

A changing landscape



The changing landscape of the energy industry requires an understanding of all grid functions, not just connecting power plants to communities.



The changing mix and location of generators require us to work closely with the generator owners, MISO, and other stakeholders to determine how we will continue to provide reliable service.

For several years, we have been discussing evolving energy markets, the need for regional planning to provide economic benefits, and the ways technology and public policy are challenging and changing the way we plan and operate the grid. New variables enter into consideration each year. Consequently, industry dynamics require an ever-expanding view and understanding of all the benefits of a strong transmission grid.

We continue to work with stakeholders when considering such traditional planning elements as changes in load, usage and possible generator retirements. Load on our system varies significantly across our service area; while load growth has slowed in recent years, our plans must account for differing needs driven by geography, population, energy-intensive industries, changes in the general economy and other variables.

Such is the case with our Bay Lake Project – a combination of new 138-kV and 345-kV lines in the northern part of our service area. The lines are designed to address a delicate, shifting balance between generation, load and transmission. A large percentage of load in that portion of our system runs nearly continuously, making it difficult to schedule maintenance outages for

transmission system components. When maintenance is performed while the system operates at near-capacity, the risk of losing service to customers is higher.

At the southern end of our system, transmission congestion has often prevented our customers from buying and selling the most economic power available in the region. The Pleasant Prairie-Zion Energy Center line, our first Midcontinent Independent System Operator-approved Multi-Value Project, was placed into service late last year and began providing benefits immediately. In fact, earlier this year, one of the Wisconsin utilities announced plans to return money to its customers as a result of increased sales to other utilities. We believe that this new MVP line was an important factor that reduced congestion, helping the sales increase.

We continue to be challenged by significant changes in generation. Some generators have retired, others have announced retirements and we have added new generation to the system. The changing mix and location of these generators require us to work closely with the generator owners, MISO and other stakeholders to determine how we will continue to provide reliable service with these changes.

High-profile events such as acts of terrorism and vandalism have placed increasing emphasis on physical and cyber security measures. A new mandatory Critical Infrastructure Protection standard is expected to be issued by the Federal Energy Regulatory Commission soon. We have launched a targeted, 10-year program to enhance security at many of our substations based on a risk methodology that assessed our threats and vulnerabilities.

We also are involved in industry discussions to address additional ways to maintain the safety and security of the electrical grid.

The 2014 Assessment covers the years 2014 to 2023 and indicates a need for \$3.3 billion to \$3.9 billion in transmission system improvements.

The planning zone summaries included in this report detail some of the specific projects identified to improve reliability, access to

the market and renewable energy resources. A more comprehensive listing of these projects is available at www.atc10yearplan.com.

Ronald C. Snead
Ron Snead
 Vice President of System Planning

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Transmission investments

The 10-year projections from past and current Transmission System Assessments

	2010	2011	2012	2013	2014
Specific Network Projects	\$1.0B	\$1.0B	\$1.9B	\$1.2B	\$1.4B
Regional Multi-Value Projects	\$0.7B	\$0.7B	\$0.8B	\$0.5B	\$0.5B
Asset Maintenance	\$0.7B	\$1.0B	\$1.1B	\$1.1B	\$1.2B
Other Capital Categories	\$1.0B	\$1.1B/\$1.7B	\$0.1B/\$1.0B	\$0.2B/\$0.8B	\$0.2B/\$0.8B
Total 10-Year Capital Cost	\$3.4B	\$3.8B/\$4.4B	\$3.9B/\$4.8B	\$3.0B/\$3.6B	\$3.3B/\$3.9B

Regional and economic planning update

ATC is involved with several planning efforts that address regional, inter-regional and Eastern Interconnection-wide needs that could impact grid operations. Proposed legislation regarding renewable energy developments and greenhouse gas emission reductions continues to evolve at the federal level. ATC monitors these discussions and continues to undertake internal analyses and participate in regional studies to anticipate the future demands on the transmission system.

Eastern Interconnection Planning Collaborative

Building on a planning initiative started in 2010, a group of 25 registered planning authorities continues to refine plans for transmission grid needs from the Rocky Mountains to the east coast and several Canadian provinces. Recent “stress test” studies performed by the collaborative show that the system has the potential to increase transfers in 2018 by 1,100 megawatts to 5,000 megawatts. In 2023, transfers could be increased between 550 and 5,000 megawatts, depending on the regions involved. These transfers are in addition to the transfers that already take place in the base case and would involve no transmission being built other than what is already included in existing plans across the interconnection. Two additional scenarios using 2018 and 2023 models are being studied using updated plans from

the previous study and a drought scenario in part of the Eastern Interconnection with transfers coming from non-drought areas.

Market constraints

Two of the three narrow constrained areas identified in the MISO region are associated with ATC. The two areas are within the Wisconsin and Upper Michigan System. Congestion within the northern WUMS study area declined significantly since 2012 due in part to transmission upgrades and generation additions. The Pleasant Prairie-Zion Energy Center MVP transmission line also has helped alleviate congestion. We continue to evaluate projects that may eliminate the NCA designation.

MISO Transmission Expansion Planning

MISO planning studies address long- and short-term issues as well as targeted needs. Long-term studies primarily look at value-based options that provide economic benefits in the 10- to 20-year horizon. Short-term planning is primarily driven by transmission owners’ reliability and NERC compliance needs in a five- to 10-year period.

MTEP 14

Our staff participates in the short-term reliability and economic studies in a variety of ways: ensuring accurate project information is included in the MISO database, building and reviewing models, correlating needs identified by MISO analyses with specific ATC projects and participating in various studies and stakeholder forums.

Other MISO planning activities

Our Strategic Projects staff participates in various technical and policy discussions and provides future direction of MTEP activities. We also are involved in joint planning studies with neighboring regional transmission organizations, including PJM and SPP. MISO and PJM coordinated, conducted and analyzed several Market Efficiency Project studies. This analysis is reviewed by an inter-regional planning stakeholder advisory committee and typically examines economic projects that could benefit both RTOs and qualify for cross-border cost-sharing.

FERC Order 1000

We also have participated in MISO’s efforts to implement a competitive bidding process for selecting developers of Market Efficiency Projects and MVPs as part of its compliance with FERC Order 1000. ATC has applied to become a qualified developer and also has participated in the stakeholder process for drafting the business practice rules for selecting developers.

In May 2014, FERC accepted revisions to our local process to comply with requirements that transmission needs driven by public policy requirements be considered in planning.





Major projects update

Reliability and Multi-Value Projects strengthen the grid within our service territory

Pleasant Prairie-Zion Energy Center

As noted in our opening letter, this project began producing economic benefits as soon as it was placed in service in late 2013. The 5.3-mile, 345-kV line between substations in Pleasant Prairie, Wis., and Zion, Ill., relieves congestion in the region and provides savings to electric utilities and their customers by enabling the most efficient generators to supply power to the energy market. It also has increased local and regional reliability by providing another interstate high-voltage connection for utilities in Illinois and Wisconsin.

We also are developing a preliminary southeast Wisconsin-northeast Illinois 345-kV transmission project to further address reliability issues at this interface. While it has not yet been identified in the specific project list, it has been considered in the capital forecast.

Mackinac HVDC Converter Station

This unique facility to help manage the flow of power across transmission lines in Michigan's Upper Peninsula was placed into commercial operation in summer 2014. The station, located adjacent to the Straits Substation in St. Ignace, Mich., is one of only three facilities of its kind in the United States. The device allows MISO to control power flow in and out of the Upper

Peninsula, helping to accommodate the transmission of renewable wind energy being developed in the west. The station was a quick and less-expensive solution compared to a portfolio of transmission lines studied as alternatives.

Bay Lake

The Bay Lake Project is a package of proposals to address the delicate, shifting balance between generation, load and transmission in the northern portion of our service area.

The Holmes-Old Mead Road portion of Bay Lake was approved by Michigan regulators in early 2014. It includes a single 58-mile, 138-kV line from the Holmes Substation in Menominee County to the Old Mead Road Substation in Escanaba, Mich. Construction of the \$120 million project is scheduled to begin in late 2014 with an in-service date of mid-2016.

The North Appleton-Morgan project includes a 345-kV and 138-kV line from our North Appleton Substation in Outagamie County to the Morgan Substation in Oconto County, Wis. Both substations will be expanded and a new substation, Benson Lake, will be required to accommodate a large voltage-control device at the site of our Amberg Substation in Marinette County. Additional work will be required at 11 other

substations. The project is currently being reviewed by the Public Service Commission of Wisconsin. If approved, construction would begin in 2017 with an in-service date of 2019. Cost of the project ranges from \$307 million to \$327 million depending on the route selected.

ATC has initiated a Northern Area Reliability Assessment effort to engage stakeholders and identify potential reinforcements due to generation uncertainties in the northern portion of the ATC system. While not yet specifically identified in the project list, the capital forecast includes consideration of preliminary alternatives that could include:

- Plains-National project
- Lakota-Winona conversion from 69-kV to 138-kV
- Morgan-Crivitz project
- Uprates or rebuilds in the Green Bay area
- Rhinelander area upgrades

ATC is collaborating with MISO to complete this assessment in late 2014. Potential generation solutions also will be considered.

Badger Coulee

Badger Coulee, one of the 17 Multi-Value Projects proposed by MISO in late 2011, also is being reviewed by the Wisconsin PSC. The 160- to 180-mile 345-kV line

between the La Crosse and Dane County areas will deliver reliability, economic and public policy benefits. Sponsored jointly with Xcel Energy, the project will

- Offset the need for about \$160 million in lower-voltage upgrades in western Wisconsin,
- Increase access to the wholesale energy market and could provide between \$259 million and \$841 million in net economic benefits over the life of the project and
- Establish another pathway for renewable energy into Wisconsin with a connection to key load centers.

Cardinal-Hickory Creek

This project between Dane County, Wis., and Dubuque County, Iowa, is a 125-mile line that will provide benefits that exceed its cost. As a joint venture with ITC Midwest LLC, this MISO Multi-Value Project would improve local and regional reliability and deliver economic benefits by providing greater access to the wholesale market. The 345-kV line would run from the Cardinal Substation in Dane County, to the proposed Hickory Creek Substation in Dubuque County. Initial Wisconsin public outreach for routing and siting the line will begin in fall 2014.



Our progress

ATC maintained top performance in line reliability in 2013 highlighted by a “Best in Class” Transmission Reliability Composite Score for 100- to 161-kV lines.

The landscape in which we operate today looks vastly different than it did when we began our operations in 2001. Then, we were operating a balkanized system of transmission assets with few interconnections with each other, let alone connections with other states. There was little operating margin, especially during times of peak demand in the summer.

Today, we have a more robust network and have established more connections to systems in other states. But a regional energy market is maturing, the grid is being asked to perform in ways it was not originally intended, and our interconnected customer needs continue to change based on economics and public policy regarding air quality issues. As a utility company with an obligation to serve, we work closely with our customers not only to provide reliable service, but also to share information about how changes in their operations impact our system.

Regional planning has become a logical outgrowth of a geographically broader energy market. As new air quality rules take effect, older coal-fired generation will be retired and replaced with newer generation, including renewable energy developments in areas with a rich wind resource but without large load centers. Transmission system expansion or reconfiguration of the system will play an important role as changes are made in generation.

Managing our existing assets goes hand in hand with our planning strategy for maintaining and improving reliability and cost-effectiveness.

Our Quad County Electric Reliability Project is a major maintenance effort to replace aging lattice and H-frame structures and wires on lines in Waukesha, Jefferson, Dodge and Washington counties in Wisconsin. Originally built in the late 1940s, the 58 miles of 138-kilovolt transmission lines will be upgraded to include fiber optic wires on portions of the project, providing high-speed data transfer and overall support to the electric system.

ATC line reliability maintained top performance in 2013, highlighted by a “Best in Class” transmission reliability composite score for 100- to 161-kV lines, and ranked in the top 10 percent for 345- to 500-kV lines. While lines are performing well, targeted investment is required to maintain reliability.

Transmission remains a good value for the electricity consumer. Transmission costs within our service area remain at about 8 to 9 percent of a retail customer’s electric bill. Retail customers pay for the generation, transmission and distribution of electricity, plus fuel costs, through regulated utility rates. Generation and fuel make up the major portion of the bill, followed by distribution infrastructure.

Major accomplishments to date

Since we were formed in 2001 as a utility solely focused on electric transmission, we have:

- upgraded more than 1,824 miles of transmission line,
- improved 165 electric substations and
- built 48 new transmission lines (600 miles)

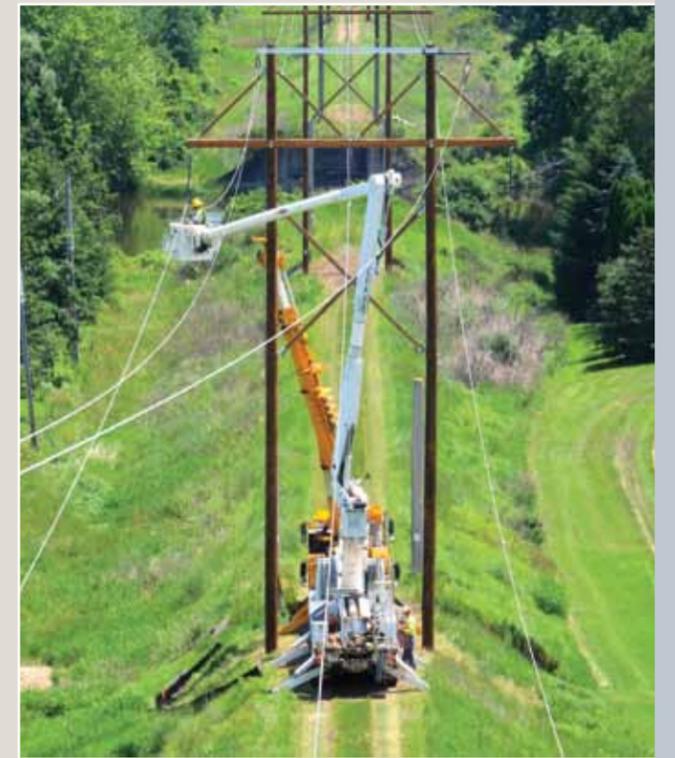
A more reliable transmission system has enabled us to:

- reliably deliver electricity to customers in Wisconsin, Michigan and Illinois at all hours of the year including peak demand hours,
- maintain top reliability performance,
- support approximately 1,200 MW of new peak electric usage,
- connect 6,048 MW of new generation at 24 sites,
- connect more than 630 MW of wind generation,
- increase the ability of our system to import power and
- resolve problems in 19 specific areas to move power into or through our system.
 - Arrowhead-Weston (Northwestern Wisconsin)
 - Blackhawk-Colley Road (Rock County, Wis.)
 - Christiana-Kegonsa (Dane County, Wis.)
 - Cranberry-Conover-Plains (Northern Wisconsin and Upper Peninsula of Michigan)
 - Eau Claire-Arpin (Wood County, Wis.)
 - Gardner Park-Central Wisconsin (Marathon and Shawano (Wis.) counties)
 - Kewaunee (Kewaunee County, Wis.)
 - Manistique-Hiawatha (Schoolcraft and Mackinac (Mich.) counties)
 - Morgan-Werner West (Shawano, Waupaca, Outagamie and Oconto (Wis.) counties)
 - North Madison-Huiskamp (Dane County, Wis.)
 - North Appleton-Lost Dauphin (Outagamie and Brown (Wis.) counties)
 - North Appleton-White Clay (Outagamie and Shawano (Wis.) counties)
 - Paddock-Rockdale (Dane and Rock (Wis.) counties)
 - Paris-St. Martins (Kenosha, Racine and Milwaukee (Wis.) counties)
 - Plains-Stiles (Oconto, Marinette, Menominee (Wis.), and Dickinson, (Mich.) counties)

- Rockdale-Cardinal (Dane County, Wis.)
- Rhinelander area (Lincoln, Oneida and Langlade (Wis.) counties)
- Wempletown-Paddock (Rock County, Wis., and northern Illinois)
- Whitewater-Mukwonago (Walworth and Waukesha (Wis.) counties)

We have made progress by actively seeking input and making our plans and proposals public. To date, ATC has:

- produced and issued 19 transmission system assessments to the public,
- held dozens of major public planning and siting meetings and
- participated in thousands of interactive local, state and industry discussions, both giving and receiving information to carry out our duties and responsibilities.



What drives the need for transmission system improvements?

Economics – We evaluate the impact of transmission congestion on wholesale power prices and study projects to determine economic savings to offset most or all of the congestion and loss costs. An example is evaluating increased access to markets outside our footprint.

Solutions: Two projects based on economics have been completed and two more are proposed.

Public policy – Pending air quality regulations, a maturing wholesale energy market and renewable energy mandates have introduced uncertainty and complexity in transmission planning.

Solutions: We work closely with our customers to determine what changes in their operations will impact the transmission system. We also are participating in several regional transmission studies to identify the transmission needed to integrate renewable generation, including wind, much of which could be located in areas remote from large load centers.

Generator retirements – Similar to new generator requests, when a large generator is retired due to age or other reasons, we will determine how system requirements will be affected. Changing economics, age and recently issued EPA rules are expected to impact retirements across the U.S. in the next five to 10 years.

Solution: We are working closely with generation owners and MISO to anticipate reliability impacts to our transmission system.

Distribution interconnections – The transmission system is dynamic; changes in load forecasts, replacing aging distribution facilities, new customers and existing customers adding load all drive the need for additional and/or modified transmission-to-distribution interconnections.

Solutions: 110 are planned in the next 10 years. More than 362 new or improved T-D interconnections have been made since 2001.

New generation – When a new generating facility is proposed, we conduct a system impact study and, if requested, a facilities study. If the existing transmission system is inadequate to ensure generator stability or reliable transmission service, we will determine what system expansion will be needed.

Solutions: 12 generators are active in the ATC footprint of the MISO generation queue, and many reflect the growing development of wind energy and natural gas.

24 generators added since 2001 required construction of transmission facilities.

Asset renewal – Keeping transmission lines, substations and related equipment in good operating condition extends the life of the facilities, improves system performance and safety, and minimizes the potential for outages. Part of the \$3.3 to 3.9 billion investment ATC will make over the next 10 years is dedicated to asset renewal. Major projects at substations include replacing circuit breakers, protective relays, lightning protection and transformers. Major work on transmission lines involves

rebuilding or upgrading aging power lines, including the replacement of structures, conductors, insulators and other equipment.

Solutions: More than 110 projects to address asset renewal needs are anticipated in the next 10 years.

Load growth – Demand for electricity during peak usage periods is forecasted to grow at a rate of approximately 0.7 percent across our service territory from 2015 through 2024.

Solutions: More than 90 projects are planned for assuring reliability, at least in part, due to load growth. Approximately 3 projects were cancelled, in part, due to slower load growth rates.

Regulatory environment – Physical and cyber security and reliability standards continue to increase, which may affect planning criteria and facility design standards.

Solution: We are participating in the North American Electric Reliability Corp.'s standards development process to help anticipate the future impacts of these changes on our planning criteria and facility design standards.

Integration of new technologies – Demand-side management, variable generation, distributed resources and smart grid technologies all require changes in how the grid is planned and operated to maintain reliability.

Solution: The type of flow-control device between Upper and Lower Michigan will be one of three utilized in the U.S.

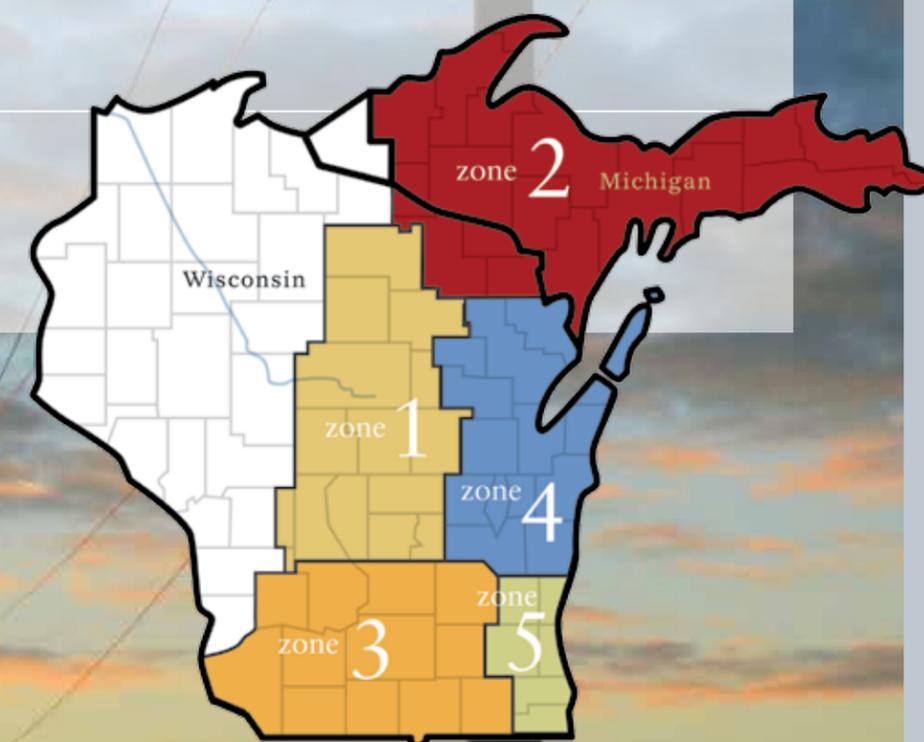
Plans and proposals for the transmission system

For planning purposes, we divide our service area into five zones representing distinct geographic or usage areas. Within each zone (shown below), we compile and assess the transmission system needs.

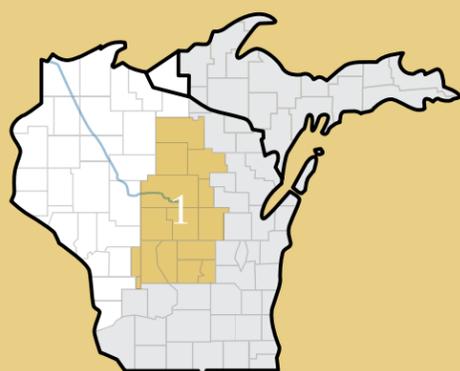
Project classifications

Within each zone, we have recommended network and asset renewal projects to address system limitations. The network projects are classified into one of three possible categories – **Planned, Proposed or Provisional** – depending upon the stage a project may be in.

	Planned	Proposed	Provisional
Status of ATC planning activities	Studies complete	Studies not complete	Studies not complete
Application for regulatory approval	Application pending or issued	None	None
Project status	Project in construction planning phase or under construction	Project identified as preliminary preferred alternative	Placeholder project; not necessarily a preferred project alternative
System solution included in generation interconnection power flow models	Project included	Project not included	Project not included



North Central Wisconsin Zone 1



COUNTIES INCLUDED IN ZONE 1 – NORTH CENTRAL WISCONSIN

- | | |
|--|---------------------------------------|
| ADAMS | ONEIDA |
| FOREST
(southwestern portion) | PORTAGE |
| FOND DU LAC
(northwestern portion) | SHAWANO
(western portion) |
| GREEN LAKE | VERNON
(eastern portion) |
| JUNEAU | VILAS
(southern portion) |
| LANGLADE | WAUPACA |
| LINCOLN | WAUSHARA |
| MARATHON | WINNEBAGO
(western portion) |
| MARQUETTE | WOOD |
| MONROE
(eastern portion) | |

Transmission system characteristics in Zone 1

ATC delivers power in Zone 1 with various transmission facilities including:

- East-west 345-kV line from Arpin Substation through Stevens Point extending to the Appleton area,
- 345-kV line extending from Wausau to northeastern Minnesota,
- 345-kV line extending from Wausau to Stevens Point to eastern Outagamie County (Highway 22),
- 115-kV network in the northern portion of the zone, and
- 138-kV and 69-kV network in the southern portion of the zone.

Transmission system limitations in Zone 1

Key system performance issues from this Assessment in Zone 1 include low voltages and thermal overloads in the southern portion of the zone. These issues will necessitate a combination of reinforcements. In addition, for the northern portion of the zone, other studies occurring in parallel with this Assessment, including the Northern Area Reliability Assessment, have identified several voltage and



thermal limitations. The most severe limitations occur during off-peak periods. See the Zone 2 section for a summary of a preliminary preferred alternative.

Electric System Overview Slight increases expected in population, employment

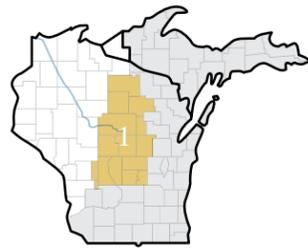
Population in Zone 1 is projected to grow at 0.7 percent annually between now and 2023. Employment is projected to grow at 1.0 percent annually between now and 2023. Marathon County is projected to realize the largest increase in population and employment, while Adams County is projected to have the highest growth rate in population and employment.

Electricity usage

Peak electric demand typically occurs during the summer months, with some winter peaks appearing in the northern portion of the zone. Primary electricity users in Zone 1 include a number of large paper mills and food processing plants.

Electric load is forecasted to grow approximately 0.5 percent annually through 2024.





North Central Wisconsin Zone 1

Transmission projects in Zone 1

The most notable planned, proposed and provisional network projects and asset renewal projects in Zone 1, along with their projected year of completion and the factors driving the need for the projects, are listed below.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Monroe County – Council Creek 161-kV line construction	2015	Low-voltage, economics, avoid reconfiguration during emergencies
Proposed Projects		
2 Fairwater – Mackford Prairie 69-kV line construction	2018	Network service, condition, overloads and low voltages
3 M13 Reinforcement Bunker Hill-Blackbrook	2019	Overloads and condition
Provisional Projects		
None		
Asset Renewal Projects		
4 Montello – Wautoma 69-kV line rebuild	2016	Condition and performance

System Solutions Key

SUBSTATION KEY

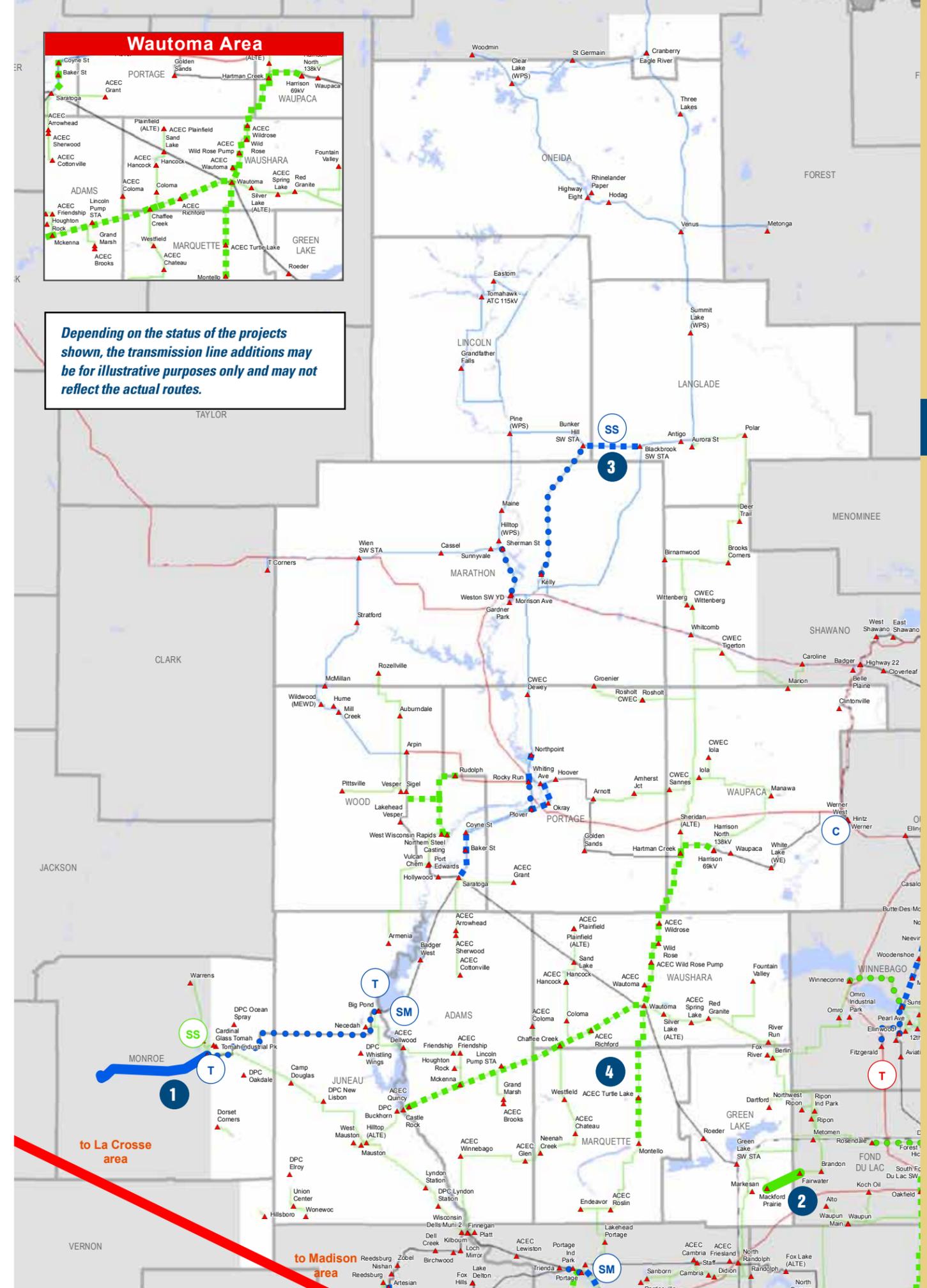
- SS** New substation
Supports transmission system expansion
- SM** Substation modifications
Upgrades equipment ratings to avert facility overloads
- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves low voltages or high voltages
- T-D** T-D interconnection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

TRANSMISSION LINE KEY

- 345-kV transmission line
- 115-, 138- or 161-kV transmission line
- 69-kV transmission line
- ▬▬▬ Rebuilt 115- or 138-kV transmission line
- ▬▬▬ Rebuilt 69-kV transmission line
- 115- or 138-kV transmission line rating upgrade
- 69-kV transmission line rating upgrade

EXISTING TRANSMISSION LINES KEY

- 69 kV
- 115 kV
- 138 kV
- 161 kV
- 230 kV
- 345 kV



Michigan's Upper Peninsula and Northern Wisconsin

Zone 2



COUNTIES INCLUDED IN ZONE 2 – MICHIGAN'S UPPER PENINSULA AND NORTHERN WISCONSIN

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

Transmission system characteristics in Zone 2

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

- Morgan-Plains and Plains-Dead River 345-kV lines,
- Plains-Stiles 138-kV double-circuit line
- Lakota Road-Plains 138-kV line, and
- 138-kV facilities tying the Upper Peninsula of Michigan to Lower Michigan.

Transmission system limitations in Zone 2

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 chronic limitations to transmission service. Primary drivers of these issues include a mismatch of load to generation in the Upper Peninsula and aging facilities in poor or obsolete condition. In addition, other studies occurring in parallel with this Assessment, including Northern Area Studies performed by ATC and MISO, have identified several voltage and thermal limitations. The most severe limitations occur during off peak periods.

While not specifically identified in the project list for this assessment, ATC's capital forecast does include dollars in anticipation of reinforcements needed to address pending generation retirements, such as the White Pines and Presque Isle plants. Potentially,

the scope of the project to address the White Pine retirement might include conversion of the 69-kV facilities between the Conover Substation in northern Wisconsin and the Winona Substation in Michigan to 138-kV operation. The potential scope of additional solutions to address the Presque Isle retirement could include a Plains-National project as well as other upgrades in Zones 1 and 4.

Electric System Overview

Small increases expected in population, employment

Population in Zone 2 is projected to grow about 0.4 percent annually between now and 2023, and employment is expected to grow about 0.8 percent each year in the same time period. Marquette County, Mich., is projected to realize the largest increase in employment, while Florence County, Wis., is projected to have the highest growth rate.

Electricity usage

Zone 2 typically experiences peak electric demand during the winter months. Ore mining and paper mills are the largest electricity users in the zone.

Electric load is forecasted to increase by 0.5 percent annually through 2024. Also, locally generated electricity is declining in the area with smaller, coal-fired generators most at risk. This includes generation owned by industry, municipalities and utilities.





Michigan's Upper Peninsula and Northern Wisconsin Zone 2

Transmission projects in Zone 2

The most notable planned, proposed and provisional network projects and asset renewal projects in Zone 2, along with their projected year of completion and the factors driving the need for the projects, are listed on the next page.

System Solutions Key

SUBSTATION KEY

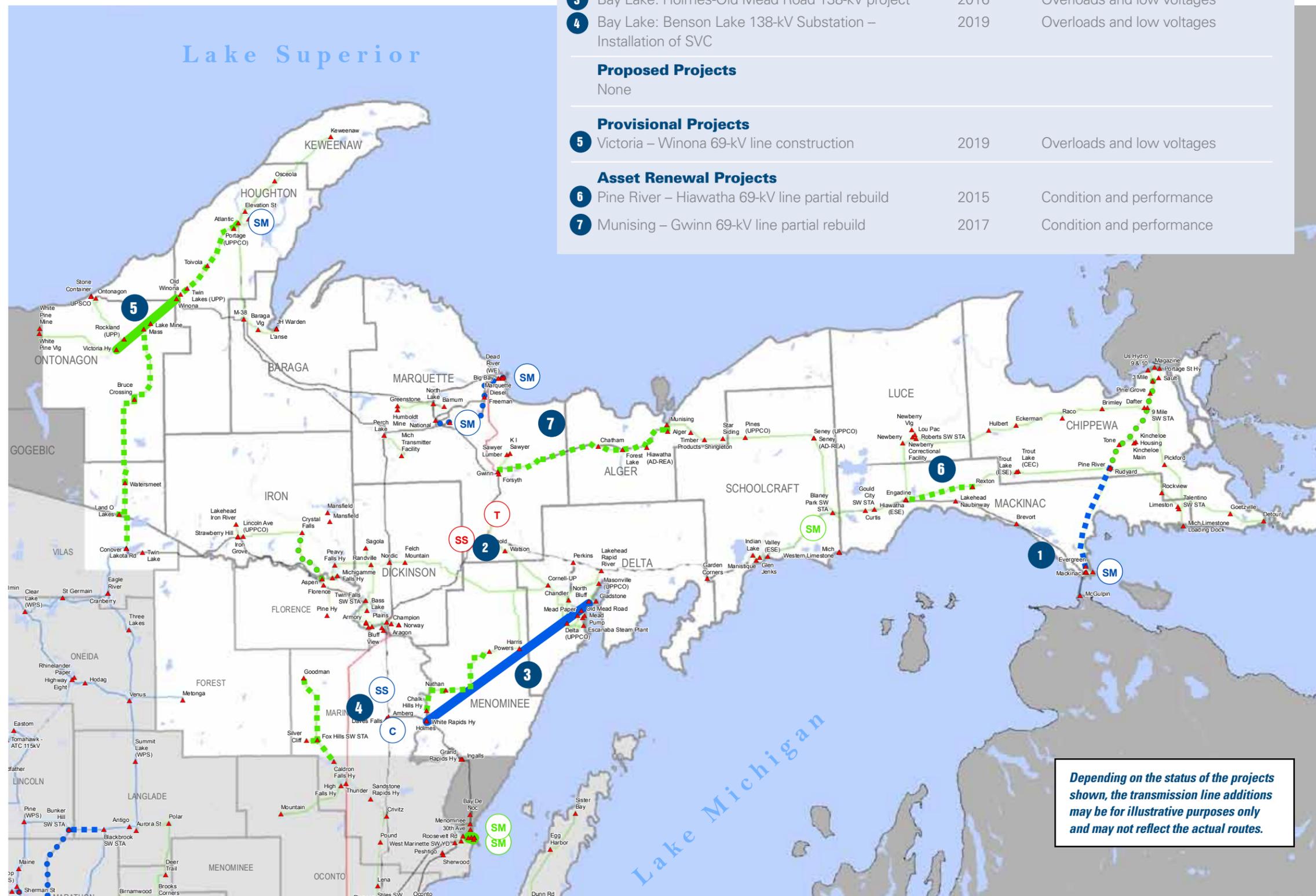
- SS **New substation**
Supports transmission system expansion
- SM **Substation modifications**
Upgrades equipment ratings to avert facility overloads
- T **Transformer**
Supports local growth and improves voltage levels
- C **Capacitor bank**
Relieves low voltages or high voltages
- T-D **T-D interconnection**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

TRANSMISSION LINE KEY

- 345-kV transmission line
- 115-, 138- or 161-kV transmission line
- 69-kV transmission line
- Rebuilt 115- or 138-kV transmission line
- Rebuilt 69-kV transmission line
- 115- or 138-kV transmission line rating upgrade
- 69-kV transmission line rating upgrade

EXISTING TRANSMISSION LINES KEY

- 69 kV
- 161 kV
- 115 kV
- 230 kV
- 138 kV
- 345 kV

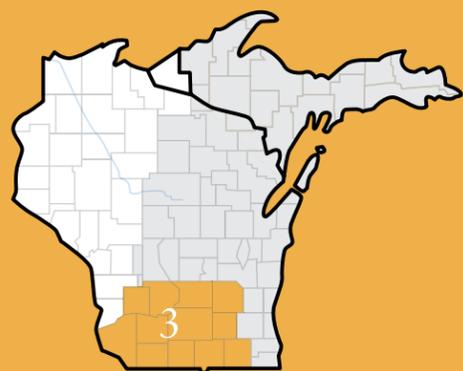


PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Mackinac 138-kV Substation: Install back-to-back HVDC flow control device	2014	Address/Control flow across eastern U.P., overloads and low voltages
2 Arnold 345-kV Substation construction and 345/138-kV transformer	2015	Overloads and low voltages
3 Bay Lake: Holmes-Old Mead Road 138-kV project	2016	Overloads and low voltages
4 Bay Lake: Benson Lake 138-kV Substation – Installation of SVC	2019	Overloads and low voltages
Proposed Projects		
None		
Provisional Projects		
5 Victoria – Winona 69-kV line construction	2019	Overloads and low voltages
Asset Renewal Projects		
6 Pine River – Hiawatha 69-kV line partial rebuild	2015	Condition and performance
7 Munising – Gwinn 69-kV line partial rebuild	2017	Condition and performance

Depending on the status of the projects shown, the transmission line additions may be for illustrative purposes only and may not reflect the actual routes.

South Central/Southwest Wisconsin and North Central Illinois

Zone 3



ZONE 3 – SOUTH CENTRAL/ SOUTHWEST WISCONSIN AND NORTH CENTRAL ILLINOIS

COLUMBIA

CRAWFORD (southern portion)

DANE

DODGE

GRANT

GREEN

IOWA

LAFAYETTE

JEFFERSON

RICHLAND

ROCK

SAUK

WALWORTH

WINNEBAGO, ILL. (northern portion)

Transmission system characteristics in Zone 3

ATC delivers power in Zone 3 with various transmission facilities including:

- Columbia-North Madison 345-kV lines,
- Columbia-Rockdale 345-kV line,
- Paddock-Rockdale 345-kV line,
- Paddock-Wempletown 345-kV line,
- Rockdale-Wempletown 345-kV line,
- Rockdale-Cardinal 345-kV line, and
- 138-kV facilities from the Nelson Dewey Power Plant, around the Madison area, and in the northwest and southeast portions of Zone 3.

Transmission system limitations in Zone 3

In our analysis of Zone 3, we identified low voltages, high voltages and transmission-facility overloads. Low voltages are located in the Verona, Lake Geneva and Hustisford areas. Several overloads on 138-kV and 69-kV facilities in Zone 3 are emerging concerns. The causes of these emerging issues include steady growth in certain areas, power plant retirement and different generation dispatch scenarios.

Electric System Overview

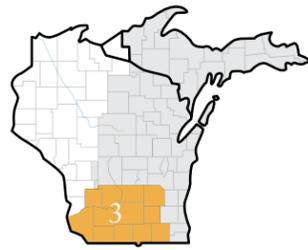
Increases expected in population, employment

Population in Zone 3 is projected to grow about 1.0 percent annually between now and 2023, and employment is projected to grow about 1.3 percent each year for the same time period. Dane County is projected to realize the largest increase in population and employment

Electricity usage

Electric load is forecasted to grow approximately 1.2 percent annually through 2024 for all of Zone 3.





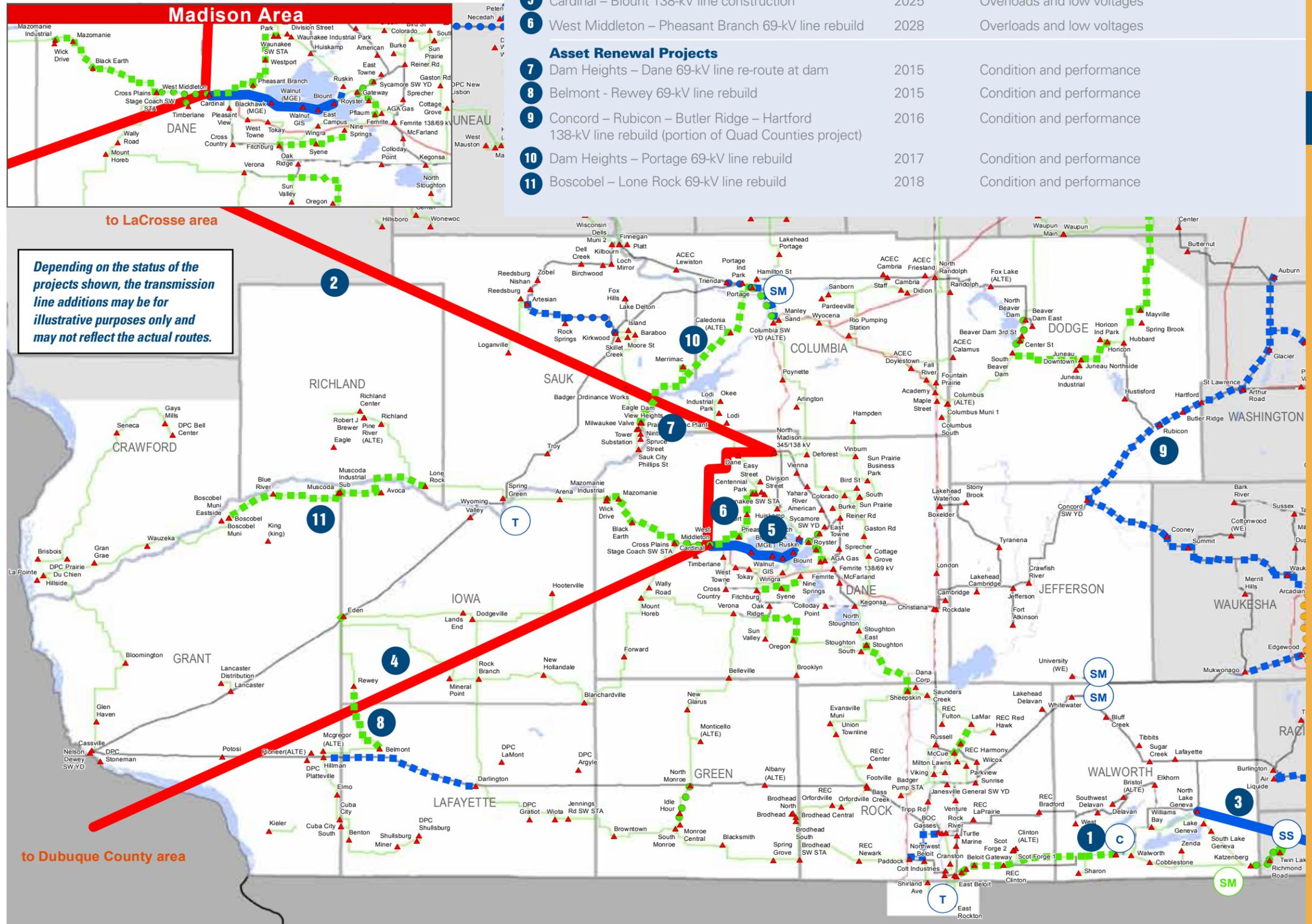
South Central/Southwest Wisconsin and North Central Illinois

Zone 3

Transmission projects in Zone 3

The most notable planned, proposed and provisional network projects and asset renewal projects in Zone 3, along with their projected year of completion and the factors driving the need for the projects, are listed on the next page.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Colley Road – Brick Church 69-kV line	2018	Overloads, low voltages, condition, rebuild and provide line sectionalizing
Proposed Projects		
2 Badger Coulee: La Crosse area – North Madison – Cardinal 345-kV line construction	2018	Reliability, economics and public policy
3 Spring Valley – North Lake Geneva 138-kV line construction	2019	Overloads and low voltages, provide network service
4 Cardinal – Hickory Creek	2020	Reliability, economics and public policy
Provisional Projects		
5 Cardinal – Blount 138-kV line construction	2025	Overloads and low voltages
6 West Middleton – Pheasant Branch 69-kV line rebuild	2028	Overloads and low voltages
Asset Renewal Projects		
7 Dam Heights – Dane 69-kV line re-route at dam	2015	Condition and performance
8 Belmont - Rewey 69-kV line rebuild	2015	Condition and performance
9 Concord – Rubicon – Butler Ridge – Hartford 138-kV line rebuild (portion of Quad Counties project)	2016	Condition and performance
10 Dam Heights – Portage 69-kV line rebuild	2017	Condition and performance
11 Boscobel – Lone Rock 69-kV line rebuild	2018	Condition and performance



System Solutions Key

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 or high voltages
- T-D** T-D interconnection
Supports local growth

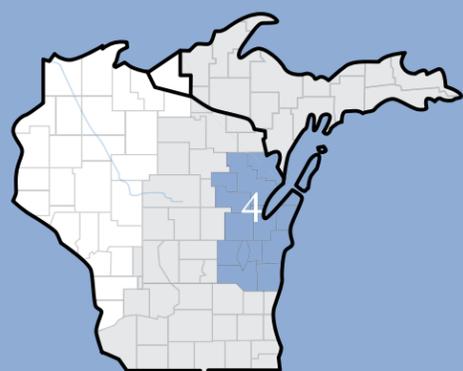
TRANSMISSION LINE KEY

- Red line** 345-kV transmission line
- Blue line** 115-, 138- or 161-kV transmission line
- Green line** 69-kV transmission line
- Blue dashed line** Rebuilt 115- or 138-kV transmission line
- Green dashed line** Rebuilt 69-kV transmission line
- Blue dotted line** 115- or 138-kV transmission line rating upgrade
- Green dotted line** 69-kV transmission line rating upgrade

EXISTING TRANSMISSION LINES KEY

- Green line** 69 kV
- Blue line** 115 kV
- Red line** 138 kV
- Pink line** 161 kV
- Yellow line** 230 kV
- Orange line** 345 kV

Northeast Wisconsin Zone 4



COUNTIES INCLUDED IN ZONE 4 – NORTHEAST WISCONSIN

- BROWN**
- CALUMET**
- DODGE**
(northeastern corner)
- DOOR**
- FOND DU LAC**
(eastern portion)
- KEWAUNEE**
- MANITOWOC**
- MARINETTE**
(southern portion)
- MENOMINEE, MICH.**(southern portion)
- MENOMINEE, WIS.**
- OCONTO**
- OUTAGAMIE**
- SHAWANO**
(eastern portion)
- SHEBOYGAN**
- WINNEBAGO**
(eastern portion)

Transmission system characteristics in Zone 4

ATC delivers power in Zone 4 with various transmission facilities including:

- Four 345-kV lines extending from the Point Beach Nuclear Plant,
- Two 345-kV lines extending from the Edgewater Power Plant,
- Four 345-kV lines connecting the Gardner Park, Werner West, Morgan, and Plains Substations,
- Two 345-kV lines from North Appleton to Werner West and Fitzgerald,
- Three 345-kV lines connecting South Fond du Lac Substation to the Columbia, Edgewater and Fitzgerald Substations, and
- A 138-kV network in the Fox River Valley/Green Bay area.

Transmission system limitations in Zone 4

In our analysis of Zone 4 we identified potential high voltages in the Outagamie and Calumet County areas and low voltages in the Brown County area. In addition, other studies occurring in parallel with this Assessment, including Northern Area Reliability Assessment, have identified several voltage and thermal limitations. The most severe limitations occur during the off-peak periods. See the Zone 2 section for a summary of a preliminary preferred alternative.



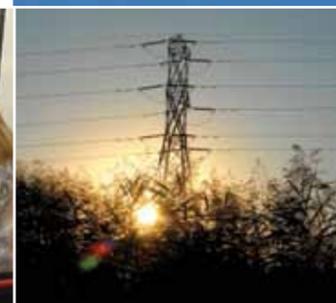
Electric System Overview Increases expected in population, employment

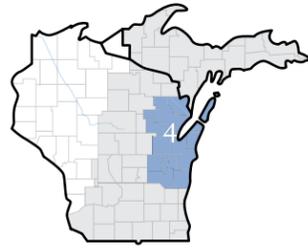
Population in Zone 4 is projected to grow 0.8 percent annually between now and 2023. Brown County is expected to realize the largest increase in population. Employment is projected to grow 1.0 percent annually in the same time period, with the largest increase projected in Brown County.

Electricity usage

Peak electric demand typically occurs during the summer months, although the northern portion of Zone 4 typically experiences nearly equal summer and winter peaks. Paper mills and foundries in the Green Bay and Appleton metropolitan areas are some of the largest electricity users in the zone.

Electric load is forecasted to grow at approximately 0.4 percent annually through 2024. Also, locally generated electricity is declining in the area with smaller, coal-fired generators most at risk. This includes generation owned by industries, municipalities and utilities.





Northeast Wisconsin Zone 4

Transmission projects in Zone 4

The most notable planned, proposed and provisional network projects and asset renewal projects in Zone 4, along with their projected year of completion and the factors driving the need for the projects, are listed below.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Pulliam – Glory Road 138-kV line conversion	2016	Overloads and low voltages
Proposed Projects		
2 Branch River 345-kV Substation construction	2018	Accommodate new generation
3 Ogden St. – Bayshore 69-kV line construction	2018	Provide network service
4 Bay Lake: North Appleton – Morgan 345-kV and 138-kV line construction	2019	Overloads and low voltages
Provisional Projects		
5 Shoto – Custer 138-kV line	2022	Overloads and low voltages
Asset Renewal Projects		
6 Dyckesville – Sawyer 69-kV line rebuild	2016	Condition and performance
7 North Appleton – Butte des Morts 138-kV rebuild	2017	Condition and performance

System Solutions Key

SUBSTATION KEY

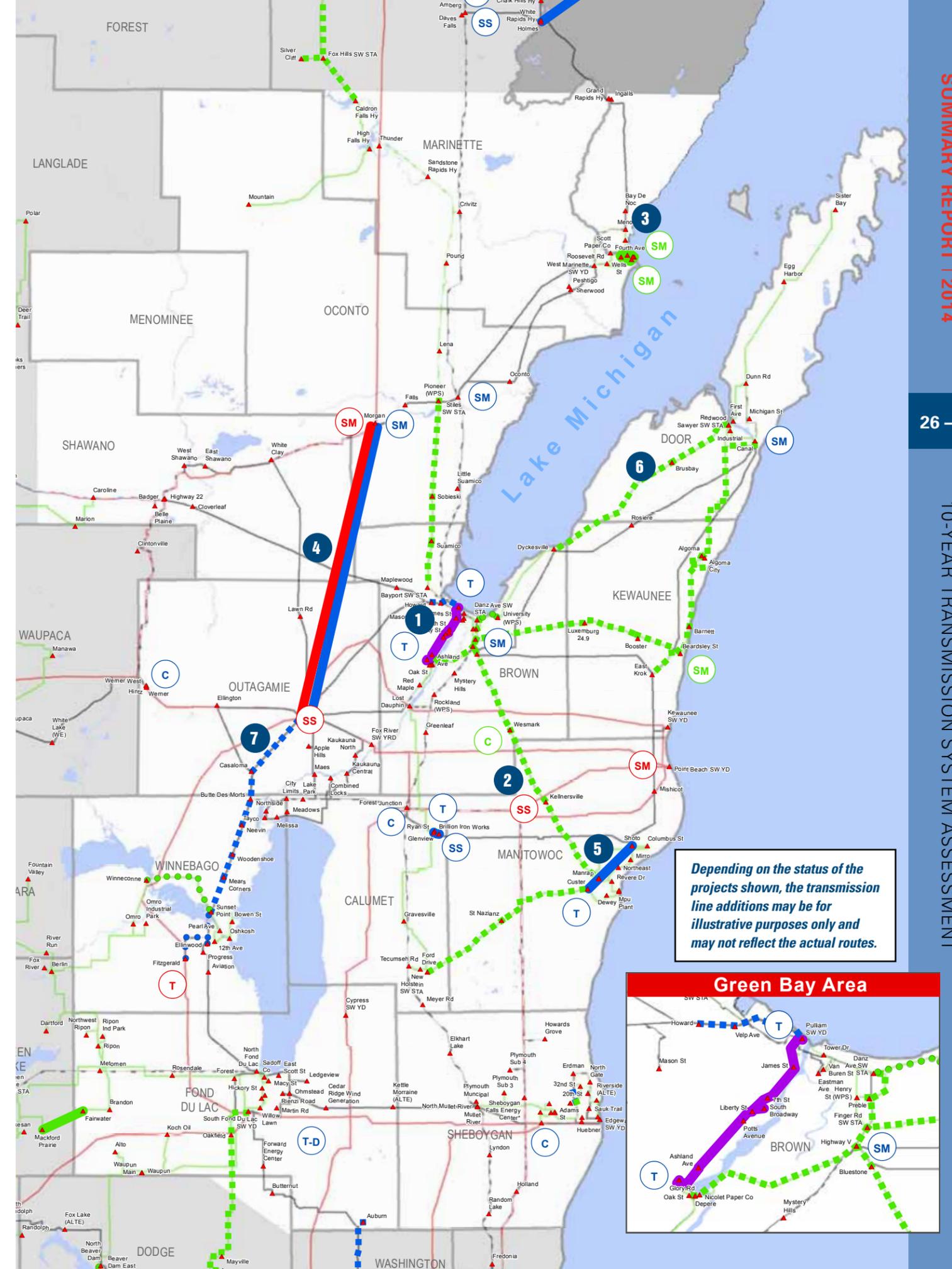
- SS** New substation
Supports transmission system expansion
- SM** Substation modifications
Upgrades equipment ratings to avert facility overloads
- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves low voltages or high voltages
- T-D** T-D interconnection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

TRANSMISSION LINE KEY

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

EXISTING TRANSMISSION LINES KEY

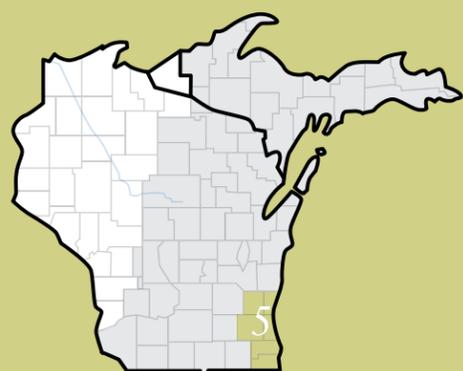
- 69 kV
- 115 kV
- 138 kV
- 161 kV
- 230 kV
- 345 kV



Depending on the status of the projects shown, the transmission line additions may be for illustrative purposes only and may not reflect the actual routes.



Southeast Wisconsin Zone 5



COUNTIES INCLUDED IN ZONE 5 – SOUTHEAST WISCONSIN

**KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WASHINGTON
WAUKESHA**

Transmission system characteristics in Zone 5

ATC delivers power in Zone 5 with various transmission facilities including:

- The southern portion of 345-kV lines from Point Beach and Edgewater,
- The Saukville, Arcadian, Granville, Oak Creek, and Racine 345/138-kV substations,
- The transmission lines emanating from the Pleasant Prairie and Oak Creek power plants,
- 230-kV facilities near Milwaukee and
- A significant 138-kV network in the Milwaukee area, a portion of which is underground.

Transmission system limitations in Zone 5

Transmission system performance issues in Zone 5 are generally related to heavy market flows from and to the south, resulting in high 345-kV and 138-kV line loadings and the need to monitor potential multiple contingency conditions.

While not specifically identified in the project list for this assessment, ATC's capital forecast includes the cost of a preliminary alternative

needed to address additional constraints identified in the southeast portion of ATC's system. Potentially, the scope of this project might include additional connections between existing transmission lines in this part of the system.

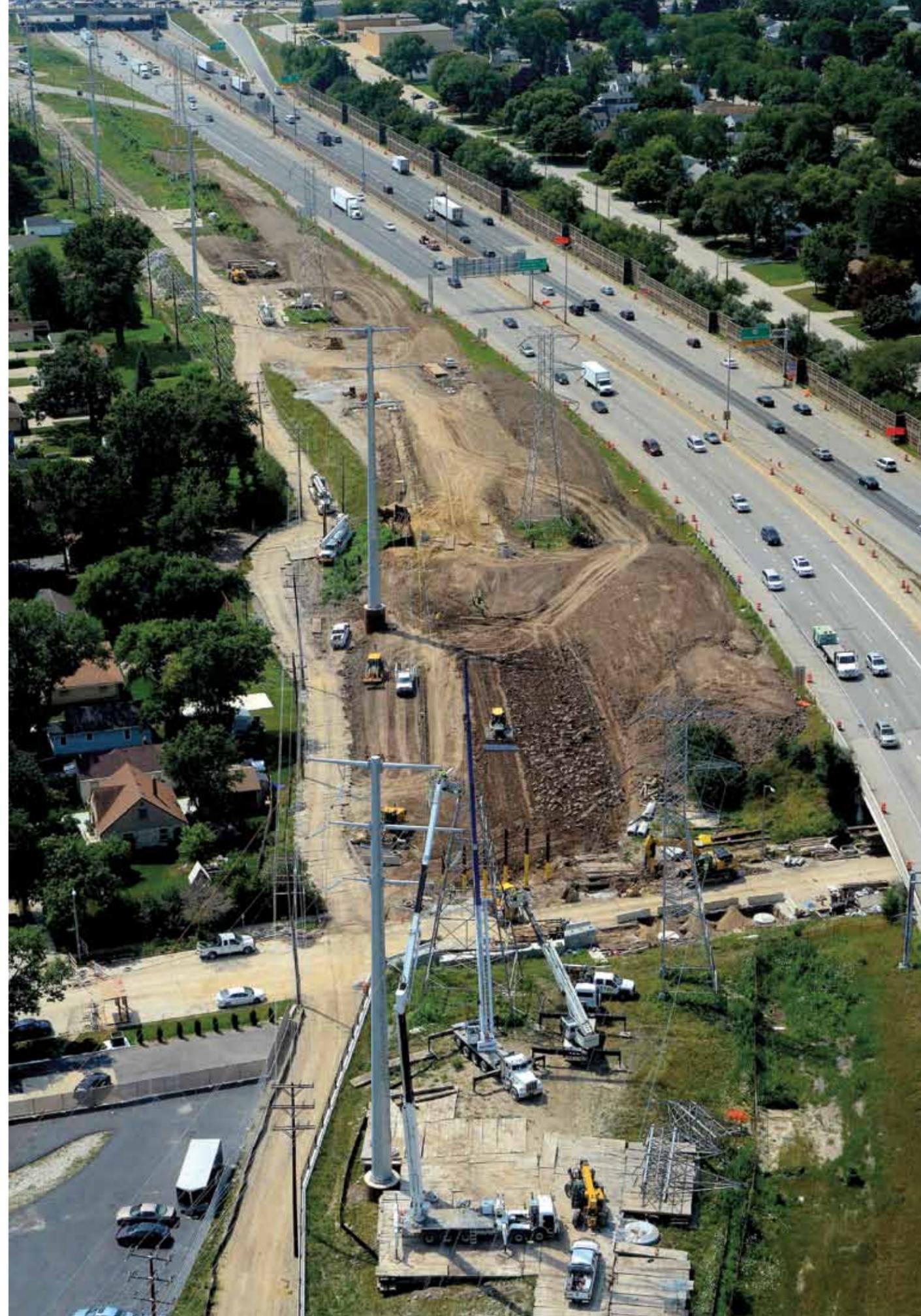
Electric System Overview Increases expected in population, employment

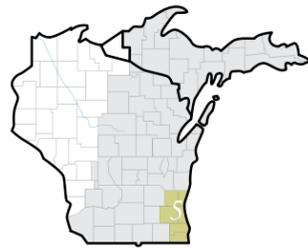
Population in Zone 5 is projected to grow 0.6 percent annually between now and 2023, and employment is projected to grow 1.1 percent in the same time period. Waukesha County is projected to realize the largest increase in both population and employment.

Electricity usage

Peak electric demand typically occurs during the summer months. Large industrial loads in the Milwaukee metropolitan area, including Charter Steel and Miller Brewing, are among the largest electricity users in the zone.

Electric load is forecasted to grow approximately 0.8 percent annually through 2024.





Southeast Wisconsin Zone 5

Transmission projects in Zone 5

The most notable planned, proposed and provisional network projects and asset renewal projects in Zone 5, along with their projected year of completion and the factors driving the need for the projects, are listed below.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Milwaukee County T-D 138-kV lines	2015	T-D interconnection
Proposed Projects		
2 Spring Valley – North Lake Geneva 138-kV line construction	2019	Overloads and low voltages, provide network service
Provisional Projects		
None		
Asset Renewal Projects		
3 Concord – Cooney 138-kV line rebuild (portion of Quad Counties project)	2015	Condition and performance
4 Merrill Hills – Summit 138-kV line partial rebuild (portion of Quad Counties project)	2015	Condition and performance
5 Paris – Albers 138-kV line rebuild	2015	Condition and performance
6 Waukesha – Merrill Hills 138-kV line partial rebuild (portion of Quad Counties project)	2016	Condition and performance
7 St. Lawrence – Hartford 138-kV line rebuild (portion of Quad Counties project)	2016	Condition and performance
8 Mukwonago – Edgewood – St. Martins 138-kV line rebuild	2017	Condition and performance

SUBSTATION KEY

- SS** New substation
Supports transmission system expansion
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- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves low voltages or high voltages
- T-D** T-D interconnection
Supports local growth

TRANSMISSION LINE KEY

- 345-kV transmission line
- 115-, 138- or 161-kV transmission line
- 69-kV transmission line
- ▬▬▬ Rebuilt 115- or 138-kV transmission line
- ▬▬▬ Rebuilt 69-kV transmission line
- 345-kV transmission line rating upgrade
- 230-kV transmission line rating upgrade
- 115- or 138-kV transmission line rating upgrade
- 69-kV transmission line rating upgrade

EXISTING TRANSMISSION LINES KEY

- ▬ 69 kV
- ▬ 161 kV
- ▬ 115 kV
- ▬ 230 kV
- ▬ 138 kV
- ▬ 345 kV





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

ATC AT A GLANCE

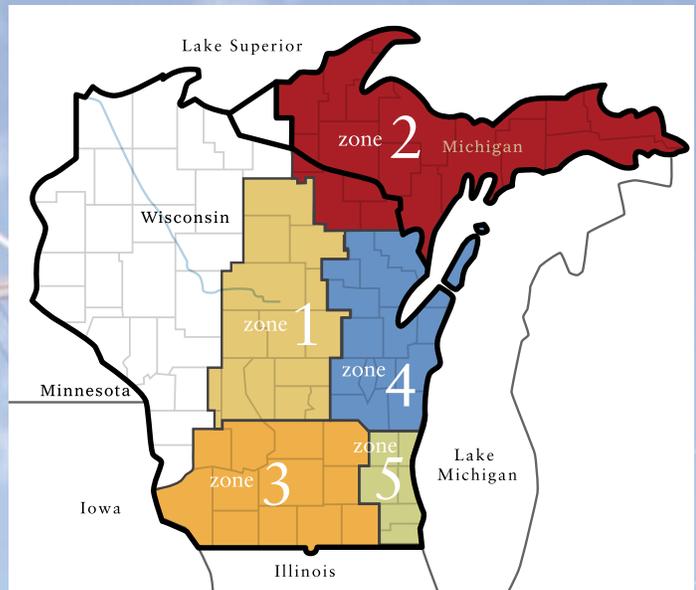
- Formed in 2001 as the first multi-state, **transmission-only utility**
- Owner and operator of approximately **more than 9,530 miles of transmission lines and 530 substations**
- Meeting electric needs of more than **five million people** in 72 counties in four states: Wisconsin, Michigan, Minnesota and Illinois
- **\$3.6 billion** in total assets

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More detailed information is available at www.atc10yearplan.com



www.atcllc.com

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