



## **ZONES AND STUDY RESULTS**

### **Introduction – Updated November 2007**

Following the completion of the 2006 Assessment, ATC recognized that need drivers and solutions have become more stable over the last several Assessments and Updates. We also saw a need to develop more fully the needs and solutions previously identified. To continue to inform stakeholders of changes to our plans and to update the ATC system Assessment in 2007, we chose to have the planners focus on developing projects and needs that had been identified in the 2006 Assessment. The results of the needs and projects analysis in 2007 are being published in this 2007 Update to the 2006 Assessment.

In recent years the federal government has taken additional steps to ensure that transmission-owning utilities, like ATC, have produced and shared planning information with the public and local stakeholders. Since 2001, we have engaged in open and collaborative efforts to share information and solicit input on our plans. We believe that in making our planning efforts transparent and available to the public, the proposals for needed facilities can be more readily understood and accepted by communities that stand to benefit from them. The underlying principles of this approach are now required from utilities that own and plan for new transmission lines. An overview of our planning process is available [here](#).

In the years 2008 and beyond, ATC will be conducting additional public outreach, gathering input from our stakeholders early in the 10-Year Assessment process to include in our assumptions and models. We will also meet with interested stakeholders in the middle of the process to review interim results. This process is intended to provide even more openness and transparency and result in better planning.

This section describes the changes we made to certain planned, proposed and provisional transmission projects since the November, 2006 Assessment. These changes are based on a variety of factors, including regulatory changes, updated information provided by the local distribution companies, up-to-date transmission service requirements, interconnection requests, recent analyses conducted by ATC and input from various stakeholders. The changes in transmission projects proposed by ATC compared to the 2006 Assessment projects are summarized in [Table PR-22](#) and are reflected in [Figures PR-1 through PR-5](#) for Zones 1-5, respectively. The entire 2007 Assessment Update project list (2007-2016) is found in [Tables 2007 PR-2 through PR-12](#). Finally, a listing of maintenance, operations or protection projects over \$0.5M can be found in [Table PR-24](#).



The rationale for some of the project changes listed in Table PR-22 is self-explanatory. However, for a more detailed description and discussion of the rationale for the changes please refer to Zone 1 – Updated Study Results, Zone 2 – Updated Study Results, Zone 3 – Updated Study Results, Zone 4 – Updated Study Results and Zone 5 – Updated Study Results.

### **Zone 1 Updated Study Results**

Refer to Table PR-22 Summary of Changes in this Update.

#### **Cancelled projects**

##### *Rebuild/reconductor Petenwell-Saratoga 138-kV line*

This project was cancelled due to recent updated study results, but may be a candidate for future economic benefits analysis.

#### **Deferred projects**

##### *Construct Brandon-Fairwater 69-kV line*

This project was proposed in response to a request from Alliant Energy for a new distribution interconnection near the community of Fairwater. Alliant Energy recently submitted a T-D interconnection change form to defer the in-service date of this interconnection request from 2008 to 2010.

##### *Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line*

This project was proposed in response to a request from Alliant Energy for a new distribution interconnection near the community of Ripon. Alliant Energy recently submitted a T-D interconnection change form to defer the in-service date of this interconnection request from 2012 to 2013.

##### *Construct Monroe County-Council Creek 161-kV line*

##### *Install a 161/138-kV transformer at Council Creek Substation*

##### *Upgrade Council Creek-Petenwell 138-kV line*

Several potential projects have been evaluated to address the system need for periodic separation of the ATC-Dairyland Power Cooperative facilities at the Council Creek Substation. They include a phase-shifting transformer, series reactor, capacitor banks, operating guides, or a combination. To address the near-term pre- and post- contingency issues, capacitor banks were installed on the Council Creek 138-kV bus in 2006 in combination with the continued use of the Council Creek operation guide. We are currently working in cooperation with Dairyland Power Cooperative and Xcel Energy to develop a more comprehensive long-term solution to address reliability issues in the Tomah area as well as the limitations of the Monroe County-Council Creek transmission corridor. The proposed solution will be to replace the existing 69-kV circuit between the Monroe County and Council Creek Substations with a new 161/69-kV double-circuit line in 2012. This



project has been deferred from 2010 to allow time to finalize need, obtain regulatory approval and implement the approved project.

### **Other project changes**

#### *Berlin capacitor banks (2008):*

Since the release of the 2006 10-Year Assessment, ATC has continued to assess the reactive power requirements for the Berlin area in an effort to optimize the size and location of the capacitor banks. The recently completed studies indicated the following capacitor installations as the configuration providing the most system benefits with the overall lowest estimated project costs:

- Upgrade existing 4.1 MVAR capacitor bank at Berlin to 8.2 MVAR
- Upgrade existing 5.4 MVAR capacitor bank at Berlin to 10.8 MVAR

#### *Gardner Park-Hwy 22 345-kV line (2009):*

The previously named Central Wisconsin Substation has been renamed Hwy 22.

### **New projects**

None

For a comprehensive list and graphical depiction of projects in Zone 1, please refer to [Table PR-13](#) and [Figure PR-1](#).

### **Zone 2 Updated Study Results**

Refer to [Table PR-22](#) Summary of Changes.

After completing the 2007 Update process late in the summer of 2007, ATC became aware of the potential for extremely low hydro output in the eastern portion of the upper peninsula of Michigan, particularly during times of winter peak loads. During the fall of 2007, ATC has been working with customers in this area to develop emergency plans to prevent overloads and extremely low voltages in this area if critical equipment were to fail to operate as needed. Some emergency projects ATC is developing, which we were not able to include in the 2007 Update project lists, include second transformers at the Straits and Hiawatha substations and advancing installation of capacitor banks at the Nine Mile Substation. ATC is continuing to work with our customers to explore longer term solutions that continue to provide reliable transmission service in this area.

### **Cancelled projects**

#### *Uprate M38 138/69-kV transformer*

This project was cancelled due to the last study results. However, a more recent review of area load suggests a potential need may reappear in the near future.



*Install 1-5.4 MVAR capacitor bank at Sawyer*

This project was replaced with a distribution capacitor bank solution.

**Deferred projects**

*Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV*

This 2008 proposed project has been deferred to 2009 as a result of revised construction schedules.

*Relocate Cedar Substation (North Lake)*

This 2008 proposed project has been deferred to 2009 as a result of revised construction schedules to support development of other critical projects.

*Rebuild/convert Conover-Plains 69-kV line to 138 kV*

*Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove Substation*

*Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen Substation*

*Relocate Iron River Substation (Iron Grove)*

These 2009 proposed projects have been deferred to 2010 due to regulatory approval delays.

*Install second 345/138-kV transformer at Plains Substation*

This 2008 proposed project has been deferred to 2009 due to updated power flow modeling.

*Rebuild/convert Blaney Park-Munising 69-kV line to 138 kV*

Portions of the Blaney Park-Munising 69-kV line will need to be rebuilt due to poor physical condition. Reliability of service to customers served by this line is also a concern because this relatively long line is currently operated radially from Munising (open at Blaney Park). The condition and rating of the line prevents us from closing both ends at the same time. If this line is converted to 138 kV, it also could provide the continuation of another 138-kV outlet from the Presque Isle Power Plant in the Marquette area, enhancing the reliability of the substation. This provisional project has been deferred from 2012 to at least 2013 to allow time to establish an appropriate long-term plan for the area that considers whether the line should be rebuilt at 138 kV or at 69 kV.

**Other project changes**

*Install 1-4.08 MVAR capacitor bank at Roberts 69-kV Substation (2008)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recently completed studies indicate that 1-4.08 MVAR capacitor bank will provide sufficient voltage support to the area, instead of the larger 5.4-MVAR size previously proposed.



**November 2007 10-Year Assessment**  
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*Install 2-4.08 MVAR capacitor banks at Munising 69-kV Substation (2008)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recently completed studies indicate that 2-4.08 MVAR capacitor banks will provide sufficient voltage support to the area, instead of the larger 2-5.4 MVAR banks previously proposed.

*Uprate Chandler-Cornell 69-kV line clearance from 130 to 167 degrees F (2009)*

This project's status has been changed from provisional to proposed. The in-service date has been changed from 2010 to 2009 as a result of revised construction schedules.

*Construct new Mackinac 138/69-kV Substation*

*Rebuild Hiawatha-Pine River 69-kV line ESE\_6908*

These two projects were previously proposed as a more comprehensive Eastern Upper Peninsula (U.P.) review, but have recently been changed to provisional status with yet to be determined in-service dates. Our ongoing review will assess if all or some of those projects should still be constructed in the future, constructed in a phased manner, or perhaps a different set of projects proposed. The results of this review and ATC's future transmission plans in the Eastern U.P. will be communicated when the review is more fully developed.

**New projects**

Since the 2007 Update analysis was completed, two emergency projects have been proposed in the eastern Upper Peninsula. The following two additional projects have been recently added to our plans:

- Install second 138/69-kV transformer at Straits Substation
- Install second 138/69-kV transformer at Hiawatha Substation

As a result of the recent proposal of these projects, they do not yet appear in the tables or figures outlined in this Update. These two projects will be in-service by the end of 2007.

*Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks (2008)*

*Install 2-16.32 MVAR capacitor banks at Perkins 138-kV Substation (2009)*

*Install 1-16.33 MVAR capacitor bank at Hiawatha 138-kV Substation (2009)*

*Install 2-4.08 MVAR capacitor banks at 9 Mile 69-kV Substation (2010)*

*Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation (2010)*

These proposed projects will boost the voltage in the Eastern Upper Peninsula under normal and single contingency conditions to acceptable levels until additional reinforcements can be implemented in the area.



*Uprate Empire-Forsyth 138-kV line to 302 MVA (2008)*

This planned project will boost the voltages in the Marquette County area under single contingency conditions to acceptable levels.

For a comprehensive list and graphical depiction of projects in Zone 2, please refer to Table PR-14 and Figure PR-2.

**Zone 3 Updated Study Results**

Refer to Table PR-22 Summary of Changes.

**Cancelled projects**

*Construct Huiskamp-Blount 138-kV line*

A major driver to watch that may affect the possible construction of Huiskamp-Blount is the announcement that the Blount Coal Units are scheduled for retirement in 2011. This news will require a careful impact study including re-evaluation of the Huiskamp-Blount project. This 2012 project has been deferred outside of the 10-Year Assessment timeframe because further studies are needed to determine the need, scope and in-service date.

*Uprate North Monroe-Idle Hour 69-kV line*

This 2012 project has been cancelled due to recently updated study results.

**Deferred projects**

*Construct a Jefferson-Lake Mills-Stony Brook (Waterloo) 138-kV line*

*Uprate Rockdale to Jefferson 138-kV line*

*Uprate Rockdale to Boxelder 138-kV line*

*Uprate Boxelder to Stony Brook (Waterloo) 138-kV line*

The construction of a new 138-kV line from Jefferson Substation to Stony Brook Substation in Waterloo has previously been identified as a long-term solution to area voltage problems. The PSCW issued an order to ATC in August of 2006 for the construction of this line with an expectation that it would be completed by 6/1/2008. Several subsequent legal challenges to the PSCW order have been resolved only recently, and ATC has not yet obtained consent from the PSCW on how the design for this project will address the potential of induced voltage on a nearby distribution neutral conductor. It is expected that resolution of this issue may take several additional months. Lack of resolution of these issues has resulted in and will continue to limit ATC's ability to complete detailed design, procure necessary materials, or procure the necessary easement to support the start of construction on the new line in the fall of 2007 to meet the in-service date of 6/1/2008. The new anticipated in-service date of these projects is 2009.



*Construct new Oak Ridge (Fitchburg)-Verona 138-kV line and install a 138/69-kV transformer at Verona (2010)*

*Rebuild the Verona-Oregon 69-kV line Y119 (2011)*

These projects have been deferred from the 2008/9 timeframe to 2010/11 as a result of regulatory delays and alignment of construction schedules. The Fitchburg to Verona 138-kV line and the Rockdale-West Middleton 345-kV line have potential shared corridors with parts or all of the existing Verona-Oregon 69-kV line. Due to the uncertainty of routing decisions on these projects, ATC has decided to delay the rebuild of the Verona-Oregon 69-kV line until these issues are resolved by the PSCW.

*Construct new North Madison-Huiskamp 138-kV line (2009)*

*Construct a new 138/69-kV substation near Huiskamp and install a 187 MVA 138/69-kV transformer (2009)*

These projects were deferred from 2008 to early 2009 as a result of regulatory delays and alignment of construction schedules.

*Rebuild Brodhead-South Monroe 69-kV line*

This 2008 project has been deferred to 2011. A detailed study is nearly completed which will determine the ultimate scope of the rebuild. In conjunction with the Bass Creek project (2013 in-service date), this rebuild will bolster the Brodhead/Monroe/Evansville area voltages and resolve thermal overloads in the foreseeable future. This project might further be delayed to 2012/2013 pending the regulatory application process and resource availability.

*Construct 345-kV line from Rockdale to West Middleton*

*Construct a 345-kV bus and install a 345/138-kV 500 MVA transformer at West Middleton Substation*

The Rockdale-West Middleton 345-kV line will address line overloads and low voltage issues in Dane County and is planned to be in-service by 2013. Demand in Dane County is projected to grow at an above-average rate for the ATC system. High demand coupled with generation retirements, concerns about the age and high cost of remaining generators, and stress on the transmission lines that are critical for importing power to Dane County will continue to increase. These projects have been deferred from 2011 to 2013 due to recently updated study results.

*Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation and install a 138/69-kV transformer at Yahara River*

*Uprate Yahara River-Token Creek 69-kV line*

Low voltages in northeastern Dane County in the future call for additional transmission reinforcement into the area. The provisional project of installing a 138/69-kV transformer at Yahara River Substation and looping the Deforest-Token Creek 69-kV line in and out of



**November 2007 10-Year Assessment**  
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Yahara River can address these problems. These two projects have been deferred from 2011 to 2014 due to a recent Columbia-Deforest line rating revision and updated system study results. The in-service date and project scope may be adjusted or changed depending on load forecast changes and project alternative evaluation.

*Upgrade Columbia 345/138-kV transformer T-22 to 527 MVA*

This project has been deferred from 2008 to 2013 due to recently updated transformer ratings.

*Loop Nine Springs-Pflaum 69-kV line into Femrite Substation*

This project has been recently deferred from 2010 to 2013. This delay will facilitate developing alternatives and anticipated regulatory schedule constraints. A possible interim system solution could be a mixture of dispatching the Nine Springs generation and/or bridging load (i.e. transferring load from one source to another). The project scope could change after a comprehensive project alternative evaluation.

*Install a 138/69-kV transformer at Bass Creek Substation*

*Rebuild/reconductor Town Line Road-Bass Creek 138-kV line*

The Evansville and Brodhead areas are facing unacceptably low voltages under single contingency conditions. In addition, the North Monroe 138/69-kV transformer loading is approaching its summer normal rating under system intact conditions in the foreseeable future under some system conditions. These projects will address these problems and provide one additional 138-kV source into Green County. In conjunction with the Brodhead-South Monroe project (2011 in-service date), these projects will bolster Brodhead/Monroe/Evansville area voltages and resolve thermal overloads in the foreseeable future. These projects have been recently deferred from 2010 to 2013 due to longer lead times and resulting schedule constraints. A possible interim system solution could be distribution capacitor bank additions at the Evansville Substation.

*Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer*

The project scope has been revised since the 2006 Assessment, which was to install a second 46 MVA transformer in 2010. The deferral (from 2010 to 2013) and project scope revision are due to updated transformer ratings and study results.

*Construct new line from Southwest Delavan to Bristol at 138 kV and operate at 69 kV*

This project has been deferred from 2007 to 2008 due to a revised construction schedule.

**Other project changes**

*Install 2-8.16 MVAR capacitor banks at South Lake Geneva 69-kV Substation (2008)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recently completed studies indicate that 2-8.16 MVAR capacitor banks will provide sufficient voltage support to the area and better support ATC





Operations with regard to voltage switching than the previously proposed 1-16.32 MVAR bank.

*Install 3-16.33 MVAR capacitor banks at North Beaver Dam 138-kV Substation (2009)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recently completed studies indicate that 3-16.33 MVAR capacitor banks will provide sufficient voltage support to the area and better support ATC Operations with regard to voltage switching than the previously proposed 2-24.5 MVAR banks. This 2009 project has also been upgraded from a provisional to a proposed status.

*Install 2-24.5 MVAR capacitor banks at Kilbourn 138-kV Substation and 2-24.5 MVAR capacitor banks at Artesian Substation (2009)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recently completed studies indicate that 2-24.5 MVAR capacitor banks at Kilbourn and Artesian (2009) will provide sufficient voltage support to the area.

*Expand the existing 69-kV capacitor bank from 5.4 to 8.1 MVAR at Richland Center Olson Substation and install 1-7.8 MVAR 12.4-kV capacitor bank at Brewer Substation (2009)*

ATC continues to assess reactive power requirements in an effort to optimize the size and location of the capacitor banks. Recent studies indicate that an additional 10.9 MVAR of capacitance in the Richland Center area (2009) will provide sufficient voltage support to the area for the foreseeable future. Currently, another alternative mix of distribution and transmission capacitor banks is under evaluation. The project scope could be altered again if this recent alternative is found to be the best value plan for the area.

*Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation (2010)*

Congestion related to importing power from the areas to the south and southwest of Zone 3 continues to be a major concern. To address this concern, ATC submitted a Certificate of Public Convenience and Necessity (CPCN) application for Paddock-Rockdale on April 16, 2007 with a projected 2010 in-service date. ATC's report entitled, "Planning Analysis of the Paddock-Rockdale Project", showed that this project will provide significant ratepayer benefits. As a result of updated study results, this project includes replacement of the 345/138-kV transformer T22 at Rockdale.

*Upgrade the existing 2-8.16 MVAR banks to 2-16.33 MVAR banks at South Lake Geneva (2010)*

The scope of this provisional project was previously to install a second capacitor bank (16.33 MVAR) at South Lake Geneva. Since the 2008 South Lake Geneva capacitor bank project has been changed from installing one 16.33 MVAR bank to two 8.16 MVAR banks,



this 2010 project was accordingly changed to upgrading the two 8.16 MVAR banks to 16.33 MVAR banks. This project could be revised again if a detailed analysis indicates that switching a 16.33 MVAR bank could cause any switching issues.

*Construct West Middleton-North Madison 345-kV line (TBD)*

This project has been changed from proposed in 2016 to provisional with a yet to be determined in-service date. Further study is needed to determine the scope and in-service date of this project.

**New projects**

*Uprate the Portage 138/69-kV transformer to 143 MVA (2008)*

Due to recently validated ratings on the transformer, it was determined that the Portage transformer would overload at 114% under certain contingencies. As a result, this transformer uprate was proposed to be installed as soon as possible.

*Uprate X-17 Eden-Spring Green 138-kV line to 167 MVA (2008)*

This project was proposed due to a recent as-built line survey, in which it was determined that the existing line clearances were inadequate for reliable system operation.

*Install 12.45 MVAR 69-kV mobile capacitor bank at Brick Church Substation (2009)*

Due to several industrial load additions, by the summer of 2009 the 138-kV bus voltages at the Dickinson Substation will fall below ATC's (NERC Category B) acceptable voltage level of 90% for the loss of the Colley Road-Dickinson 138-kV line. Before a robust long-term system solution is developed, the mobile capacitor bank with distribution power factor correction is needed to provide sufficient voltage support in this area.

*Install 24.5 MVAR 138-kV temporary capacitor bank at Boxelder Substation (2008)*

Due to the delay of the Jefferson-Stony Brook (Waterloo) project, additional voltage support is needed for the summer of 2008 under certain contingencies.

*Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line (schedule to be determined)*

Detailed studies need to be performed to determine the need for, schedule, and final scope of this project.

For a comprehensive list and graphical depiction of projects in Zone 3, please refer to [Table PR-15](#) and [Figure PR-3](#).

**Zone 4 Updated Study Results**

Refer to [Table PR-22](#) Summary of Changes.



### Cancelled projects

None

### Deferred projects

*Construct a 345-kV substation at new Cypress and loop existing Forest Junction-Arcadian 345-kV line into new Cypress*

The 2006 planned project has been deferred to 2007. This change is due to the updated in-service date of the units at Blue Sky and Green Field Wind Farms.

*Rebuild Crivitz-High Falls 69-kV double circuit line*

This project has been deferred from 2008 to 2009 due to ATC resource availability. Deferring the in-service date is possible because of the permanent load shift from Goodman to Metonga as well as the temporary load shift from Sandstone to Crivitz by 2008 summer. The project will address potential low voltages and line overload issues in the area.

*Install 138/69-kV transformer at Custer Substation*

*Construction Shoto to Custer 138-kV line*

These projects have been deferred from 2012 to 2014 due to updated study results. The projects will address potential line overload issues in the area.

### Other project changes

*Expand the Menominee 69-kV Substation and install 138-kV terminals; loop the West Marinette-Bay de Noc 138-kV line into the Substation (2008)*

*Install 138/69-kV transformer at the expanded Menominee Substation (2008)*

These projects have changed from provisional to proposed status.

*Install 2-1.2 MVAR distribution capacitor banks at Sister Bay 69 kV (2008)*

The previous scope of this project was to install 2-4.1 MVAR capacitor banks on the transmission side. After joint discussions with Wisconsin Public Service Corporation, the preferred solution was modified to installing 2-1.2 MVAR distribution capacitor banks. This project has also been updated from provisional to proposed status.

### New projects

*Relocate Mishicot 138-kV Substation (2007)*

This relocation is required in conjunction with the Twin Creeks generator interconnection request.

*Construct a 138-kV substation at a new Cedar Ridge; loop existing Ohmstead-Kettle Moraine 138-kV line into new Cedar Ridge Substation (2008)*

This project is required to accommodate the Cedar Ridge generator interconnection request.



For a comprehensive list and graphical depiction of projects in Zone 4, please refer to [Table PR-16](#) and [Figure PR-4](#).

### **Zone 5 Updated Study Results**

Refer to [Table PR-22](#) Summary of Changes.

#### **Cancelled projects**

##### *Reconductor Cornell-Range Line 138-kV line*

The Cornell – Rangeline 138-kV underground line was scheduled to be rebuilt as part of the Port Washington phase 2 generation project. In recent years, there have been occasional large power flows through the Cornell/Center area. To provide relief, System Operators will open a circuit breaker at Cornell on the Cornell - Fiebrantz – Center 138-kV line. With the system configured in this manner, the Cornell – Rangeline 138-kV line is not expected to overload with 1200 MW of generation at Port Washington. As a result, this project has been cancelled.

##### *Install series reactor at Cornell Substation*

The installation of a reactor was previously being considered at Cornell Substation to control power flowing on the Cornell – Fiebrantz – Center 138-kV underground line. Recent studies have indicated that this project is no longer needed.

##### *Elm Road Phase 3 generation cancellation:*

- Expand Oak Creek 345-kV switchyard to interconnect three new generators plus one new 345-kV line and 138-kV switchyard to accommodate new St. Martins line
- Construct a 345/138-kV switchyard at Hale (Brookdale) to accommodate two 345-kV lines, a 500 MVA 345/138-kV transformer and 4-138-kV lines plus three 138-26.2 kV transformers
- Install two 345-kV line terminations at Pleasant Prairie Substation and loop Zion-Arcadian 345-kV line into Pleasant Prairie
- Construct an Oak Creek-Hale (Brookdale) 345-kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV and 5 mi. 138 kV
- Construct Oak Creek-St. Martins 138-kV circuit #2 installing 16.6 mi. conductor on existing towers
- Construct a Hale (Brookdale)-Granville 345-kV line converting/reconductoring 5.6 mi. 138 kV, rebuilding 7 mi. 138-kV double-circuit tower line and converting/reconductoring 3 mi. 138 kV on existing 345-kV structures

The above 2013 projects have been cancelled due to We Energies' decision to cancel Phase 3 of their Elm Road generation project.



### **Deferred projects**

#### *Install 200 MVAR capacitor bank at Bluemound Substation*

This provisional project has been deferred from 2008 to 2010. A detailed study is in progress to determine the ultimate scope and in-service date for this project.

#### *Construct a 345-kV bus at Bain Substation*

This provisional project has been deferred from 2009 to 2014. Further study is needed to determine the ultimate scope and in-service date for this project.

### **Other project changes**

None

### **New projects**

#### *Upgrade St. Martins 138-kV bus to 2000A (2007)*

This project is being installed to relieve thermal overloads on the Paris-St. Martins 138-kV line under contingency.

#### *Upgrade St. Lawrence 138-kV bus (2007)*

Recently, the ratings on the St. Lawrence 138-kV bus were downgraded as part of a routine validation. As a result, this project is being installed to relieve thermal overloads that appear on the St. Lawrence-Glacier 138-kV line under contingency.

#### *Upgrade Arcadian-Waukesha 138-kV lines KK9942/KK9962 (2010)*

These lines are being upgraded to relieve thermal overload of one line for loss of the adjacent line.

#### *Install 2-32 MVAR capacitor banks at Mukwonago 138-kV Substation (2011)*

Further study is needed to determine the scope and in-service date of this provisional project.

#### *Install 2-32 MVAR capacitor banks at Summit 138-kV Substation (2010)*

This project has been proposed to relieve first-contingency voltage violations in Waukesha County.

For a comprehensive list and graphical depiction of projects in Zone 5, please refer to Table PR-17 and Figure PR-5.

*Table PR-13  
Transmission System Additions for Zone 1*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct Stone Lake-Arrowhead 345-kV line	1997	2008	1	service limitation, reliability, import capability & Weston stability	Planned
Construct the new permanent Stone Lake 345/161-kV Substation	2008	2008	1	reliability, import capability & Weston stability	Planned
Install 1-75 MVAR capacitor bank and 1-45 MVAR inductor at Stone Lake 345 kV	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned
Construct new Arrowhead 345-kV Substation, install 2-75 MVAR capacitor banks, 1-800 MVA PST and 1-800 MVA 345/230-kV transformer	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned
Construct Cranberry-Conover 115-kV line	2008	2008	1	reliability, transfer capability	Planned
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and upgrade the 5.4 MVAR capacitor bank to 10.8 MVAR at Berlin 69-kV Substation	2008	2008	1	reliability	Planned
Construct Gardner Park-Hwy 22 345-kV line	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned
Construct new Hwy 22 345-kV Substation	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned
Replace 138/69-kV transformer at Metomen Substation	2010	2010	1	reliability	Provisional
Construct Brandon-Fairwater 69-kV line	2010	2010	1	T-D interconnection	Proposed
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69-kV Substation	2011	2011	1	reliability	Provisional
Construct Monroe County-Council Creek 161-kV line	2012	2012	1	access initiative, reliability	Provisional
Install a 161/138-kV transformer at Council Creek Substation	2012	2012	1	access initiative, reliability	Provisional
Upgrade Council Creek-Petenwell 138-kV line	2012	2012	1	access initiative, reliability	Provisional
Upgrade Gardner Park-Black Brook 115-kV line - scope TBD	2012	2012	1	reliability	Provisional
Upgrade Mckenna 6.3 MVAR capacitor bank to 10.8 MVAR and install a second new 10.8 MVAR capacitor bank	2013	2013	1	reliability	Provisional

*Table PR-13  
Transmission System Additions for Zone 1 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2013	2013	1	T-D interconnection	Provisional
Construct Fairwater-Mackford Prairie 69-kV line	2014	2014	1	reliability	Provisional
Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap	2014	2014	1	reliability	Provisional
Install a second 138/69-kV transformer at Wautoma Substation	2015	2015	1	reliability	Provisional
Install a 12.2 MVAR capacitor bank at Hilltop 69-kV Substation	2016	2016	1	reliability	Provisional

*Table PR-14  
Transmission System Additions for Zone 2*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Rebuild Atlantic-Osceola 69-kV line (Laurium #1)	2006	2008	2	reliability, condition	Planned
Install 1-4.08 MVAR capacitor bank at Roberts 69-kV Substation	2007	2008	2	reliability	Proposed
Construct 138 kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover Substation	2008	2008	2	reliability, transfer capability	Planned
Install 2-4.08 MVAR capacitor banks at Munising 69-kV Substation	2008	2008	2	reliability	Proposed
Uprate Mass-Winona 69-kV line clearance to 185 degrees F	2008	2008	2	generation	Planned
Uprate Winona-Atlantic 69-kV line clearance to 185 degrees F	2008	2008	2	generation	Planned
Uprate Empire-Forsyth 138-kV line to 302 MVA	2008	2008	2	reliability	Planned
Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks	2008	2008	2	reliability	Proposed
Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV	2008	2009	2	reliability	Proposed
Relocate Cedar Substation (North Lake)	2005	2009	2	reliability, condition	Proposed
Install 2-16.33 MVAR capacitor bank at Perkins 138-kV Substation	2009	2009	2	reliability	Proposed
Install 1-16.33 MVAR capacitor bank at Hiawatha 138-kV Substation	2009	2009	2	reliability	Proposed
Install 2-8.16 MVAR capacitor banks at the 9 Mile 69-kV Substation	2009	2009	2	reliability	Proposed
Uprate Chandler-Cornell 69-kV line clearance from 120 to 167 deg F	2009	2009	2	reliability	Proposed
Install second 345/138-kV transformer at Plains Substation	2009	2009	2	reliability, transfer capability	Proposed
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2010	2010	2	reliability, transfer capability	Planned
Construct 138 kV bus and install a 138/69 kV, 60 MVA transformer at Iron Grove Substation	2010	2010	2	reliability, transfer capability	Planned



*Table PR-14  
Transmission System Additions for Zone 2 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct 138 kV bus and install a 138/69 kV, 60 MVA transformer at Aspen Substation	2010	2010	2	reliability	Planned
Relocate Iron River Substation (Iron Grove)	2010	2010	2	reliability	Planned
Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation	2010	2010	2	reliability	Proposed
Rebuild Blaney Park-Munising 69 kV to 138 kV	2013	2013	2	reliability, condition	Provisional
Rebuild/convert Holmes-Chandler 69 kV to 138-kV operation	2013	2013	2 & 4	reliability, condition	Provisional
Construct new Mackinac 138/69-kV Substation	TBD	TBD	2	reliability	Provisional
Rebuild Hiawatha-Pine River 69-kV line ESE_6908	TBD	TBD	2	maintenance	Provisional
Increase ground clearance of M38-Atlantic 69-kV line from 120 to 167 degrees F	TBD	TBD	2	reliability	Provisional
Convert Indian Lake-Hiawatha 69-kV line to double-circuit 138-kV operation, construct new Hiawatha 138-kV Substation	TBD	TBD	2	reliability	Provisional
Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings	TBD	TBD	2	reliability	Provisional
Install 2-5.4 MVAR capacitor banks at Osceola 69 kV	TBD	TBD	2	reliability	Provisional
Install 2-8.16 MVAR capacitor banks at M38 69 kV	TBD	TBD	2	reliability	Provisional
Install 1-5.4 MVAR capacitor bank at MTU or Henry Street 69-kV Substation	TBD	TBD	2	reliability	Provisional

*Table PR-15  
Transmission System Additions for Zone 3*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct new line from Southwest Delavan to Bristol at 138 kV and operate at 69 kV	2007	2008	3	T-D interconnection	Planned
Uprate Portage 138/69-kV transformer to 143 MVA	2007	2008	3	reliability	Planned
Install temporary 24.5 MVAR capacitor bank at Boxelder 138-kV Substation	2008	2008	3	reliability	Proposed
Install 2-8.16 MVAR 69-kV capacitor bank at South Lake Geneva Substation	2007	2008	3	reliability	Planned
Construct a Rubicon-Hustisford 138-kV line	2008	2008	3	reliability	Planned
Rebuild Hustisford-Horicon 69 kV to 138 kV	2008	2008	3	reliability	Planned
Construct 138/69 kV substation at a site near Horicon and install a 138/69-kV transformer	2008	2008	3	reliability	Planned
Uprate Brick Church-Zenda 69-kV line to 115 MVA	2008	2008	3	reliability	Proposed
Uprate X-17 Eden-Spring Green 138-kV line to 167 degrees F	2008	2008	3	reliability	Planned
Uprate Portage-Trienda 138-kV line to 339 MVA	2008	2008	3	reliability	Proposed
Construct a new 138-kV line from North Madison to Huiskamp (was Waunakee)	2008	2009	3	reliability	Planned
Construct a new 138/69-kV substation near Huiskamp and install a 187 MVA 138/69-kV transformer	2008	2009	3	reliability	Planned
Construct a Jefferson-Lake Mills-Stony Brook 138-kV line	2006	2009	3	reliability	Planned
Convert Rock River to Bristol to Elkhorn 138-kV operation; rebuild Bristol with a new 138 kV bus	2008	2009	3	reliability	Planned
Uprate Rockdale to Jefferson 138-kV line	2008	2009	3	reliability	Planned
Uprate Rockdale to Boxelder 138-kV line	2008	2009	3	reliability	Planned
Uprate Boxelder to Stony Brook 138-kV line	2008	2009	3	reliability	Planned
Install 3-16.33 MVAR 138-kV capacitor banks at North Beaver Dam Substation	2005	2009	3	reliability	Proposed
Uprate North Lake Geneva-Lake Geneva 69-kV line to 115 MVA	2009	2009	3	reliability	Proposed

*Table PR-15  
Transmission System Additions for Zone 3 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Uprate Walworth- North Lake Geneva 69-kV to 69 MVA	2009	2009	3	reliability	Proposed
Install 2-24.5 MVAR 138 kV capacitor banks at Kilbourn Substation and install 2-24.5 MVAR 138-kV capacitor banks at Artesian Substation	2009	2009	3	reliability	Proposed
Install 12.45 MVAR 69-kV mobile capacitor bank at Brick Church Substation	2008	2009	3	reliability	Proposed
Expand the existing 69-kV capacitor bank from 5.4 to 8.1 MVAR at Richland Center Olson Substation and install 1-7.8 MVAR 12.4-kV capacitor bank at Brewer Substation	2009	2009	3	reliability	Proposed
Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona	2009	2010	3	reliability	Planned
Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation	2010	2010	3	access initiative	Planned
Install 2-16.33 MVAR capacitor banks at Spring Green 69-kV Substation	2010	2010	3	reliability	Provisional
Upgrade the existing 2-8.16 MVAR to 2-16.33 MVAR capacitor banks at South Lake Geneva Substation	2010	2010	3	reliability	Provisional
Rebuild the Verona to Oregon 69-kV line Y119	2008	2011	3	reliability, maintenance	Proposed
Uprate McCue-Milton Lawns 69-kV line	2011	2011	3	reliability	Provisional
Rebuild Brodhead to South Monroe 69-kV line	2011	2011	3	generation interconnection, reliability	Proposed
Construct a North Lake Geneva-White River 138-kV line	2012	2012	3	T-D interconnection	Provisional
Uprate Brick Church-Walworth 69-kV line to 115 MVA	2012	2012	3	reliability	Provisional
Construct 345-kV line from Rockdale to West Middleton	2013	2013	3	reliability	Planned
Construct a 345-kV bus and install a 345/138 kV 500 MVA transformer at West Middleton Substation	2013	2013	3	reliability	Planned
Uprate Columbia 345/138-kV transformer T-22 to 527 MVA	2013	2013	3	reliability	Provisional

*Table PR-15  
Transmission System Additions for Zone 3 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Loop Nine Springs-Pflaum 69-kV line into Femrite Substation	2006	2013	3	reliability	Provisional
Install a 138/69-kV transformer at Bass Creek Substation	2010	2013	3	reliability	Provisional
Rebuild/reconductor Town Line Road-Bass Creek 138-kV line	2010	2013	3	reliability	Provisional
Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer	2013	2013	3	reliability	Provisional
Construct a Lake Delton-Birchwood 138-kV line	2013	2013	3	reliability	Provisional
Uprate Sheepskin-Dana 69-kV line to 95 MVA	2013	2013	3	reliability	Provisional
Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2013	2013	3	reliability	Provisional
Construct a Horicon-East Beaver Dam 138-kV line	2014	2014	3	reliability	Provisional
Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation and install a 138/69-kV transformer at Yahara River	2014	2014	3	reliability	Provisional
Uprate Yahara River-Token Creek 69-kV line	2014	2014	3	reliability	Provisional
Construct a 345-kV bus, install a 345/138-kV 500 MVA transformer at North Randolph and loop the Columbia to South Fond Du Lac 345-kV line into the substation	2014	2014	3	reliability	Provisional
Uprate X-67 Portage-Trienda 138-kV line to 373 MVA	2014	2014	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Eden Substation	2014	2014	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks and 2-24.5 MVAR capacitor banks at Femrite substation	2014	2014	3	reliability	Provisional
Install 2-12.25 MVAR 69-kV capacitor banks at Mazomanie Substation	2014	2014	3	reliability	Provisional
Install 2-16.33 MVAR capacitor banks at Montrose Substation	2014	2014	3	reliability	Provisional

*Table PR-15  
Transmission System Additions for Zone 3 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Install a second 138/69-kV transformer at McCue Substation	2014	2014	3	reliability	Provisional
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation	2016	2016	3	reliability	Provisional
Upgrade the Royster to Sycamore 69-kV line to 115 MVA	2016	2016	3	reliability	Provisional
Construct Evansville-Brooklyn 69-kV line	2016	2016	3	reliability	Provisional
Construct new 138-kV line from South Lake Geneva to White River Substation	2016	2016	3	reliability, T-D interconnection	Provisional
Construct West Middleton-Blount 138-kV line	TBD	TBD	3	reliability	Provisional
Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	TBD	TBD	3	negotiated agreement with Madison	Provisional
Construct West Middleton-North Madison 345-kV line	TBD	TBD	3	reliability, access initiative	Provisional

*Table PR-16  
Transmission System Additions for Zone 4*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress Substation	2006	2007	4	new generation	Planned
Relocate Mishicot 138-kV Substation	2007	2007	4	new generation	Planned
String a new Ellinwood-Sunset Point 138-kV line on existing structures	2007	2007	4	reliability	Planned
Uprate North Appleton-Lawn Road-White Clay 138-kV line	2007	2007	4	reliability	Planned
Expand the Menominee 69-kV Substation and install 138 kV terminals. Loop the West Marinette-Bay De Noc 138-kV line into the Substation	2008	2008	4	reliability	Proposed
Install 138/69-kV transformer at the expanded Menominee Substation	2008	2008	4	reliability	Proposed
Construct a 138-kV substation at a new Cedar Ridge; loop existing Ohmstead-Kettle Moraine 138-kV line into new Cedar Ridge Substation	2008	2008	4	new generation	Planned
Install 2-1.2 MVAR distribution capacitor banks at Sister Bay 69 kV	2008	2008	4	reliability	Proposed
Uprate North Appleton-Mason Street 138-kV line	2008	2008	4	reliability, service limitation	Proposed
Uprate North Appleton-Lost Dauphin 138-kV line	2008	2008	4	reliability, service limitation	Proposed
String a new 138-kV line from Clintonville-Werner West primarily on Morgan-Werner West 345-kV line structures	2004	2009	4	reliability, service limitation	Planned
Construct Morgan-Werner West 345-kV line	2004	2009	4	reliability, service limitation	Planned
Rebuild Crivitz-High Falls 69-kV double circuit line	2009	2009	4	reliability	Planned
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2009	2009	4	reliability	Proposed
Install two 69-kV breakers at Beardsley Street Substation	2010	2010	4	reliability	Provisional
Install 2-16.3 MVAR capacitor bank at Mears Corners 138-kV Substation	2011	2011	4	reliability	Provisional

*Table PR-16  
Transmission System Additions for Zone 4 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Install 2-16.3 MVAR capacitor bank at Rosiere 138-kV Substation	2011	2011	4	reliability	Provisional
Replace the 400 amp metering CT at North Mullet River 69-kV Substation	2011	2011	4	reliability	Provisional
Construct Canal-Dunn Road 138-kV line	2012	2012	4	reliability	Proposed
Install 60 MVA 138/69-kV transformer at Dunn Road	2012	2012	4	reliability	Proposed
Rebuild/convert Holmes-Chandler 69 kV to 138-kV operation	2013	2013	2 & 4	reliability, condition	Provisional
Replace the existing 138/69-kV transformer at South Sheboygan Falls Substation with 100 MVA transformer	2014	2014	4	reliability	Provisional
Replace two existing 138/69-kV transformers at Glenview Substation with 100 MVA transformers	2014	2014	4	reliability	Provisional
Replace the 1200 A breaker at Edgewater T22 345/138-kV transformer	2014	2014	4	reliability	Proposed
Uprate the Melissa-Tayco to 229 MVA (300F)	2014	2014	4	reliability	Provisional
Install 138/69-kV transformer at Custer Substation	2014	2014	4	reliability	Provisional
Construct Shoto to Custer 138-kV line	2014	2014	4	reliability	Provisional
Install 2-16.3 MVAR capacitor bank at Aviation Substation	2015	2015	4	reliability	Provisional
Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation	2015	2015	4	reliability	Provisional
Reconductor Pulliam-Danz 69-kV line	2015	2015	4	reliability	Provisional
Reconductor Danz-Henry Street 69-kV line	2015	2015	4	reliability	Provisional
Reconductor Pulliam-Van Buren 69-kV line	2015	2015	4	reliability	Provisional
Replace two existing 138/69-kV transformers at Sunset Point Substation with 100 MVA transformers	2015	2015	4	reliability	Provisional
Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV	2016	2016	4	reliability, condition	Provisional
Construct a second Dunn Road-Egg Harbor 69-kV line	2016	2016	4	reliability	Proposed

*Table PR-16  
Transmission System Additions for Zone 4 (continued)*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Construct a Northside-City Limits 138-kV line	2016	2016	4	reliability	Provisional



*Table PR-17  
Transmission System Additions for Zone 5*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Upgrade St. Martins 138-kV bus to 2000A	2007	2007	5	reliability	Planned
Upgrade St. Lawrence 138-kV bus	2007	2007	5	reliability	Planned
Reconductor Saukville-St Lawrence 138-kV line	2008	2008	5	new generation	Planned
Replace relaying on 230-kV circuits at Oak Creek	2009	2009	5	new generation	Planned
Replace two 345-kV circuit breakers at Pleasant Prairie Substation on the Racine and Zion lines with IPO breakers and upgrade relaying	2009	2009	5	new generation	Planned
Expand Oak Creek 345-kV switchyard to interconnect one new generator	2009	2009	5	new generation	Planned
Reconductor Oak Creek-Ramsey 138-kV line	2009	2009	5	new generation	Planned
Reconductor Oak Creek-Allerton 138-kV line	2009	2009	5	new generation	Planned
Install second 500 MVA 345/138-kV transformer at Oak Creek Substation	2009	2009	5	new generation	Planned
Loop Ramsey5-Harbor 138-kV line into Norwich and Kansas to form a new line from Ramsey-Norwich and Harbor-Kansas 138-kV lines	2009	2009	5	new generation	Planned
Replace CTs at Racine 345-kV Substation	2009	2009	5	new generation	Planned
Construct a 138-kV bus at Hale Substation to permit third Brookdale distribution transformer interconnection	2009	2009	5	T-D interconnection	Proposed
Construct a 138-kV bus at Pleasant Valley Substation to permit second distribution transformer interconnection	2009	2009	5	T-D interconnection	Proposed
Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	2010	2010	5	reliability	Proposed
Expand 345-kV switchyard at Oak Creek to interconnect one new generator	2010	2010	5	new generation	Planned
Uprate Oak Creek-Root River 138-kV line	2010	2010	5	new generation	Planned
Uprate Oak Creek-Nicholson 138-kV line	2010	2010	5	new generation	Planned
Install 200 MVAR capacitor bank at Bluemound Substation	2010	2010	5	reliability	Provisional

*Table PR-17*  
*Transmission System Additions for Zone 5*

<b>System additions</b>	<b>System need year</b>	<b>Projected in-service year</b>	<b>Planning zone</b>	<b>Need category</b>	<b>Planned, Proposed or Provisional</b>
Install 2-32 MVAR capacitor banks at Summit 138-kV Substation	2009	2010	5	reliability	Proposed
Install 2-32 MVAR capacitor banks at Mukwonago 138-kV Substation	2011	2011	5	reliability	Provisional
A second distribution transformer at Somers Substation requires a rebuild of the Racine-Somers-Albers 138-kV line; extend Albers 138-kV bus to permit connecting the Racine-Somers-Albers radial line to the Albers 138-kV bus	2011	2011	5	T-D interconnection	Provisional
Construct a 345-kV bus at Bain Substation	2008	2014	5	reliability	Provisional

**Table PR-22****Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2007 10-Year Assessment**

<b>PROJECTS CANCELLED</b>	<b>Former In-Service Date</b>	<b>Planning Zone</b>	<b>Reason for Removal</b>
Rebuild/reconductor Petenwell-Saratoga 138-kV line	2010	1	Updated study results
Uprate M38 138/69-kV transformer	TBD	2	Revised load/model information
Install 1-5.4 MVAR capacitor bank at Sawyer 69 kV	TBD	2	Replaced with distribution capacitor bank solution
Construct Huiskamp-Blount 138-kV line	2012	3	Further studies needed to determine scope and in-service date
Uprate North Monroe-Idle Hour 69-kV line	2012	3	Updated study results
Install series reactor at Cornell Substation	2007	5	Updated study results
Expand Oak Creek 345-kV switchyard to interconnect three new generators plus one new 345-kV line and 138-kV switchyard to accommodate new St. Martins line	2013	5	Elm Road generation Phase 3 cancellation
Construct a 345/138-kV switchyard at Hale (Brookdale) to accommodate two 345-kV lines, a 500 MVA 345/138-kV transformer and 4-138-kV lines plus three 138-26.2 kV transformers	2013	5	Elm Road generation Phase 3 cancellation
Install two 345-kV line terminations at Pleasant Prairie Substation and loop Zion-Arcadian 345-kV line into Pleasant Prairie	2013	5	Elm Road generation Phase 3 cancellation
Construct an Oak Creek-Hale (Brookdale) 345-kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV and 5 mi. 138 kV	2013	5	Elm Road generation Phase 3 cancellation
Construct Oak Creek-St. Martins 138-kV circuit #2 installing 16.6 mi. conductor on existing towers	2013	5	Elm Road generation Phase 3 cancellation
Construct a Hale (Brookdale)-Granville 345-kV line converting/reconductoring 5.6 mi. 138 kV, rebuilding 7 mi. 138 kV double circuit tower line and converting/reconductoring 3 mi. 138 kV on existing 345-kV structures	2013	5	Elm Road generation Phase 3 cancellation
Reconductor Cornell-Range Line 138-kV line	2014	5	Updated study results

**Table PR-22 (continued)****Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2007 10-Year Assessment**

<b>PROJECTS DEFERRED</b>	<b>New date</b>	<b>Planning Zone</b>	<b>Reason for Deferral</b>
Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress Substation	2007	4	Was 2006; revised construction schedule
Construct new line from Southwest Delavan to Bristol at 138 kV and operate at 69 kV	2008	3	Was 2007; revised construction schedule
Construct North Madison-Huiskamp 138-kV line	2009	3	Was 2008; revised construction schedule
Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV	2009	2	Was 1-5.4 MVAR bank in 2008; revised construction schedule
Relocate Cedar Substation (North Lake)	2009	2	Was 2008; deferred due to resource availability
Install second 345/138-kV transformer at Plains Substation	2009	2	Was 2008; revised load/model information
Construct a Jefferson-Lake Mills-Stony Brook 138-kV line	2009	3	Was 2008; deferred due to route contention
Uprate Rockdale to Jefferson 138-kV line	2009	3	Was 2008; deferred because route contention
Uprate Rockdale to Boxelder 138-kV line	2009	3	Was 2008; deferred because of route contention
Uprate Boxelder to Stonybrook 138-kV line	2009	3	Was 2008; deferred because of route contention
Rebuild Crivitz-High Falls 69-kV double circuit line	2009	4	Was 2008; resource availability
Construct Brandon-Fairwater 69-kV line	2010	1	Was 2008; customer's decision to defer
Rebuild/convert Conover-Plains 69-kV line to 138 kV, construct 138-kV bus and install transformers at Iron Grove and Aspen, and relocate Iron River Substation (Iron Grove)	2009	2	Was 2008; deferred due to regulatory delays
Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona	2010	3	Was 2009; regulatory delay
Rebuild the Verona to Oregon 69-kV line Y119	2011	3	Was 2008; route overlap complications and associated regulatory delay for portion from Verona to Sun Valley (due to Oak Ridge to Verona delay) and Rockdale to West Middleton overlap for entire route
Install 200 MVAR capacitor bank at Bluemound Substation	2010	5	Was 2008; detailed study in progress to determine scope and in-service date

**Table PR-22 (continued)****Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2007 10-Year Assessment**

<b>PROJECTS DEFERRED (continued)</b>	<b>New date</b>	<b>Planning Zone</b>	<b>Reason for Deferral</b>
Rebuild Brodhead to South Monroe 69-kV line	2011	3	Was 2008; updated study results and resource availability
Construct Monroe County-Council Creek 161-kV line	2012	1	Was 2010; resource availability
Install a 161/138-kV transformer at Council Creek Substation	2012	1	Was 2010; resource availability
Uprate Council Creek-Petenwell 138-kV line	2012	1	Was 2010; resource availability
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2013	1	Was 2012; customer's decision to defer
Rebuild Blaney Park-Munising 69 kV to 138 kV	2013	2	Was 2012; Asset Management review
Construct 345-kV line from Rockdale to West Middleton	2013	3	Was 2011; updated study results
Construct a 345-kV bus and install a 345/138 kV 500 MVA transformer at West Middleton Substation	2013	3	Was 2011; updated study results
Uprate Columbia 345/138-kV transformer T-22 to 527 MVA	2013	3	Was 2008; revised rating information
Loop Nine Springs-Pflaum 69-kV line into Femrite Substation	2013	3	Was 2010; delayed due to resource availability
Install a 138/69-kV transformer at Bass Creek Substation	2013	3	Was 2010; delayed due to resource availability
Rebuild/reconductor Town Line Road-Bass Creek 138-kV line	2013	3	Was 2010; delayed due to resource availability
Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer	2013	3	Was second transformer in 2010; updated study results
Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation and install 138/69-kV transformer at Yahara River	2014	3	Was 2011; delayed due to updated study results
Uprate Yahara River-Token Creek 69-kV line	2014	3	Was 2011; delayed due to updated study results
Install 138/69-kV transformer at Custer Substation	2014	4	Was 2012; updated study results
Construct Shoto to Custer 138-kV line	2014	4	Was 2012; updated study results
Construct a 345-kV bus at Bain Substation	2014	5	Was 2009; further study needed to determine scope and in-service date

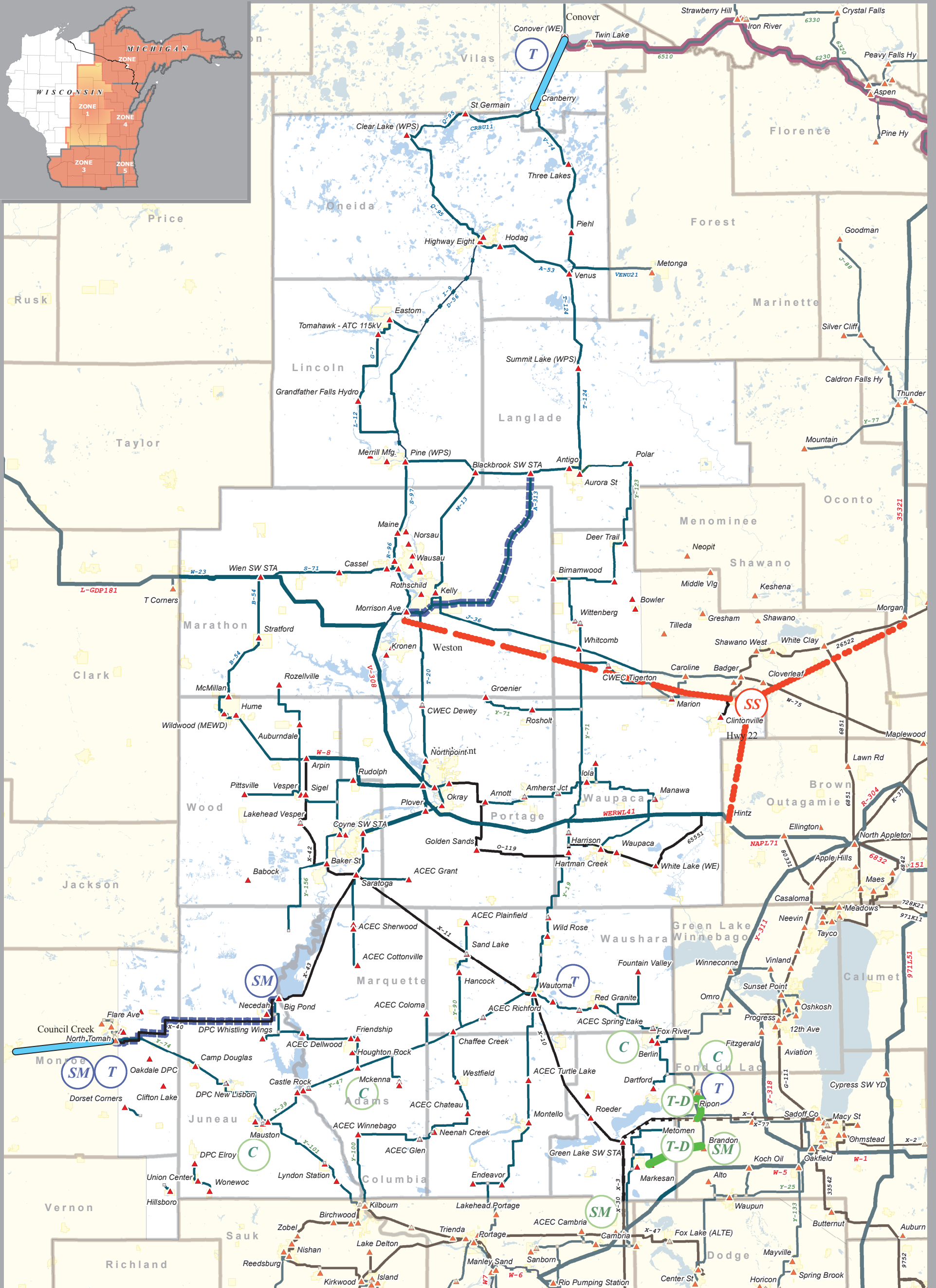
**Table PR-22 (continued)****Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2007 10-Year Assessment**

<b>OTHER PROJECT CHANGES AND POSSIBLE CHANGES</b>	<b>Date</b>	<b>Planning Zone</b>	<b>Nature of Change or Update</b>
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and upgrade the 5.4 MVAR capacitor bank to 10.8 MVAR at Berlin 69-kV Substation	2008	1	Was total of 12.8 MVAR upgrade
Install 1-4.08 MVAR capacitor bank at Roberts 69-kV Substation	2008	2	Was 5.4 MVAR capacitor bank
Install 2-4.08 MVAR capacitor banks at Munising 69-kV Substation	2008	2	Was 2-5.4 MVAR banks
Install 2-8.16 MVAR 69-kV capacitor bank at South Lake Geneva Substation	2008	3	Was 1-16.33 MVAR bank
Expand the Menominee 69-kV Substation and install 138 kV terminals. Loop the West Marinette-Bay De Noc 138-kV line into the Substation	2008	4	Was provisional, now proposed
Install 138/69-kV transformer at the expanded Menominee Substation	2008	4	Was provisional, now proposed
Install 2-1.2 MVAR distribution capacitor banks at Sister Bay 69 kV	2008	4	Was 2-4.1 MVAR banks on transmission side, was provisional and now is proposed
Construct Gardner Park-Hwy 22 345-kV line	2009	1	Central Wisconsin was renamed Hwy 22
Construct new Hwy 22 345-kV Substation	2009	1	Central Wisconsin was renamed Hwy 22
Upgrade Chandler-Cornell 69-kV line clearance from 120 to 167 deg F	2009	2	Was provisional in 2010; now proposed in 2009
Install 3-16.33 MVAR 138-kV capacitor banks at North Beaver Dam Substation	2009	3	Was provisional, now proposed; was 2-24.5 MVAR banks
Install 2-24.5 MVAR 138 kV capacitor banks at Kilbourn Substation and install 2-24.5 MVAR 138-kV capacitor banks at Artesian Substation	2009	3	Was 2-16.33 capacitor banks at Kilbourn and 2-24.5 at Artesian
Expand the existing 69-kV capacitor bank from 5.4 to 8.1 MVAR at Richland Center Olson Substation and install 1-7.8 MVAR 12.4-kV capacitor bank at Brewer Substation	2009	3	Was 2-8.16 MVAR banks at Brewer
Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation	2010	3	Added the transformer replacement
Upgrade the existing 2-8.16 MVAR to 2-16.33 MVAR capacitor banks at South Lake Geneva Substation	2010	3	Was second 16.33 MVAR bank
Construct new Mackinac 138/69-kV Substation	TBD	2	Was Proposed in 2011, now Provisional and TBD
Rebuild Hiawatha-Pine River 69-kV line ESE_6908	TBD	2	Was Proposed in 2009; now Provisional and TBD
Construct West Middleton-North Madison 345-kV line	TBD	3	Was proposed in 2016; now Provisional and TBD

**Table PR-22 (continued)****Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2007 10-Year Assessment**

NEW PROJECTS	In-Service Date	Planning Zone	Reason for Project
Relocate Mishicot 138-kV Substation	2007	4	new generation
Upgrade St. Martins 138-kV bus to 2000A	2007	5	reliability
Upgrade St. Lawrence 138-kV bus	2007	5	reliability
Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks	2008	2	reliability
Uprate Empire-Forsyth 138-kV line to 302 MVA	2008	2	reliability
Uprate Portage 138/69-kV transformer to 143 MVA	2008	3	reliability
Uprate X-17 Eden-Spring Green 138-kV line to 167 degrees F	2008	3	reliability
Install temporary 24.5 MVAR capacitor bank at Boxelder 138-kV Substation	2008	3	reliability; Jefferson-Stony Brook project delay
Construct a 138-kV substation at new Cedar Ridge; loop existing Ohmstead-Kettle Moraine 138-kV line into new Cedar Ridge Substation	2008	4	accommodate new generation
Install 2-16.32 MVAR capacitor bank at Perkins 138-kV Substation	2009	2	reliability
Install 1-16.33 MVAR capacitor bank at Hiawatha 138-kV Substation	2009	2	reliability
Install 12.45 MVAR 69-kV mobile capacitor bank at Brick Church Substation	2009	3	reliability
Install 2-32 Mvar capacitor banks at Mukwonago 138-kV Substation	2009	5	reliability
Install 2-4.08 MVAR capacitor banks at the 9 Mile 69-kV Substation	2010	2	reliability
Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation	2010	2	reliability
Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	TBD	3	negotiated agreement with Madison
Install 2-32 MVAR capacitor banks at Summit 138-kV Substation	2010	5	reliability
Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	2010	5	reliability

Figure PR-1



Transmission System Additions (May be Planned, Proposed or Provisional)

**PLANNING ZONE 1**



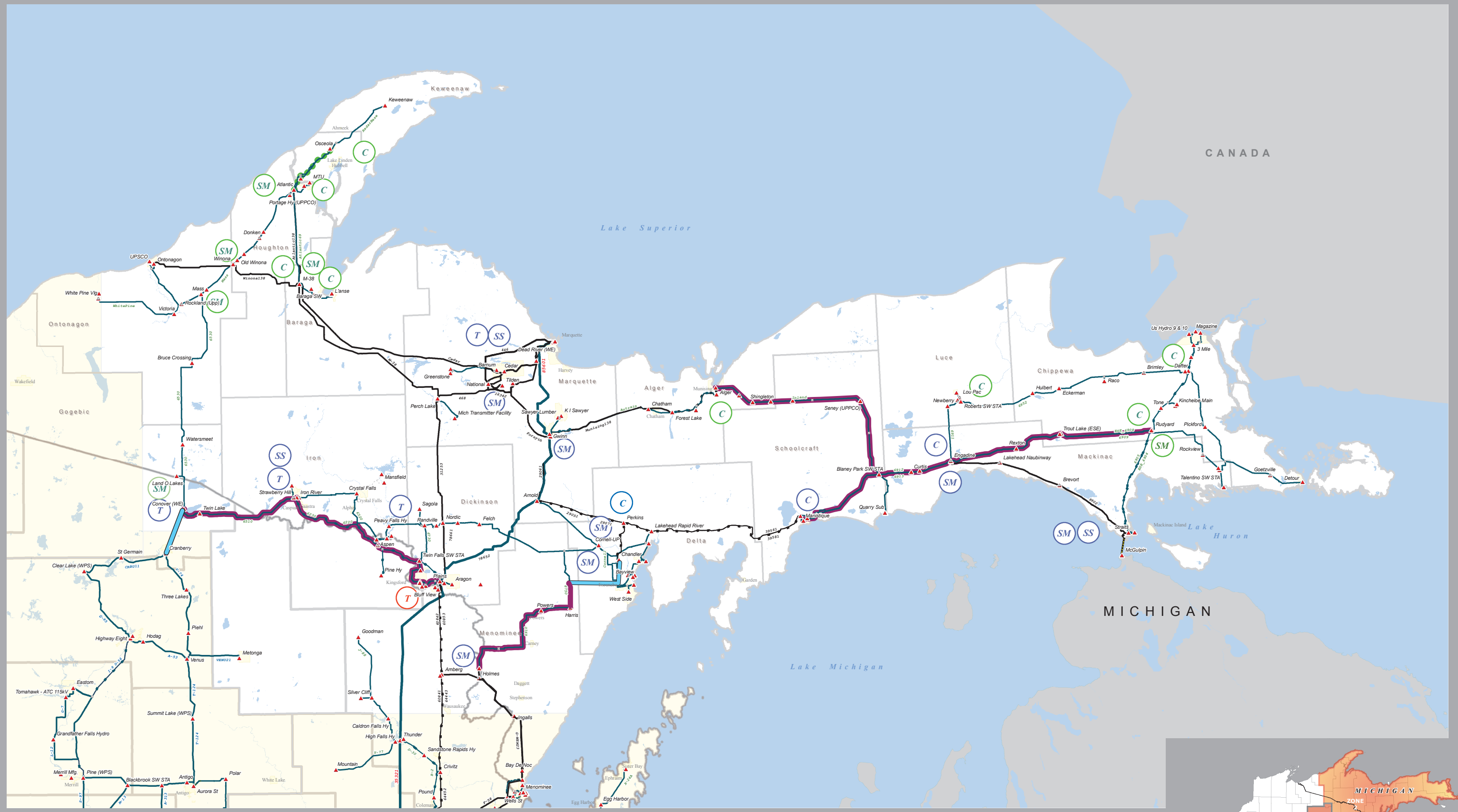
- (SS)** New Substation
- (SM)** Substation Modifications
- (T)** Transformer
- (C)** Capacitor Bank
- (T-D)** New T-D Interconnection

- 345 kV Transmission Line
- ▬▬▬ 115 or 138 kV Transmission Line
- ▬▬▬ Rebuilt 115 or 138 kV Transmission Line
- ▬▬▬ Transmission Line Voltage Conversion
- ▬▬▬ 69 kV Transmission Line

- Transmission Related Facilities**
- ▲ Substation, Switchyard or Terminal
  - Proposed/Design/Construction
  - ATC Office Location
  - Generation
  - Other Facility

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.



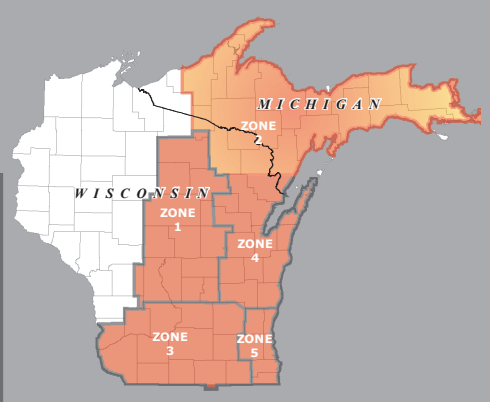


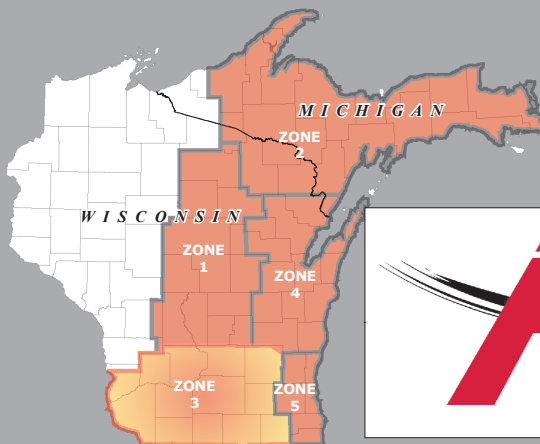
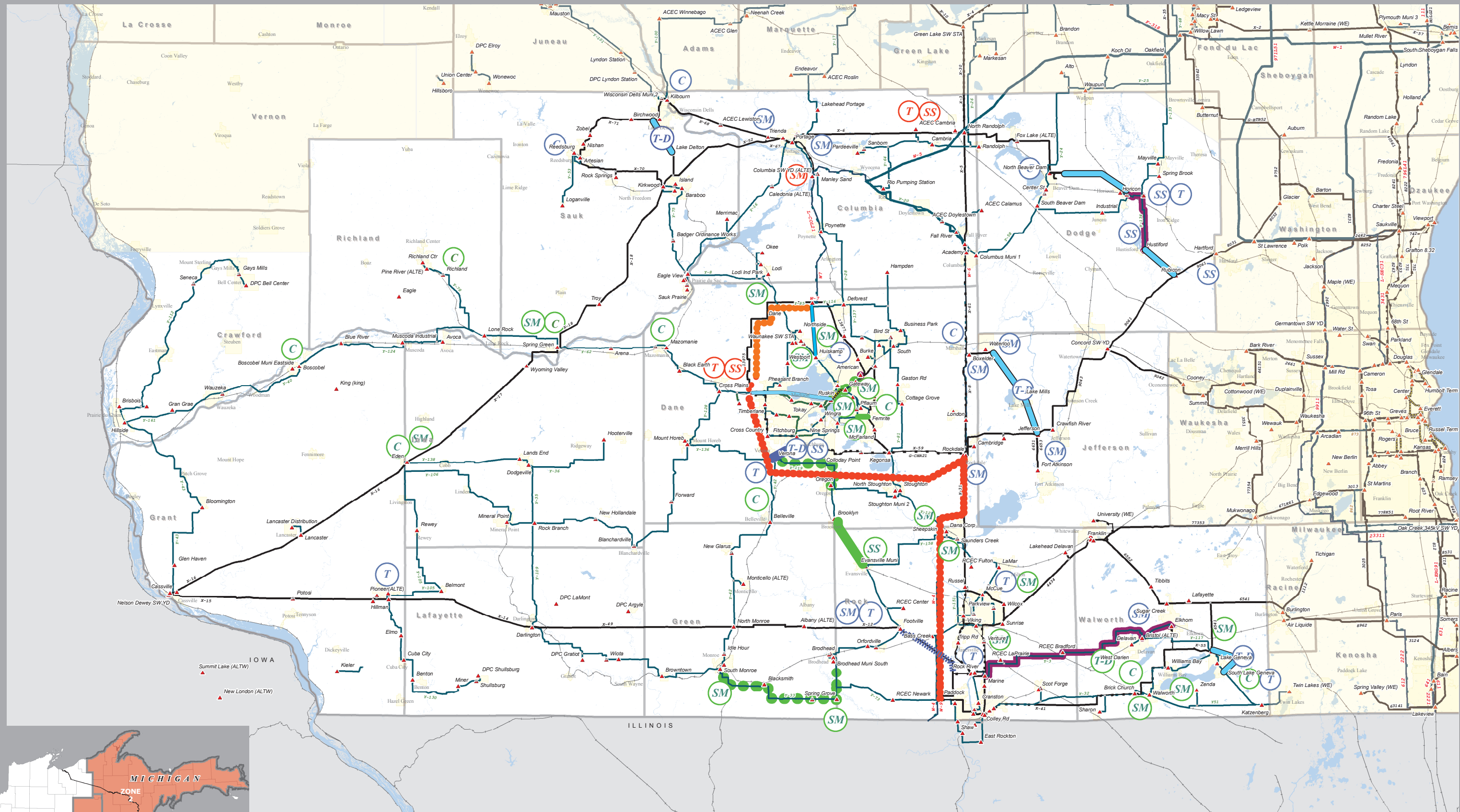
Transmission System Additions (May be Planned, Proposed or Provisional)  
**PLANNING ZONE 2**

- |      |                          |       |                            |       |                                      |
|------|--------------------------|-------|----------------------------|-------|--------------------------------------|
| (SM) | Substation Modifications | (C)   | Capacitor Bank             | ————— | 115 or 138 kV Transmission Line      |
| (T)  | Transformer              | (T-D) | New T-D Interconnection    | ————— | Rebuilt 115 or 138 kV Transmission   |
| (SS) | New Substation           | ●●●●  | Rebuilt 69 kV Transmission | ————— | Transmission Line Voltage Conversion |
|      |                          |       |                            | ————— | 69 kV Transmission Line              |

**Transmission Related Facilities**

- ▲ Substation, Switchyard or Terminal
- ATC Office Location
- Proposed/Design/Construction
- ☐ Generation
- Other Facility





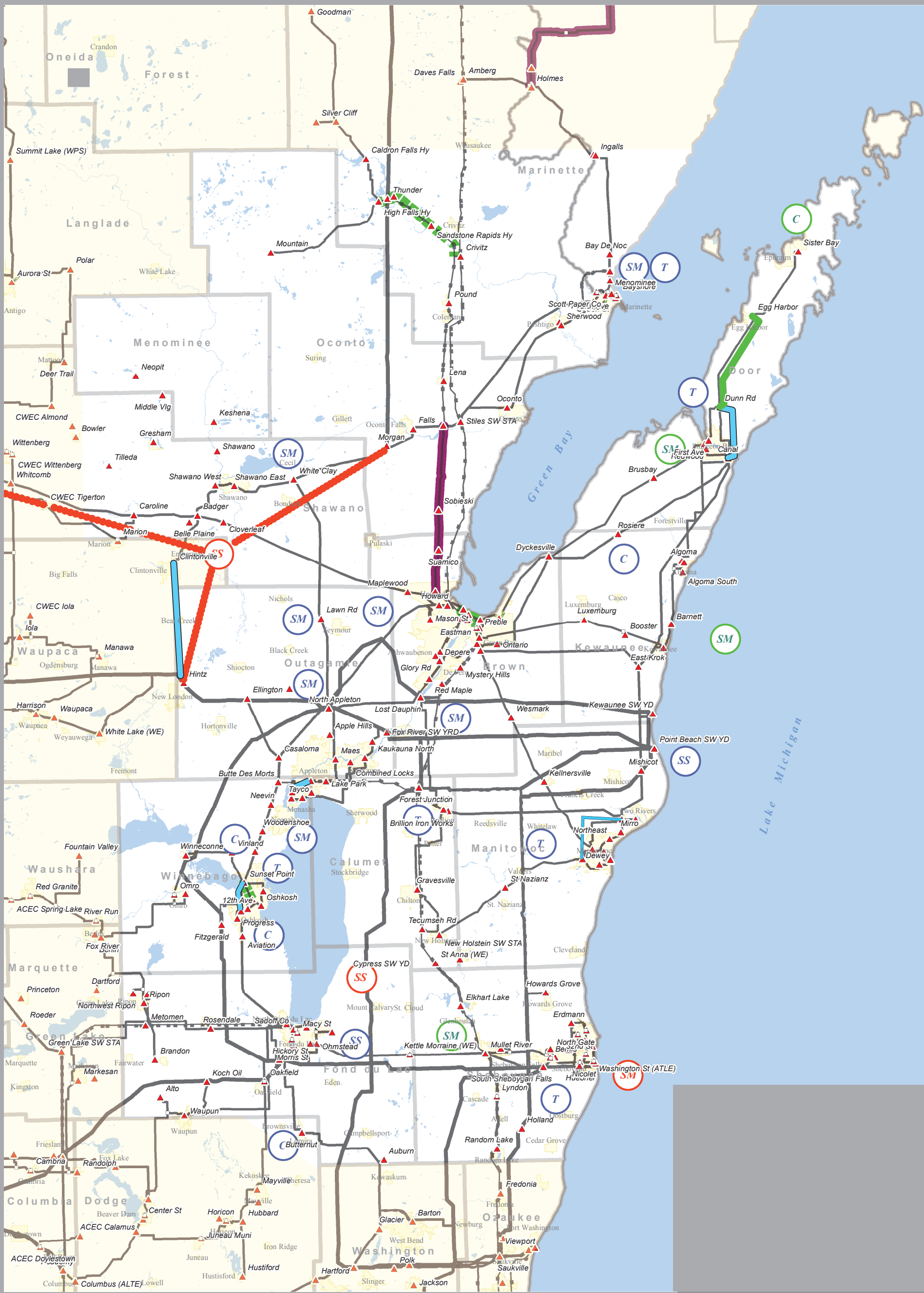
Transmission Planning Additions (May be Planned, Proposed or Provisional)

## PLANNING ZONE 3

<p><b>SS</b> New Substation</p> <p><b>SM</b> Substation Modifications</p> <p><b>T</b> Transformer</p>	<p><b>C</b> Capacitor Bank</p> <p><b>T-D</b> New T-D Interconnection</p> <p><b>PS</b> Phase Shifter</p>	<p><span style="color: red;">●●●●</span> 345 kV Transmission Line</p> <p><span style="color: blue;">▬▬▬▬</span> 115 or 138 kV Transmission Line</p> <p><span style="color: blue;">▬▬▬▬▬▬▬▬</span> 115 or 138 kV Transmission Line Rebuild</p> <p><span style="color: purple;">▬▬▬▬▬▬▬▬</span> Transmission Line Voltage Conversion</p>	<p><span style="color: green;">▬▬▬▬</span> 69 kV Transmission Line</p> <p><span style="color: green;">●●●●</span> 69 kV Transmission Line Rebuild</p>
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### Transmission Related Facilities

<p><span style="color: red;">▲</span> Substation, Switchyard or Terminal</p> <p><span style="color: orange;">■</span> Proposed/Design/Construction</p>	<p><span style="color: orange;">●</span> ATC Office Location</p> <p><span style="color: brown;">■</span> Generation</p> <p><span style="color: black;">■</span> Other Facility</p>
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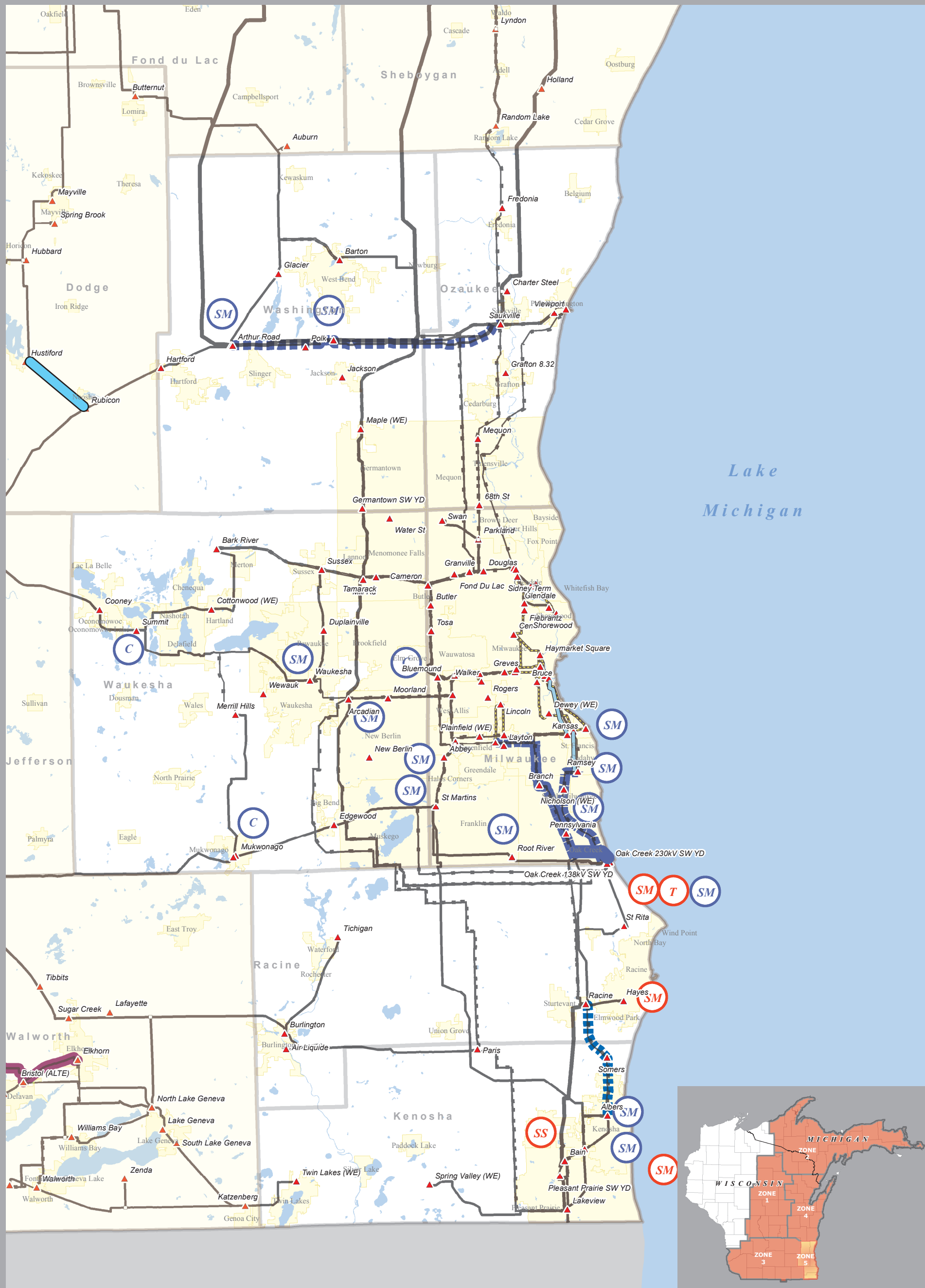
Transmission System Additions (May be Planned, Proposed or Provisional)

**PLANNING ZONE 4**

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

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

- Transmission Related Facilities**
- ▲ Substation, Switchyard or Terminal
  - ▲ ATC Office Location
  - Proposed/Design/Construction
  - Generation
  - Other Facility



Transmission System Additions (May be Planned, Proposed or Provisional)  
**PLANNING ZONE 5**

- SS** New Substation
- SM** Substation Modifications
- T** Transformer
- C** Capacitor Bank
- T-D** New T-D Interconnection
- R** Series Reactor

- 345 kV Transmission Line
- ▬▬▬▬ 115 or 138 kV Transmission Line
- ▬▬▬▬ Rebuilt 115 or 138 kV Transmission Line
- ▬▬▬▬ Transmission Line Voltage Conversion

- Transmission Related Facilities**
- ▲ Substation, Switchyard or Terminal
  - Proposed/Design/Construction
  - ATC Office Location
  - Generation
  - Other Facility