



## Zone 3 overview

Zone 3 includes the Wisconsin counties of:

- Columbia
- Crawford (southern portion)
- Dane
- Dodge
- Grant
- Green
- Iowa
- Lafayette
- Jefferson
- Richland
- Rock
- Sauk
- Walworth and
- Winnebago, Ill. (northern portion)

The physical boundaries of Zone 3 and transmission facilities located in Zone 3 are shown in [Figure ZS-24](#).

Land use in Zone 3 is a mix of rural, urban and agricultural.

The major population centers are the Madison metropolitan area and the Janesville/Beloit area.

Zone 3 typically experiences peak demands during the summer months. Manufacturing, food processing, state government and institutional loads are among the largest electricity users in the zone.

### **Demographics**

#### *Historical and Projected Population*

The population of the counties in Zone 3 grew at an annual rate of .9% from 2001 to 2010. The highest growth rate of 1.5% per year and the largest increase in population of 64,400 occurred in Dane County.

Population in Zone 3 is projected to grow at 1.2% annually for the 2011 to 2020 period. From 2011 to 2020, Dane County is projected to realize the largest increase in population (82,900) and is projected to have the highest growth rate of 1.7%.

#### *Historical and Projected Employment*



During the same period, the annual employment growth rate was 0.6%. The highest growth rate (1.2%) and the largest increase in employment (37,800) occurred in Dane County.

Employment in Zone 3 is projected to grow at 1.2% annually between 2011 and 2020. Dane County is projected to realize the largest increase in employment of over 54,000 and the highest growth rate of 1.4%.

| <b>Employment</b>  |        |           |        |
|--------------------|--------|-----------|--------|
| Annual Growth Rate |        |           |        |
| 2001-2010          |        | 2011-2020 |        |
| Zone 3             | 0.6    | Zone 3    | 1.2    |
| Dane, WI           | 1.2    | Dane, WI  | 1.4    |
| Total Increase     |        |           |        |
| 2001-2010          |        | 2011-2020 |        |
| Zone 3             | 42,276 | Zone 3    | 91,406 |
| Dane, WI           | 37,870 | Dane, WI  | 54,008 |

| <b>Population</b>  |        |           |         |
|--------------------|--------|-----------|---------|
| Annual Growth Rate |        |           |         |
| 2001-2010          |        | 2011-2020 |         |
| Zone 3             | 0.9    | Zone 3    | 1.2     |
| Dane, WI           | 1.5    | Dane, WI  | 1.7     |
| Total Increase     |        |           |         |
| 2001-2010          |        | 2011-2020 |         |
| Zone 3             | 96,894 | Zone 3    | 131,829 |
| Dane, WI           | 64,473 | Dane, WI  | 82,972  |

**Zone 3 Environmental Considerations**

Zone 3 covers the south central and southwestern portions of Wisconsin and the Illinois county of Winnebago.

The ecological landscapes in this zone vary from Southeast Glacial Plains in the east through the Central Sand Hills area to areas that are part of the Southwest Savanna and Western Coulee and Ridges landscapes in the west. The eastern portions of the zone generally are level to gently rolling terrain, while the western areas are characterized by the ridges and valleys of the driftless area.



The northern and western portions of this zone are located in the Lower Wisconsin River Drainage Basin, and the Mississippi River forms the zone's western boundary. Other portions of this zone are located in the Grant-Platte, Sugar River-Pecatonica, Upper and Lower Rock and Fox Illinois drainage basins. Horicon Marsh National Wildlife Refuge is located in the northeast part of the zone, and the Upper Mississippi River Wildlife and Fish Refuge is located along the zone's western edge. The Baraboo Hills are located in the north-central portion of the zone. The Lower Wisconsin River State Riverway also is found in this zone.

### ***Zone 3 electricity demand and generation***

The coincident peak load forecasts for Zone 3 for 2012, 2016, 2021 and 2026 are shown in Table ZS-11. The table also shows existing generation, proposed generation based on projected in-service year, and resultant capacity margins (with and without the proposed generation).

The table shows that load in Zone 3 is projected to grow at roughly 1.37 percent annually from 2012 through 2021. Comparing load with generation (at maximum output) within the zone indicates that Zone 3 has more generation than peak load during peak load periods. However, actual operating experience indicates that during most load periods, Zone 3 is a net importer of power.

### ***Zone 3 transmission system issues***

Key transmission facilities in Zone 3 include:

- 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, and
- 138-kV facilities from the Nelson Dewey Power Plant, around the Madison area, and in the northwest and southeast portions of Zone 3.

Key system performance issues in Zone 3 include:

- Existing contingency thermal overloads on the Fitchburg-Royster 69-kV line,
- Low voltages for two separate double circuit tower outages in Dane County transmission system calls for reactive support in 2011
- Maintaining reliability of service to load in and around the Madison area requires that system reinforcements be implemented in the near term. Longer term, a 345-kV source on the west side of Madison will be required,



# 10-Year Assessment

An annual report summarizing proposed additions and expansions to ensure electric system reliability.

# 2011

**September 2011 10-Year Assessment**  
**[www.atc10yearplan.com](http://www.atc10yearplan.com)**

- Load growth in the Rock and Green Counties, along with the mismatch of load to generation in the area, could result in the Monroe area 69-kV network being subjected to unacceptably low voltages and thermal overloads under both normal and contingency conditions in the summer of 2011. Rebuilding the 69-kV line Y-33 from Brodhead to South Monroe will address these issues.
- Load growth in Green County, west of Rock County and south of Dane County requires one additional 69-kV source into the area. Adding the Bass Creek 138/69-kV transformation will address a number of potential low voltage issues and transformer overloads.
- Several provisional projects in past 10-Year Assessments found low voltage and thermal overload issues which did not appear in the 2011 Assessment. The provisional project in-service dates were retained for now until it can be determined in future assessments that these voltage and thermal issues no longer exist.



### **Zone 3 - 2012 study results**

Refer to Table ZS-1 and Figure ZS-9

#### *Summary of key findings*

- Short term operation procedures are required to address the Fitchburg-Royster 69-kV line overload problems before a permanent transmission solution can be implemented,
- Maintaining reliability of service to load in and around the Madison area requires that system reactive reinforcements be implemented in the near term. Longer term, a 345-kV source on the west side of Madison will be required,
- Load growth in the Rock and Green Counties, along with the mismatch of load to generation in the area, could result in the Monroe area 69-kV network being subjected to unacceptably low voltages and thermal overloads under both normal and contingency conditions in the summer of 2011. Rebuilding the 69-kV line Y-33 from Brodhead to South Monroe will address these issues.
- Load growth in Green County, west of Rock County and south of Dane County requires one additional 69-kV source into the area. Adding the Bass Creek 138/69-kV transformation addresses a number of potential low voltage issues and transformer overloads.

In response to some single contingency low voltage problems in Zone 3, a total of 98 MVAR of capacitor banks distributed among the Femrite, Kegonsa and Spring Green substations was deemed to be the most feasible solutions in the 2011-2012 timeframe.

Studies have shown the potential for severe low voltage problems in Dane County area for the loss of certain double circuit tower outages. To address these issues in the near term, one-32.66 MVAR 138-kV Femrite capacitor bank and one-32.66 MVAR 138-kV Kegonsa capacitor bank have been installed. Also in Dane County, the Fitchburg, Cross County, Oak Ridge and Pleasant View 138-kV buses have marginal system intact voltages under certain conditions. The Femrite and Kegonsa capacitor bank projects will also improve potential system intact low voltage limitations.

The Fitchburg to Royster 69-kV line is susceptible to thermal overloads and the area experiences low voltages at Syene, Nine Springs, and Pflaum for certain single contingencies. A package of projects was proposed to address these issues. It includes upgrading the Fitchburg-Nine Springs 69-kV and Royster-Pflaum 69-kV lines, moving the AGA load to the Royster-Femrite 69-kV line and installing two 16.33 MVAR, 69-kV capacitor banks at the Nine Springs Substation in 2013. Prior to the implementation of these projects, a short-term operation procedure including potential load bridging is



available. The short-term operation procedure will be evaluated each year until the transmission projects are implemented.

ATC and the city of Madison have proposed to bury part of the two Blount-Ruskin 69-kV overhead lines underground. This project was completed in 2011.

Load growth in the Rock and Green Counties, along with the mismatch of load to generation in the area, will result in unacceptably low voltages in the Monroe area. Under several single contingency conditions, thermal overloads also arise on the Y-33 69-kV line sections Brodhead-Spring Grove-Blacksmith-South Monroe. The planned solution to address these issues is to rebuild the Brodhead-South Monroe 69-kV line (Y-33) using 138-kV construction standards and initially operate the line at 69-kV.

The Evansville and Brodhead areas are facing unacceptably low voltages under single contingency conditions. A 138/69-kV transformer at Bass Creek and the Townline Road–Bass Creek 138-kV line uprate have been put in service in 2011 to address these problems and provide an additional 69-kV source into Green and Rock Counties. These projects will also allow the delay of a new Brooklyn to Evansville 69-kV line project outside of ATC's 10-year planning horizon.

We currently mitigate several of the identified 138-kV low voltages through remote control of the 138/69-kV transformers in the affected areas. In certain instances, transformer load tap changers are adjusted to bring the 138-kV contingency voltages above the planning criteria limits while maintaining the 69-kV bus voltages above criteria limits. This is a balancing act, and as loads continue to grow the process will no longer be effective.

No performance limits were exceeded for Category A conditions for all 2012 analysis except the high voltage at Darlington 138-kV bus in the 2012 minimum load model. The Darlington high voltage issue can be addressed by adjusting the North Monroe 138/69-kV transformer LTC settings.



### **Zone 3 - 2016 study results**

Refer to Table ZS-2 and Figure ZS-10

#### *Summary of key findings*

- Numerous low voltages and line overloads along with the potential for voltage collapse in the Madison area signal the need for another new 345-kV source on the west side of Madison,
- Low voltage problems were observed in the Boscobel area under single contingency conditions with the Gran Grae 161/69-kV transformer prior outage.
- Due to 69-kV system load growth in Verona and Spring Green areas, the West Middleton-Stage Coach 69-kV line requires higher capacity.

In 2009, ATC received the regulatory CPCN approval for the Rockdale-West Middleton (Cardinal) 345-kV line project. This project will address line overloads and low voltage issues in Dane County and is planned to be in-service in 2013.

ATC Asset Management has determined that currently ATC has no spares for a 161/69-kV transformer installed in the system and the spare equipment lead-time is in excess of 1 year. The provisional project of installing one 8.16 Mvar capacitor bank at Boscobel 69-kV substation and upgrading the existing 5.4 Mvar bank with an 8.16 MVAR bank is advanced from 2019 to 2015. The advance is mainly due to single contingency low voltage constraints near Boscobel area observed in the 2011 10-Year Assessment with the prior outage of the existing 161/69 kV transformer.

Upgrading the West Middleton-Stage Coach 69-kV line is needed by 2015. It will address potential line overload problems under single contingency conditions. In addition, under the certain transformer prior outage condition, the West Middleton-Stage Coach 69-kV line can be overloaded after another transformer outage.

Past 10-Year Assessments found thermal and voltage issues involving the 69-kV loop between North Lake Geneva and Brick Church under contingency conditions. A new 138kV line between North Lake Geneva – South Lake Geneva was proposed for 2016 to resolve these issues. However, recent load forecast reduction has resulted in ATC delaying the North Lake Geneva – South Lake Geneva project in-service date from 2016 to 2018. This area continues to be under review to determine when the next system additions are warranted.

No performance limits were exceeded for Category A conditions for all 2016 analysis.



The lead times necessary to implement the corrective plans that are scheduled for 2012 through 2016 were considered and taken into account prior to assigning an in-service date for each associated project. All of the projects scheduled for the near term planning horizon have an “In-service date” that matches the “Need date”, except the following projects:

*Projects whose “Need date” precedes the “In-service date”*

- Uprate Fitchburg-Nine Springs and Royster-Pflaum 69-kV lines, move AGA to the Femrite-Royster 69-kV line and install Nine Springs capacitor bank. The need year is listed as 2008. The in-service year is 2013. Post-contingency generation dispatch or distribution load bridging will be utilized as an interim mitigation measure to alleviate potential single-contingency thermal and voltage issues.

*Projects whose “In-service date” precedes the “Need date”*

- None

**Zone 3 - 2021 study results**

Refer to [Table ZS-3](#) and [Figure ZS-11](#)

*Summary of key findings*

- Additional reactive power is needed throughout the Zone 3,
- The estimated need date for the West Middleton (Cardinal) - Blount 138-kV project is 2020; the primary need driver is certain double circuit tower outages,
- Due to 69-kV system load growth in the Southeast Madison area, the Sycamore-Royster 69-kV line requires higher capacity,
- Several projects were delayed due to lower load forecast in certain local area

In response to low voltages throughout Zone 3, a significant amount of capacitor banks distributed at the Eden, Mazomanie, Concord, Brick Church, Sun Prairie, Dam Heights, and North Monroe substations in the 2017-2023 timeframe were deemed to be the preliminary solutions. The in-service dates for some of these capacitor bank projects are delayed mainly due to load forecast reduction in local areas. The new in-service dates are chosen considering both the latest 2011 10-Year Assessment need date and previous 10-Year Assessments identified need dates.

The Royster-Sycamore 69-kV line is overloaded under single contingency conditions in the 2021 summer peak model analysis. The existing provisional Royster-Sycamore line uprate





project is advanced to 2018 based on the new results. A potential project alternative to the line uprate is to add a second Femrite transformer.

Past 10-Year Assessments found thermal overload issues under single contingency conditions for the existing Spring Green 138/69-kV transformer, the existing Hillman 138/69-kV transformer and the North Monroe-South Monroe 69-kV line. Those issues did not appear in the 2011 10-Year Assessment. The past solutions were to install a second transformer at Spring Green, a second transformer at Hillman and uprate the Y87 line in 2018. These provisional projects were retained for now until it can be determined in future 10-Year Assessments that these thermal issues truly no longer exist.

Due to higher validated line ratings and load forecast reduction in Alliant area, the reliability need date for the Y119 Sun Valley tap-Oregon 69-kV line rebuild project is beyond 2026 in the 2011 TYA analysis. A new in-service date of 2020 is chosen mainly based on the preliminary Asset Management need date for rebuilding this line.

Past 10-Year Assessments found voltage and thermal issues in the Reedsburg loop. Those issues did not appear in the 2011 10-Year Assessment. The past solution was to construct a 138kV line between Lake Delton and Birchwood in 2020. This provisional project was retained for now until it can be determined in future 10-Year Assessments that the line is not needed.

In the 2008 Assessment, the West Middleton 138/69-kV transformers and West Middleton-Blackhawk 69-kV line were observed to be overloaded under single contingency conditions in the 2017 timeframe. To address these thermal overloads, a Cardinal to Blount 138-kV line project was being considered. In conjunction with the Rockdale-West Middleton (Cardinal) 345-kV line project (2013), the Cardinal-Blount 138-kV line could eliminate the thermal overload issues in the long term and provide additional transfer capability into downtown Madison.

In 2013, the existing West Middleton substation will be divided into two separate adjacent substations behind the same fence as follows:

- West Middleton will remain as 69 kV, and
- Cardinal Substation will encompass 138 and 345-kV portions of the substation.

Since the 2008 Assessment, the West Middleton (Cardinal) 138/69-kV transformer ratings have been validated with higher ratings. In addition, with the new load forecasts utilized in the 2009, 2010 and 2011 10-Year Assessments, the original needs for the Cardinal-Blount 138-kV project are sliding out of 10-year planning horizon. However, considering the potential severe low voltage problem under certain double circuit tower outage conditions (especially during a major 345-kV line maintenance outage), as a potential long term



solution, it was decided to keep the project in the project table as a provisional 2020 project. It is provisional because the justification of the project needs to be confirmed and a project scope needs to be developed.

Past 10-Year Assessments have identified the emerging McCue-Lamar and Bass Creek-Footville thermal overloads and voltage issues at the Lamar Substation under single-contingency conditions. Those issues did not appear in the 2011 10-Year Assessment. A second 69-kV line from McCue to Lamar in 2017 was being considered as a placeholder to resolve the issues in this area. It was decided to delay this provisional project to 2019 for now until it can be determined in future 10-Year Assessments that the project is not needed.

In the past, Y-32 (Colley Road-Brick Church 69-kV line) saw thermal overloads under contingency conditions as well as age and condition issues. The thermal issues were not seen in the 2011 10-Year Assessment. The age and condition issues remain and will likely result in a line rebuild in the next 10-15 years. The project In-Service date was retained at 2018 until future 10-Year Assessments assure the need to rebuild for thermal reasons no longer exists.

Past 10-Year Assessments determined the Brick Church 138-kV bus could experience low voltages under various contingencies. The provisional project of 2-24.5 MVAR 138-kV capacitor banks and 1-18 MVAR 69-kV capacitor bank at Brick Church would address these issues. While voltage issues were not seen in the Brick Church area, the 2017 In-Service date was retained until we can be assured the voltage issues won't return in the next few 10-Year Assessments.

Past 10-Year Assessments found thermal and voltage issues in the Lake Geneva area. A provisional project to construct a 138kV line between Spring Valley, in eastern Kenosha County to the Lake Geneva area is still being considered. It is expected the new 138kV line would connect to the proposed North Lake Geneva – South Lake Geneva 138kV line. One or two 138/69kV transformers could be installed along the provisional Spring Valley – North Lake Geneva line to strengthen the area. Past 10-Year Assessment had the provisional Spring Valley – Lake Geneva line being placed in service in 2018. The project has been delayed to 2019 due to lower load forecasts.

For detailed discussions on the Badger-Coulee 345-kV line project and the Dubuque-Spring Green-Cardinal 345-kV line project, please refer to Regional Planning section.

No performance limits were exceeded for Category A conditions for all 2021 analysis.

The lead times necessary to implement the corrective plans that are scheduled for 2017 through 2021 were considered and taken into account prior to assigning an in-service date



for each associated project. All of the projects scheduled for the longer term planning horizon have an “In-service date” that matches the “Need date”, except the following projects:

*Projects whose “Need date” precedes the “In-service date”*

- None

*Projects whose “In-service date” precedes the “Need date”*

- None

### **Zone 3 - 2026 study results**

Refer to [Table ZS-4](#) and [Figure ZS-12](#)

#### *Summary of key findings*

- 69-kV lines between West Middleton and Waunakee substations are exceeding their summer emergency ratings under single contingency conditions,
- Waunakee Industrial Park-Huiskamp 69-kV line is approaching its summer emergency rating under single contingency condition.

The 2026 results suggest that further study of Zone 3, particularly around Dane County area, is needed to identify an appropriate long-term solution for this area that may be required beyond the year 2020.

Thermal overloads were observed on the Y-131 Waunakee - West Port 69-kV line and the 6963 West Middleton-Pheasant Branch 69-kV lines under single contingency conditions. Rebuilding West Middleton-Pheasant Branch 69-kV line with double circuits in 2022 could be a potential long term solution to address these two potential constraints.

Past 10-Year Assessments determined the Portage – Trienda 138-kV line could experience thermal issues under various contingencies. The provisional project was to uprate the line by 2022. While thermal issues were not seen with the Portage – Trienda line in the 2011 10-Year Assessment analysis, the 2022 In-Service date was retained until we can be assured the thermal issues won’t return in the next few 10-Year Assessments.

Past 10-Year Assessments determined that 345/138kV transformation was needed in the North Randolph area to support the area. The provisional project was to construct a 345kV bus at North Randolph and loop the Columbia – South Fond du Lac 345kV line into North Randolph. The need for the transformer was not seen in the 2011 10-Year Assessment. While need drivers did not appear in this 10-Year Assessment, the 2025 In-Service date



was retained until we can be assured the area needs won't return in the next few 10-Year Assessments.

The provisional project of constructing a Hubbard-East Beaver Dam 138-kV line will address not only several 69-kV thermal overloads, but also the low voltages in the Beaver Dam area for an outage of the North Randolph-North Beaver Dam 138-kV line. While the 2011 10-Year Assessment didn't show a need this year, the 2020 In-Service date was retained until future 10-Year Assessments indicate the need is no longer there.

No performance limits were exceeded for Category A conditions for all 2026 analysis.

### ***Assessment of Steady State Compliance with NERC Standards***

The mitigation plans comprised of planned, proposed and provisional projects identified for Zone 3 in this Assessment will allow the ATC system in Zone 3 to meet the steady state portions of NERC standards TPL-001 and TPL-002 in each of the five years 2012-2016, and for the 2017-2021 planning horizon.

Table ZS-1  
2012 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2012 Summer Peak Case              |                          | 2012 Minimum Load Case |                          | Facility Outage(s)   |
|---------------|---|------------------------------------|--------------------------|------------------------|--------------------------|--|
|               |   | % of Facility Rating               | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage |  |
| 1             | Base case loading criteria exceeded   | FALSE                              | --                       | FALSE                  | --                       | System Intact  |
| 1             | Base case voltage criteria exceeded   | --                                 | FALSE                    | --                     | FALSE                    | System Intact  |
| 1             | Council Creek 138-kV bus  | --                                 | 89.1% - 89.2%            | --                     | --                       | Council Creek - Petenwell 138-kV line<br>ACEC Badger West - Saratoga 138 KV line<br>ACEC Badger West - Petenwell 138 KV line<br>Saratoga - Petenwell 138-KV line |
| 1             | Badger West 138-kV bus  | --                                 | 89.3%                    | --                     | --                       | ACEC Badger West - Saratoga 138 KV line  |
| 1             | Petenwell 138-kV bus  | --                                 | 89.3%                    | --                     | --                       | ACEC Badger West - Saratoga 138 KV line<br>ACEC Badger West - Petenwell 138 KV line<br>Saratoga - Petenwell 138-KV line  |
| 2             | Base case loading criteria exceeded   | FALSE                              | --                       | FALSE                  | --                       | System Intact  |
| 2             | Base case voltage criteria exceeded   | --                                 | FALSE                    | --                     | TRUE                     | System Intact  |
| 2             | M38 – Atlantic 69-kV line   | 94.6%                              | --                       | --                     | --                       | M38 – Atlantic 138-kV line<br>M38 – Atlantic 138-kV line <sup>5</sup>  |
| 2             | Chandler – Lakehead Tap 69-kV line<br>Masonville – Lakehead Tap 69-kV line<br>Gladstone – North Bluff 69-kV line<br>Madonville – Gladstone 69-kV line | 108.5%<br>104.3%<br>97.3%<br>97.2% | --                       | --                     | --                       | Delta – Mead 69-kV line  |
| 2             | Delta – Mead 69-kV line   | 97.3%                              | --                       | --                     | --                       | Chandler – Lakehead 69-kV line   |
| 2             | Engadine, Newberry, LouPac, Newberry Hospital, Newberry Village, Roberts 69-kV buses  | --                                 | 90.9 - 91.3%             | --                     | --                       | Hiawatha – Engadine 69-kV line   |
| 2             | North Bluff, Bay View, Mead, Gladstone, Masonville and Lakehead 69-kV buses   | --                                 | 84.2 - 89.1%             | --                     | --                       | Delta – Mead 69-kV line  |
| 2             | Mead and Bay View 69-kV buses   | --                                 | --                       | --                     | 90.4-91.0%               | Delta – Mead 69-kV line  |
| 2             | Alger Delta, Munising, Alger 69-kV buses  | --                                 | --                       | --                     | 105.4-105.5%             | System Intact  |
| 2             | Atlantic 138-kV bus   | --                                 | --                       | --                     | 113.7%                   | Atlantic – M38 138-kV line   |
| 3             | Base Case Loading Criteria Exceeded   | FALSE                              | --                       | FALSE                  | --                       | System Intact  |
| 3             | Base Case Voltage Criteria Exceeded   | --                                 | FALSE                    | --                     | TRUE                     | System Intact  |
| 3             | Royster – AGA Gas Tap 69-kV line  | 109.0%                             | --                       | --                     | --                       | Fitchburg – Syene 69-kV line   |
| 3             | Royster – Sycamore 69-kV line   | 95.5%                              | --                       | --                     | --                       | Femrite 138/69-kV transformer  |
| 3             | Darlington 138-kV bus   | --                                 | --                       | --                     | 105.2%                   | System Intact  |
| 3             | Huiskamp 138-kV bus   | --                                 | 90.5%                    | --                     | 114.8%                   | Huiskamp – North Madison 138-kV line   |
| 3             | Verona 138-kV bus   | --                                 | 90.9%                    | --                     | 114.6%                   | Verona – Oak Ridge 138-kV line   |

Table ZS-1  
2012 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2012 Summer Peak Case |                          | 2012 Minimum Load Case |                          | Facility Outage(s)   |
|---------------|---|-----------------------|--------------------------|------------------------|--------------------------|--|
|               |   | % of Facility Rating  | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage |  |
| 3             | Hubbard and Hustisford 138-kV buses   | --                    | 87.5%<br>88.1%<br>88.1%  | --                     | 90.1%<br>90.2%<br>90.2%  | Rubicon – Hustisford 138-kV line<br>Hustisford – Hubbard 138-kV line<br>Rubicon – Hustisford – Hubbard 138-kV line |
| 4             | Base case loading criteria exceeded   | FALSE                 | --                       | FALSE                  | --                       | System Intact  |
| 4             | Base case voltage criteria exceeded   | --                    | FALSE                    | --                     | FALSE                    | System Intact  |
| 4             | Sunset Point – Pearl Avenue 69-kV line  | 106.7%<br>106.4%      | --                       | --                     | --                       | Ellinwood – 12th Avenue 69-kV line<br>Ellinwood 138/69-kV transformer <sup>3</sup>                                 |
| 5             | Base Case Loading Criteria Exceeded   | FALSE                 | --                       | FALSE                  | --                       | System Intact  |
| 5             | Base Case Voltage Criteria Exceeded   | --                    | FALSE                    | --                     | TRUE                     | System Intact  |
| 5             | Albers, Allerton, Hayes, Kenosha, Nicholson, Oak Creek, Pennsylvania, Racine, Ramsey, St. Rita, and Somers 138-kV buses | --                    | --                       | --                     | 105-106.1%               | System Intact  |
| 5             | Maple and Germantown 138-kV buses   | --                    | 91.7%<br>91.2%           | --                     | --                       | Maple – Saukville 138-kV line  |
| 5             | Bain 345/138-kV transformer #5  | 108.3%<br>158.2%      | --                       | --                     | --                       | Split Pleasant Prairie 345-kV bus 34<br>Split Pleasant Prairie 345-kV bus 23                                       |
| 5             | Oak Creek 345/230-kV transformer T895   | 104%<br>100.1%        | --                       | --                     | --                       | Split Oak Creek 230-kV bus 78<br>Split Oak Creek 230-kV bus 67   |
| 5             | Arcadian4 – Waukesha1 138-kV line   | 98.8%                 | --                       | --                     | --                       | Arcadian6 – Waukesha3 138-kV line  |
| 5             | Arcadian6 – Waukesha3 138-kV line   | 95.7%                 | --                       | --                     | --                       | Arcadian4 – Waukesha1 138-kV line<br>Split Waukesha 138-kV bus 12  |
| 5             | Harbor – Kansas 138-kV line   | 94.8%                 | --                       | --                     | --                       | Kansas – Norwich 138-kV line   |

Table ZS-2  
2016 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2016 Summer Peak Case     |                          | 2016 70% Load Case       |                          | 2016 90% Load Case        |                          | 2016 105% Load Case       |                          | 2016 65% High W-E Case    |                                  | Facility Outage(s)   |
|---------------|---|---------------------------|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|---------------------------|----------------------------------|--|
|               |   | % of Facility Rating      | % of Nominal Bus Voltage | % of Facility Rating     | % of Nominal Bus Voltage | % of Facility Rating      | % of Nominal Bus Voltage | % of Facility Rating      | % of Nominal Bus Voltage | % of Facility Rating      | % of Nominal Bus Voltage         |  |
| 1             | Base case loading criteria exceeded   | FALSE                     | --                       | FALSE                    | --                       | FALSE                     | --                       | FALSE                     | --                       | FALSE                     | --                               | System Intact  |
| 1             | Base case voltage criteria exceeded   | --                        | FALSE                    | --                       | FALSE                    | --                        | TRUE                     | --                        | FALSE                    | --                        | TRUE                             | System Intact  |
| 1             | Council Creek 138-kV bus  | --                        | 104.9%                   | --                       | --                       | --                        | 105.3%                   | --                        | --                       | --                        | 105.4%                           | System Intact  |
| 1             | Dartford 69-kV bus  | --                        | 91.2 - 91.4%             | --                       | --                       | --                        | --                       | --                        | --                       | --                        | --                               | Ripon - Northwest Ripon Tap 69-KV line<br>Metomen - Ripon 69-KV line   |
| 1             | Petenwell 138/69 KV transformer   | 98.0 - 95.2%              | --                       | --                       | --                       | --                        | --                       | 98.1%                     | --                       | 115.5%                    | --                               | Castle Rock - Quincy ACEC 69-KV line<br>Hilltop - Buckhorn Tap 69-KV line<br>Castle Rock - McKenna 69-kV line <sup>1</sup><br>McKenna - Quincy ACEC 69-KV line |
| 1             | ACEC Badger West - Saratoga 138-kV line   | --                        | --                       | 95.2 - 96.8%             | --                       | --                        | --                       | --                        | --                       | 95.8 - 100.9%             | --                               | Arpin - Eau Claire 345-kV line<br>King - Eau Claire - Arpin 345-kV line <sup>5</sup>   |
| 1             | ACEC Badger West - Petenwell 138-kV line  | --                        | --                       | 98.2 - 99.8%             | --                       | --                        | --                       | --                        | --                       | 95.8 - 103.9%             | --                               | Arpin - Eau Claire 345-kV line<br>King - Eau Claire - Arpin 345-kV line <sup>5</sup>   |
| 2             | Base case loading criteria exceeded   | FALSE                     | --                       | FALSE                    | --                       | FALSE                     | --                       | FALSE                     | --                       | FALSE                     | --                               | System Intact  |
| 2             | Base case voltage criteria exceeded   | --                        | FALSE                    | --                       | TRUE                     | --                        | FALSE                    | --                        | FALSE                    | --                        | FALSE                            | System Intact  |
| 2             | Mead and Chandler 69-kV buses   | --                        | --                       | --                       | --                       | --                        | --                       | --                        | --                       | --                        | 95.1 - 95.9%                     | System Intact  |
| 2             | Munising, Alger, Alger-Delta 69-kV buses  | --                        | --                       | --                       | 105-105.5%               | --                        | --                       | --                        | --                       | --                        | --                               | System Intact  |
| 2             | Lakota Road 115-kV bus  | --                        | --                       | --                       | 105.30%                  | --                        | --                       | --                        | --                       | --                        | --                               | System Intact  |
| 2             | Indian Lake 69-kV bus   | --                        | --                       | --                       | --                       | --                        | --                       | --                        | --                       | --                        | 92.0%<br>91.1%<br>91.6%<br>91.7% | Pleasant Prairie – Zion 345-kV line<br>Pleasant Prairie – Zion 345-kV line <sup>27</sup><br>Indian Lake 69-kV capacitor bank<br>Perkins 138-kV capacitor bank  |
| 2             | Indian Lake 138/69-kV transformer #1<br>Indian Lake 138/69-kV transformer #2                                    | --                        | --                       | --                       | --                       | --                        | --                       | --                        | --                       | 97.2-98.2%                | --                               | Indian Lake 138/69-kV transformer #2<br>Indian Lake 138/69-kV transformer #1   |
| 2             | Delta – Mead 69-kV line   | 102.3%<br>97.4%<br>97.1%  | --                       | --                       | --                       | --                        | --                       | 101.7%<br>96.8%<br>96.7%  | --                       | --                        | --                               | Chandler – Lakehead Tap 69-kV line<br>Masonville – Lakehead Tap 69-kV line<br>Chandler - Lakehead - Masonville 69-kV line <sup>26</sup>                        |
| 2             | Chandler – Lakehead Tap 69-kV line<br>Masonville – Gladstone 69-kV line<br>Masonville – Lakehead Tap 69-kV line | 112.8%<br>96.9%<br>108.5% | --                       | 101.8%<br>90.7%<br>98.8% | --                       | 108.6%<br>94.3%<br>104.7% | --                       | 114.8%<br>97.9%<br>110.2% | --                       | 103.9%<br>93.4%<br>101.1% | --                               | Delta – Mead 69-kV line  |
| 2             | M38 – Atlantic 69-kV line   | --                        | --                       | --                       | --                       | --                        | --                       | 96.3%<br>96.5%<br>100%    | --                       | --                        | --                               | M38 – Atlantic 138-kV line<br>Atlantic 138/69-kV transformer<br>M38 – Atlantic 69-kV line <sup>23</sup>  |
| 2             | Engadine, Newberry, Newberry Hospital, Roberts, LouPac, Newberry Village, Hulbert and Eckerman 69-kV buses      | --                        | 90.3-90.7%               | --                       | --                       | --                        | 91.5-91.9%               | --                        | 91.3-91.7%               | --                        | --                               | Hiawatha – Engadine 69-kV line   |
| 2             | North Bluff, Bay View, Mead, Gladstone, Lakehead, Masonville 69-kV buses  | --                        | 84.7-91.8%               | --                       | 85.5-90.1%               | --                        | 84.9-89.6%               | --                        | 83.7-91.6%               | --                        | 82.3-90.5%                       | Delta – Mead 69-kV line  |
| 2             | Empire - Presque Isle 138-kV line   | --                        | --                       | --                       | --                       | --                        | --                       | --                        | --                       | 100.6%                    | --                               | Split Empire 138-kV bus #23  |
| 2             | Escanaba and West 69-kV buses   | --                        | 91.4-91.9%               | --                       | --                       | --                        | --                       | --                        | --                       | --                        | --                               | Delta - West Tap 69-kV line  |
| 2             | Nordic – Mountain 69-kV line  | --                        | --                       | --                       | --                       | --                        | --                       | --                        | --                       | 102.0%<br>110.5%          | --                               | Empire – Forsyth 138-kV line<br>Plains – Arnold 138-kV line  |

Table ZS-2  
2016 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need                 | 2016 Summer Peak Case               |                          | 2016 70% Load Case   |                          | 2016 90% Load Case   |                          | 2016 105% Load Case  |  | 2016 65% High W-E Case  |                          | Facility Outage(s)   |
|---------------|--|-------------------------------------|--------------------------|----------------------|--------------------------|----------------------|--------------------------|----------------------|--|---|--------------------------|--|
|               |  | % of Facility Rating                | % of Nominal Bus Voltage | % of Facility Rating | % of Nominal Bus Voltage | % of Facility Rating | % of Nominal Bus Voltage | % of Facility Rating | % of Nominal Bus Voltage                     | % of Facility Rating  | % of Nominal Bus Voltage |  |
| 3             | Base case loading criteria exceeded    | FALSE                               | --                       | FALSE                | --                       | FALSE                | --                       | FALSE                | --   | FALSE   | --                       | System Intact  |
| 3             | Base case voltage criteria exceeded    | --                                  | FALSE                    | --                   | FALSE                    | --                   | FALSE                    | --                   | FALSE  | --  | FALSE                    | System Intact  |
|               | Royster – Sycamore 69-kV line          | 98.2%                               | --                       | --                   | --                       | --                   | --                       | --                   | 104.5%                                       | --  | --                       | Femrite 138/69-kV transformer  |
| 3             | Verona 138-kV bus                      | --                                  | 89.4%                    | --                   | --                       | --                   | 89.9%                    | --                   | 88.8%  | --  | --                       | Verona – Oak Ridge 138-kV line   |
| 3             | Huiskamp 138-kV bus                    | --                                  | 89.9%                    | --                   | 91.7%                    | --                   | 90.4%                    | --                   | 89.9%  | --  | 91.7%                    | Huiskamp – North Madison 138-kV line   |
| 3             | Darlington – North Monroe 138-kV line  | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | --   | 102.0 – 95%   | --                       | Paddock 345/138-kV transformer<br>Darlington 138/69-kV transformer<br>Darlington – DPC Gratiot 69-kV line  |
| 3             | Eden – Mineral Point 69-kV line        | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | --   | 95.3%   | --                       | Darlington – Lafayette Wind 138-kV line  |
| 3             | South Monroe – Browntown 69-kV line    | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | --   | 97.0%   | --                       | Darlington – North Monroe 138-kV line  |
| 3             | Concord 138-kV bus                     | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | 96.0%  | --  | --                       | System Intact  |
| 3             | Hubbard and Hustisford 138-kV buses    | --                                  | 87.5%<br>88.2%<br>88.2%  | --                   | 87.1%<br>87.4%<br>87.4%  | --                   | 87.2%<br>86.5%<br>86.5%  | --                   | --   | --  | 87.2%<br>87.9%<br>87.9%  | Rubicon – Hustisford 138-kV line<br>Hustisford - Hubbard 138kV line<br>Rubicon - Hustisford - Hubbard 138kV line   |
| 4             | Base case loading criteria exceeded    | FALSE                               | --                       | FALSE                | --                       | FALSE                | --                       | FALSE                | --   | FALSE   | --                       | System Intact  |
| 4             | Base case voltage criteria exceeded    | --                                  | FALSE                    | --                   | FALSE                    | --                   | FALSE                    | --                   | FALSE  | --  | FALSE                    | System Intact  |
| 4             | Manrap – Custer 69-kV line             | --                                  | --                       | --                   | --                       | --                   | --                       | 95.4%                | --   | --  | --                       | Dewey – Lakefront 69-kV line   |
| 4             | Lau Road – Elkhart Lake 138-kV line    | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | --   | 95.6%<br>95.6%<br>95.6%   | --                       | Sheboygan Energy Center – Grandville 345-kV line<br>Point Beach – Sheboygan Energy Center 345-kV line<br>Point Beach 345-kV bus tie 1 - 2  |
| 4             | Elkhart Lake – Saukville 138-kV line   | --                                  | --                       | --                   | --                       | --                   | --                       | --                   | --   | 106.7%<br>106.7%<br>106.6%<br>103.4%<br>102.9%<br>101.9 – 95.0% | --                       | Point Beach 345-kV bus tie 1 - 2<br>Point Beach – Sheboygan Energy Center 345-kV line<br>Sheboygan Energy Center – Grandville 345-kV line<br>Cypress – Arcadian 345-kV line<br>Edgewater – Cedarsauk 345-kV line<br>Plus other less severe contingencies |
| 4             | Gravesville - Glenview 138-kV line     | 96.7%<br>96.7%<br>96.6%<br>--<br>-- | --                       | --                   | --                       | --                   | --                       | --                   | 102.9%<br>102.9%<br>102.9%<br>96.0%<br>96.0% | --  | --                       | Tecumseh Road 138/69 kV Transformer*<br>Tecumseh Road 138/69 kV Transformer<br>Tecumseh Road - Ford Drive tap 69-kV line<br>Ford Drive tap - New Holstein 69-kV line<br>Tecumseh Road - New Holstein 69-kV line*   |
| 4             | Sunset Point – Pearl Avenue 69-kV line | 107.9%<br>107.9%                    | --                       | --                   | --                       | 97.0%<br>96.9%       | --                       | 113.6%<br>113.4%     | --   | --  | --                       | Ellinwood – 12th Avenue 69-kV line<br>Ellinwood 138/69-kV transformer*   |
| 5             | Base case loading criteria exceeded    | FALSE                               | --                       | FALSE                | --                       | FALSE                | --                       | FALSE                | --   | FALSE   | --                       | System Intact  |
| 5             | Base case voltage criteria exceeded    | --                                  | FALSE                    | --                   | FALSE                    | --                   | FALSE                    | --                   | FALSE  | --  | FALSE                    | System Intact  |
| 5             | Bain 345/138-kV transformer #5         | 158.6%<br>111.4%                    | --                       | 142.5%<br>--         | --                       | 158.8%<br>--         | --                       | 158.3%<br>106.4%     | --   | 142.6%<br>127.1%  | --                       | Split Pleasant Prairie 345-kV bus 34<br>Split Pleasant Prairie 345-kV bus 23   |
| 5             | Oak Creek 345/230-kV transformer T895  | 104.2%<br>101.5%                    | --                       | --                   | --                       | 104.4%<br>--         | --                       | 104.3%<br>101.9%     | --   | --  | --                       | Split Oak Creek 230-kV bus 78<br>Split Oak Creek 230-kV bus 67   |
| 5             | Arcadian4 – Waukesha1 138-kV line      | 97.9%                               | --                       | 114.1%               | --                       | 130.4%               | --                       | 98.5%                | --   | --  | --                       | Arcadian6 – Waukesha3 138-kV line  |
| 5             | Arcadian6 – Waukesha3 138-kV line      | 94.7%<br>--                         | --                       | 110.5%<br>100.4%     | --                       | 126.3%<br>112.7%     | --                       | 95.4%<br>--          | --   | --  | --                       | Arcadian4 – Waukesha1 138-kV line<br>Split Waukesha 138-kV bus 12  |



Table ZS-2  
2016 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2016 Summer Peak Case |                          | 2016 70% Load Case                   |                          | 2016 90% Load Case       |                          | 2016 105% Load Case  |                          | 2016 65% High W-E Case |                          | Facility Outage(s)   |
|---------------|---|-----------------------|--------------------------|--------------------------------------|--------------------------|--------------------------|--------------------------|----------------------|--------------------------|------------------------|--------------------------|--|
|               |   | % of Facility Rating  | % of Nominal Bus Voltage | % of Facility Rating                 | % of Nominal Bus Voltage | % of Facility Rating     | % of Nominal Bus Voltage | % of Facility Rating | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage |  |
| 5             | Arcadian 345/138-kV transformer #3  | --                    | --                       | --                                   | --                       | 96.2%<br>99.6%<br>94.9%  | --                       | --                   | --                       | --                     | --                       | Split Arcadian 345-kV bus 12<br>Arcadian 345-kV bus outage<br>Arcadian 345/138-kV transformer #1   |
| 5             | Bain – Kenosha 138-kV line  | --                    | --                       | --                                   | --                       | --                       | --                       | --                   | --                       | 100.3%                 | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Pleasant Prairie – Zion 345-kV line   | --                    | --                       | --                                   | --                       | --                       | --                       | --                   | --                       | 96.8%                  | --                       | Zion – Arcadian 345-kV line <sup>27</sup>  |
| 5             | Granville 345/138-kV transformer #1   | --                    | --                       | --                                   | --                       | 108.2%                   | --                       | --                   | --                       | --                     | --                       | Split Granville 345-kV bus 23  |
| 5             | Harbor – Kansas 138-kV line   | --                    | --                       | 110.4%<br>105.3%<br>102.5%<br>101.7% | --                       | 100.0%<br>--<br>--<br>-- | --                       | --                   | --                       | --                     | --                       | Kansas – Norwich 138-kV line<br>Dewey – Norwich 138-kV line<br>Split Dewey 138-kV bus<br>Dewey – Montana 138-kV line<br>Plus Other Less Severe Outages |
| 5             | Albers – Kenosha 138-kV line  | --                    | --                       | 107.2%                               | --                       | 105.6%                   | --                       | --                   | --                       | --                     | --                       | Albers – Bain 138-kV line  |
| 5             | Edgewood – St. Martins 138-kV line  | --                    | --                       | 98.1%                                | --                       | --                       | --                       | --                   | --                       | --                     | --                       | Merrill Hills – Waukesha 138-kV line   |
| 5             | Oak Creek – Ramsey 138-kV line<br>Kansas – Ramsey 138-kV line<br>Nicholson – Ramsey 138-kV line | --                    | --                       | --                                   | --                       | 101.0%<br>96.1%<br>95.1% | --                       | --                   | --                       | --                     | --                       | Oak Creek – Pennsylvania 138-kV line   |
| 5             | Waukesha 138-kV bus 12  | --                    | --                       | --                                   | --                       | 99.7%                    | --                       | --                   | --                       | --                     | --                       | Arcadian6 – Waukesha3 138-kV line  |
| 5             | Kenosha – Lakeview 138-kV line  | --                    | --                       | --                                   | --                       | --                       | --                       | 96.2%                | --                       | 126.9%                 | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Lakeview – Zion 138-kV line   | --                    | --                       | --                                   | --                       | --                       | --                       | --                   | --                       | 129.9%                 | --                       | Pleasant Prairie – Zion 345-kV line  |

Table ZS-3  
2021 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2021 Summer Peak Case                                  |                                       | 2021 Minimum Load Case |                          | 2021 70% Shoulder Case |                          | 2021 90% E-W Bias Case |                          | 2021 65% High W-E Bias Case |                          | Facility Outage(s)  |
|---------------|---|--|---------------------------------------|------------------------|--------------------------|------------------------|--------------------------|------------------------|--------------------------|-----------------------------|--------------------------|---|
|               |   | % of Facility Rating                                   | % of Nominal Bus Voltage              | % of Facility Rating   | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage | % of Facility Rating        | % of Nominal Bus Voltage |   |
| 1             | Base case loading criteria exceeded   | TRUE   | --                                    | FALSE                  | --                       | FALSE                  | --                       | FALSE                  | --                       | TRUE                        | --                       | System Intact   |
| 1             | Base case voltage criteria exceeded   | --   | FALSE                                 | --                     | TRUE                     | --                     | FALSE                    | --                     | FALSE                    | --                          | FALSE                    | System Intact   |
| 1             | Dartford, Ripon Industrial Park, Northwest Ripon and Ripon 69-kV buses                                  | --   | 90.5 - 91.9%<br>90.6 - 91.9%<br>91.6% | --                     | --                       | --                     | --                       | --                     | --                       | --                          | --                       | Ripon - NW Ripon Tap 69-KV line<br>Metomen - Ripon 69-KV line<br>NW Ripon Tap - Dartford Tap 69-KV line   |
| 1             | Winneconne, Omro and Omro Industrial Park 69-kV buses   | --   | 90.8 - 91.4%                          | --                     | --                       | --                     | --                       | --                     | --                       | --                          | --                       | Winneconne - Sunset Point 69-kV line  |
| 1             | Council Creek 161-kV bus  | --   | 91.2%                                 | --                     | --                       | --                     | --                       | --                     | --                       | --                          | --                       | Monroe County - La Crosse 161-kV line   |
| 1             | Council Creek 138-kV bus  | --   | --                                    | --                     | 105.5%                   | --                     | --                       | --                     | --                       | --                          | --                       | System Intact   |
| 1             | Metomen 138/69 KV transformer   | 95.6%  | --                                    | --                     | --                       | --                     | --                       | --                     | --                       | --                          | --                       | System Intact   |
| 1             | Petenwell 138/69 KV transformer   | 101.7%<br>106.2%<br>104.1%<br>103.5%<br>101.4 - 103.3% | --                                    | --                     | --                       | 95.6 - 104.2%          | --                       | --                     | --                       | 119.2%                      | --                       | System Intact<br>Castle Rock - Quincy ACEC 69-KV line<br>Hilltop - Buckhorn Tap 69-KV line<br>Castle Rock - McKenna 69-kV line <sup>14</sup><br>Plus other less severe contingencies  |
| 1             | Castle Rock - ACEC Quincy 69-KV line  | 98.8%<br>98.8%<br>98.7%                                | --                                    | --                     | --                       | --                     | --                       | --                     | --                       | --                          | --                       | Petenwell - Big Pond 69-KV line<br>Petenwell 138/69-kV Transformer<br>Necedah Tap - Big Pond 69-KV line   |
| 1             | ACEC Badger West - Petenwell 138-kV line  | --   | --                                    | --                     | --                       | 96.9 - 135.9%          | --                       | --                     | --                       | 96.1 - 103.8%               | --                       | Arpin - Eau Claire 345-kV line<br>King - Eau Claire 345-kV line<br>Arpin 345/138-kV transformer<br>Arrowhead - Stone Lake 345-kV line<br>Plus other less severe contingencies   |
| 1             | ACEC Badger West - Saratoga 138-kV line   | --   | --                                    | --                     | --                       | 97.1 - 132.7%          | --                       | --                     | --                       | 100.5%                      | --                       | Arpin - Eau Claire 345-kV line<br>King - Eau Claire 345-kV line<br>Arpin 345/138-kV transformer<br>Arrowhead - Stone Lake 345-kV line<br>Plus other less severe contingencies   |
| 2             | Base case loading criteria exceeded   | FALSE  | --                                    | FALSE                  | --                       | FALSE                  | --                       | FALSE                  | --                       | FALSE                       | --                       | System Intact   |
| 2             | Base case voltage criteria exceeded   | --   | FALSE                                 | --                     | FALSE                    | --                     | FALSE                    | --                     | FALSE                    | --                          | FALSE                    | System Intact   |
| 2             | Engadine, Newberry, Newberry Hospital, Roberts, LouPac, Newberry Village, Hulbert, Eckerman 69-kV buses | --   | 84.4-90.4%<br>--                      | --                     | --                       | --                     | --                       | --                     | 88.5-89.0%<br>89.5-89.8% | --                          | --                       | Hiawatha-Engadine 69-kV line<br>Engadine-Newberry 69-kV line  |
| 3             | Base case loading criteria exceeded   | FALSE  | --                                    | FALSE                  | --                       | FALSE                  | --                       | FALSE                  | --                       | FALSE                       | --                       | System Intact   |
| 3             | Base case voltage criteria exceeded   | --   | FALSE                                 | --                     | FALSE                    | --                     | FALSE                    | --                     | FALSE                    | --                          | FALSE                    | System Intact   |
| 3             | Darlington - North Monroe 138-kV line   | --   | --                                    | --                     | --                       | --                     | --                       | --                     | --                       | 118.8 - 98.8%               | --                       | Paddock 345/138-kV transformer<br>Darlington 138/69-kV transformer<br>Darlington - DPC Gratiot 69-kV line<br>Eden - Wyoming Valley 138-kV line<br>Eden - Wyoming Valley - Spring Green 138-kV line plus other less severe contingencies |
| 3             | Eden - Mineral Point 69-kV line   | --   | --                                    | --                     | --                       | --                     | --                       | --                     | --                       | 111.3 - 98.5%               | --                       | Darlington - Lafayette Wind 138-kV line   |
| 3             | South Monroe - Browntown - Jennings Road - Wiote 69-kV line   | --   | --                                    | --                     | --                       | --                     | --                       | --                     | --                       | 110.8 - 101.2%              | --                       | Darlington - North Monroe 138-kV line   |
| 3             | Nelson Dewey 161/138-kV transformer   | --   | --                                    | --                     | --                       | 96.0%                  | --                       | --                     | --                       | --                          | --                       | System Intact   |
| 3             | Nelson Dewey 161/138-kV transformer   | --   | --                                    | --                     | --                       | 103.1 - 99.4%          | --                       | --                     | --                       | --                          | --                       | Nelson Dewey Unit 2<br>Pleasant Praire Unit 1<br>Pleasant Praire Unit 2<br>Edgewater Unit 5 plus other less severe contingencies  |
| 3             | Royster - Sycamore 69-kV line   | 106.3%   | --                                    | --                     | --                       | --                     | --                       | 96.3%                  | --                       | --                          | --                       | Femrite 138/69-kV transformer   |

Table ZS-3  
2021 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need   | 2021 Summer Peak Case                        |                          | 2021 Minimum Load Case |                          | 2021 70% Shoulder Case     |                          | 2021 90% E-W Bias Case |                          | 2021 65% High W-E Bias Case |                          | Facility Outage(s)   |
|---------------|--|--|--------------------------|------------------------|--------------------------|----------------------------|--------------------------|------------------------|--------------------------|-----------------------------|--------------------------|--|
|               |  | % of Facility Rating                         | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage | % of Facility Rating       | % of Nominal Bus Voltage | % of Facility Rating   | % of Nominal Bus Voltage | % of Facility Rating        | % of Nominal Bus Voltage |  |
| 3             | Westport – Wanakee Muni#2 69-kV line   | 98.1%  | --                       | --                     | --                       | --                         | --                       | --                     | --                       | --                          | --                       | West Middleton – Pheasant Branch 69-kV line  |
| 3             | Verona 138-kV bus  | --   | 87.9%                    | --                     | --                       | --                         | 90.8%                    | --                     | 88.8%                    | --                          | 91.4%                    | Verona – Oak Ridge 138-kV line<br>Verona 138/69-kV transformer   |
| 3             | Huiskamp 138-kV bus  | --   | 89.4%                    | --                     | 114.8%                   | --                         | 90.1%                    | --                     | 90.4%                    | --                          | 91.4%                    | Huiskamp – North Madison 138-kV line   |
| 3             | Hubbard and Hustisford 138-kV bus  | --   | 87.5%<br>88.1%<br>88.1%  | --                     | 87.5%<br>87.6%<br>87.6%  | --                         | 86.9%<br>87.3%<br>87.3%  | --                     | 88.1%<br>88.1%<br>88.1%  | --                          | 87.2%<br>87.2%<br>87.1%  | Rubicon – Hustisford 138-kV line<br>Hustisford – Hubbard 138-kV line<br>Rubicon – Hustisford – Hubbard 138-kV line   |
| 3             | Paddock – Townline 138kV line  | --   | --                       | --                     | --                       | 102.8%<br>101.8%<br>101.1% | --                       | --                     | --                       | --                          | --                       | NW Neloit – Paddock 138-kV line<br>Paddock – NW Beloit – Blackhawk 138-kV line<br>NW Beloit – Blackhawk 138-kV line  |
| 3             | NW Beloit – Paddock 138kV line   | --   | --                       | --                     | --                       | 96.9%                      | --                       | --                     | --                       | --                          | --                       | Paddock – Townline 138-kV line   |
| 4             | Base case loading criteria exceeded  | FALSE  | --                       | FALSE                  | --                       | FALSE                      | --                       | FALSE                  | --                       | FALSE                       | --                       | System Intact  |
| 4             | Base case voltage criteria exceeded  | --   | FALSE                    | --                     | TRUE                     | --                         | FALSE                    | --                     | FALSE                    | --                          | FALSE                    | System Intact  |
| 4             | Manrap – Custer 69-kV line   | 99.3%  | --                       | --                     | --                       | --                         | --                       | --                     | --                       | --                          | --                       | Dewey – Lakefront 69-kV line   |
| 4             | Glenview – Gravesville 69-kV line  | 103.7%<br>103.7%<br>103.7%<br>97.0%<br>97.0% | --                       | --                     | --                       | --                         | --                       | --                     | --                       | --                          | --                       | Tecumseh Road 138/69 kV Transformer*<br>Tecumseh Road 138/69 kV Transformer<br>Tecumseh Road - Ford Drive tap 69-kV line<br>Ford Drive tap - New Holstein 69-kV line<br>Tecumseh Road - New Holstein 69-kV line* |
| 4             | Sunset Point – Pearl Avenue 69-kV line   | 110.5%<br>110.4%                             | --                       | --                     | --                       | --                         | --                       | 98.9%<br>98.9%         | --                       | --                          | --                       | Ellinwood 138/69-kV transformer*<br>Ellinwood – 12th Avenue 69-kV line   |
| 4             | Morgan – Falls 138-kV line   | --   | --                       | --                     | --                       | 101.8%                     | --                       | --                     | --                       | --                          | --                       | Morgan – Plains 345-kV line  |
| 4             | Elkhart Lake – Saukville 138-kV line   | --   | --                       | --                     | --                       | --                         | --                       | --                     | --                       | 97.9%                       | --                       | Barnhart – Cedarsauk 345-kV line   |
| 4             | Kewaunee 138-kV bus  | --   | --                       | --                     | 103.6%                   | --                         | --                       | --                     | --                       | --                          | --                       | System Intact  |
| 5             | Base case loading criteria exceeded  | FALSE  | --                       | FALSE                  | --                       | FALSE                      | --                       | FALSE                  | --                       | FALSE                       | --                       | System Intact  |
| 5             | Base case voltage criteria exceeded  | --   | FALSE                    | --                     | TRUE                     | --                         | FALSE                    | --                     | FALSE                    | --                          | FALSE                    | System Intact  |
| 5             | Oak Creek 345/230-kV transformer T895  | 104.3%<br>102.5%                             | --                       | --                     | --                       | --                         | --                       | 104.4%<br>102.5%       | --                       | 102.7%<br>99.8%             | --                       | Split Oak Creek 230-kV bus 78<br>Split Oak Creek 230-kV bus 67   |
| 5             | Bain 345/138-kV transformer #5   | 158.4%<br>104.6%                             | --                       | --                     | --                       | --                         | --                       | --                     | --                       | --                          | --                       | Split Pleasant Prairie 345-kV bus 34<br>Split Pleasant Prairie 345-kV bus 23   |
| 5             | Arcadian4 – Waukesha1 138-kV line  | 98.4%  | --                       | --                     | --                       | 110.2%                     | --                       | 120.4%                 | --                       | --                          | --                       | Arcadian6 – Waukesha3 138-kV line  |
| 5             | Arcadian6 – Waukesha3 138-kV line  | 95.3%  | --                       | --                     | --                       | 106.8%<br>95.8%            | --                       | 116.6%<br>102.0%       | --                       | --                          | --                       | Arcadian4 – Waukesha1 138-kV line<br>Split Waukesha 1-2 bus  |
| 5             | Arcadian 345/138-kV transformer #3   | --   | --                       | --                     | --                       | --                         | --                       | 95.9%                  | --                       | --                          | --                       | Arcadian 345/138-kV transformer #1   |
| 5             | Pleasant Prairie – Zion 345-kV line  | --   | --                       | --                     | --                       | --                         | --                       | --                     | --                       | 108.2%<br>101.1%<br>98.8%   | --                       | Zion – Arcadian 345-kV line<br>Zion - Arcadian 345-kV line <sup>14</sup><br>System Intact  |
| 5             | Lakeview – Zion 138-kV line<br>Arcadian – Zion 345-kV line<br>Kenosha - Lakeview 138-kV line | 96.8%<br>--<br>99.6%                         | --                       | --                     | --                       | --                         | --                       | --                     | --                       | 144%<br>108.1%<br>141.9%    | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Bain – Kenosha 138-kV line   | --   | --                       | --                     | --                       | --                         | --                       | --                     | --                       | 107.8%                      | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Albers – Kenosha 138-kV line   | --   | --                       | --                     | --                       | 100.4%                     | --                       | --                     | --                       | --                          | --                       | Albers – Bain 138-kV line  |
| 5             | Maple and Germantown 138-kV buses  | --   | --                       | --                     | --                       | --                         | --                       | --                     | 89.7-90.3%               | --                          | --                       | Saukville – Maple 138-kV line  |

Table ZS-4  
2026 Limitations and Performance Criteria Exceeded

| Planning Zone | Criteria Exceeded/Need  | 2026 Summer Peak Case   |  | Facility Outage(s)   |
|---------------|---|---|--|--|
|               |   | % of Facility Rating  | % of Nominal Bus Voltage                                     |  |
| 1             | Base case loading criteria exceeded   | TRUE  | --   | System Intact  |
| 1             | Base case voltage criteria exceeded   | --  | TRUE   | System Intact  |
| 1             | Silver Lake, ACEC Spring Lake, Redgranite, Fountain Valley, River Run, Berlin and Fox River 69-kV buses | --  | 90.0 - 91.7%<br>91.0 - 91.2%<br>91.2 - 91.4%<br>91.8 - 91.9% | Wautoma – Silver Lake Tap 69-kV line<br>Ripon - Northwest Ripon Tap 69-kV line<br>Metomen – Ripon 69-kV line<br>Silver Lake – ACEC Spring Lake 69-kV line  |
| 1             | Dartford, Ripon Industrial Park, Northwest Ripon and Ripon 69-kV buses                                  | --  | 96.4%<br>88.3 - 89.8%<br>88.5 - 89.9%<br>90.4 - 91.8%        | System Intact<br>Ripon - Northwest Ripon Tap 69-KV line<br>Metomen – Ripon 69-kV line<br>Northwest Ripon Tap - Dartford Tap 69-KV line   |
| 1             | Winneconne, Omro and Omro Industrial Park 69-kV buses   | --  | 89.4 - 90.0%   | Winneconne – Sunset Point 69-kV line   |
| 1             | Castle Rock – ACEC Quincy 69-kV line  | 101.1%  | --   | Necedah Tap – Big Pond 69-kV line<br>Pettenwell – Big Pond 69-kV line<br>Pettenwell 138/69-kV transformer  |
| 1             | Metomen 138/69 KV transformer   | 100.5%<br>101.4%<br>100.0%                                      | --   | System Intact<br>North Fond du Lac 138/69-kV transformer<br>North Fond du Lac – Rosendale Tap 69-kV line   |
| 1             | Pettenwell 138/69-kV transformer  | 106.2%<br>110.2%<br>107.9%<br>107.5%<br>107.3%<br>98.6 - 106.2% | --   | System Intact<br>Castle Rock – Quincy ACEC 69-kV line<br>McKenna – Quincy ACEC 69-kV line<br>Hilltop – Buckhorn Tap 69-kV line<br>Castle Rock - McKenna 69-kV line <sup>25</sup><br>Plus other less severe contingencies |
| 1             | Wautoma - ACEC Wautoma Tap 69-kV line   | 96.9%   | --   | Harrison North - Harrison 69-kV line   |
| 2             | Base case loading criteria exceeded   | FALSE   | --   | System Intact  |
| 2             | Base case voltage criteria exceeded   | --  | FALSE  | System Intact  |
| 2             | Hulbert, Eckermann, Lou-Pac, Newberry Village, Roberts, Talantino 69-kV buses                           | --  | 83.5 - 89.4%<br>88.1 - 91.5%<br>86.4 - 90.8%<br>86.7 - 91.2% | Engadine – Newberry 69-kV line<br>Newberry – Newberry Hospital 69-kV line<br>Newberry Hospital – Roberts 69-kV line<br>Hiawatha – Roberts 69-kV line 6911 <sup>24</sup>  |
| 3             | Base case loading criteria exceeded   | FALSE   | --   | System Intact  |
| 3             | Base case voltage criteria exceeded   | --  | FALSE  | System Intact  |
| 3             | Timberlane Tap – West Middleton 69-kV line  | 95.6%   | --   | Spring Green 138/69-kV transformer   |
| 3             | West Middleton – Pheasant Branch 69-kV line   | 107.8 – 96.5%   | --   | Waunakee Switching – Waunakee Municipal 2 69-kV line<br>Westport – Waunakee Municipal 2 69-kV line<br>West Middleton 138/69-kV transformer   |
| 3             | West Middleton 138/69-kV transformer  | --  | --   | West Middleton 138/69-kV transformer   |
| 3             | Westport – Waunakee Muni2 69-kV line  | 114.7%  | --   | West Middleton – Pheasant Branch 69-kV line  |
| 3             | Waunakee Industrial Park – Huiskamp 69-kV line  | 95.7%   | --   | West Middleton – Pheasant Branch 69-kV line  |
| 3             | Royster – Sycamore 69-kV line   | 115.0%  | --   | Femrite 138/69-kV transformer  |
| 3             | Huiskamp 138-kV bus   | --  | 88.7%  | Huiskamp – North Madison 138-kV line   |
| 3             | Verona 138-kV bus   | --  | 86.0%  | Verona – Oak Ridge 138-kV line   |
| 3             | Hubbard and Hustisford 138-kV bus   | --  | 87.0%<br>87.7%<br>87.7%                                      | Rubicon – Hustisford 138-kV line<br>Hustisford – Hubbard 138-kV line<br>Rubicon – Hustisford – Hubbard 138-kV line   |
| 3             | Alto 69-kV bus  | --  | 96.8%  | System Intact  |
| 4             | Base case loading criteria exceeded   | FALSE   | --   | System Intact  |
| 4             | Base case voltage criteria exceeded   | --  | FALSE  | System Intact  |
| 4             | Manrap – Custer 69-kV line  | 106.2%  | --   | Dewey – Lakefront 69-kV line   |

Table ZS-4  
2026 Limitations and Performance Criteria Exceeded

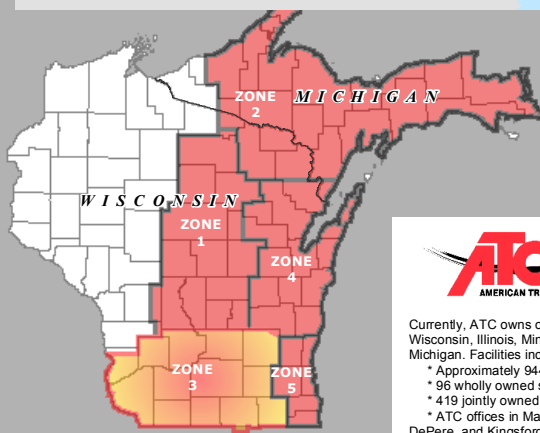
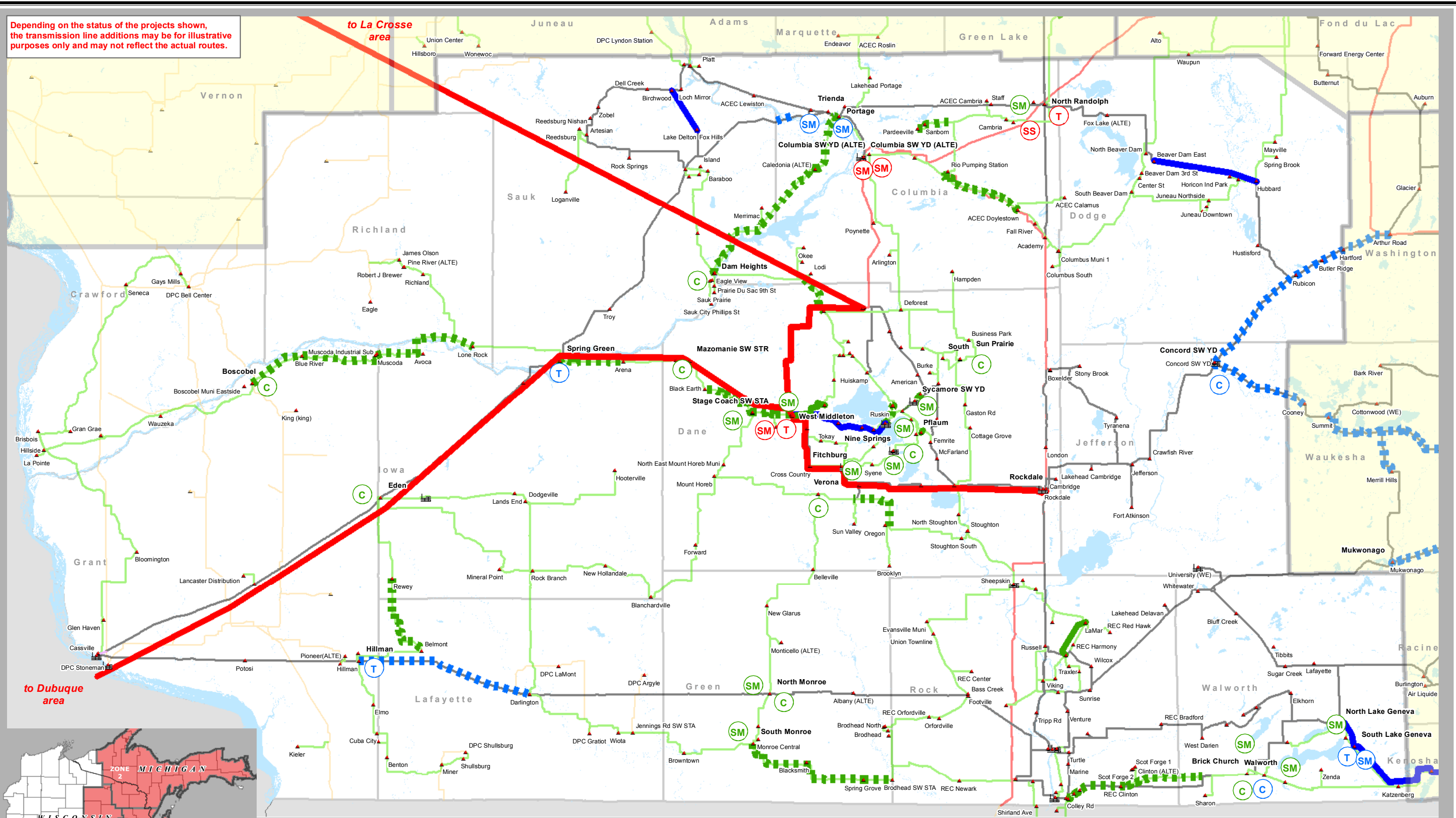
| Planning Zone | Criteria Exceeded/Need                 | 2026 Summer Peak Case      |                          | Facility Outage(s)   |
|---------------|--|----------------------------|--------------------------|--|
|               |  | % of Facility Rating       | % of Nominal Bus Voltage |  |
| 4             | Glenview – Gravesville 69-kV line      | 101.5%<br>101.5%<br>101.5% | --                       | Tecumseh Road 138/69-kV transformer <sup>24</sup><br>Tecumseh Road 138/69-kV transformer<br>Tecumseh Road – Ford Drive 69-kV |
| 4             | Sunset Point – Pearl Avenue 69-kV line | 113.2%<br>112.9%           | --                       | Ellinwood – 12th Avenue 69-kV line<br>Ellinwood 138/69-kV transformer <sup>20</sup>  |
| 5             | Base Case Loading Criteria Exceeded    | FALSE                      | --                       | System Intact  |
| 5             | Base Case Voltage Criteria Exceeded    | --                         | FALSE                    | System Intact  |
| 5             | Bluemound 230-kV buses #1, #2 and #3   | --                         | 95.8%                    | System Intact  |
| 5             | Brookdale East, Allerton 138-kV buses  | --                         | 95.5 - 95.9%             | System Intact  |
| 5             | Bain 345/138-kV transformer #5         | 158.9%<br>99.5%            | --                       | Split Pleasant Prairie 345-kV bus 34<br>Split Pleasant Prairie 345-kV bus 23   |
| 5             | Oak Creek 345/230-kV transformer T895  | 102.4%<br>104.7%           | --                       | Split Oak Creek 230-kV bus 67<br>Split Oak Creek 230-kV bus 78   |
| 5             | Kenosha – Lakeview 138-kV line         | 103.0%                     | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Lakeview – Zion 138-kV line            | 99.3%                      | --                       | Pleasant Prairie – Zion 345-kV line  |
| 5             | Pennsylvania 138-kV bus                | --                         | 91.6%                    | Oak Creek – Pennsylvania 138-kV line   |
| 5             | Arcadian – Waukesha 138-kV line        | --                         | 96.8%                    | Arcadian – Waukesha 138-kV line  |

*Table ZS-10  
Zone 3 Load and Generation*

| Zone 3   | 2012    | 2016    | 2021    | 2026    |
|--|---------|---------|---------|---------|
| Peak Forecast (megawatts)  | 2975.9  | 3124.5  | 3363.2  | 3600.4  |
| Average Peak Load Growth   | N/A     | 1.23%   | 1.48%   | 1.37%   |
| Existing Generation Capacity (megawatts)   | 1203.2  | 1203.2  | 1203.2  | 1203.2  |
| Existing Capacity Less Load (megawatts)  | -1772.7 | -1921.3 | -2160   | -2397.2 |
| Existing Generation Capacity plus Modeled<br>Generating Capacity Additions (megawatts) | 1203.2  | 1351.9  | 1351.9  | 1351.9  |
| Modeled Capacity Less Load (megawatts)   | -1772.7 | -1772.6 | -2011.3 | -2248.5 |

Figure PR-3

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.



### 2011 10-Year Assessment Projects PLANNING ZONE 3

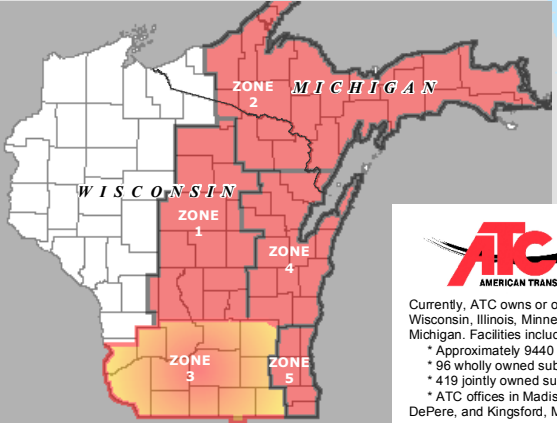
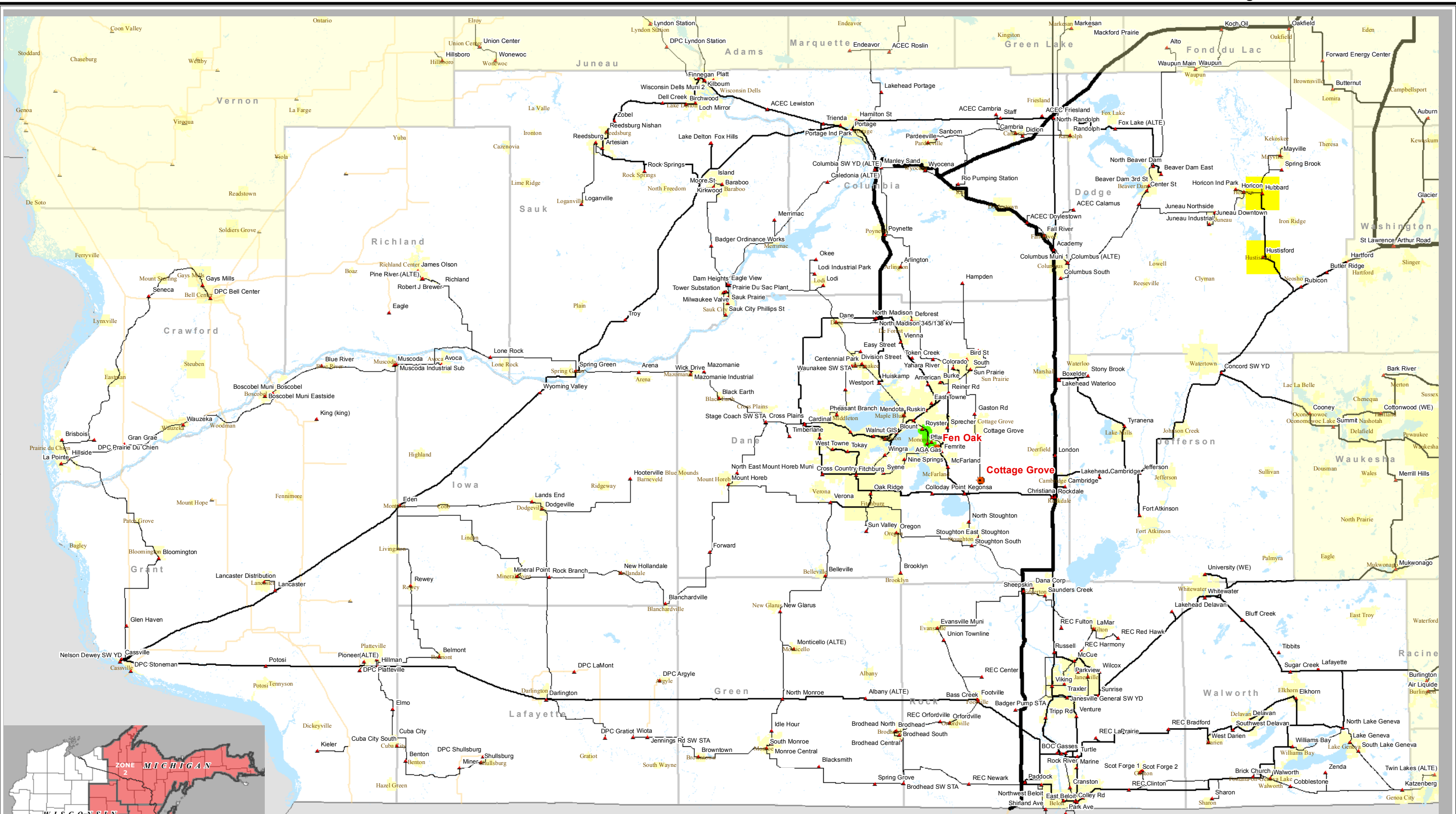
Currently, ATC owns or operates transmission facilities in Wisconsin, Illinois, Minnesota, and the Upper Peninsula of Michigan. Facilities include:  
 \* Approximately 9440 miles of transmission lines  
 \* 96 wholly owned substations  
 \* 419 jointly owned substations  
 \* ATC offices in Madison, Cottage Grove, Pewaukee, DePere, and Kingsford, MI

- New 69kV Transmission Line
- - - - Rebuilt 69 kV Transmission Line
- New 115, 138 or 161 kV Transmission Line
- - - - Rebuilt 115, 138 or 161 kV Transmission Line
- New 345 kV Transmission Line
- - - - Rebuilt 345 kV Transmission Line
- Transmission Line Voltage Conversion

- SS New Substation
- SM Substation Modifications
- T-D T-D Interconnection
- C Capacitor Bank
- T Transformer

- #### Existing Transmission Facilities
- ▲ ATC Substation, Switchyard or Terminal
  - ⚡ Generation
  - ▲ Non-ATC Substation, Switchyard or Terminal
  - Non-ATC Transmission Line
- #### ATC Transmission Lines
- 69 kV
  - 115 kV
  - 138 kV
  - 161 kV
  - 230 kV
  - 345 kV

Figure ZS-9



**ATC**  
AMERICAN TRANSMISSION COMPANY

Currently, ATC owns or operates transmission facilities in Wisconsin, Illinois, Minnesota, and the Upper Peninsula of Michigan. Facilities include:  
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 \* ATC offices in Madison, Cottage Grove, Pewaukee, DePere, and Kingsford, MI

The information presented in this map document is advisory and is intended for reference purposes only. American Transmission Company owned and operated facility locations are approximate.

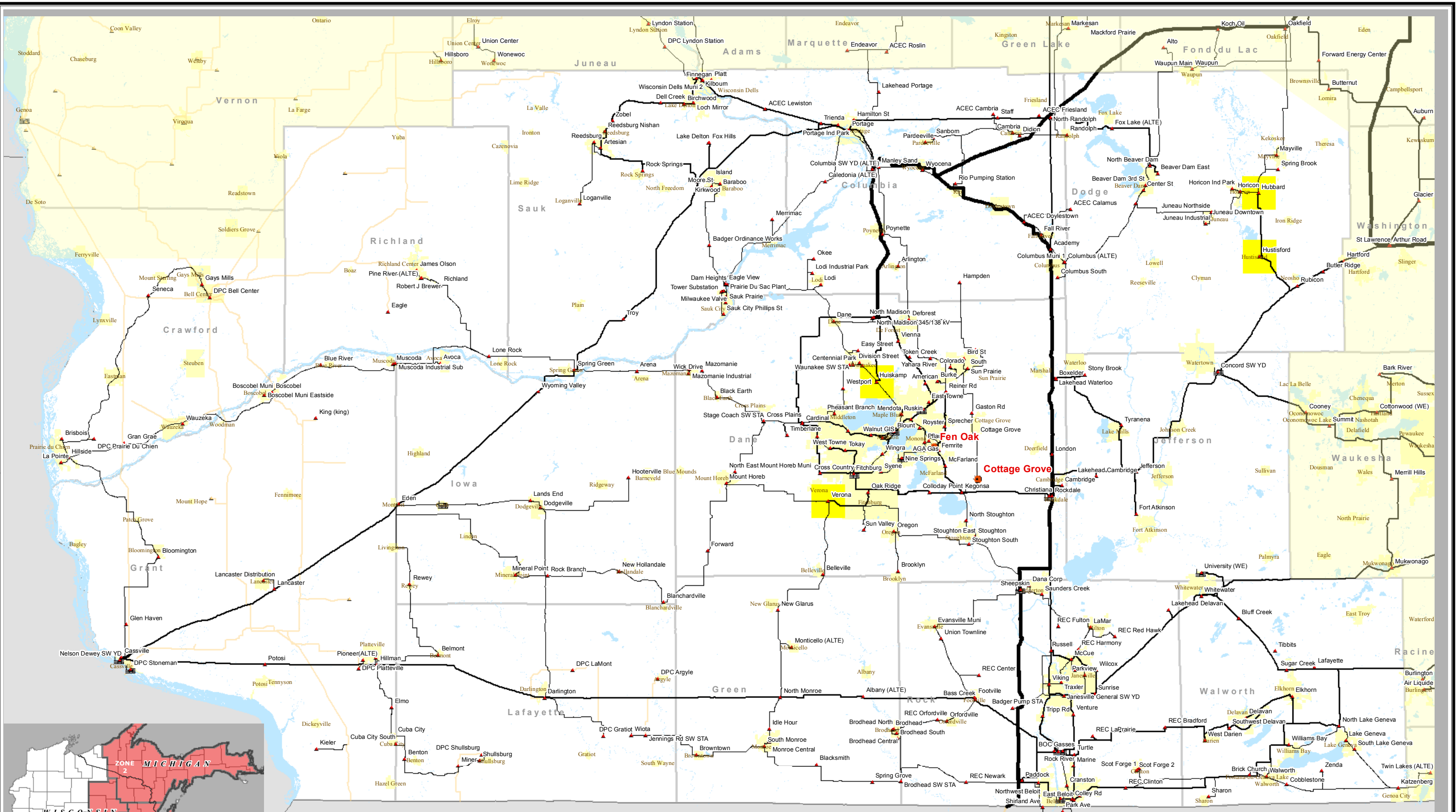
Performance Criteria Exceeded and Other Constraints (2011-2012)  
**PLANNING ZONE 3**

- High or Low Bus Voltage
- Overloaded Facility

- Existing Transmission Facilities**
- ATC Office Location
  - ATC Substation, Switchyard or Terminal
  - Non-ATC Substation, Switchyard or Terminal
  - Generation
  - ATC Transmission Line (width = voltage)
  - Non-ATC Transmission Line



Figure ZS-10



Performance Criteria Exceeded and Other Constraints (2013-2016)  
**PLANNING ZONE 3**

- High or Low Bus Voltage
- Overloaded Facility

- Existing Transmission Facilities**
- ATC Office Location
  - ▲ ATC Substation, Switchyard or Terminal
  - ▲ Non-ATC Substation, Switchyard or Terminal
  - ☐ Generation
  - ATC Transmission Line (width = voltage)
  - Non-ATC Transmission Line

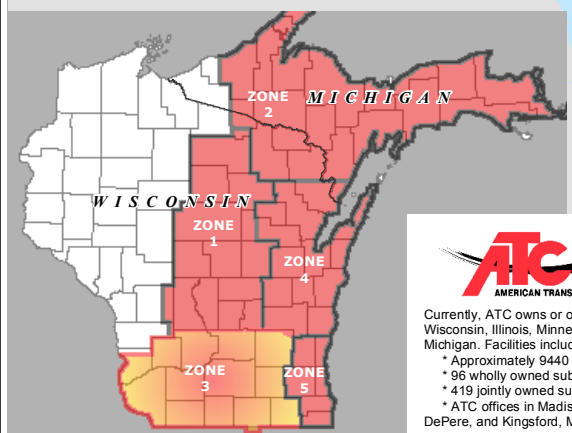
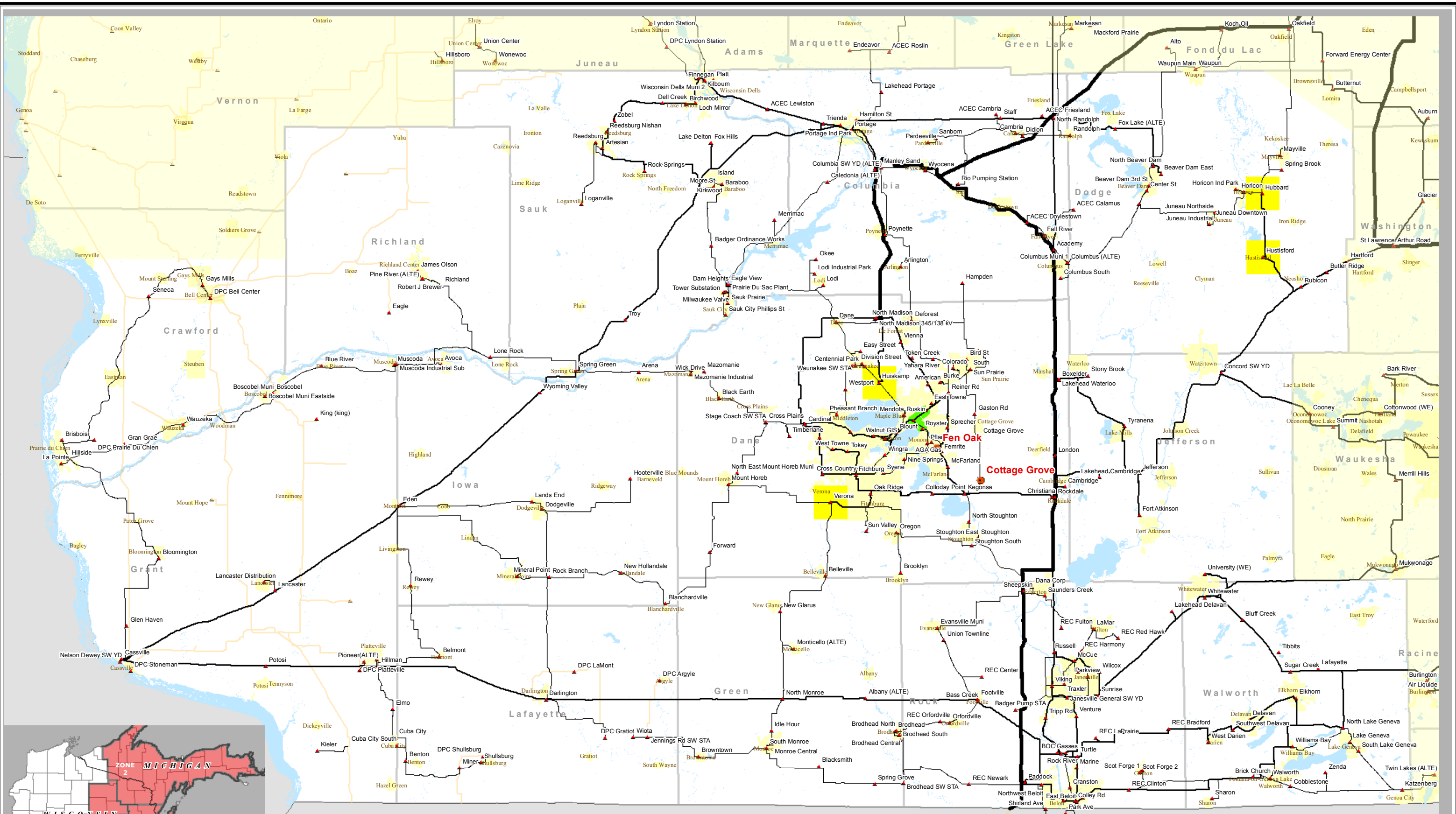
**ATC**  
 AMERICAN TRANSMISSION COMPANY

Currently, ATC owns or operates transmission facilities in Wisconsin, Illinois, Minnesota, and the Upper Peninsula of Michigan. Facilities include:

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Figure ZS-11



**ATC**  
AMERICAN TRANSMISSION COMPANY

Currently, ATC owns or operates transmission facilities in Wisconsin, Illinois, Minnesota, and the Upper Peninsula of Michigan. Facilities include:  
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 \* 96 wholly owned substations  
 \* 419 jointly owned substations  
 \* ATC offices in Madison, Cottage Grove, Pewaukee, DePere, and Kingsford, MI

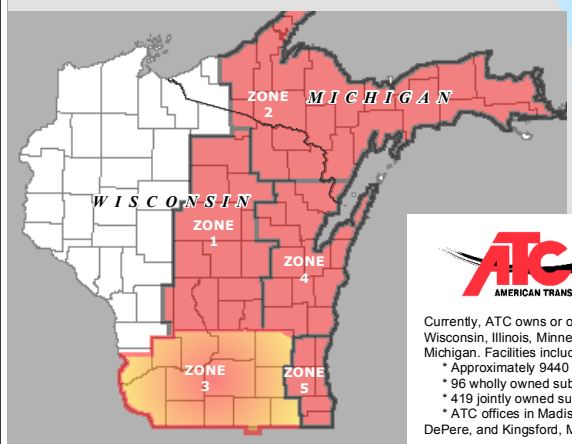
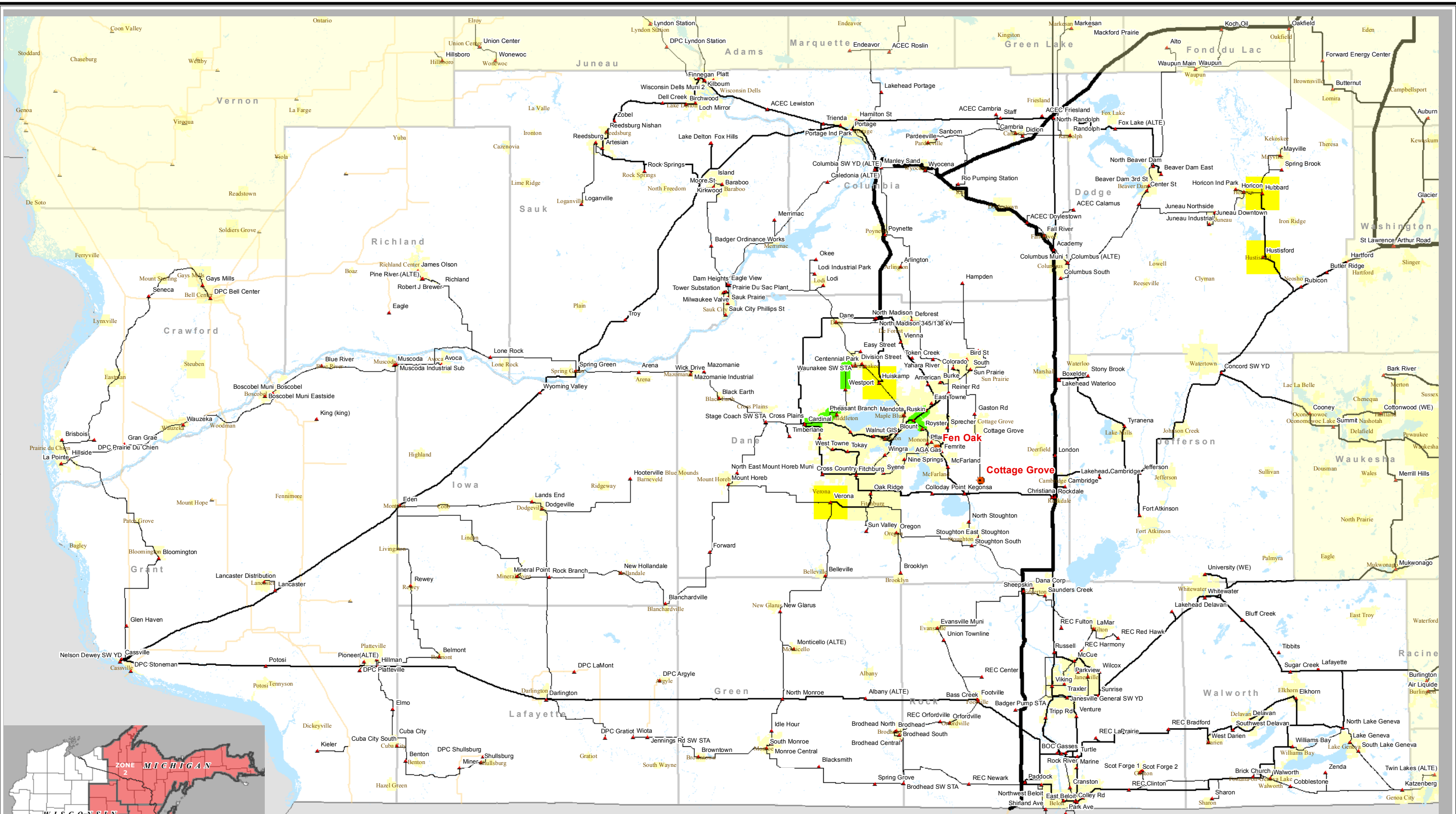
Performance Criteria Exceeded and Other Constraints (2017-2021)  
**PLANNING ZONE 3**

- High or Low Bus Voltage
- Overloaded Facility

- Existing Transmission Facilities**
- ATC Office Location
  - ATC Substation, Switchyard or Terminal
  - Non-ATC Substation, Switchyard or Terminal
  - Generation
  - ATC Transmission Line (width = voltage)
  - Non-ATC Transmission Line

The information presented in this map document is advisory and is intended for reference purposes only. American Transmission Company owned and operated facility locations are approximate.

Figure ZS-12



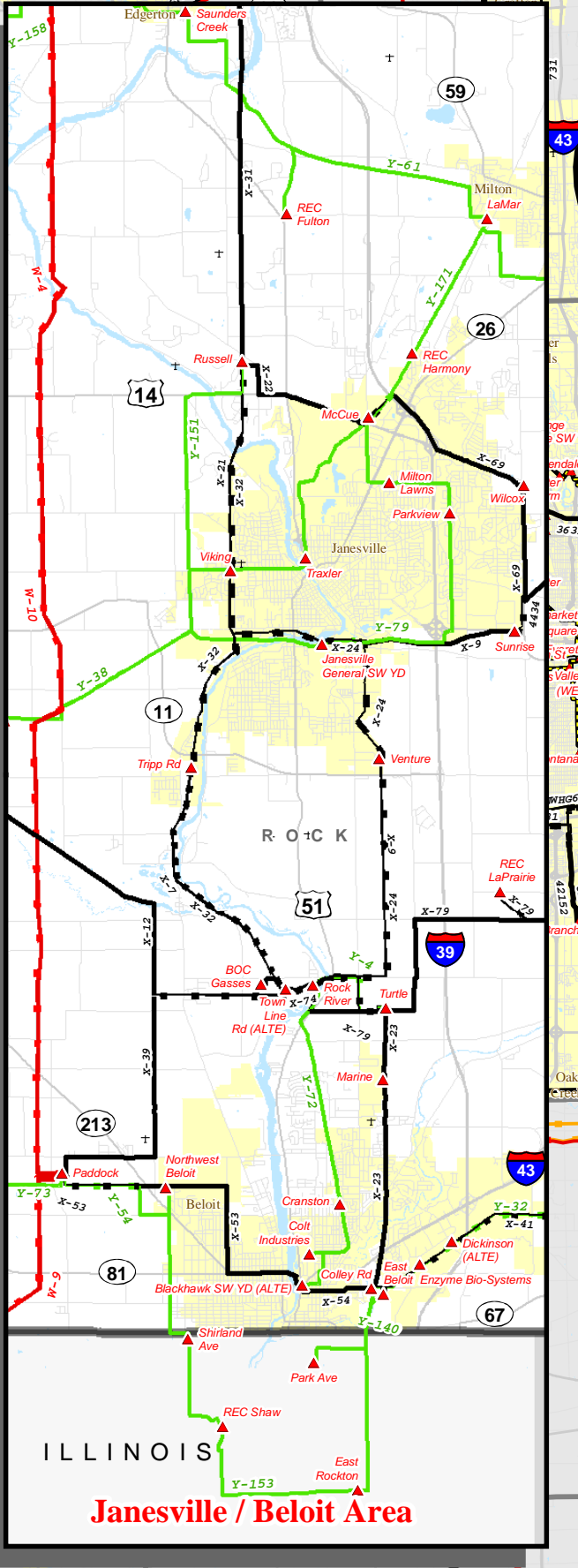
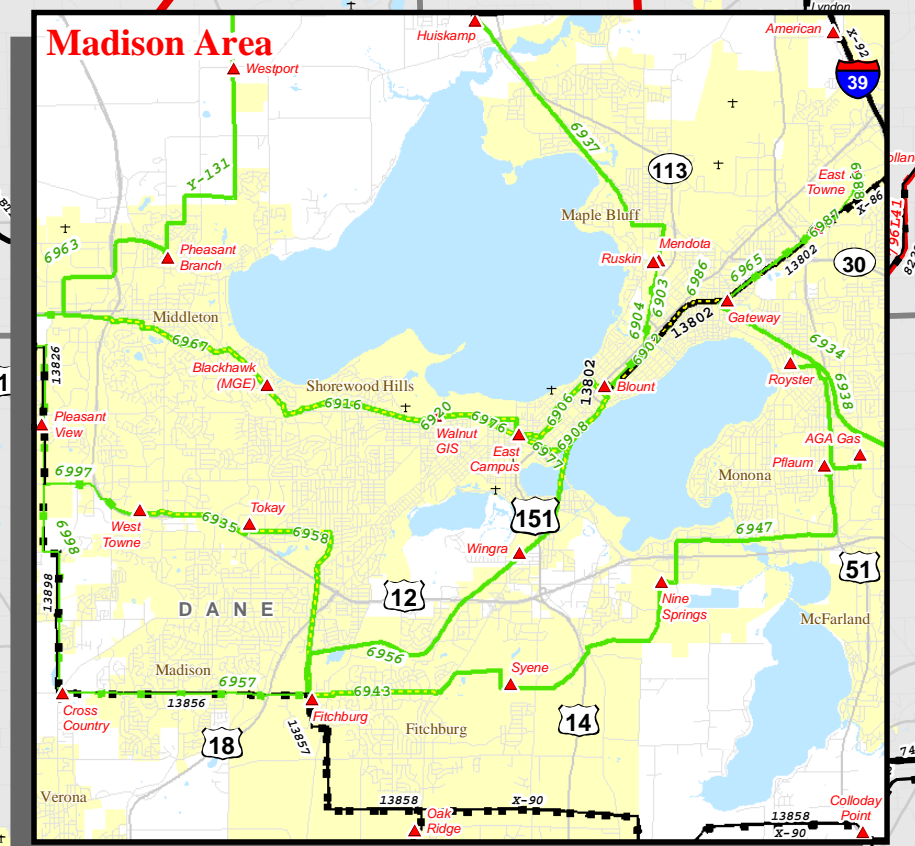
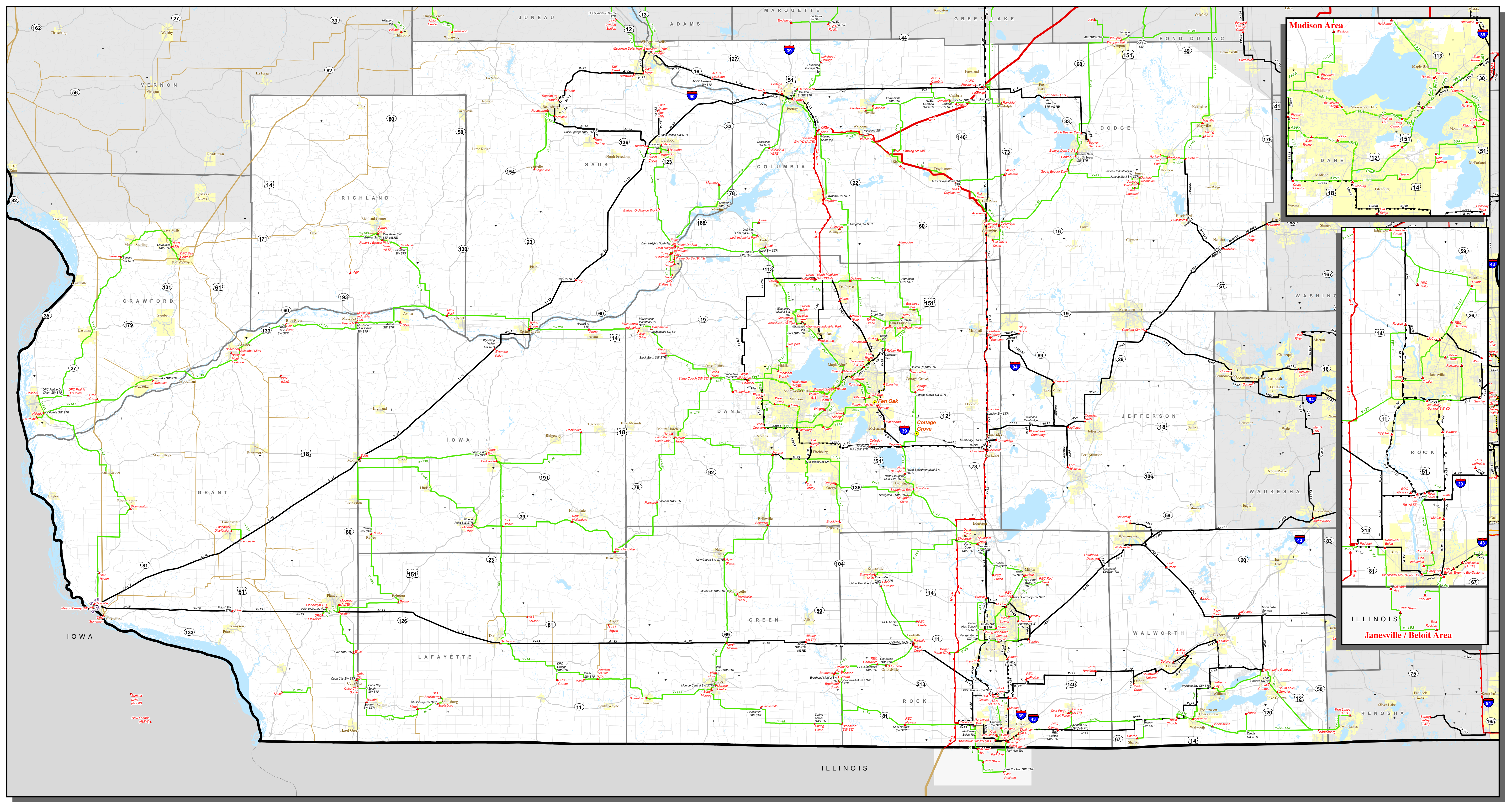
Currently, ATC owns or operates transmission facilities in Wisconsin, Illinois, Minnesota, and the Upper Peninsula of Michigan. Facilities include:  
 \* Approximately 9440 miles of transmission lines  
 \* 96 wholly owned substations  
 \* 419 jointly owned substations  
 \* ATC offices in Madison, Cottage Grove, Pewaukee, DePere, and Kingsford, MI

The information presented in this map document is advisory and is intended for reference purposes only. American Transmission Company owned and operated facility locations are approximate.

Performance Criteria Exceeded and Other Constraints (2022-2026)  
**PLANNING ZONE 3**

- High or Low Bus Voltage
- Overloaded Facility

- Existing Transmission Facilities**
- ATC Office Location
  - ATC Substation, Switchyard or Terminal
  - Non-ATC Substation, Switchyard or Terminal
  - Generation
  - ATC Transmission Line (width = voltage)
  - Non-ATC Transmission Line

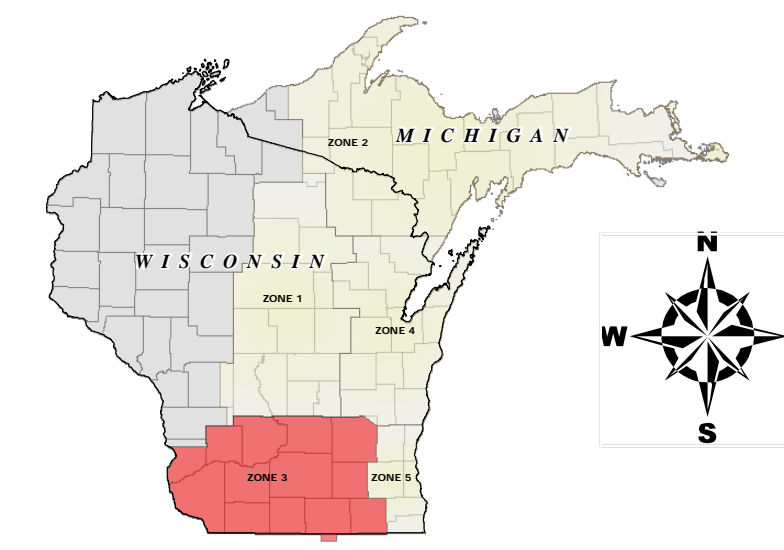
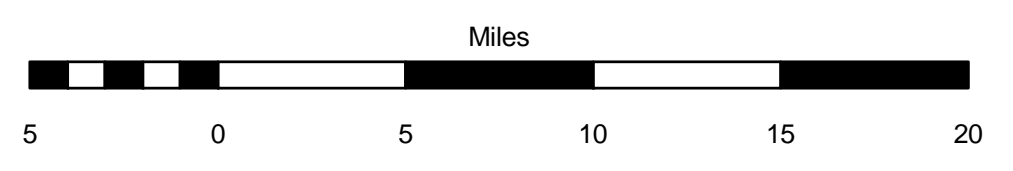


Electric Transmission and Related Facilities

| Transmission Facilities |  | Transmission Line Voltage and Type |   | Non-ATC |         |
|-------------------------|--|------------------------------------|---|---------|---------|
|                         | Substation or Switching Yard                 |                                    | 69 kV   |         | < 50 kV |
|                         | Tap or Switching Structure                   |                                    | 115 kV Double Circuit   |         | 69 kV   |
|                         | Generation                                   |                                    | 138 kV Double Circuit   |         | 88 kV   |
|                         | ATC Office Location                          |                                    | 161 kV Double Circuit   |         | 115 kV  |
|                         | Airport, Airstrip or Helicopter Landing Area |                                    | 230 kV Double Circuit   |         | 161 kV  |
|                         |  |                                    | 345 kV Double Circuit   |         | 345 kV  |
|                         |  |                                    | 69 kV Underground   |         |         |
|                         |  |                                    | 115 kV Underground  |         |         |
|                         |  |                                    | 138 kV Underground  |         |         |
|                         |  |                                    | 161 kV Underground  |         |         |
|                         |  |                                    | 230 kV Underground  |         |         |
|                         |  |                                    | 345 kV Underground  |         |         |
|                         |  |                                    | Non-Op Underground  |         |         |
|                         |  |                                    | Mixed voltage double circuit lines drawn with each line color corresponding to the appropriate voltage. |         |         |

Transmission Network and Substations

PLANNING ZONE 3



Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:  
 \* Approximately 9350 miles of transmission lines  
 \* 90 wholly owned substations  
 \* 410 jointly owned substations  
 \* ATC offices in Madison, Cottage Grove, Pewaukee, Oak Grove, Wausau and Kingsford, WI

The information presented in this map document represents the most current and accurate georeferenced compilation of ATC owned and operated transmission facilities available - some facility locations may be approximate. This map is advisory and intended for reference purposes only. Please direct any revisions or corrections to ATC Asset Applications and GIS Group.

Base Map Information: ATC, PSCW, MDNR, WDNR