ATC Energy Collaborative – Michigan Needs Analysis Update

Network Customer Meeting February 26, 2009

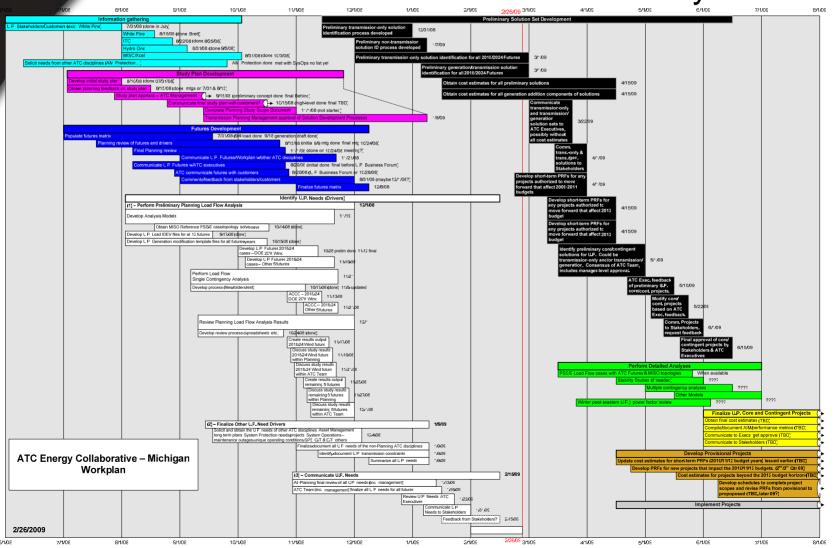


Summary

- 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

		I	np	ut									ATC Futures - ATC Energy Collaborative - Michigan													
		Load Assumptions												January 2, 2009 (ATC Internal Use Only Discussion) (Rev 4.0)												
UP Micro-	Demand Growth Within UP En									Total UP	Total UP	Demand Growth	Generation Assumptions New Generation in Norther									Generation in Northern				
Drivers (Demand		d Growth Wir Demand MW:	thin UP s)	Energy Gr	rowth Within MWHrs)	MWHrs)		oint Loads MW added in the UP (2018/2024)		Growth (2018)	(2024)	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			Lower Michigan	
Bounds	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		
							(-6/0)	(-111 / 0)	(-2/0)				Fossil (-69MW Total) "WP Mine1 2-3 (40) + SM-ST (11) + Warden (18)	Fossil (-151MW Total) 'PI6-6 Derate (40) + ESC1-2 (26) + Neenah-MUN (5)+NP7 Plus (55) + MBLP (25)	9.4MW Diesel Available			5 MW		116 MW						
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	5MW Diesel	None	PI3-4 (116)	None	Zero	Zero	Zero	Zero	
								(-40 / 0)					(-51MW Total) "WP Mine1-2-3 (40) + SM-ST (11)	Fossil (-134MW Total) PI5-6 Derate (40) + ESC 1-2 (26) + Neenah-MUN (5) + MBLP (25) + NP7 (38)												
Mid-Lower	0.36%	0.48%	0.40%	0.36%	0.48%	0.40%	No Change	-40 MW	No Change	-0.24%	-0.05%	1.0%	Hydro 20% of max	Hydro 20% of max			None									
							(+5 / 0)	(+29 / 0)	(+33 / 0)				(-40MW Total) "WP Mine1-2-3 (40)	Fossil (-65MW Total) PI5-6 Derate (40) + MBLP (25)	11.4MW Diesel Available		10MW	29 MW	None		None					
Mid	0.73%	0.84%	0.75%	0.73%	0.84%	0.75%	+5 MW	+29 MW	+33 MW	1.14%	0.84%	1.75%	Hydro 40% of max	Hydro 40% of max,	20MW Hydro Available	None	10MW Bio Mass NMU	5MW Diesel + 24MW Bio Mass			None	25MW	50MW	50MW	100MW	
							(+16 / +3)	(+79 / +20)	(+35 / +5)				Fossil all available	Fossil (-40MW Total) PI 5-6 (40)	11.4MW diesel Available		60MW 10 NMU+50	93MW	None		None					
Mid-Upper	1.23%	1.25%	1.25%	1.23%	1.25%	1.25%	+19 MW	+99 MW	+40 MW	2.00%	1.60%	2.0%	Hydro 50% of max	Hydro 50% of max	32MW Hydro Available		Sawyer Bio Mass	24MW Bio Mass + 9MW Hydro + 60 MW Mascoma				50MW	100MW	100MW		
							(+19 / +22)	(+134 /+50)	(+46 / +10)				Fossil all available	Fossil all available	16MW Diesel Available		110MW 10 NMU+100		None	138 MW	None					
Upper	1.93%	2.00%	2.00%	1.93%	2.00%	2.00%	+41 MW	+184 MW	+56 MW	3.00%	2.58%	3.0%	Hydro 60% of max	Hydro 60% of max	44MW Hydro Available	None	Sawyer Bio Mass	Mass + 9MW Hydro + 60 MW Mascoma		PI3-4 (116) +GLAD (22)		100MW	200MW	200MW	600MW	
2018 Futures																										
Descriptions																										
	(+1.93%)	(+2.00%)	(+2.00%)	(+1.93%)	(+2.00%)	(+2.00%)	(+19 MW)	(+134 MW)	(+46 MW)	(+3.00%)		3.0%	-OMW	-OMW	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	Mid	Upper	Mid-Upper	Upper	Lower	Lower	Lower	Mid	Mid	Mid	Upper							
	(+0.73%)	(+0.84%)	(+0.75%)	(+0.73%)	(+0.84%)	(+0.75%)	(+5 MW)	(+29 MW)	(+33 MW)	(+1.14%)		1.75%	-69MW	-151MW	32MW Hydro	(none)	(none)	(+29MW)	(none)	(-138 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)	
High Retirements	Mid (+0.36%)	Mid (+0.48%)	Mid (+0.40%)	Mid (+0.36%)	Mid (+0.48%)	Mid (+0.40%)	Mid (no change)	(-40 MW)	(no change)	Mid (-0.24%)		Mid 1.0%	Lower -51MW	Lower -134MW	Mid-Upper 20MW Hydro	(none)	(none)	Mid (+5 MW)	(none)	(-116 MW)	(none)	Mid (+50 MW)	Mid (+100 MW)	Mid (+100 MW)	(none)	
High Environmental	Mid-Lower (-0.10%)	Mid-Lower (+0.08%)	Mid-Lower	Mid-Lower (-0.10%)	Mid-Lower (+0.08%)	Mid-Lower (+0.10%)	Mid-Lower (-6 MW)	Mid-Lower (-111 MW)	Mid-Lower (-2 MW)	Mid-Lower (-1.44%)		Mid-Lower 0.5%	Mid-Lower -40MW	Mid-Lower -65MW	Mid 44MW Hydro	Lower (none)	Lower 10MW	Lower (+5 MW)	Lower (none)	Lower (-116 MW)	Lower (none)	Mid-Upper (+100 MW)	Mid-Upper (+200 MW)	Mid-Upper	Lower (none)	
Slow Growth	(0.10%)	(10.00%)	(10.10%)	(10.10%)	(10.00%)	, ,				١.		0.070	Mid	Mid	Upper	(1010)	100001	Lower			(none)	(1100 11111)	(1200 11111)	(1200 1111)	Lower	
Slow Growth	(+1.23%)	(+1.25%)	(+1.25%)	(+1.23%)	(+1.25%)	(+1.25%)	(+16 MW)	(+79 MW)	(+35 MW)	(+2.00%)		2.0%	-69MW	-151MW	20MW Hydro	(none)	(none)	(+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	Lower	Lower	Mid	Lower	Lower	Mid-Upper	Lower	Upper	Lower	Upper	Upper	Upper	(Wind) Mid							
Fuel and Investment	(+0.73%)	(+0.84%)	(+0.75%)	(+0.73%)	(+0.84%)	(+0.75%)	(no change)	(+6 MW)	(no change)	(0.48%)		1.3%	-40MW	-65MW	0MW Hydro	(none)	10MW	(+5 MW)	(none)	(-116 MW)	(none)	(none)	(none)	(none)	(none)	
Limitations	Mid	Mid	Mid	Mid	Mid	Mid	Mid-Lower	Mid-Lower	Mid-Lower	Mid-Lower		Mid-Lower	Mid	Mid	Lower	Mid	Mid	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower	
2024 Futures																										
<u>Descriptions</u>	(+1.93%)	(+2.00%)	(+2.00%)	(+1.93%)	(+2.00%)	(+2.00%)	(+41 MW)	(+184 MW)	(+56 MW)	ı	(+2.58%)	3.0%	-OMW	-OMW	20MW Hydro	(none)	110MW	(+101 MW)	(none)	(-116 MW)	(none)	(+25 MW)	(+50 MW)	(+50 MW)	(+ 600 MW)	
Robust Economy	Upper (+0.73%)	Upper (+0.84%)	Upper (+0.75%)	Upper (+0.73%)	Upper (+0.84%)	Upper (+0.75%)	Upper (+5 MW)	Upper (+29 MW)	Upper (+33 MW)		Upper (+0.84%)	Upper 1.75%	Upper -69MW	Upper -151MW	Mid 32MW Hydro	Upper (none)	Upper (none)	Upper (+29MW)	Lower (none)	Lower (-138 MW)	Lower (none)	Mid (+25 MW)	Mid (+50 MW)	Mid	Upper (+ 600 MW)	
High Retirements	Mid	Mid	Mid		Mid	Mid	Lower	Lower	Mid-Upper	Lower	Lower	Mid	Lower	Upper	Lower	Mid	Mid	Mid	Upper							
High Environmental	(+0.36%) Mid-Lower (-0.10%)	(+0.48%) Mid-Lower (+0.08%)	(+0.40%) Mid-Lower (+0.10%)	(+0.36%) Mid-Lower (-0.10%)	(+0.48%) Mid-Lower (+0.08%)	(+0.40%) Mid-Lower (+0.10%)	(no change) Mid-Lower (-6 MW)	(-40 MW) Mid-Lower (-111 MW)	(no change) Mid-Lower (-2 MW)		(-0.05%) Mid-Lower (-0.86%)	1.0% Mid-Lower 0.5%	-51MW Mid-Lower -40MW	-134MW Mid-Lower -65MW	20MW Hydro Mid 44MW Hydro	(none) Lower (none)	(none) Lower 10MW	(+5 MW) Lower (+5 MW)	(none) Lower (none)	(-116 MW) Lower (-116 MW)	(none) Lower (none)	(+50 MW) Mid-Upper (+100 MW)	(+100 MW) Mid-Upper (+200 MW)	(+100 MW) Mid-Upper (+200 MW)	(none) Lower (none)	
Slow Croudh	Louis	Louns	Louis	(-0.1076)	Lewer	(10.1076)	Louise	Lawer	Lower		(-0.0070)	Laura	Mid			(Horie)	Med		Lawer	(-1.0 mill)	Laure:	(. roo miv)	(Llongs	(.zoomiri)	Louis	
Slow Growth DOE 20% Wind	(+1.23%) Mid-Upper	(+1.25%) Mid-Upper	(+1.25%) Mid-Upper	(+1.23%) Mid-Upper	(+1.25%) Mid-Upper	(+1.25%) Mid-Upper	(+19 MW) Mid-Upper	(+99 MW) Mid-Upper	(+40 MW) Mid-Upper		(+1.60%) Mid-Upper	2.0% Mid-Upper	Mid -69MW Lower	Mid -151MW Lower	Upper 20MW Hydro Mid	Mid (none)	Mid (none) Lower	Lower (+93 MW) Mid-Upper	(none) Lower	(-138 MW) Upper	(none)	(+100 MW) Upper	(+200 MW)	(+200 MW) Upper	(+ 100 MW) (Wind) Mid	
Fuel and Investment	(+0.73%)	(+0.84%)	(+0.75%)	(+0.73%)	(+0.84%)	(+0.75%)	(no change)	(+6 MW)	(no change)		(0.45%)	1.3%	-40MW	-65MW	0MW Hydro	(none)	10MW	(+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	Mid	Lower	Mid	Mid	Lower	Lower	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

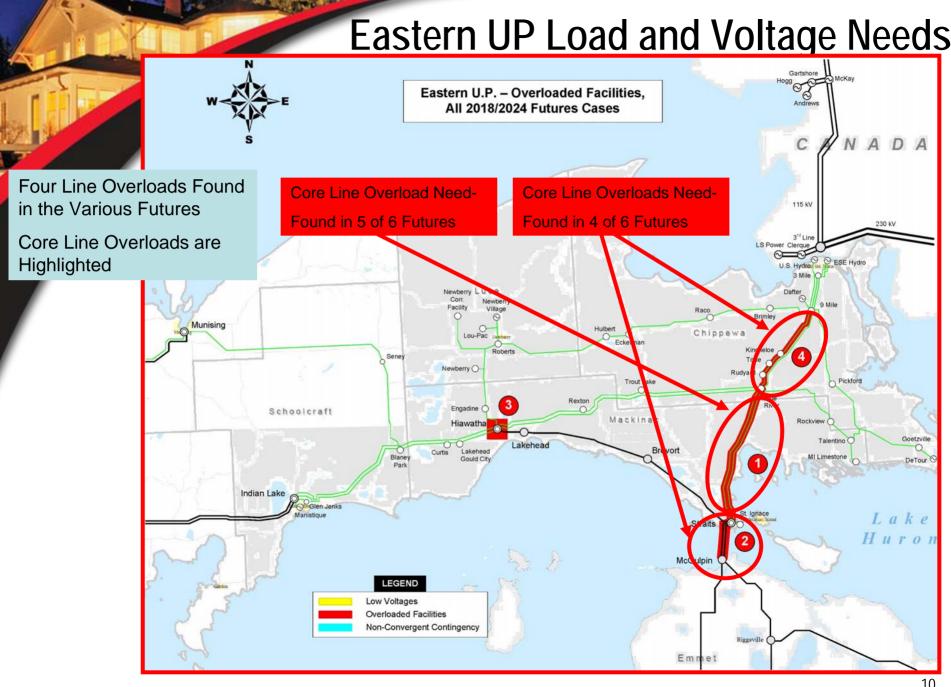
Western UP Load and Voltage Needs

Ten Line Overloads Found in the Various Futures

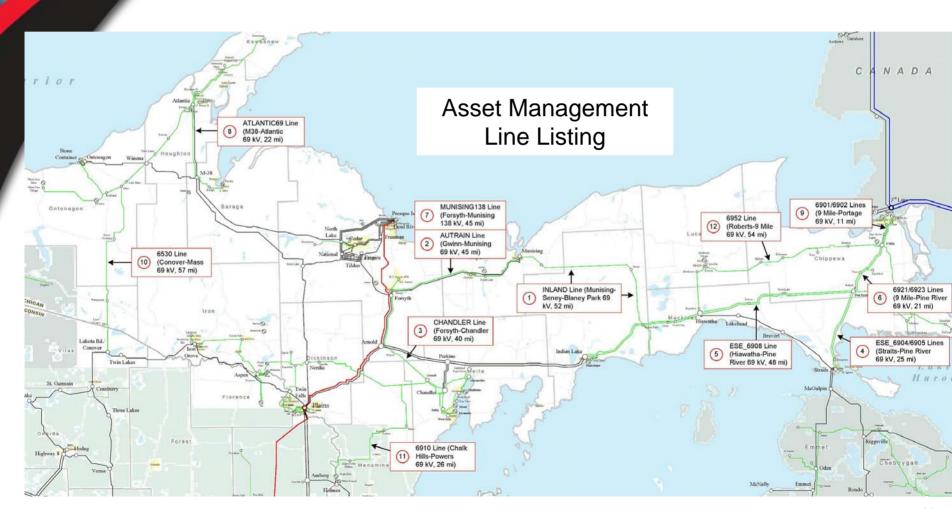
Core Line Overloads and Low Voltages are Highlighted



Central UP Load and Voltage Needs Central U.P. - Overloaded Facilities. Baraga All 2018/2024 Futures Cases Sixteen Line Overloads Found in the Various **Futures** Core Line Overload Need-Core Line Overloads Found in 5 of 6 Futures VI S and Low Voltages are Core Low Voltage Need-Highlighted Found in 5 of 6 Futures Indian Lake Core Line Overload Need-Florence Found in 4 of 6 Futures Core Low voltage Need-Found in 4 of 6 Futures LEGEND Menominee Low Voltages Overloaded Facilities Non-Convergent Contingency



UP Lines with Asset Management Need Drivers





- 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

