

10-YEAR TRANSMISSION SYSTEM ASSESSMENT

2016
SUMMARY
REPORT



Powering forward – safely and reliably

Our 10-year plan recognizes a slowing, but continuing, need to expand the regional grid as well as the need to efficiently maintain and upgrade older assets.



For the past 15 years, American Transmission Co. has provided electric transmission service to Wisconsin, Upper Michigan and portions of Illinois and Minnesota. As the first multi-state, transmission-only utility in the United States, ATC remains committed to the safe and reliable transmission of electricity throughout the region.

We do so through a network of more than 9,540 miles of high-voltage transmission lines and 548 substations, providing communities with access to a variety of local and regional energy sources.

Planning a safe and reliable transmission network involves ongoing evaluation of the system and taking a comprehensive look at the various factors that have an impact on electric use in the region. Some of those factors include business development and employment trends, proposed new generation and projected growth in electric usage. Because transmission projects take years to design

and build, it is crucial to plan for new transmission lines well in advance to be able to serve our customers well.

We anticipate that the next 10 years will continue to present new challenges, including changes in generation sources due to the Clean Power Plan. In addition, as the need to build out the transmission system in our region slows down, the need to efficiently maintain and upgrade older assets will ramp up. Our investment forecast for the next 10 years is a reflection of that.

This 2016 10-Year Assessment contains a summary of ATC's planning initiatives and an overview of network-driven and asset-renewal projects in each of our planning zones. It covers 2016 to 2025 and calls for \$3.6 billion to \$4.4 billion in system improvements.

For more detailed information, please visit www.atc10yearplan.com.

Ron Snead
Vice President, System Planning

John McNamara
Vice President, Asset Management

Transmission investments

Projections from past and current Transmission System Assessments

	2012	2013	2014	2015	2016
Specific Network Projects	\$1.9B	\$1.2B	\$1.4B	\$1.4B	\$1.3B
Regional Multi-Value Projects	\$0.8B	\$0.5B	\$0.5B	\$0.5B	\$0.5B
Asset Maintenance	\$1.1B	\$1.1B	\$1.2B	\$1.4B	\$1.4B
Other Capital Categories	\$0.1B / \$1.0B	\$0.2B / \$0.8B	\$0.2B / \$0.8B	\$0.4B / \$1.2B	\$0.4B / \$1.2B
Total 10-Year Capital Cost	\$3.9B / \$4.8B	\$3.0B / \$3.6B	\$3.3B / \$3.9B	\$3.7B / \$4.5B	\$3.6B / \$4.4B



Regional and economic planning update

ATC is an active participant in a variety of efforts to address regional and inter-regional planning initiatives designed to maintain a reliable grid and capture economic benefits in a dynamic energy marketplace. Policy initiatives to curb greenhouse gas emissions and expand the use of renewable energy continue to evolve, and we work closely with our customers to plan for an electric transmission system that will serve their needs well into the future.

Midcontinent Independent System Operator 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 North American Electric Reliability Corporation compliance needs in a five- to 10-year period.



MTEP 16

ATC staff participates in the MISO 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.

Market constraints

Two of the five narrowly constrained areas identified in the MISO region are associated with ATC, and we continue to track these as well as other constraints. Such tracking assists in planning projects that alleviate congestion within the MISO market.

Other MISO planning activities

Our planning staff participates in various technical and policy discussions and provides future direction for MTEP activities. We also are involved in joint planning studies with neighboring regional transmission organizations, including PJM and SPP.

MISO and PJM coordinate, conduct and analyze several market efficiency project studies. This analysis is reviewed by an inter-regional planning stakeholder advisory committee, which typically examines economic projects that could benefit both RTOs and qualify for cross-border cost-sharing.



Regional and inter-regional planning for reliability is needed in a dynamic marketplace, as well as for capturing economic benefits.





Major projects update

Badger Coulee

Construction is underway on the Badger Coulee transmission line, one of MISO's 17 Multi-Value Projects. The project was approved by the Public Service Commission of Wisconsin in spring 2015 and is expected to be in service in 2018. The 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 line will:

- offset the need for about \$190 million in lower-voltage upgrades in western Wisconsin,
- increase access to the wholesale energy market and provide between \$118 million and \$700 million in net economic benefits over the life of the line, and
- establish another pathway for renewable energy into Wisconsin with a connection to key load centers.

Bay Lake

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

Construction of the \$120 million Holmes-Old Mead Road portion of Bay Lake began in early 2015. 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., and was placed in service on time and under budget in August 2016.

The North Appleton-Morgan portion includes 345-kV and 138-kV lines from our North Appleton Substation in Outagamie County to the Morgan Substation in Oconto County, Wis.; both substations will be expanded. A new substation, Benson Lake in Marinette County, will be required to accommodate a large voltage-control device. Additional work will be required at 11 other substations. The project was approved by the Public Service Commission of Wisconsin in May 2015. Construction of the \$328 million project began in 2016. It has an in-service date of late 2018.





Cardinal-Hickory Creek

ATC, ITC Midwest LLC and Dairyland Power Cooperative have plans for a 125-mile, 345-kV transmission line connecting Dubuque County, Iowa, to Dane County, Wis.

The Cardinal-Hickory Creek Project is another of MISO's Multi-Value Projects. Studies indicate that Cardinal-Hickory Creek will deliver benefits to local communities and the Midwest region by:

- improving electric system reliability locally and regionally,
- delivering economic benefits for utilities and electric consumers, and
- expanding infrastructure to support public policy for greater use of renewables.

If approved by Wisconsin and Iowa regulators, construction is anticipated to begin in 2019 with an estimated in-service date of 2023.

Northern Area Reliability Assessment

ATC initiated an effort in 2014 to engage stakeholders and identify potential reinforcements due to generation uncertainties in the northern portion of the ATC system. The 10-year project list includes the following preliminary projects:

- Plains-National 138-kV line,
- Plains-Arnold 138-kV line uprate,
- Increased Plains 345/138-kV transformer capacity, and
- Morgan-Thunder-Crivitz 138-kV project.



ATC had collaborated with MISO to include these projects in MTEP 15. ATC is supportive of efforts in Michigan to add generation in the area and will continue to assess the need for these projects as generation proposals progress.

Wisconsin-Illinois Reliability Project

ATC has proposed a reinforcement project to address reliability concerns associated with the Wisconsin-Illinois Reliability Project. The project efficiently reconfigures two existing 345-kV lines in Wisconsin and Illinois, linking them with approximately three to five miles of double-circuit, 345-kV lines and a new substation.

This proposed reliability project has been approved in the MISO regional-planning process with a projected in-service date of 2020. It requires approvals from the Public Service Commission of Wisconsin and the Illinois Commerce Commission.

Spring Valley-North Lake Geneva

The \$71 million Spring Valley-North Lake Geneva Project was approved by the Public Service Commission of Wisconsin in spring 2016. This project is needed to meet an increase in electric demand in Walworth and Kenosha counties in Wisconsin.

The project involves:

- construction of a new 138-kV transmission line of approximately 23 miles, stretching from the North Lake Geneva Substation in southern Walworth County to the Spring Valley Substation in western Kenosha County,
- construction of a new 138- and 69-kV substation on an ATC-owned parcel along Highway 50 in the Town of Wheatland,
- construction of a new 69-kV transmission line to connect the new substation to the existing Twin Lakes Substation in Twin Lakes, and
- other power line modifications.

Construction will begin in 2017 to meet a 2019 in-service date.



Our progress

While our top priority has always been electric reliability, our mission today is somewhat different than when we began operations on day one in 2001. At first, our efforts focused on connecting the major components of a fragmented system that was created after the founding utilities pooled their assets to form ATC. There was little incentive for those transmission owners to make investments in the system and it was geographically constrained by Lake Michigan and Lake Superior. Now, after \$3.8 billion in investments, we have a grid that enables our customers to participate in and reap the benefits of the wholesale energy market.

As we continue to use our system-wide planning process to effectively and economically improve reliability, more emphasis is being placed on the need to efficiently maintain and upgrade our older assets. Our asset management program is focused on the life-cycle management of transmission assets. The objective is to ensure assets perform the required function in a sustainable manner while managing life-cycle cost. Coordination of design, commissioning, operation, maintenance and replacement strategy is crucial to developing the replacement strategy of the asset life cycle. Asset renewal is driven by public and worker safety, regulatory compliance, reliability and operational performance.

Our system-wide planning process has helped improve electric reliability, allowing our customers to participate in and reap the benefits of the wholesale energy market.

Due in large part to our asset management efforts, our reliability has remained best-in-class in several industry benchmarking studies. In 2015, we achieved top decile performance for components operating at 69 kV and between 100 and 161 kV, along with top quartile for the 345- to 500-kV voltages classes.

Our single-focus, transmission-only business model has produced significant results for our customers over the years.

Since we were formed in 2001, we have:

- Upgraded more than 2,130 miles of transmission line,
- Improved 181 electric substations,
- Built 51 new transmission lines (679 miles)
- Connected 6,000 MW of new generation at 25 sites,
- Saved customers more than \$100 million a year in reduced energy costs with access to the marketplace and lower line losses,
- Increased import and export capability, and
- Improved transmission reliability.

What drives the need for transmission system improvements?

Early in our operational existence, we focused on “seams” issues – finding the logical places in our service area to link transmission assets to create a smooth-flowing electrical highway to serve our customers. Those major, network-driven projects accounted for significant investment in the build-out of our 345-kV system. As we were making our network more interconnected and reliable, we also focused on the life-cycle maintenance of our existing assets, focusing on an asset management strategy to complement and create synergies with our network additions.

Today, our effective management of transmission components complements our planning strategy for electric reliability and economic benefits.

In a collaborative process, our asset management and planning teams work with other functional groups and stakeholders to achieve the best solutions to transmission system needs. Asset management staff monitor the system through maintenance and inspection programs to identify issues related to equipment performance or

condition. Equipment needing attention is discussed with planning to determine if other reliability needs exist on a line or within the geographic area. Projects are evaluated using various options to determine the best means of maintaining reliability.

Common needs that drive system improvements include:

- New or retiring generation – changes the generation impact on transmission
- Economics – greater access to the wholesale energy marketplace provides economic opportunities to utility customers
- Enhanced NERC reliability standards – require a greater degree of redundancy and analysis to assure reliable operation
- Public policy – renewable energy mandates and pending air-quality regulations will affect how the transmission system will be built and used
- Asset renewal – maintaining the system in good operating condition extends its life and improves safety and performance
- Interconnections – changes in how our customers distribute electricity to consumers require new or modified transmission facilities
- Load changes – while overall load growth is low, loads are appearing and disappearing; changing power flows on the system
- New technologies – synchronized phasor measurements, demand-side management and distributed resources affect how the grid is planned and operated to maintain reliability
- Communications – improvements in communication technology, such as fiber optics, are incorporated to support an ever-increasing need to see and control what is happening on the transmission system in real time



Plans and proposals for the transmission system

For planning purposes, ATC’s service area is divided into five zones representing distinct geographic or usage areas. Within each zone, we compile and assess the transmission system needs.

Project classifications

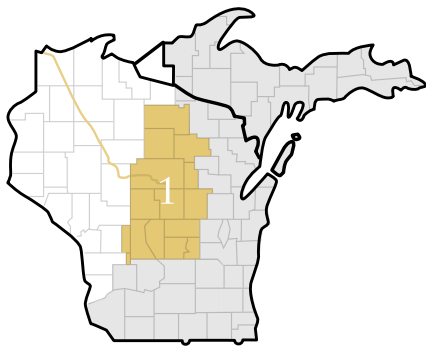
Network and asset-renewal projects have targeted in-service dates that are designed to address system limitations and condition needs. The network projects are classified into one of three possible categories – Planned, Proposed or Provisional – depending upon the stage of the project.

	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 preferred alternative	Project is not necessarily the preferred project alternative

Asset-renewal projects generally fall into the Provisional or Planned categories.

NORTH CENTRAL WISCONSIN

Zone 1



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 Stevens Point north to Wausau toward eastern Shawano 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 in Zone 1 include low voltages and thermal overloads in the southern portion of the zone. These issues will necessitate a combination of reinforcements. For the northern portion of the zone, other ongoing studies have identified thermal limitations. The most severe limitations occur during both peak and off-peak periods.

Electric System Overview

Small increases expected in population, employment

Population in Zone 1 is projected to grow at 0.5 percent annually between now and 2025. Employment is projected to grow at 1.0 percent annually between now and 2025. 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.

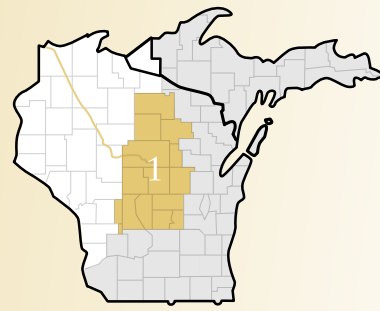
Electric load is forecasted to grow approximately 0.3 percent annually through 2026.



COUNTIES INCLUDED IN ZONE 1 – NORTH CENTRAL WISCONSIN

ADAMS | FOREST (southwestern portion) | Fond du Lac (northwestern portion) | Green Lake | Juneau | Langlade
 Lincoln | Marathon | Marquette | Monroe (eastern portion) | Oneida | Portage | Shawano (western portion)
 Vernon (eastern portion) | Vilas (southern portion) | Waupaca | Waushara | Winnebago (western portion) | Wood

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
1 Montello – Wautoma 69-kV line rebuild	2016	Condition and performance
2 Fairwater – Mackford Prairie 69-kV line construction	2017	Network service, condition, overloads and low voltages
3 Plover – Whiting 115-kV line rebuild	2019	Condition and performance
4 M13-Reinforcement-Bunker Hill-Blackbrook	2019	Overloads and condition
5 Coyne – Saratoga 115-kV line rebuild	2020	Condition and performance

Additional projects may be found in the full 10-Year Assessment at atc10yearplan.com.

SUBSTATION KEY

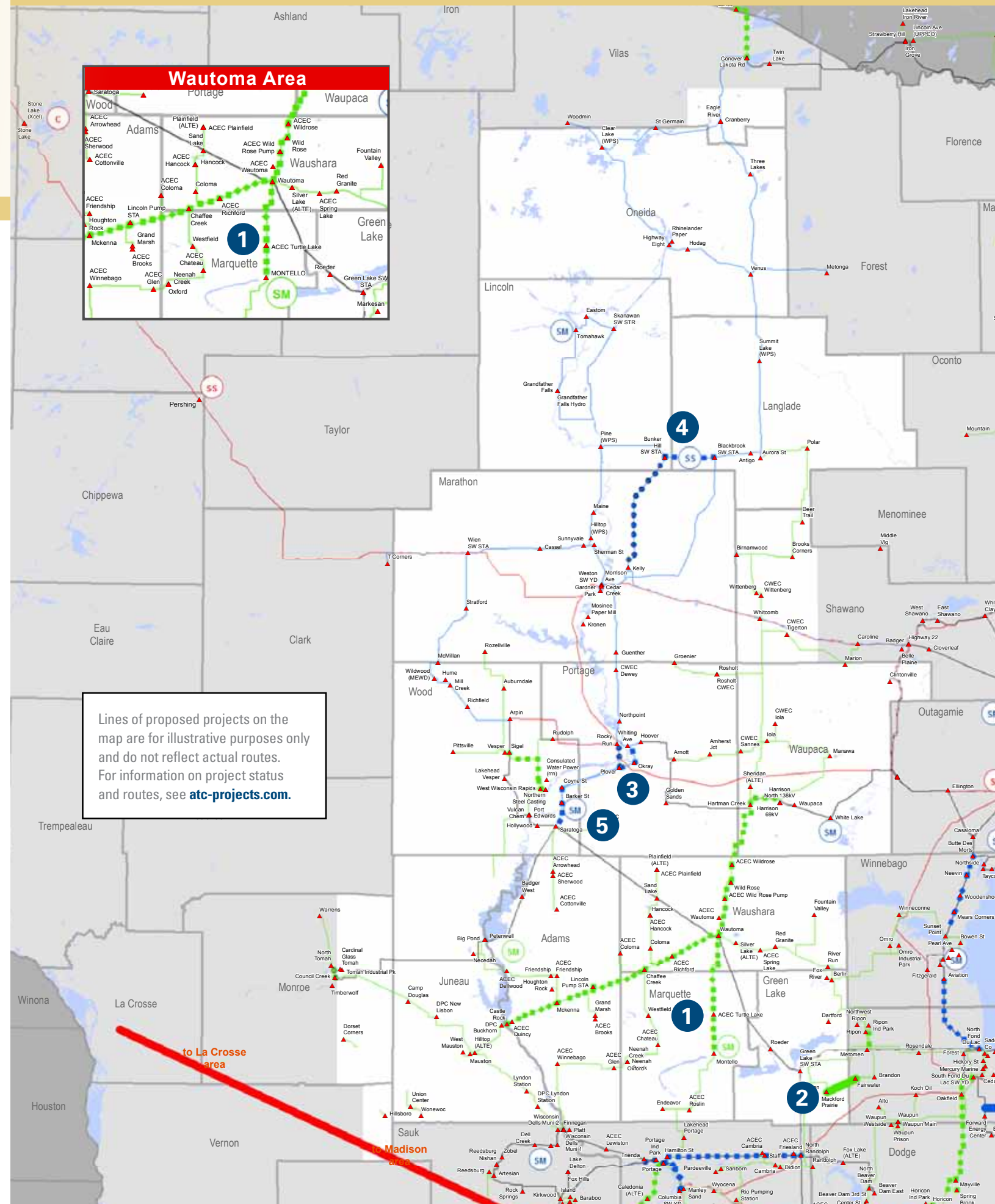
- SS** New substation
Supports transmission system expansion
- SM** Substation modifications
Upgrades equipment ratings to avert facility overloads
- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves low voltages or high voltages
- T-D** T-D interconnection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

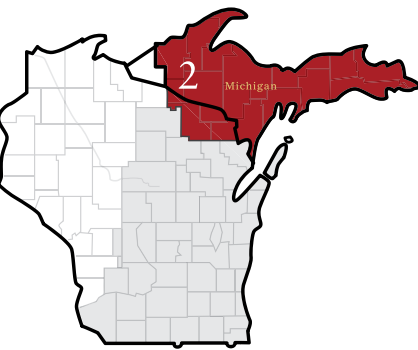
EXISTING TRANSMISSION LINES KEY

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



MICHIGAN'S UPPER PENINSULA AND NORTHERN WISCONSIN

Zone 2



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 ongoing studies, including northern area studies performed by ATC and MISO, have identified several voltage and thermal limitations. The most severe limitations occur during both peak and off-peak periods.

ATC's capital forecast anticipates reinforcements needed to address pending generation retirements such as

White Pine. The scope for a transmission project to address White Pine generation retirements is under review.

Electric System Overview

Small increases expected in population, employment

Population in Zone 2 is projected to grow about 0.2 percent annually between now and 2025, and employment is expected to grow about 0.9 percent each year in the same time period. Marquette County (Michigan) is projected to realize the largest increase in population and employment. Florence County (Wisconsin) is projected to have the highest growth rate in population, while Forest County (Wisconsin) is projected to have the highest growth rate in employment.

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 0.3 percent annually through 2026. 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.



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

- 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



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 page 19.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Munising – Gwinn 69-kV line partial rebuild	2017	Condition and performance
2 9 Mile – Detour 69-kV line partial rebuild	2017	Condition and performance
3 Pine River – Hiawatha 69-kV line partial rebuild	2018	Condition and performance
4 Bay Lake: Benson Lake 138-kV Substation – Installation of a static VAR compensator	2019	Low voltages
Provisional Projects		
5 Plains – National 138-kV project	2023	Overloads and low voltages
6 Plains 345/138-kV project	2023	Overloads and low voltages
7 Plains – Arnold 138-kV uprate	2023	Overloads and low voltages
8 Lakota – Winona 138-kV conversion	2021	Overloads and low voltages
9 Winona – Atlantic 69-kV line rebuild	2024	Overloads and low voltages

Additional projects may be found in the full 10-Year Assessment at atc10yearplan.com.

System Solutions Key

SUBSTATION KEY

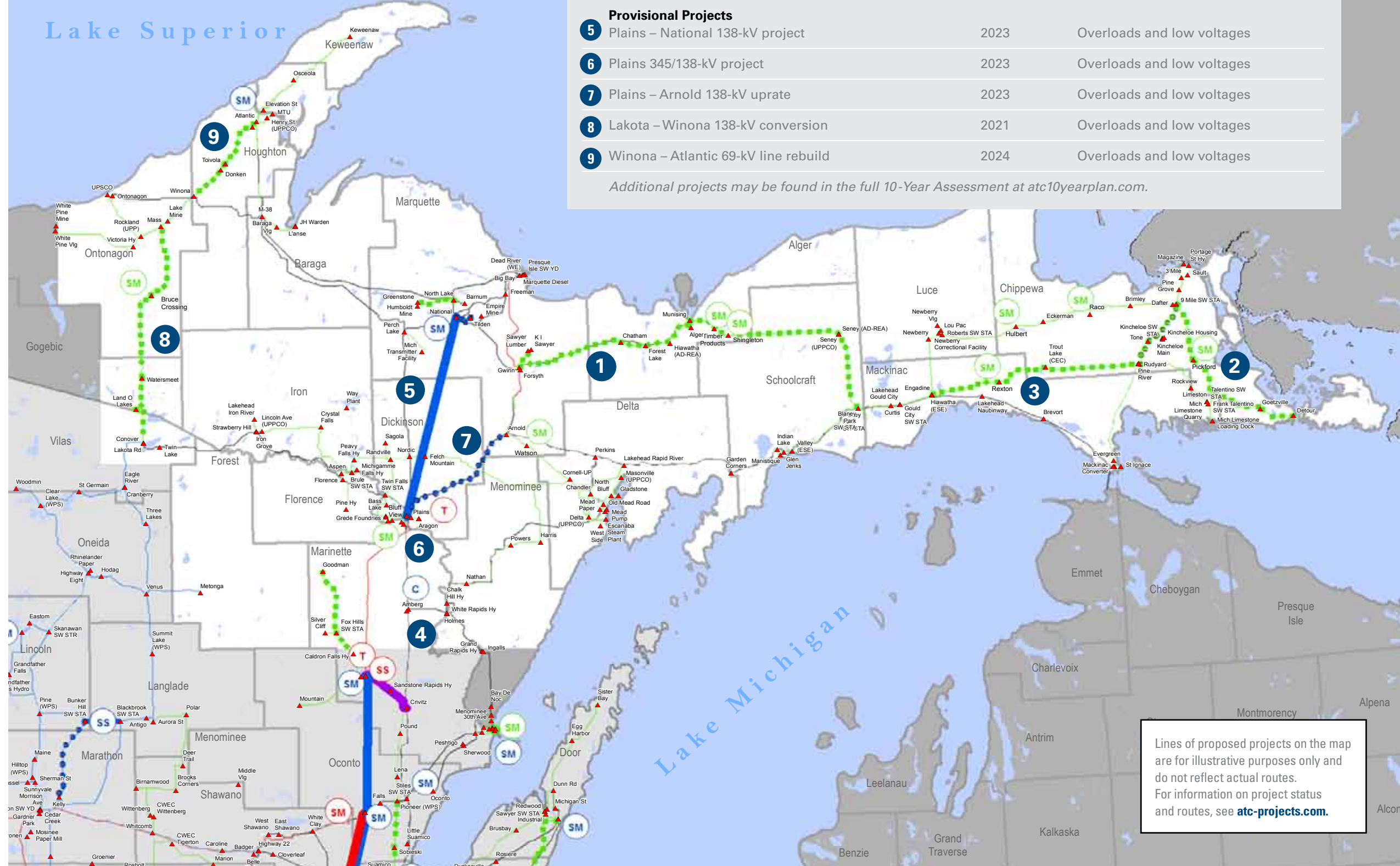
- SS **New substation**
Supports transmission system expansion
- SM **Substation modifications**
Upgrades equipment ratings to avert facility overloads
- T **Transformer**
Supports local growth and improves voltage levels
- C **Capacitor bank**
Relieves low voltages or high voltages
- T-D **T-D interconnection**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

TRANSMISSION LINE KEY

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

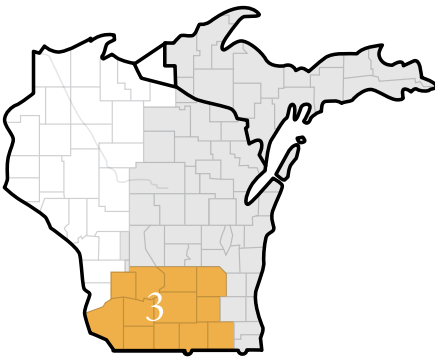
EXISTING TRANSMISSION LINES KEY

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



Lines of proposed projects on the map are for illustrative purposes only and do not reflect actual routes. For information on project status and routes, see atc-projects.com.

SOUTH CENTRAL/SOUTHWEST WISCONSIN AND NORTH CENTRAL ILLINOIS Zone 3



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 Nelson Dewey, 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 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 0.9 percent annually between now and 2025, 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. Dane County also is projected to have the highest growth rate in population, while Dodge County is projected to have the highest growth rate in employment.

Electricity usage

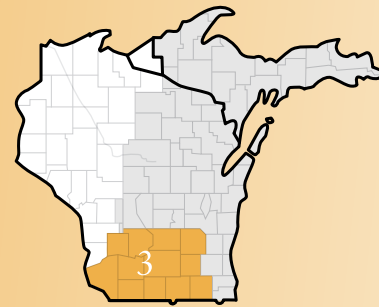
Electric load is forecasted to grow approximately 1.1 percent annually through 2026 in Zone 3.



COUNTIES INCLUDED IN 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)

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 page 23.

PROJECT DESCRIPTION	IN-SERVICE YEAR	NEED DRIVER
Planned Projects		
1 Dam Heights – Portage 69-kV line rebuild	2017	Condition and performance
2 Kegonsa – Sun Prairie 69-kV line partial rebuild	2017	Condition and performance
3 Colley Road – Brick Church 69-kV line rebuild	2018	Overloads, low voltages and condition
4 Badger Coulee: Briggs Rd – North Madison – Cardinal 345-kV line construction	2018	Reliability, economics and public policy
5 Spring Valley – North Lake Geneva 138-kV line construction	2019	Overloads and low voltages, provide network service
6 Boscobel – Lone Rock 69-kV line rebuild	2019	Condition and performance
7 Portage – Staff – North Randolph 138-kV line rebuild	2019	Condition and performance
8 Dane – Waunakee 69-kV line rebuild	2020	Condition and performance
Proposed Project		
9 Cardinal – Hickory Creek	2023	Reliability, economics and public policy
Provisional Project		
10 Cardinal – Blount 138-kV line construction	2029	Overloads and low voltages

Additional projects may be found in the full 10-Year Assessment at atc10yearplan.com.

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
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Supports local growth

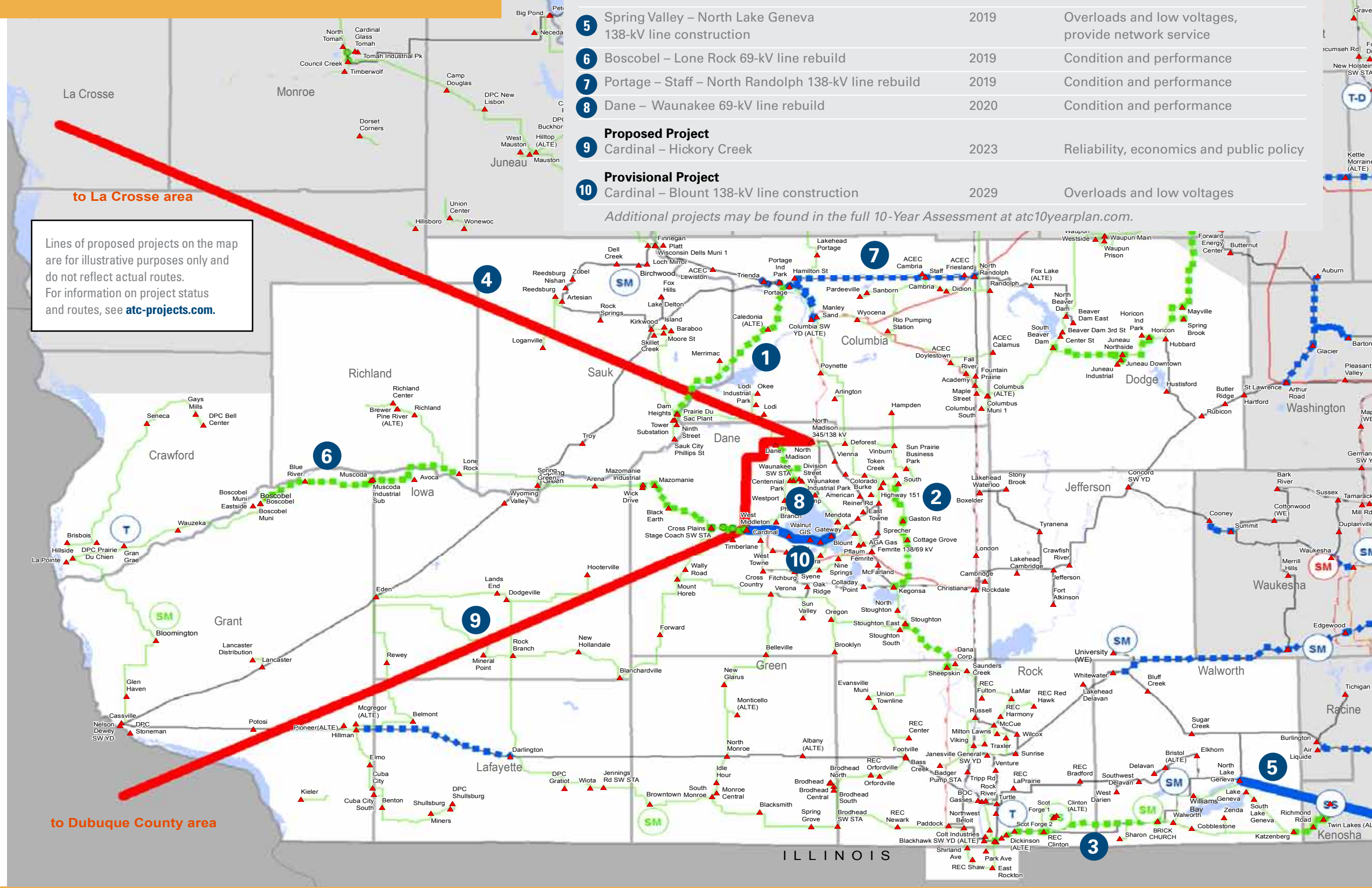
TRANSMISSION LINE KEY

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

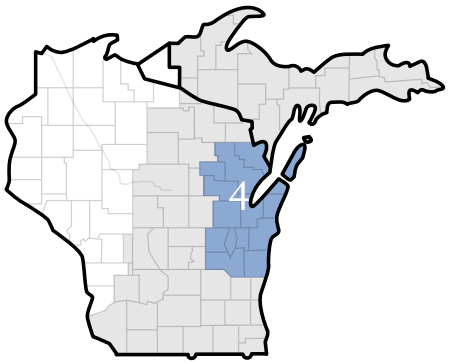
EXISTING TRANSMISSION LINES KEY

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

Lines of proposed projects on the map are for illustrative purposes only and do not reflect actual routes. For information on project status and routes, see atc-projects.com.



NORTHEAST WISCONSIN Zone 4



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 to South Fond du Lac and Cedarsauk,
- two additional 345-kV lines connecting the South Fond du Lac Power Plant to Columbia and Fitzgerald,
- four 345-kV lines connecting the Gardner Park, Werner West, Morgan and Plains substations,
- four 345-kV lines from North Appleton to Kewaunee, Fox River, Werner West and Fitzgerald, and
- a 138-kV network throughout the zone.

Transmission system limitations in Zone 4

In our analysis of Zone 4, we continue to monitor potential high voltages in Outagamie and Calumet counties and impending low voltages in Brown County. In addition, other ongoing studies have identified several voltage and thermal limitations. The most severe limitations occur during both peak and off-peak periods.

Electric System Overview

Increases expected in population, employment

Population in Zone 4 is projected to grow at 0.7 percent annually between now and 2025. Employment is projected to grow at 1.1 percent annually between now and 2025. Brown County is projected to realize the largest increase in population and employment, while Calumet County is projected to have the highest growth rate in population and employment.

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 and around the Green Bay and Appleton metropolitan areas are some of the largest electricity users in the zone.

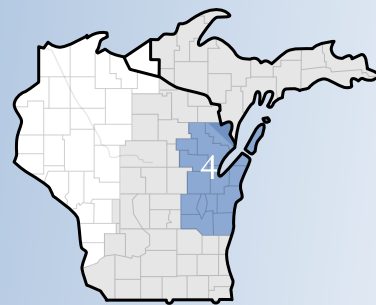
Electric load is forecasted to grow at approximately 0.5 percent annually through 2026. Also, locally generated electricity is declining in the area with smaller, coal-fired generators most at risk. This includes generation owned by industries, municipalities and utilities.



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)

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
2 Creekview Substation: 138-kV line construction to serve T-D interconnection	2017	T-D interconnection
3 Bay Lake: North Appleton – Morgan 345-kV and 138-kV line construction	2018	Overloads and low voltages
4 Branch River 345-kV Substation construction	2018	Accommodate new generation
5 Cedar Ridge Wind Generation – Mullet River 138-kV line rebuild	2019	Condition and performance
6 Finger Road – Canal 69-kV line rebuild	2021	Condition and performance
Proposed Project		
7 Ogden St. – Bayshore 69-kV line construction	2018	Provide network service
Provisional Projects		
8 Morgan – Thunder 138-kV project	2023	Overloads and low voltages
9 Morgan – Plains 345-kV loop into new Thunder 354-kV line rebuild	2023	Overloads and low voltages
10 Aviation – North Fond du Lac 138-kV line rebuild	2025	Overloads
11 Shoto – Custer 138-kV line	2026	Overloads and low voltages

Additional projects may be found in the full 10-Year Assessment at atc10yearplan.com.

SUBSTATION KEY

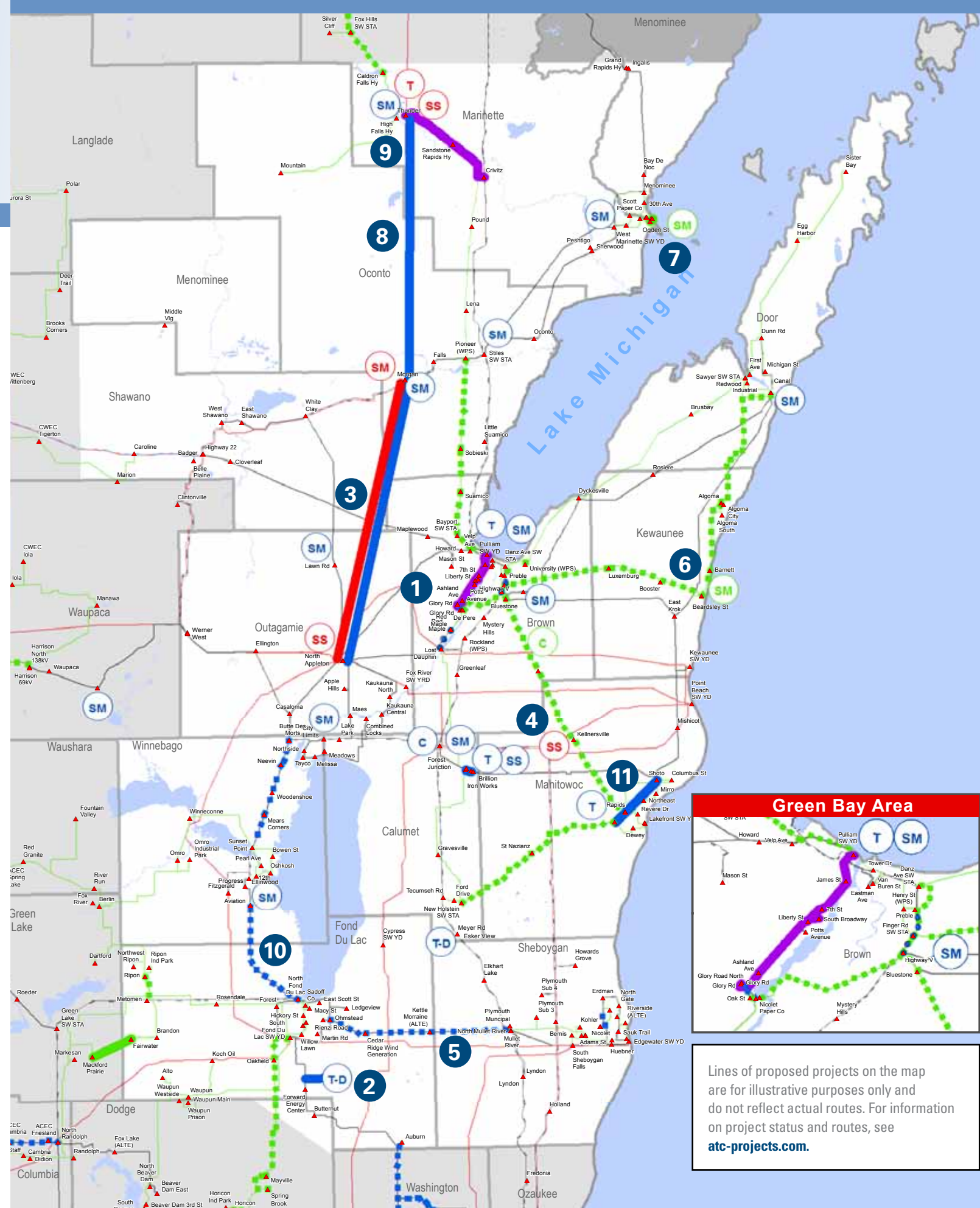
- SS** New substation
Supports transmission system expansion
- SM** Substation modifications
Upgrades equipment ratings to avert facility overloads
- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves low voltages or high voltages
- T-D** T-D interconnection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

System Solutions Key

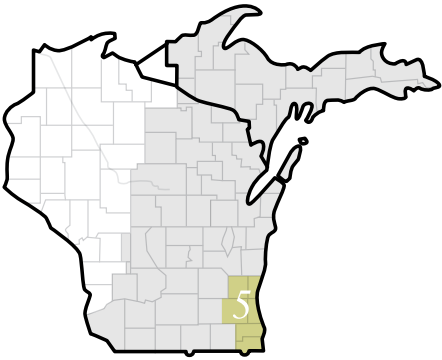
- 345-kV transmission line
- 115-, 138- or 161-kV transmission line
- 69-kV transmission line
- Transmission line voltage conversion
- ▬▬▬ Rebuilt 115- or 138-kV transmission line
- ▬▬▬ Rebuilt 69-kV transmission line
- 115- or 138-kV transmission line rating upgrade
- 69-kV transmission line rating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

EXISTING TRANSMISSION LINES KEY

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



SOUTHEAST WISCONSIN Zone 5



Transmission system characteristics in Zone 5

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

- southern portion of 345-kV lines from Point Beach and Edgewater,
- Saukville, Arcadian, Granville, Oak Creek, and Racine 345/138-kV substations,
- 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 include heavy market flows to and from the south, resulting in high 345-kV and 138-kV line loadings and the need to monitor potential multiple contingency conditions.

Electric System Overview

Increases expected in population, employment

Population in Zone 5 is projected to grow 0.4 percent annually between now and 2025, 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. Waukesha County also is projected to have the highest growth rate in employment, while Washington County is projected to have the highest growth rate in population.

Electricity usage

Peak electric demand typically occurs during the summer months. Large industrial loads in the Milwaukee metropolitan area are among the largest electricity users in the zone.

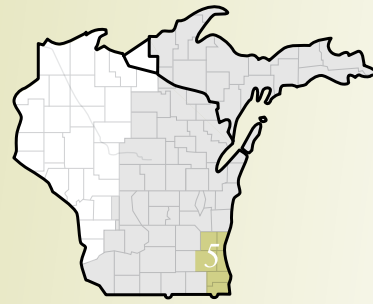
Electric load is forecasted to grow approximately 0.6 percent annually through 2026.



COUNTIES INCLUDED IN ZONE 5 – SOUTHEAST WISCONSIN

Kenosha | Milwaukee | Ozaukee | Racine | Washington | Waukesha

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 Oak Creek – Hayes 138-kV upgrade and reconfiguration	2018	Overloads
2 Spring Valley – North Lake Geneva 138-kV line construction	2019	Overloads and low voltages, provide network service
3 Mukwonago – Edgewood – St. Martins 138-kV line rebuild	2019	Condition and performance
Proposed Projects		
4 Southeastern Wisconsin – Northeastern Illinois Interface Project	2020	Overloads
5 Port Washington – Saukville 138-kV line rebuild	2021	Overloads
6 Arcadian – Waukesha 138-kV rebuild	2025	Overloads

Additional projects may be found in the full 10-Year Assessment at atc10yearplan.com.

SUBSTATION KEY

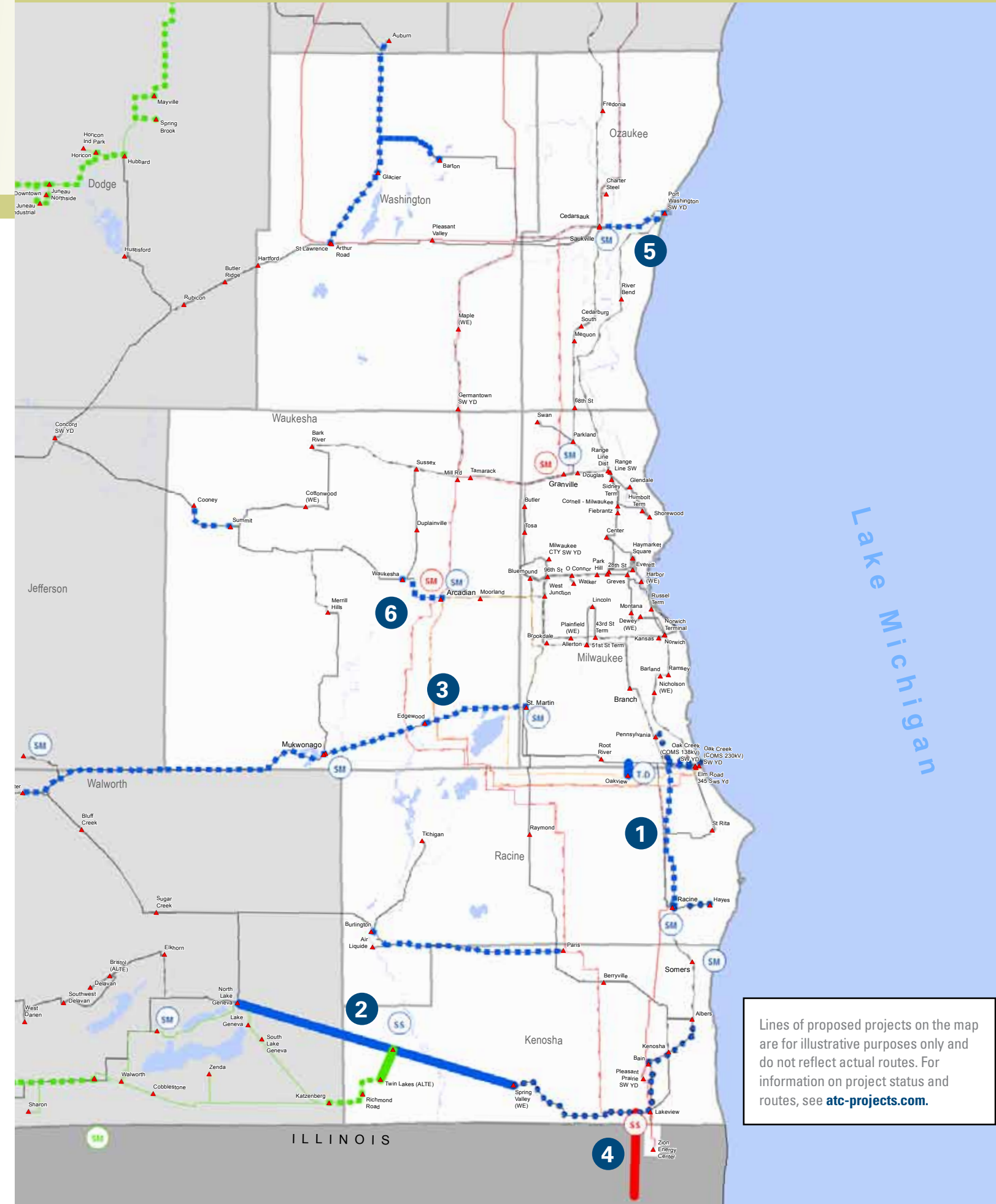
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Supports transmission system expansion
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Upgrades equipment ratings to avert facility overloads
- T** Transformer
Supports local growth and improves voltage levels
- C** Capacitor bank or reactor
Relieves 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
- 230-kV transmission line rating upgrade

EXISTING TRANSMISSION LINES KEY

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



Lines of proposed projects on the map are for illustrative purposes only and do not reflect actual routes. For information on project status and routes, see atc-projects.com.

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 **more than 9,540 miles of transmission lines and 548 substations**
- Meeting electric needs of more than **five million people** in 72 counties in four states: Wisconsin, Michigan, Minnesota and Illinois
- **\$4 billion** in total assets

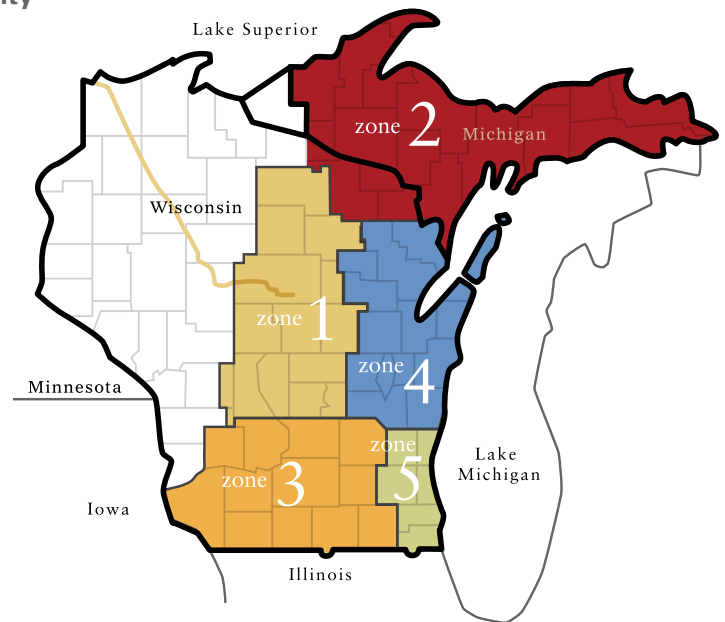
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**Would you like a speaker from ATC to address your group?
Give us a call, toll-free, at 866-899-3204, ext. 8679.**

