

# 10-Year Transmission System Assessment

A look at electric transmission system limitations and proposed solutions for improving electric system reliability

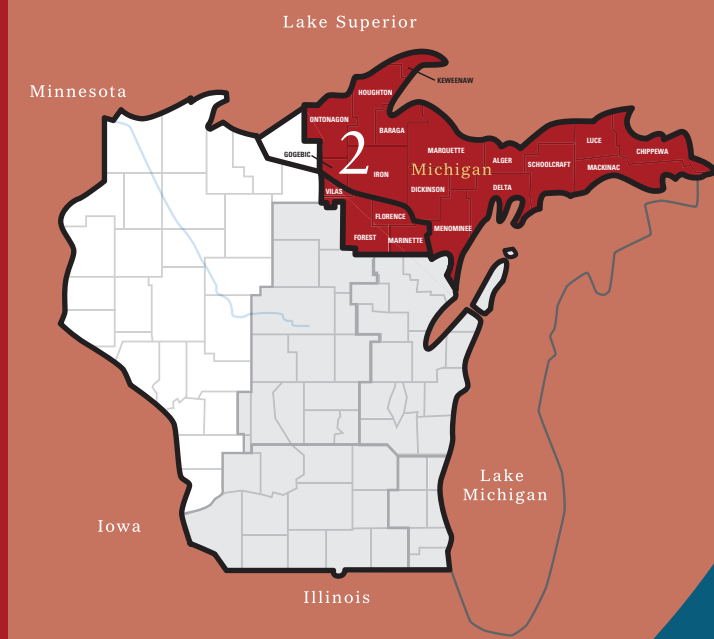
[www.atc10yearplan.com](http://www.atc10yearplan.com)

September 2008



- ALGER, MICH.**
- BARAGA, MICH.**
- CHIPPEWA, MICH.**
- DELTA, MICH.**
- DICKINSON, MICH.**
- FLORENCE, WIS.**
- FOREST, WIS.** (northern portion)
- GOGEBIC, MICH.** (eastern portion)
- HOUGHTON, MICH.**
- IRON, MICH.**
- KEWEENAW, MICH.**
- LUCE, MICH.**
- MACKINAC, MICH.**
- MARINETTE, WIS.** (northern portion)
- MARQUETTE, MICH.**
- MENOMINEE, MICH.** (northern portion)
- ONTONAGON, MICH.** (eastern portion)
- SCHOOLCRAFT, MICH.**
- VILAS, WIS.** (northern portion)

## Michigan's Upper Peninsula and Northern Wisconsin



# zone 2



## Looking at tomorrow's electric needs today

***Advances in technology powered by electricity are improving our quality of life. At the same time, they've created a dependence on and expectation for an uninterrupted supply of electricity. However, the age of the transmission system and changes in the regional wholesale electricity market are impacting the reliability of the electric system upon which people and businesses have become so dependent.***

American Transmission Co. was formed in 2001 to plan, permit, build, own, operate and maintain a transmission system that meets the reliability, economic and adequacy needs of our customers. Our planners continually conduct engineering studies on the electric transmission system looking for potential problems that may affect the future performance of the system.

Since 2001, ATC has produced annual assessments of the transmission system, identifying areas of need on the system and proposing solutions to those needs. This assessment covers the years 2008 through 2018. Our studies identify and prioritize future projects needed to improve system adequacy and reliability and meet evolving priorities for increased availability of renewable generation. As part of our technical studies, we take a comprehensive look at various factors affecting electricity utilization in the region, such as business development, employment trends, population and projected growth in electricity usage. We look 10 years into the future because it can take 5 to 10 years to plan, study route options, get approvals and build new transmission lines.

In this year's assessment, our studies identify and prioritize \$2.7 billion in future projects needed over the next 10 years to improve the adequacy and reliability of the electric transmission system for our customers and all electricity users in the region we serve. In this report we also identify new challenges facing the electric industry.

### **Clean energy objectives impact transmission planning**

Concerns for climate change have caused many states, consumers and utilities to turn toward greater use of renewable generation of electricity, such as wind, solar, biomass or hydro power. With renewable resources often being located in remote locations, new interstate high voltage transmission lines will be needed to deliver large volumes of renewable

energy from where it's produced to population centers where it's used. As today's transmission system has neither the capacity nor the configuration to accommodate high volumes of renewable energy, we're reaching out to regulators and utilities across state lines to begin planning a regional transmission grid that can meet these challenges.

Annual energy efficiency and conservation efforts also are currently mandated by state law, and the energy savings from these efforts are factored in to each utility's load growth forecast and our needs analysis. Programs that are designed to reduce electricity usage during peak-use periods have greater potential to impact planning for new transmission lines than overall efficiency programs. However, increasing energy use is only one of many drivers of new transmission projects. Changing power flows, generation utilization and location, and shifts in population centers also contribute to the need for new transmission facilities.

### **Our progress continues**

Since we were formed in 2001, we've invested \$1.9 billion to upgrade more than 1,350 miles of transmission line, improve 110 electric substations and build 32 new transmission lines totaling 344 miles. These investments have helped to raise the system's performance in meeting peak demand, supporting a new fleet of generation, increasing import capability, interconnecting wind projects, alleviating overloads and voltage instabilities, reducing energy losses and improving system reliability ratings. As we plan for new challenges of meeting renewable energy mandates and accommodating changing market power flows, we will do so with your input.

### **We seek your input**

As part of the planning that occurs throughout the year, we proactively seek input from customers, regulators, community officials, residents and others in an effort to strike the right balance between the need for a safe and reliable system, and the potential impacts on costs, landowners and the environment. Public examination and discussion can improve projects by incorporating the perspectives of those most familiar with impacted areas. We believe that by working with the people and communities we serve, we can find better solutions that will meet future electricity demand.

The details of our studies can be found at [www.atc10yearplan.com](http://www.atc10yearplan.com).

# Michigan's Upper Peninsula and Northern Wisconsin – Zone 2

## Electric System Overview

### Population, employment increasing

- Population in Zone 2 is projected to grow on an annual basis slightly between 2008 and 2013 and only 0.4 percent from 2013 through 2018. From 2008 to 2013, Chippewa County (Michigan) is projected to realize the largest increase in population and Florence County is projected to have the highest growth rate.
- Employment in Zone 2 is projected to grow at 1.5 percent annually between 2008 and 2013 and at 1.4 percent from 2013 through 2018. From 2008 to 2013, Marquette County (Michigan) is projected to realize the largest increase in employment, while Vilas County is projected to have the highest growth rate.

### Electricity usage growing

- Zone 2 typically experiences peak electric demands during the winter months. Ore mining and paper mills are the largest electricity users in the zone.
- Electric load is projected to decrease by 0.2 percent annually through 2018 as a result of decreasing mine load in the area.

### Transmission projects completed or under way address electric needs

- **Cranberry-Conover new 115-kilovolt line** – A new 115-kilovolt transmission line joining the southern boundary of Eagle River to just east of Conover was recently completed.

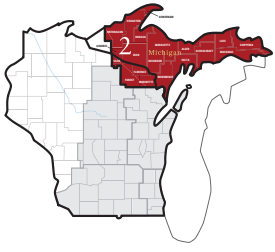


- **Conover-Plains transmission line rebuild** – In conjunction with the Cranberry-Conover project outlined above, rebuilding this 69-kilovolt line for 138-kilovolt operation improves the voltage profile in the western Upper Peninsula and addresses aging facilities with condition issues.

Our 2008 10-Year Transmission System Assessment outlines 25 additional projects to ensure electric system reliability in Michigan's Upper Peninsula and Northern Wisconsin. The following pages describe the system limitations in Michigan's Upper Peninsula and Northern Wisconsin, and our planned, proposed and provisional projects to address those limitations.

## Transmission is the vital link in bringing power to communities

Transmission lines move electricity at high voltages over long distances – from power plants to communities where local utilities deliver power to homes and businesses via local electric distribution lines. A reliable transmission network provides access to many sources of power, whether they are local or regional. Having multiple paths to get power from producers to consumers lessens the chance that they will experience service interruptions. Multiple major transmission lines also give power generators and local utilities the flexibility to access regions where they can sell and buy electricity to control overall costs for everyone.



# System Limitations Michigan's Upper Peninsula and Northern Wisconsin – Zone 2

## Transmission system characteristics in Zone 2

ATC delivers power in Zone 2 with various transmission facilities including:

- a north-south 345-kV line extending from near Marquette to the Iron Mountain area and southwest to the Oconto area,
- 138-kV lines from Arnold to the Manistique area,
- a 138/69-kV network in the western portion of the zone and
- a 69-kV network in the eastern portion of the zone.

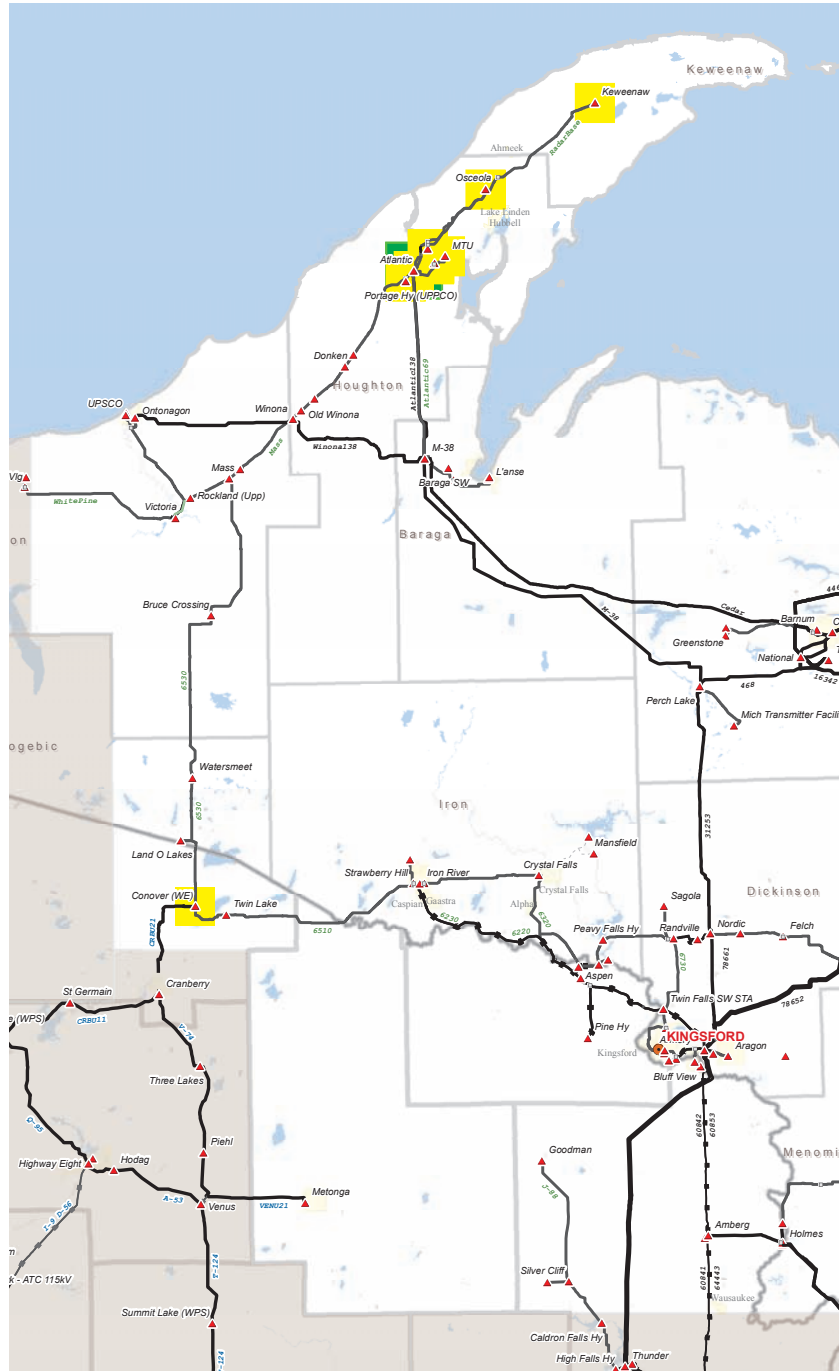
There are a number of transmission system performance issues in Zone 2 including limited ability to import or export power, generator instability, overloaded lines and equipment, low system voltages and the chronic limitations to transmission service. Primary drivers of these issues include a mismatch of low-cost generation to load in the Upper Peninsula and aging facilities in poor or obsolete condition.

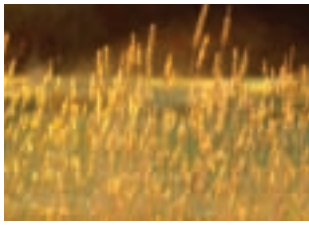
ATC completed or has under construction a series of significant upgrades across the Upper Peninsula (U.P.). The most notable projects completed as part of this effort are the Eastern U.P. Reliability and Operating Enhancement Phase 1 (EUROPE) projects (completed in 2006) and the Northern Umbrella Projects (NUP) scheduled for completion in 2010. ATC recently completed three urgent projects in the Eastern U.P. in the winter of 2007-08 to hedge the risk of low water availability for hydroelectric generation. Even with these significant upgrades, operational challenges remain in this region due to the delicate balance among generation, load, market flows and transmission that currently exists.

To vet our planning assumptions for the intermediate (3-5 year) and long term (10-15 year) periods before future projects are proposed, we are engaging stakeholders in a collaborative process across the U.P. to examine the bounds of several plausible futures. From this process, ATC intends to develop a plan that will provide more operational flexibility and may impact the Lower Peninsula of Michigan or Canada as well as the U.P. and northern Wisconsin.

## Transmission system limitations in Zone 2

In the analysis of Zone 2, we identified low voltages, transmission facility overloads and transmission service limitations. In addition, heavily loaded facilities during off-peak periods, especially when the Ludington Pumped Storage

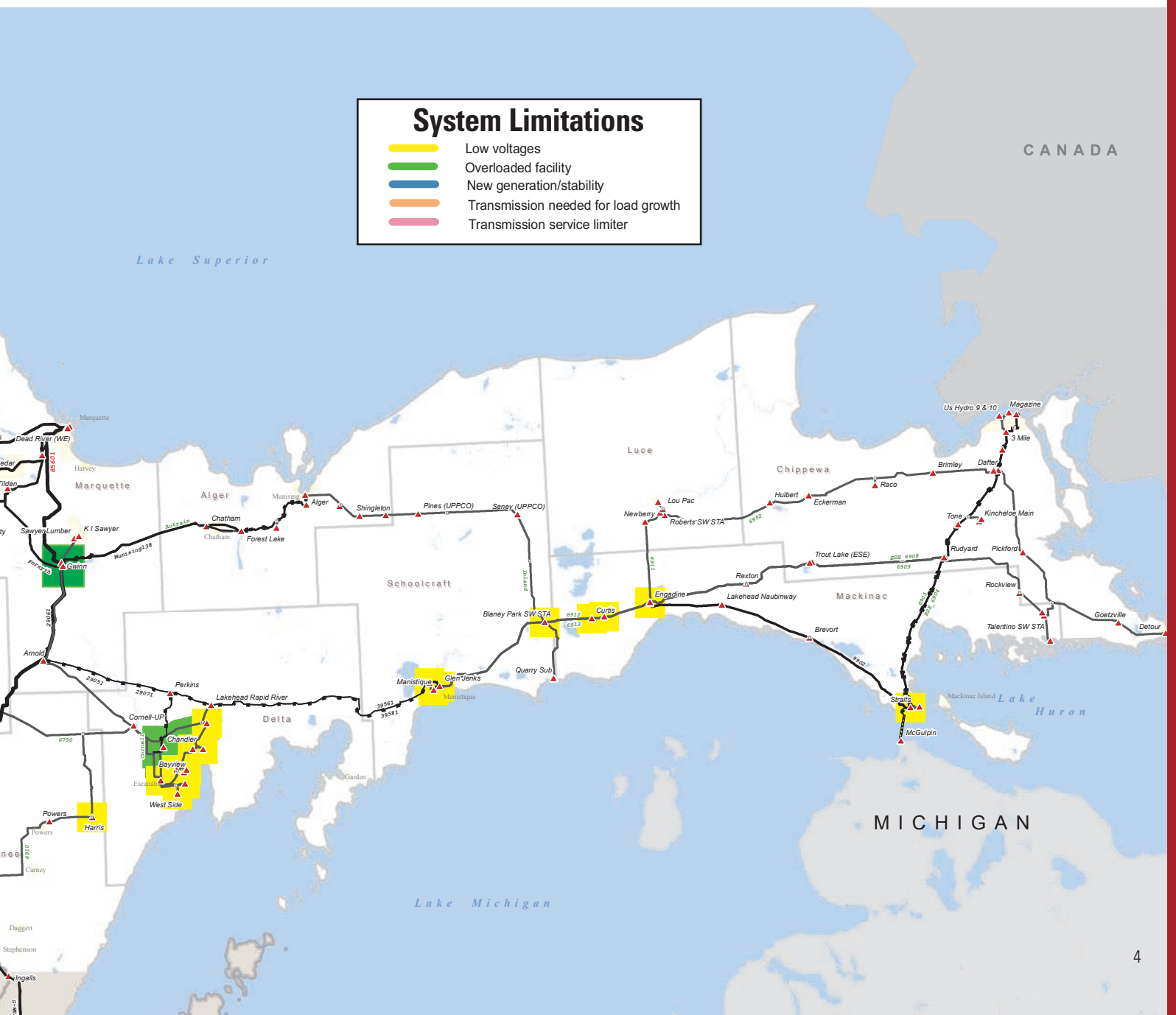




Facility in Lower Michigan is pumping continue to keep the system working with very small operating margins.

The potential for generation at Presque Isle Power Plant becoming unstable after certain disturbances on the transmission

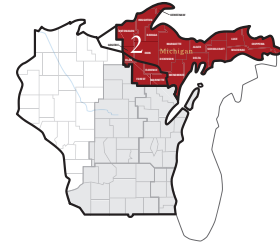
system has been a long-standing limitation and the reason for an automated tripping scheme in place at Presque Isle. We are evaluating alternatives to this complex scheme.





# System Solutions

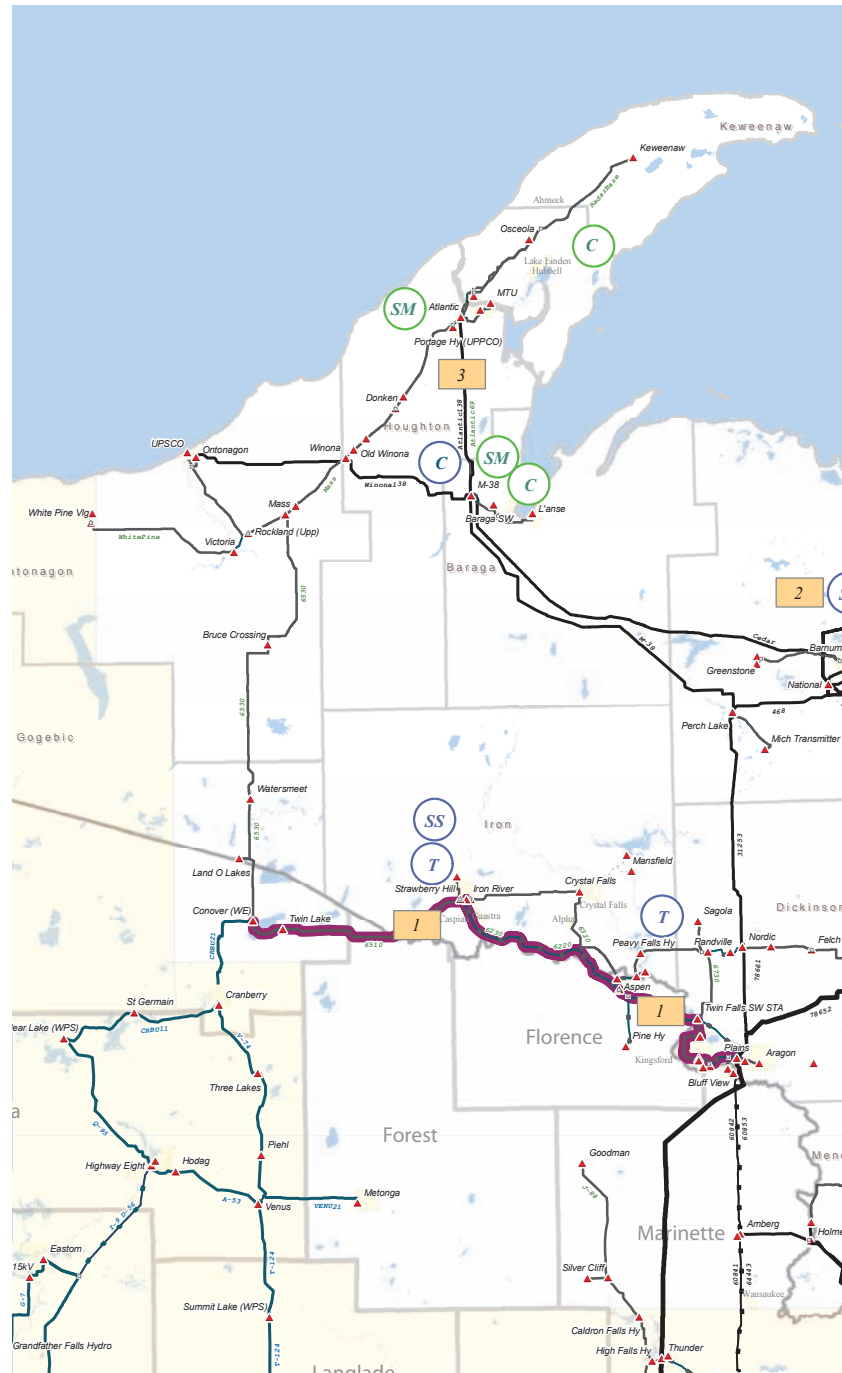
## Michigan's Upper Peninsula and Northern Wisconsin – Zone 2



### Transmission system limitations in Zone 2

ATC completed 11 projects in Zone 2 since the 2007 Assessment Update. These projects include capacitor bank installations, transformer installations and upgrades, and line upgrades or rebuilds.

Our current plans in Zone 2 include more than 25 projects between 2008 and 2018 to address issues. These projects are in various stages of development. The most notable planned, proposed and provisional projects in Zone 2, along with their projected year of completion and the factors driving the need for the projects, are listed at right.



	Project description	In-service year	Need driver
<b>Planned projects</b>			
1	Cranberry-Conover 115-kV line (completed in 2008) and Conover-Iron River-Plains rebuild & conversion to 138 kV	2008-2010	Part of Cranberry-Conover project (Zone 1) for Rhinelander Loop, improves voltage profile in the area, addresses aging facilities with condition issues
2	Relocate Cedar Substation (North Lake)	2009	Improves reliability in the area, addresses aging facilities in poor condition
<b>Provisional projects</b>			
3	Increase ground clearance of M38-Atlantic 69-kV line	2013	Improves reliability in the area
4	Rebuild Blaney Park-Munising 69-kV line and convert to 138 kV	2014	Addresses low voltages and aging facilities in poor condition, improves stability of Presque Isle

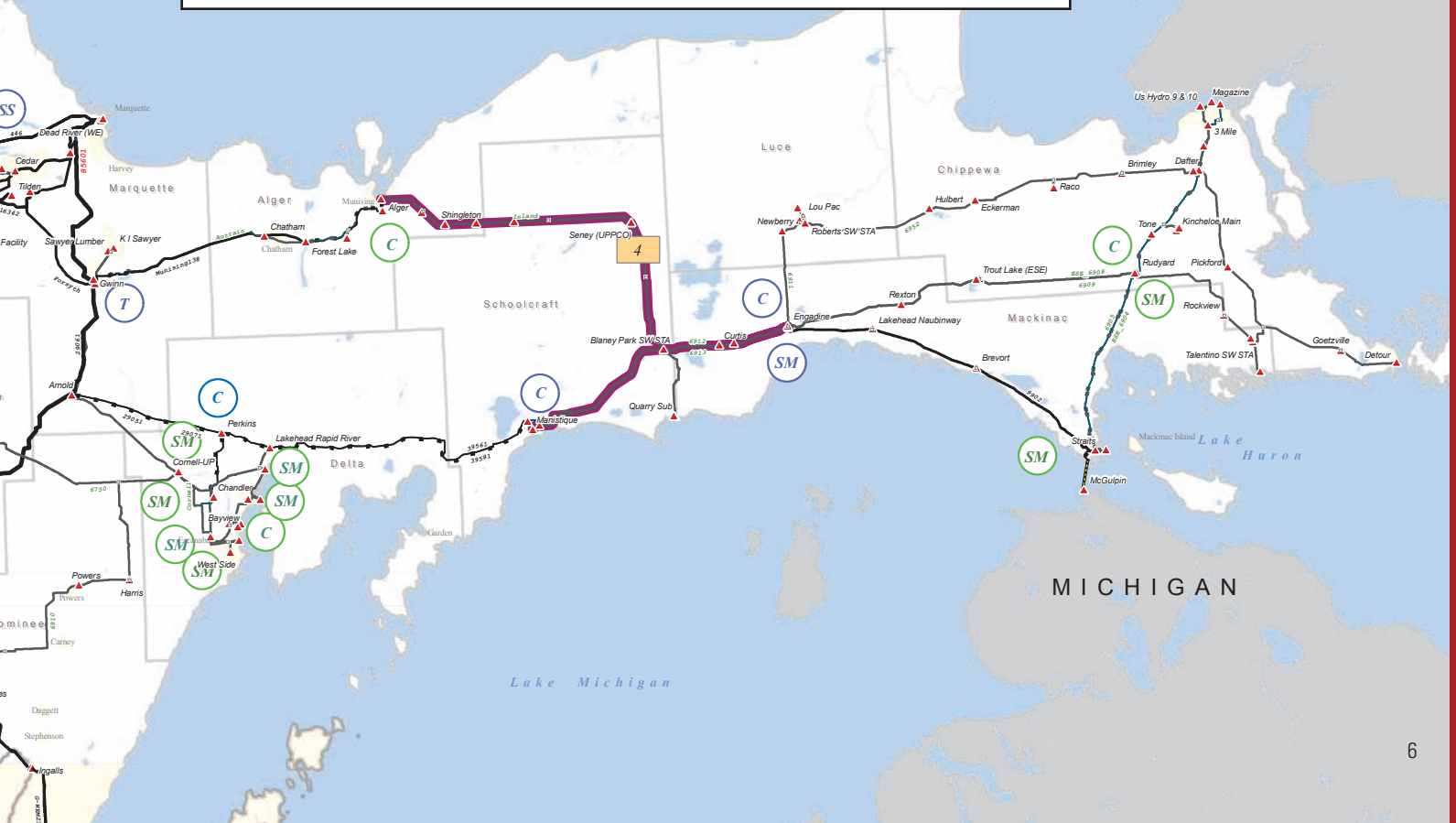
## System Solutions

### SUBSTATION KEY

- SS** New substation  
Supports transmission system expansion
- SM** Substation modifications  
Upgrades equipment ratings to avert facility overloads
- T** Transformer  
Supports local growth and improves voltage levels
- C** Capacitor bank  
Relieves low voltages
- T-D** T-D interconnection  
Supports local growth

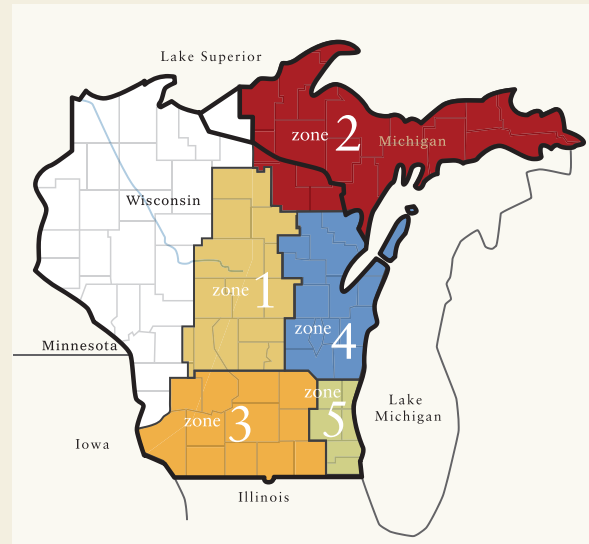
### TRANSMISSION LINE KEY

- 345-kV transmission line
- ▬ 115-, 138- or 161-kV transmission line
- ▬ Rebuilt 115- or 138-kV transmission line
- ▬ Transmission line voltage conversion
- ▬ 69-kV transmission line
- ▬ Rebuilt 69-kV transmission line



## ATC AT A GLANCE

- Formed in 2001 as the first multi-state, **transmission-only utility**.
- Owner and operator of approximately **9,350 miles of transmission line and 500 substations**.
- Meeting electric needs of approximately **five million people**.
- Transmission facilities in **66 counties** in Wisconsin, Michigan and Illinois.
- **\$2.2 billion** in total assets.
- **Seven offices** in the communities of Cottage Grove, De Pere, Madison, Waukesha and Wausau, Wis.; Kingsford, Mich.; and Washington DC.



## AS A PUBLIC UTILITY, WE HAVE DUTIES AND RESPONSIBILITIES TO:

- Operate the transmission system reliably,
- Assess the ability of the system to adequately meet current and future needs,
- Plan system upgrades to meet those needs in the most efficient, effective and economic ways,
- Construct upgrades in time to meet those needs,
- Maintain the transmission equipment and surroundings to minimize opportunity for failures.

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businesses running and communities strong.

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