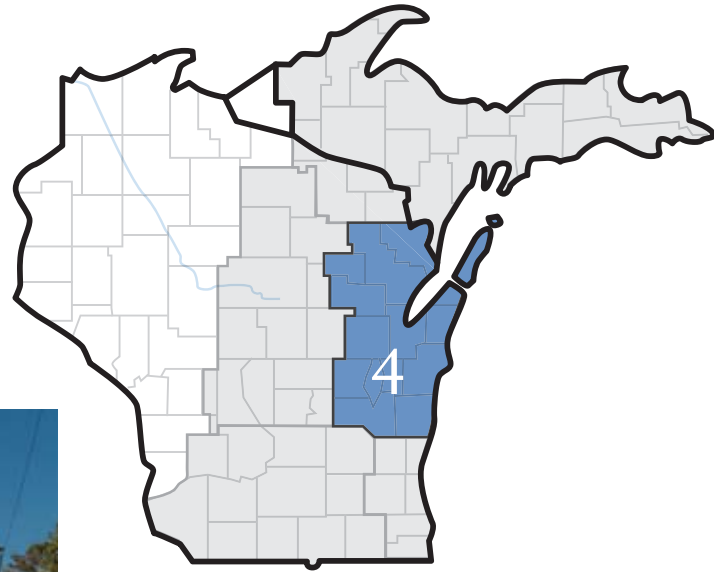


# 10-Year Transmission System Assessment

## Proposals to ensure

- Electric system reliability
- Access to low-cost sources of power
- Access to renewable energy

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



## Zone 4 Northeast Wisconsin

**BROWN**  
**CALUMET**  
**DODGE** (northeast 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)

# Planning for future reliability

American Transmission Co. was formed in 2001 to plan, permit, build, own, operate and maintain a high-voltage electric grid that meets the reliability and economic 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. Our studies identify and prioritize future projects needed to improve the adequacy and reliability of the electric transmission system and meet evolving public priorities for increased availability of renewable generation.

Many projects serve to increase customer access to low-cost generation, which can reduce the cost of serving load in our footprint. In certain cases, expected economic benefits may be the primary driver of a project. Such is the case with our Paddock-Rockdale 345-kV line in southern Wisconsin. It is the first of its kind in the Midwest – while the line will enhance reliability, economics drove the decision to build. Local electric utilities will save through improved access to the wholesale electric market, and those savings will be passed on to end-use electric customers.

Whatever the need, we select best-value projects that resolve multiple system issues, and we do so in a transparent, collaborative process. We bring people into the process, engaging stakeholders in transmission discussion. We believe this open collaboration is critical to efficiently and economically meet renewable portfolio standards in the region. To that end, we are leading and participating in about a dozen regional and intra-regional studies and initiatives. We also are continuing to work with stakeholders in identifying projects that provide economic

benefits and upgrades that could improve access to lower-cost sources of power inside and outside our service territory.

In this, our ninth year of producing a 10-year forecast of transmission system needs, our focus remains on maintaining the adequacy and reliability of the system to meet the current and future needs of our customers. However, this is the first year that we have included asset renewal projects in the Assessment. While our reliability performance data indicates that our system is performing well, we are placing increased emphasis on managing the risk of aging infrastructure. Our approach to work that traditionally has been called maintenance is moving from a time-based program to a more-efficient process that is informed by performance analysis and operational experience.

The 2009 Assessment covers the years 2010 to 2019, and identifies \$2.5 billion in necessary transmission system improvements. The total includes \$1 billion for transmission network upgrades specifically described in this report, along with \$1.5 billion in interconnection and asset renewal projects, infrastructure replacements and relocations, and other smaller network reliability improvements.

While the cost estimate in our 2009 Assessment is slightly less than the \$2.7 billion identified in last year's report, we may increase our overall 10-year capital spending because of increased focus on regional transmission support to move renewable generation to areas where the power is needed. With more than \$2.1 billion invested in the system since 2001, we have become a recognized, national leader in planning, permitting and building electric transmission infrastructure.

Cost estimate of system improvements					
	2005	2006	2007	2008	2009
Total 10-Year Capital Cost	\$3.4B	\$3.1B	\$2.8B	\$2.7B	<b>\$2.5B</b>



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businesses running and communities strong™



# Northeast Wisconsin – Zone 4

## Electric System Overview

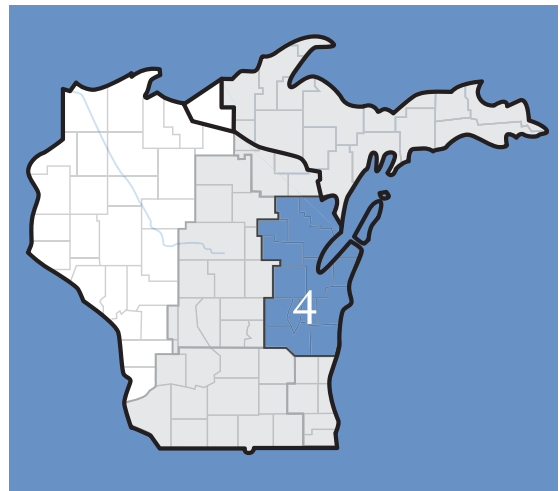
### **Increases expected in population, employment**

Population in Zone 4 is projected to grow 0.7 percent annually between now and 2019. Brown County is expected to realize the largest increase in population. Employment is projected to grow 1 percent annually in the same time period, with the largest increase projected in Calumet County.

### **Electricity usage is growing**

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.

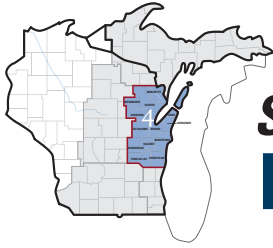
Electric load is projected to grow at approximately 1.5 percent annually through 2019. Comparing load with generation (at maximum output) within the zone indicates that Zone 4 has more generation than load during peak load periods. Actual operating experience indicates that during lighter load periods, Zone 4 is a net exporter of power.



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## **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 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. With an increasing emphasis on renewable energy, transmission system planning will become even more important to put the power of wind on the wires.**



## ***System Limitations*** **Northeast Wisconsin – Zone 4**

### **Transmission system characteristics in Zone 4**

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

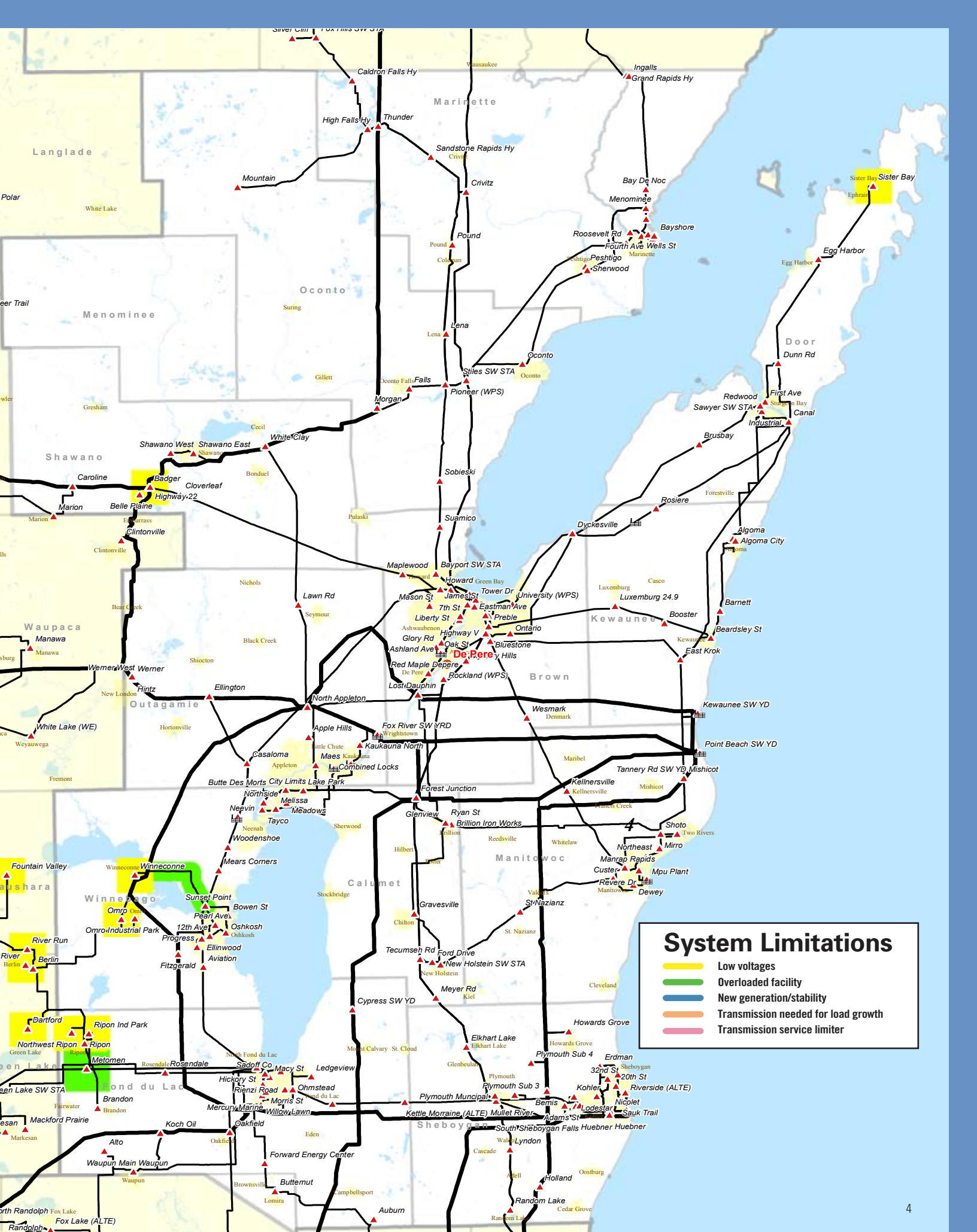
- four 345-kV lines extending from the Kewaunee and Point Beach nuclear plants,
- two 345-kV lines extending from the Edgewater Power Plant,
- a west-east 345-kV line extending from Stevens Point to the Appleton area,
- three 345-kV lines connecting Fond du Lac to Columbia, Edgewater and North Appleton, and
- one 345-kV line connecting Morgan to Plains.

Due to the reduced load forecast utilized in key areas of the zone, there were very few system limitations found in Zone 4.

### **Transmission system limitations in Zone 4**

In the analysis of Zone 4, we identified few voltage or thermal limitations as part of this Assessment. However, it should be noted that transmission service limitations during off-peak periods provide very small operating margins. During these off-peak periods, the Ludington Pumped Storage Facility is in its pump mode, which contributes to heavy loading on facilities from south of Green Bay and north to the Upper Peninsula of Michigan.

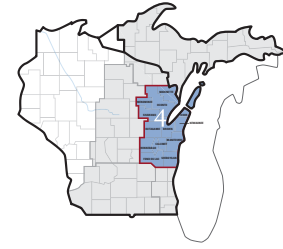
Switchyard maintenance, offsite power reliability and generation availability issues identified at the Kewaunee 345/138-kV Substation will necessitate significant system reinforcements at the substation.



### System Limitations

- Low voltages
- Overloaded facility
- New generation/stability
- Transmission needed for load growth
- Transmission service limiter

# Transmission projects in Zone 4 Northeast Wisconsin – Zone 4














We have completed four network projects in Zone 4 since the 2008 Assessment, most notably the construction of the Clintonville-Werner West 138-kV line.

Our current plans in Zone 4 include 15 system reliability and economic projects between 2009 and 2023. These projects are in various stages of development. The most notable proposed, provisional 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
	<b>Proposed projects</b>		
1	Kewaunee bus reconfiguration and a new second 345/138-kV transformer	2011	Increase offsite power reliability, improve switchyard maintenance and operation flexibility, increase generation availability and meet present substation standards
2	Canal (Sturgeon Bay)-Dunn Road 138-kV line	2012	Addresses low voltages and facility overloads
	<b>Provisional projects</b>		
3	Dunn Road-Egg Harbor 69-kV line	2016	Addresses low voltages and provides network service
4	Shoto-Custer 138-kV line	2020	Addresses facility overloads
5	Bayport-Suamico-Sobieski-Pioneer 69-kV line rebuild and conversion to 138 kV	2020	Addresses facility overloads, addresses aging facilities in poor condition and provides network service
	<b>Asset Renewal projects</b>		
6	Mears Corners-Sunset Point 138-kV line rebuild	2012	Improve condition and increase reliability performance of existing line
7	Dyckesville-Sawyer 69-kV line rebuild	2013	Improve condition and increase reliability performance of existing line
8	Butte des Morts-Neevin 138-kV line rebuild	2015	Improve condition and increase reliability performance of existing line
9	Neevin-Woodenshoe 138-kV line rebuild	2016	Improve condition and increase reliability performance of existing line
10	North Appleton-Butte des Morts 138-kV line rebuild	2017	Improve condition and increase reliability performance of existing line

## System Solutions

SUBSTATION KEY		TRANSMISSION LINE KEY	
	<b>New substation</b> Supports transmission system expansion		345-kV transmission line
	<b>Substation modifications</b> Upgrades equipment ratings to avert facility overloads		115-, 138- or 161-kV transmission line
	<b>Transformer</b> Supports local growth and improves voltage levels		Rebuilt 115- or 138-kV transmission line
	<b>Capacitor bank</b> Relieves low voltages		Transmission line voltage conversion
	<b>T-D interconnection</b> Supports local growth		69-kV transmission line
			Rebuilt 69-kV transmission line





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## ATC AT A GLANCE

- Formed in 2001 as the first multi-state, **transmission-only utility**.
- Owner and operator of approximately **9,400 miles of transmission line and 510 substations**.
- Meeting electric needs of more than **five million people** in 72 counties in four states: Wisconsin, Michigan, Minnesota and Illinois.
- \$2.5 billion** in total assets.

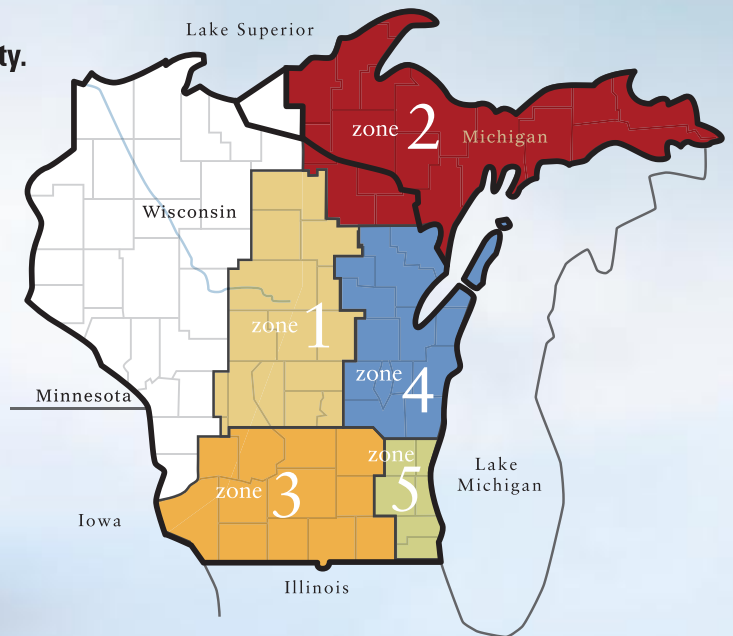
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