Zero			Zero		
													(-6 / 0)			(-111 / 0)			(-2 / 0)																																	
												-6 MW			-111 MW			-2 MW			-1.44%			-0.86%			0.5%																									
Lower	-0.10%	0.08%	0.10%	-0.10%	0.08%	0.10%	-6 MW	-111 MW	-2 MW	-1.44%	-0.86%	0.5%	Hydro 20% of max	Hydro 20% of max	0MW Hydro Available	None	None	9MW Diesel	None	P13-4 (116)	None	Zero	Zero	Zero	Zero																											
								</																																												

## 2018 Futures Descriptions

	(+1.93%)	(+2.00%)	(+2.00%)	(+1.93%)	(+2.00%)	(+2.00%)	Upper	(+134 MW)	(+46 MW)	(+3.00%)	3.0%	-0MW	-0MW	20MW Hydro	(none)	60MW	(+101 MW)	(none)	(-116 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)
Robust Economy	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
	(+0.73%)	(+0.84%)	(+0.73%)	(+0.73%)	(+0.84%)	(+0.73%)	(+5 MW)	(+29 MW)	(+33 MW)	(-1.14%)	1.75%	-69MW	-151MW	32MW Hydro	(none)	Mid-Upper	(+29MW)	(none)	(-138 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)
High Retirements	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	1.0%	-51MW	-134MW	20MW Hydro	Lower	Lower	Mid	Lower	Lower	Lower	Mid	Mid	Mid	Upper
	(+0.36%)	(+0.48%)	(+0.40%)	(+0.36%)	(+0.48%)	(+0.40%)	(no change)	(-40 MW)	(no change)	(-0.24%)	1.0%	-51MW	-134MW	20MW Hydro	Lower	Lower	(+6 MW)	(none)	(-116 MW)	(none)	(+50 MW)	(+100 MW)	(+100 MW)	(none)
High Environmental	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid	Lower	Lower	Lower	Lower	Lower	Lower	Mid-Upper	Mid-Upper	Mid-Upper	Lower
	(-0.10%)	(+0.08%)	(+0.10%)	(-0.10%)	(+0.08%)	(+0.10%)	(-6 MW)	(-111 MW)	(-2 MW)	(-1.44%)	0.5%	-40MW	-65MW	44MW Hydro	Lower	Lower	(+5 MW)	(none)	(-116 MW)	(none)	(+100 MW)	(+200 MW)	(+200 MW)	(none)
Slow Growth	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Mid	Mid	Upper	Mid	Mid	Lower	Lower	Lower	Lower	Upper	Upper	Upper	Lower
	(+1.23%)	(+1.25%)	(+1.23%)	(+1.25%)	(+1.25%)	(+1.25%)	(+16 MW)	(+79 MW)	(+35 MW)	(+2.00%)	2.0%	-69MW	-151MW	20MW Hydro	Mid	Upper	(+93 MW)	(none)	(-138 MW)	(none)	(+100 MW)	(+200 MW)	(+200 MW)	(+ 100 MW)
DOE 20% Wind	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Lower	Lower	Mid	Lower	Lower	Mid-Upper	Lower	Lower	Lower	Upper	Upper	Upper	Mid
	(-0.73%)	(-0.84%)	(-0.73%)	(-0.73%)	(-0.84%)	(-0.73%)	(no change)	(+6 MW)	(no change)	(0.48%)	1.3%	-40MW	-65MW	0MW Hydro	Lower	Lower	(+5 MW)	(none)	(-116 MW)	(none)	(none)	(none)	(none)	(none)
Fuel and Investment Limitations	Mid	Mid	Mid	Mid	Mid	Mid	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid	Lower	Mid	Mid	Mid	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower

## 2024 Futures Descriptions

	(+1.93%)	(+2.00%)	(+2.00%)	(+1.93%)	(+2.00%)	(+2.00%)	(+41 MW)	(+184 MW)	(+56 MW)		(+2.58%)	3.0%	-0MW	-0MW	20MW Hydro	(none)	110MW	(+101 MW)	(none)	(-116 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)
Robust Economy	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
	(+0.73%)	(+0.84%)	(+0.73%)	(+0.73%)	(+0.84%)	(+0.73%)	(+56 MW)	(+293 MW)	(+33 MW)		(+0.84%)	1.75%	-69MW	-151MW	32MW Hydro	(none)	(none)	(+29MW)	(none)	(-138 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)
High Retirements	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Mid	Lower	Lower	Mid-Upper	Lower	Lower	Mid	Lower	Upper	Lower	Mid	Mid	Mid	Upper
	(+0.36%)	(+0.49%)	(+0.40%)	(+0.36%)	(+0.49%)	(+0.40%)	(no change)	(-40 MW)	(no change)		(-0.05%)	1.0%	-51MW	-134MW	20MW Hydro	(none)	(none)	(+5 MW)	(none)	(-116 MW)	(none)	(+50 MW)	(+100 MW)	(+100 MW)	Lower
High Environmental	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid	Lower	Lower	Lower	Lower	Lower	Lower	Mid-Upper	Mid-Upper	Mid-Upper	Lower
	(-0.10%)	(+0.08%)	(+0.10%)	(-0.10%)	(+0.08%)	(+0.10%)	(-6 MW)	(-111 MW)	(-2 MW)		(-0.86%)	0.5%	-40MW	-65MW	44MW Hydro	(none)	10MW	(+5 MW)	(none)	(-116 MW)	(none)	(+100 MW)	(+200 MW)	(+200 MW)	Lower
Slow Growth	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Mid	Mid	Lower	Lower	Lower	Lower	Lower	Upper	Upper	Upper	Lower
	(+1.23%)	(+1.25%)	(+1.25%)	(+1.23%)	(+1.25%)	(+1.25%)	(+19 MW)	(+69 MW)	(+40 MW)		(+1.60%)	2.0%	-69MW	-151MW	20MW Hydro	(none)	(none)	(+93 MW)	(none)	(-138 MW)	(none)	(+100 MW)	(+200 MW)	(+200 MW)	(+ 100 MW) (Wind)
DOE 20% Wind	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Mid-Upper	Lower	Lower	Mid	Lower	Lower	Mid-Upper	Lower	Upper	Lower	Upper	Upper	Upper	Lower
	(+0.73%)	(+0.84%)	(+0.73%)	(+0.73%)	(+0.84%)	(+0.73%)	(no change)	(+46 MW)	(no change)		(+0.45%)	1.3%	-40MW	-65MW	0MW Hydro	(none)	10MW	(+5 MW)	(none)	(-116 MW)	(none)	(none)	(none)	(none)	Lower
Fuel and Investment Limitations	Mid	Mid	Mid	Mid	Mid	Mid	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower	Mid	Mid	Lower	Mid	Mid	Mid	Mid	Lower	Lower	Lower	Lower	Lower	Lower

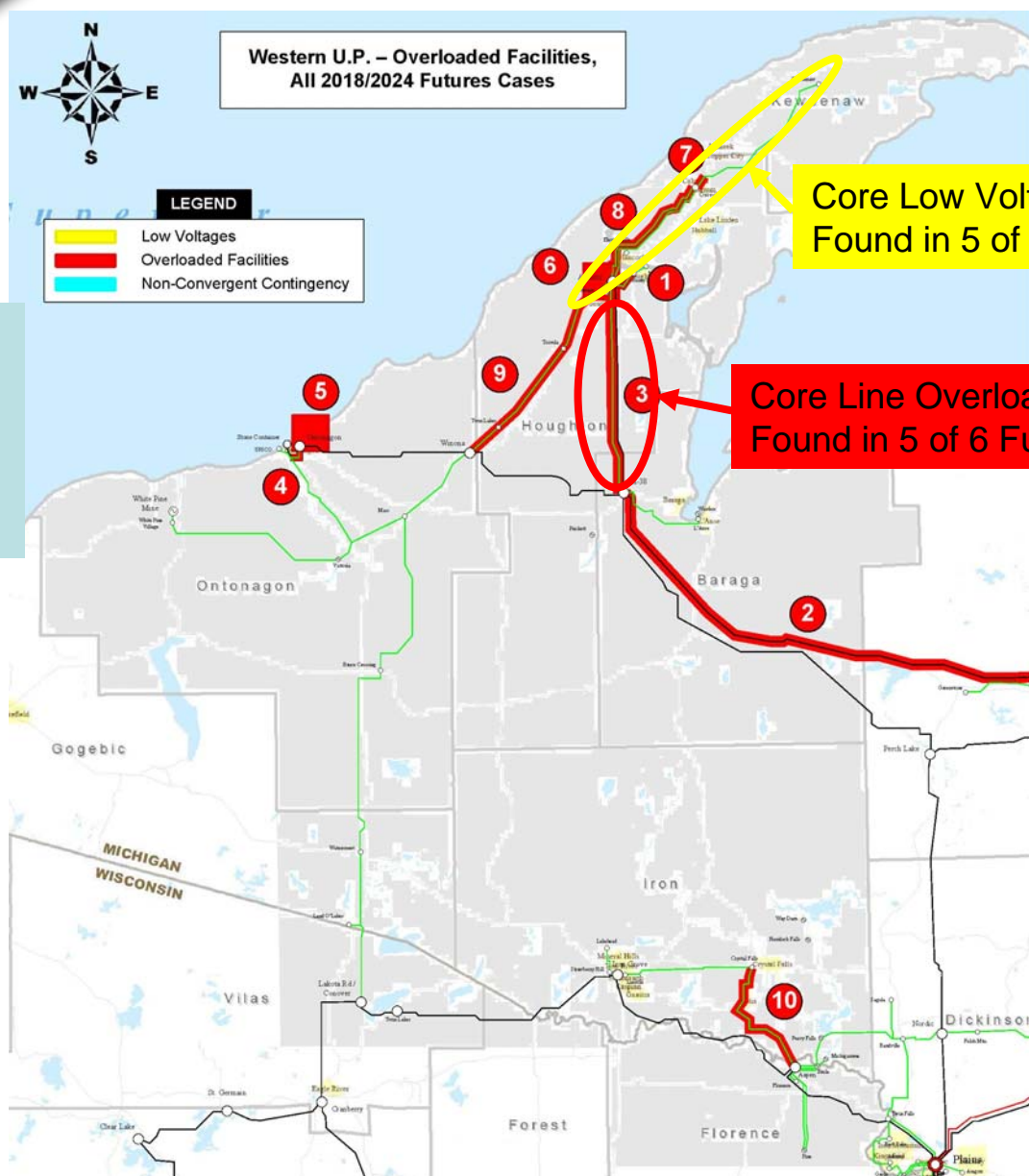


# UP Need Summary

- Aggregation of ATC need drivers
  - Planning Studies
    - Line loadings and voltages
  - System Operations
    - Special operating guides
  - Asset Management
    - Poor line performance
    - Transformers, circuit breakers and relays
  - New Interconnections
    - 14 load requests under study
    - 2 wind generation studies in progress
  - Smart Grid initiatives
    - Fiber optic corridor additions
    - RTU and SCADA projects



# Western UP Load and Voltage Needs



Core Low Voltage Need-  
Found in 5 of 6 Futures

Core Line Overload Need-  
Found in 5 of 6 Futures

Ten Line Overloads Found  
in the Various Futures

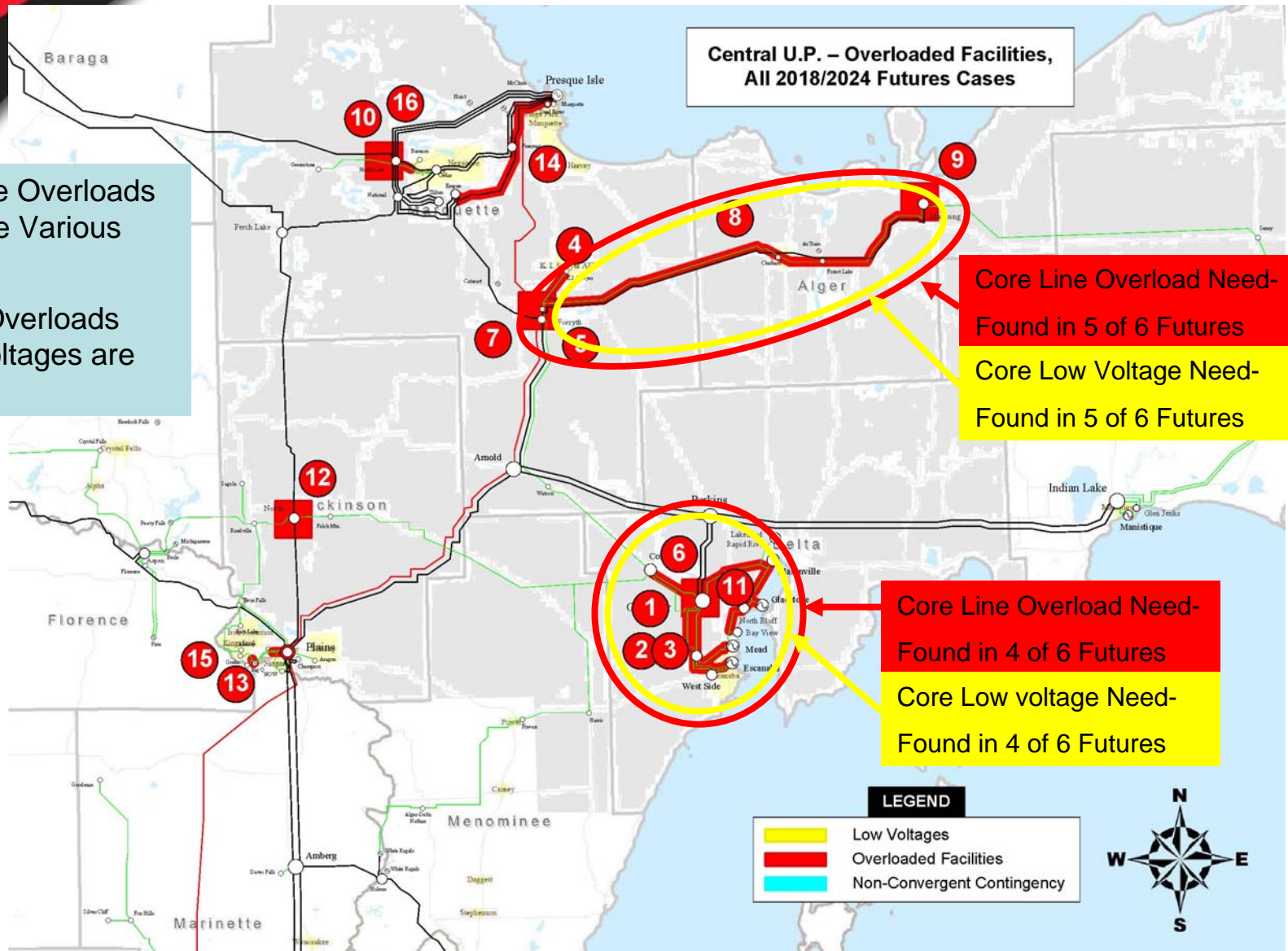
Core Line Overloads and  
Low Voltages are  
Highlighted



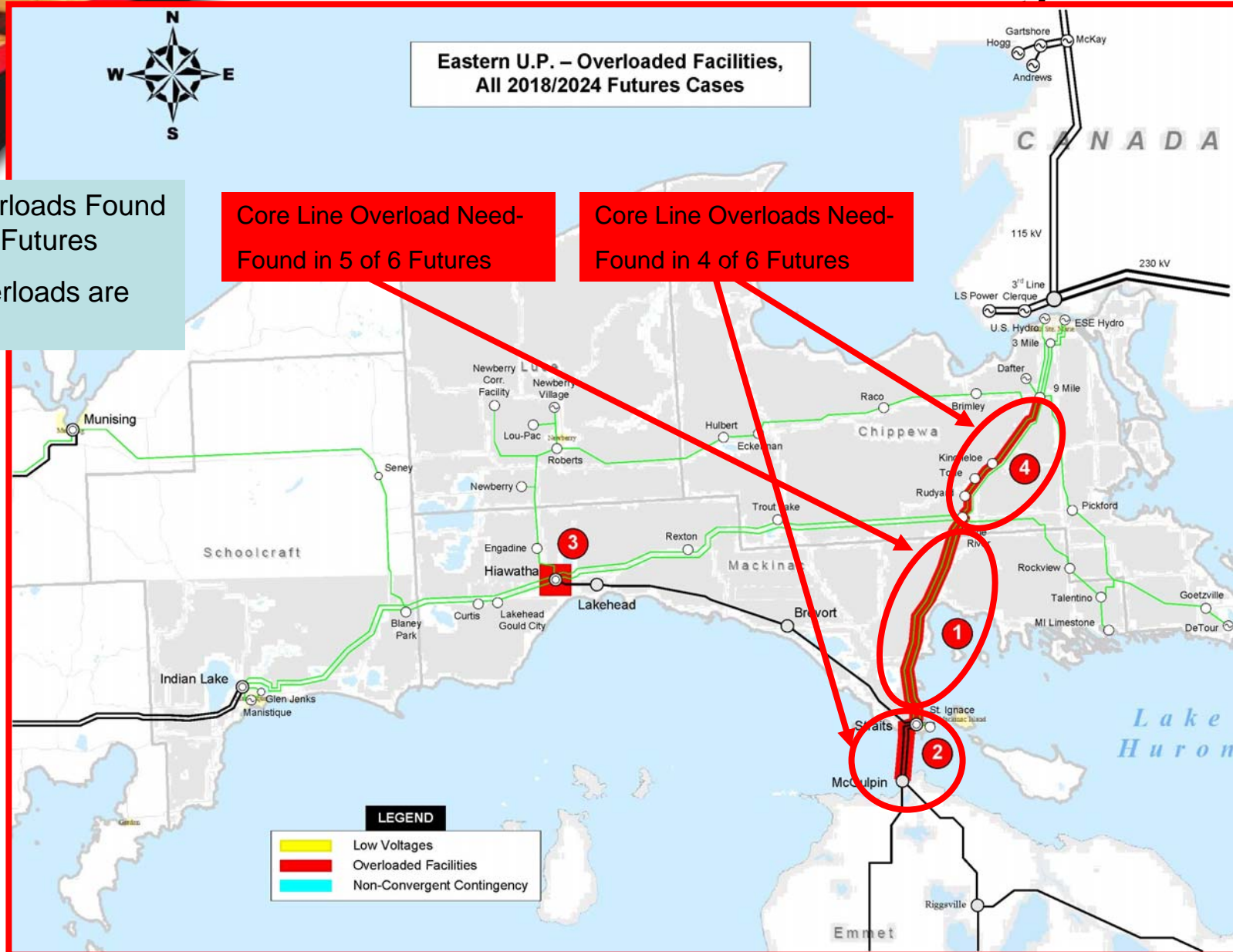
# Central UP Load and Voltage Needs

Sixteen Line Overloads Found in the Various Futures

Core Line Overloads and Low Voltages are Highlighted

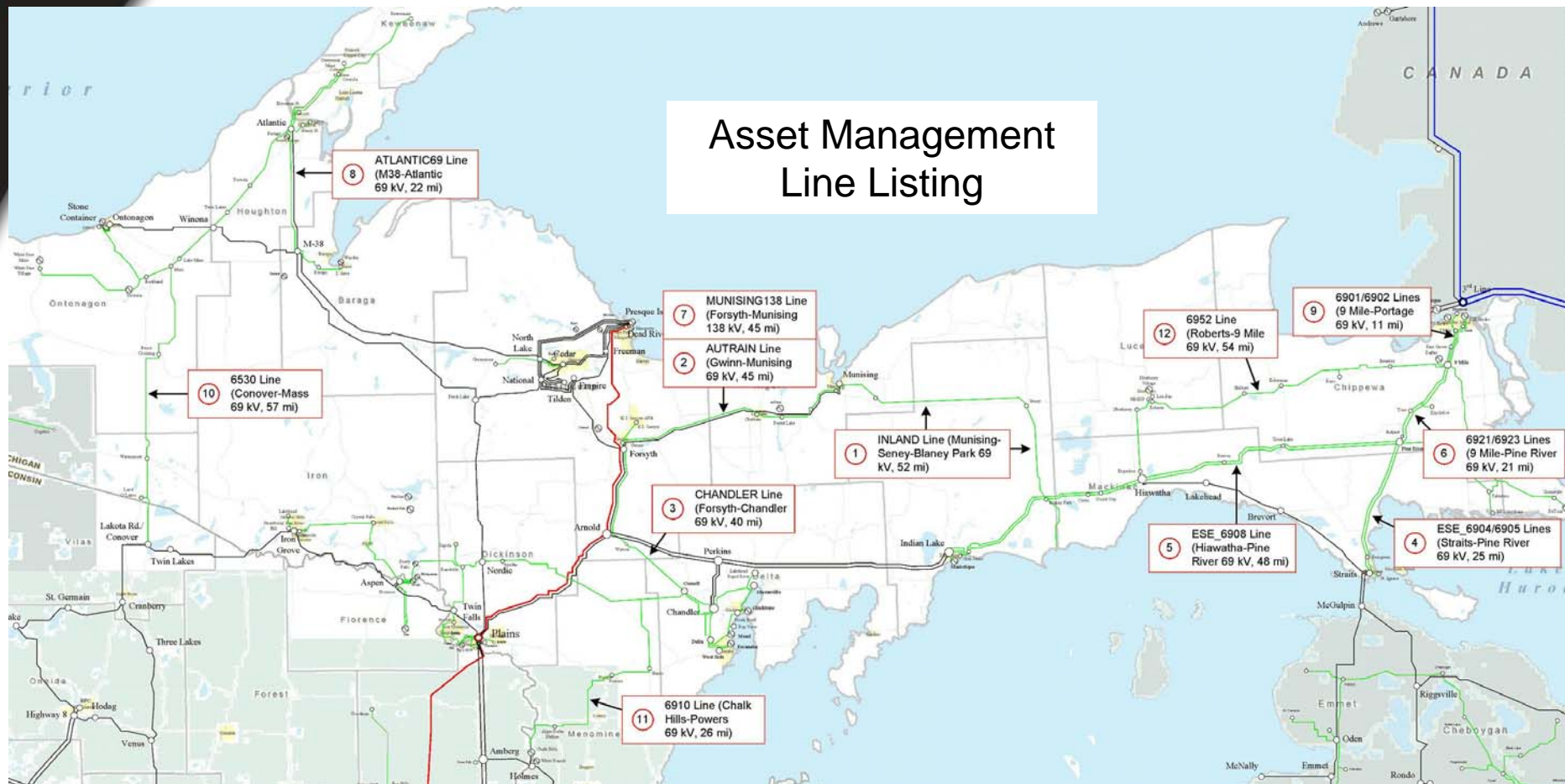


# Eastern UP Load and Voltage Needs





# UP Lines with Asset Management Need Drivers





# Next Steps

- Needs summary communication with Stakeholders
- Solution development process
  - Joint meetings with Planning, Asset Management, System Operations and Project Management
  - Solicit non-transmission solutions from Stakeholders
    - Right size, Right Place Generation
    - Demand Response
- 2010/2011 budget inputs



# Questions?