



System Planning Update

**Network Customer Meeting
October 20, 2010**

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Manager - Reliability

Helping to **keep the lights on,**
businesses running and communities strong®



2010 10-Year Assessment *Messages*

- Planning for Regional Solutions
- Improved Access
- Asset Renewal

2010 10-Year Assessment 345-kV Line Projects

	2009 Assessment	Miles	2010 Assessment
1	Paddock-Rockdale	35	(complete)
2	Rockdale-West Middleton (Cardinal)	32	Rockdale-West Middleton (Cardinal)
3	Arpin-Rocky Run rebuild	20	(complete)
4	(new in 2010)	150	Badger-Coulee
5	(new in 2010)	6	Construct Bain-Zion 345- kV line
6	(new in 2010)	51	Forest Junction- Sheboygan area 138 to 345-kV conversion
7	(new in 2010)	80	Dubuque-Spring Green- Cardinal

2010 10-Year Assessment Estimated Capital Costs

	Nov 2006	Nov 2007	Oct 2008	Oct 2009	Sept 2010
10-Year Assessment Projects	\$1.7B	\$1.4B	\$1.3B	\$1.0B	\$1.0B
Other Capital Expenditures	\$1.4B	\$1.4B	\$1.4B	\$1.5B	\$1.7B
Regional Multi- value projects	\$0.0B	\$0.0B	\$0.0B	\$0.0B	\$0.7B
Total 10-Year Capital Cost	\$3.1B	\$2.8B	\$2.7B	\$2.5B	\$3.4B

ATC Energy Collaborative - MI

- Core projects status board
- Flow control status
- High Retirements Future

ATC Energy Collaborative - MI

Core Projects Status Board

- Available on ATC 10-Year Assessment web site
 - <http://www.atc10yearplan.com>
 - Energy Collaboratives, *tab*
 - Energy Collaborative – MI, *tab*
 - Table UP-1, *link*

Core Project Name	Code	ISD	Status
East Area			
Straits Reactors	New	2010	In-Service
Straits-McGulpin uprate	E2	2010	Planned
Straits-Pine R rebuild	E4c	2014	Planned
Flow control	E31	2014	Provisional
Indian Lake-Hiawatha 138 kV Line	E8	2014	Provisional
Pine River-Nine Mile uprate, asset renewal	E6, EAR-2	2016	Provisional

Core Project Name (cont'd)	Code	ISD	Status
Escanaba Area			
Uprate Escanaba Loop 69 kV lines	C2a	2010	In-service
Chandler Line insulator replacements	C-AR3	2010	Planned
Chandler 138-69 kV second transformer and ring bus	C3a	2011, 2012	Proposed
Delta breakers, stability, asset renewal	C36, C37	2012	Proposed
Chandler-18th Rd 138/69 double circuit line, 18th Rd 138-69 substation	C5,6,8	2014	Provisional
Breaker/Relay/Capacitor asset renewal	New	various	various
Chalk Hills-Powers asset renewal	C-AR4	2020?	Provisional

Core Project Name (cont'd)	Code	ISD	Status
Munising/Newberry Area			
Nine Mile-Roberts asset renewal	E-AR3	2012?	Planned
Hiawatha-Engadine 69-kV line	New	2012	Provisional
Munising138-kV Line asset renewal	C-AR1	2012?	Provisional
Autrain Line asset renewal	C-AR1	2013?	Provisional
Inland Line uprate and Asset renewal	C17, C-AR2	2014	Provisional
New Gwinn-Forsyth 69 line	C10	2016	Provisional
West Area			
M38-Atlantic 69-kV Line uprate, asset renewal	W13, W-AR1	2013	Provisional

Flow Control Status - Constrained Area

U.P. High West-to-East and East-to-West Flows

Midwest ISO Map of Operations

Electric Transmission Lines	Electric Generating Stations
138 kV	Coal-Fire
230 kV	Nuclear
345 kV	Hydro
500 kV	Pumped Storage
100 kV to 138 kV	Wind
DC Line	Transmission Station

Midwest ISO Reliability Area

Presque Isle Generation/
Mine Load

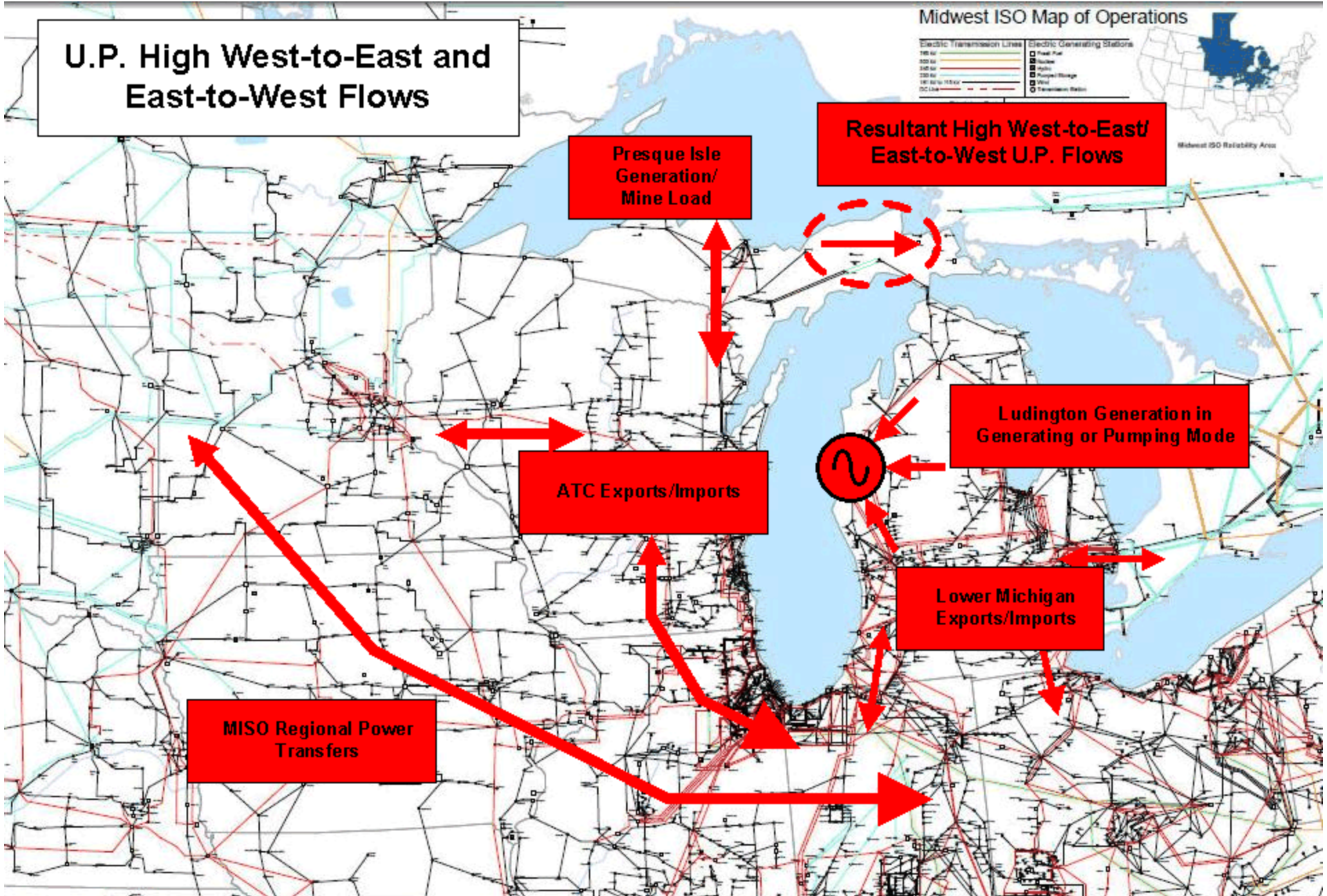
Resultant High West-to-East/
East-to-West U.P. Flows

Ludington Generation in
Generating or Pumping Mode

ATC Exports/Imports

Lower Michigan
Exports/Imports

MISO Regional Power
Transfers



ATC/ITC/MISO Study Initiative

- Weekly Meetings since May 2010
 - Evaluated the need for flow control
 - Checking to avoid negative impacts on ITC system
- Using MISO MTEP10 models with high flows
 - system peak, east-to-west U.P. flows
 - shoulder peak, west-to-east U.P. flows
 - Also ATC 2010 Minimum Load model



Core Project Recommendation

- Add Back-to-Back HVDC
- Locate near Straits substation
- ~ \$90 Million
- Schedule
 - Proposed Project by Jan 2011
 - MTEP11 appendix A in 2011
 - In-service date ~ 2014

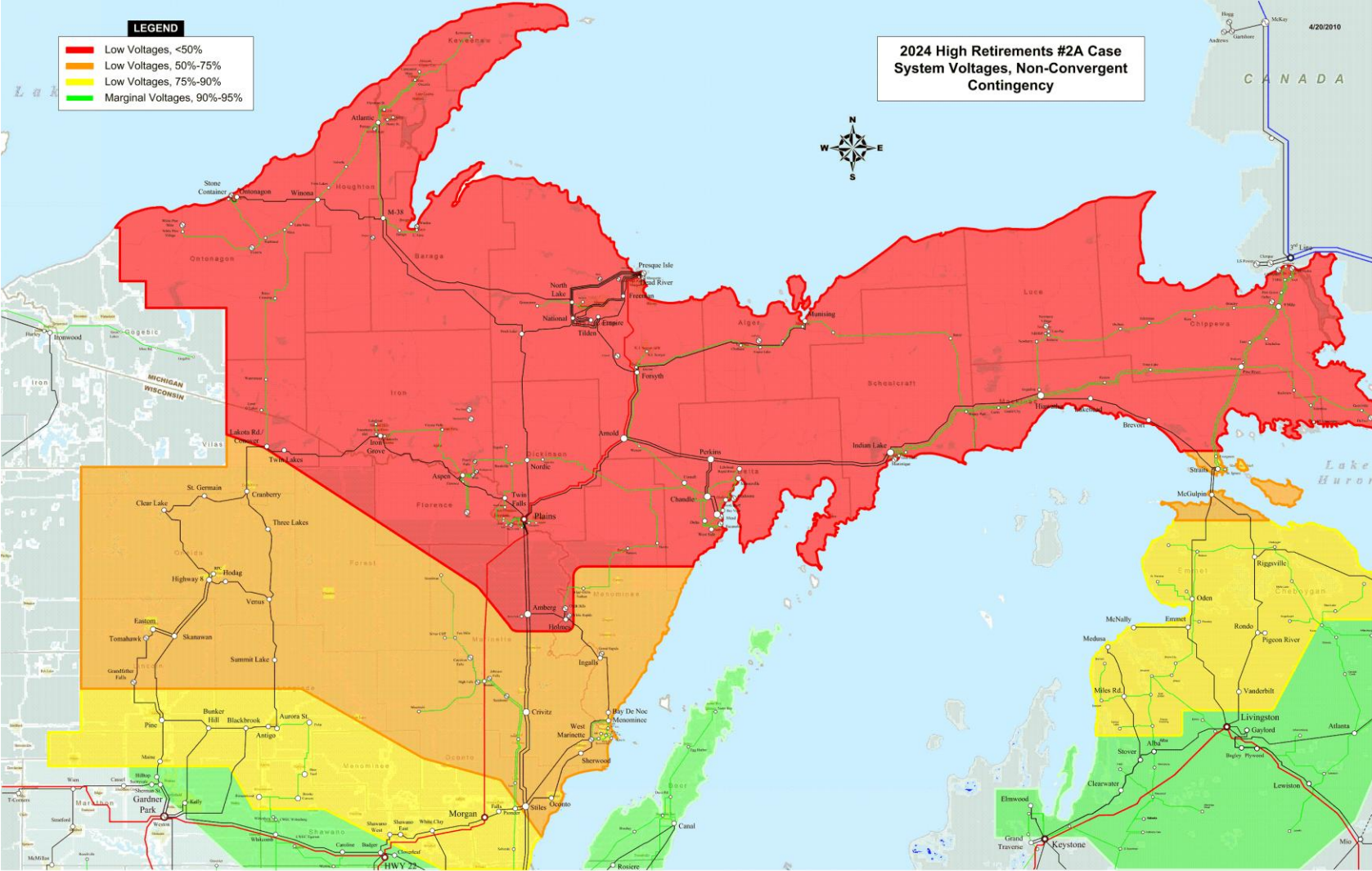
High Retirements Future *Enhancements*

- Available on ATC 10-Year Assessment web site
 - <http://www.atc10yearplan.com>
 - Energy Collaboratives, *tab*
 - Energy Collaborative – MI, *tab*
 - High Retirements Future Enhancements, *Link*

Background

- Started with High Retirements Future
- Recent Stakeholder Feedback
- Assumption changes
 - 2024 study year
 - Summer peak case
 - Increase load levels to 1.5% growth/year
 - Very low U.P. generation
 - Scenario 2A – 350 MW assumed retired
 - Scenario 2B – 500 MW assumed retired

Needs: System Voltages in Scenario 2A





Conceptual Options Studied

- 345-kV transmission
- 138-kV transmission
- 345/138-kV transmission
- Synchronous condensers
- Generation at another site
- SVC or other reactive support
- Combinations

2A Conceptual Solutions

350 MW generation retired

- Option 1 - 345-kV transmission
 - Two 345-kV lines, 160 total miles
 - \$330 million capital
- Option 2 - 138-kV transmission
 - Seven 138-kV lines, 676 total miles
 - 345/138-kV transformer
 - \$460 million capital
- Option 3 - Generation
 - 250 MW generation (2@100, 1@50)
 - 35 MVAR synchronous condenser
 - Uprate existing 138-kV line (\$5M estimated)
 - \$170 - \$240 million capital
- Option 4 - Synchronous condensers
 - Did not work as a stand-alone option

2B Conceptual Solutions

500 MW generation retired

- Option 1 - 345-kV transmission
 - Two lines, 160 miles
 - 105 MVAR synchronous condenser
 - \$340 million capital
- Option 2 - 345/138-kV transmission
 - One 345-kV line, 143 miles
 - Two 138-kV lines, 113 miles
 - 345/138-kV transformer
 - 167 MVAR synchronous condenser
 - \$390 million capital
- Option 3 - Generation
 - 400 MW generation (4@100 MW)
 - 167 MVAR synchronous condenser
 - 80 MVAR SVC
 - Rebuild/uprate two existing lines (\$22M estimated)
 - \$330 - \$440 million capital

Study Limitations

- No operating cost analysis
- No Special Protection System Review
- Only one generator location studied
- No generator stability analysis
- No detailed voltage stability analysis
- Minimal multiple outage analysis
- Implies:
 - Greater uncertainty with generation options
 - Needs more reactive power support

High Retirements *Solutions*

- This is a contingent set of solutions as part of the overall ATC Energy Collaborative – Michigan
 - This is one of six futures studied



Questions

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