PLANNING FACTORS > Planning considerations

In evaluating the transmission system and planning for what will be needed in the future, we consider a number of variables such as:

- *At what rate will electricity demand increase in the future? What kind of electricity uses will drive the increases in demand?*
- *What generation is likely to be constructed; what is likely to be retired?*
- *What types of disturbances on the transmission system are particularly serious or problematic?*
- *What existing facilities need to be replaced based on their age or condition?*
- *How can improving access to low-cost power outside of Wisconsin and Michigan's Upper Peninsula best be achieved? Which chronic constraints need to be addressed?*
- *How can improving access between in-state utilities best be achieved? Which chronic constraints need to be addressed?*
- *How much will it cost to provide reliable transmission service and improve access?*
- *What are the benefits associated with transmission system expansion plans and how can they be measured?*
- *What are the social and environmental impacts of our transmission system expansion plans?*
- *What new, proven technologies may be available to help meet the needs more effectively and efficiently?*

These are some key considerations that we take into account, but there are numerous other objectives including improving system efficiency, providing economic development opportunities and helping our customers remain competitive in the future. Throughout this 10-Year Assessment, we are striving to address the issues and questions above to develop the most beneficial and cost-effective expansion plan possible.

PLANNING FACTORS > Expansion drivers

There are numerous factors that can drive the need for transmission system expansion. In some cases, more than one factor will signal the need for system expansion. The most common expansion drivers are described below and include:

- ❑ Electric load growth
- ❑ Transmission-distribution interconnections
- ❑ Transmission service limitations
- ❑ New generation
- ❑ Transmission service requests
- ❑ System repair or replacement
- ❑ Economic strategic expansion

- ❑ **Electric load growth** – The load growth driver in this Assessment is similar to that in the previous Assessment. Demand for electricity during peak load periods is projected to grow at a rate of just over 2 percent across our service territory from 2005 through 2014. However, load growth rates in some areas are projected to grow at as much as 8 percent, while no growth is projected in other areas. Not surprisingly, many areas of high load growth correspond to areas where we are proposing system expansion.

  Figure PF-1 shows the projected growth in peak demand, in MW, from 2005 through 2014 for various areas of our system. Note that most of the high growth (greater than 20 MW) is in the metropolitan Milwaukee, Madison and Fox Valley areas. While these higher-growth areas may require system expansion, there is considerably more existing transmission infrastructure in these areas. Of equal or greater concern is high growth in areas where there is much less existing transmission infrastructure because the capacity of the existing system may be reaching its limits, perhaps requiring additional infrastructure.

  Figure PF-2 shows the projected rates of growth on our system. This is perhaps more revealing as it shows what areas are experiencing high rates of growth, regardless of the magnitude of load that exists today. Certain areas of our system have more transmission infrastructure today and are not as likely to need infrastructure additions to support expected load growth. Note that the high rates of growth in and around Madison, Lake Geneva, Green Bay, Marinette, Rhinelander, Wis., and Menominee, Mich. were not depicted as being among the highest MW growth areas in Figure PF-1. These areas of high growth rates actually are better indicators of when and where system expansion is likely to be needed.

  Many of the line or transformer overloads or low voltages during peak load are due to electric load growth. System expansion is required to ensure that the transmission system can operate reliably – mitigating overloads and low voltages.

- **Transmission-distribution interconnections –** A natural extension of load growth is the need for additional transmission-distribution interconnections (TDIs). As the capacity of the transmission system gets more fully utilized when load growth occurs, similarly this often happens on the distribution systems as well, requiring new interconnections to the transmission system.

  In most cases, distribution companies will attempt to unload existing distribution facilities by siting a new TDI near an existing transmission line and redistributing some of the load in the area to the new TDI. In some instances, however, it makes more sense to construct transmission closer to where the load growth is occurring.

  A list of all of the planned TDIs on ATC's system can be found at: *http://www.atcllc.com/oasis/liqueue.xls.*

- **Transmission service limitations –** We identify the points on our system where transmission service is limited. Transmission service requests may be denied; transmission service requests may be granted and then curtailed or interrupted; generation may have to be dispatched uneconomically to avoid curtailing or interrupting service, or the system may have to be reconfigured to avoid curtailing or interrupting service. Depending on the frequency, the amount of service curtailed or interrupted, the cost of redispatching generation, and/or the risk of reconfiguring the system, it may be prudent to expand the transmission system to avoid these types of events. A list of the most chronic transmission service limitations on the ATC system can be found in Tables ZS-4 through ZS-7 for the years 2004-2001 respectively.

  We have constructed and are in the process of planning and/or constructing, transmission facilities that address chronic transmission service limitations. The transmission facilities being planned or constructed to address chronic constraints can be found in Tables PR-2 through PR- 23**.** In the Need Category column, look for "service limitation."

- **New generation** – When entities plan to construct new generating facilities, there are two key considerations from the transmission owners perspective:
  - Can the proposed generating facilities be interconnected and remain stable during system disturbances, and will nearby generating facilities remain stable?
  - Can the electricity produced by the generating facilities be delivered reliably to the ultimate customer(s)?

  For each entity that plans to construct a new generating facility, the transmission provider will conduct an interconnection study and, if requested, a transmission service study. If the existing transmission system is inadequate to ensure generator stability or reliable transmission service, the transmission provider will determine what system expansion will be needed.

We have constructed and are in the process of planning and/or constructing, transmission facilities that are needed to interconnect and/or provide transmission service from new generators. The transmission facilities being planned or constructed to accommodate new generation can be found in Tables PR-2 through PR-23**.** In the Need Category column, look for "new generation." Also, see Generation Interconnections.

- **Transmission service requests** – In the MISO Day 2 Market, transmission services requests are used less but still are an available option. Power plant owners and local distribution companies can transact with other entities to buy and sell electricity. Power plant owners with surplus generating capacity may attempt to sell that surplus capacity. Entities serving end-use customers may attempt to lower their costs by accessing and purchasing low-cost electricity. In addition to the Day 2 Market another way in which these entities gain access to the transmission system to make these transactions is by making transmission service requests to transmission service providers, like ATC. Transmission service providers evaluate those requests to determine whether the transmission system can be operated reliably if the request is granted. If the request can't be granted, the transmission service provider may determine how the transmission system needs to be expanded to grant the request. Typically, the types of requests that would require some sort of system expansion are longer-term requests (transactions lasting longer than one year) and which start at some point in time in the future. Requests for service in the near future may have to simply be denied because system expansion facilities can't be constructed in time.

  We have constructed and are in the process of planning and/or constructing, transmission facilities that are required to grant transmission service requests. The transmission facilities being planned or constructed to meet transmission service requests can be found in Tables PR-2 through PR-23**.** In the Need Category column, look for "service limitation."

- **System repair or replacement –** Many components of our transmission system will need to be repaired or replaced in the coming years due to condition or obsolescence. In some cases, the need to reconstruct a transmission line may provide opportunities to increase the capacity of those components and improve reliability. The transmission facilities being planned or constructed that have condition or obsolescence issues can be found in Tables PR-2 through PR-24. In the Need Category column, look for "condition."

- **Economic/strategic system expansion** – In the electric utility industry, change has become more of the norm rather than the exception. For example, in recent years, wholesale electricity markets have continued to evolve, renewable generation has gained a larger market share, and the generation market, in general, has become more competitive. Utilities and generation developers, which were constructing only

natural gas-fired generation in recent years, now are considering the merits of, or have already planned to construct, coal-fired generation. In addition, because both residential and business customers are more mobile, migration of electric customers to other areas is a greater risk consideration for utilities. In order for utilities to remain cost competitive, they must have the flexibility to take advantage of trends that have the potential to lower costs. To the extent that low-cost generation development is occurring in an adjacent state, it may make sense for a transmission provider to construct transmission facilities that would allow its utility customers better access to that low-cost generation.

Along these lines, we have been investigating ways to take advantage of certain potential developments in the electricity industry to give our customers more ways to lower costs. The primary outgrowth of this effort is our Access Initiative.

Our Service Territory

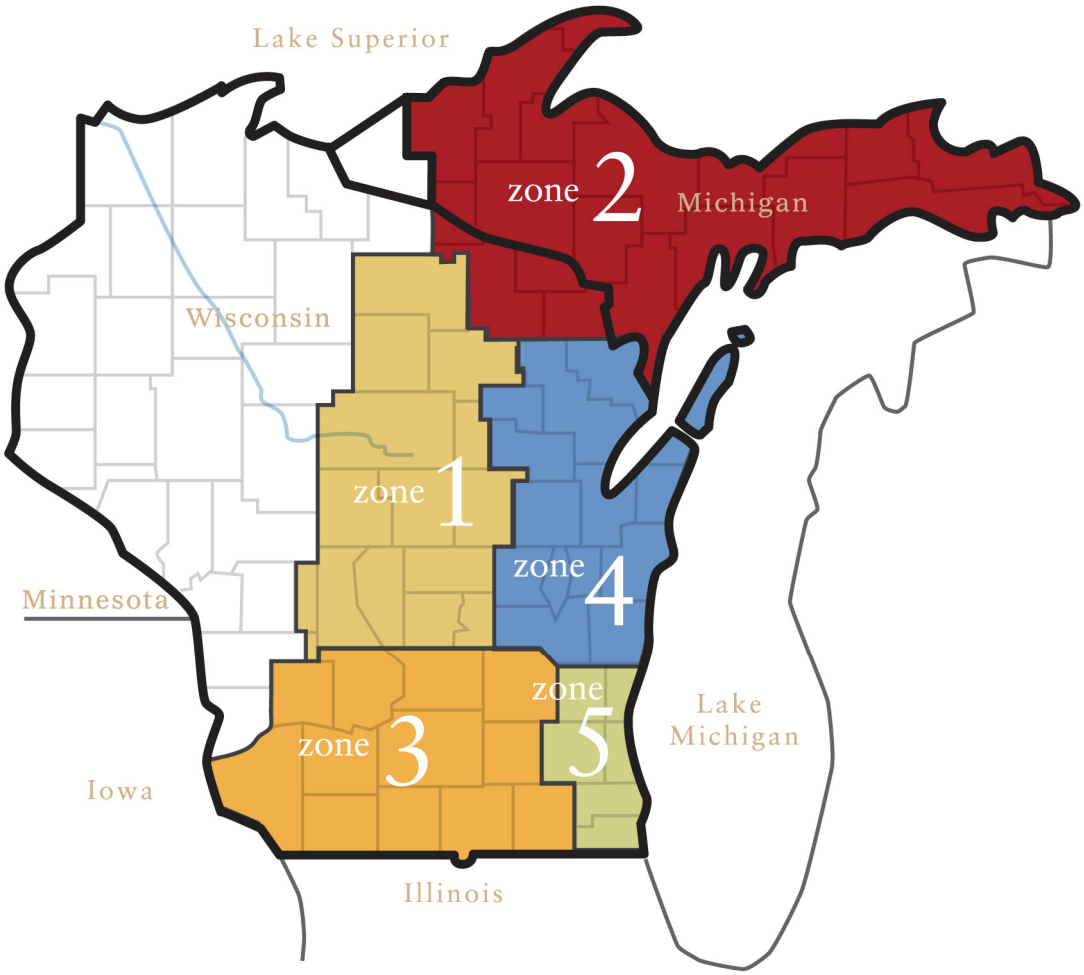

Figure PF-1

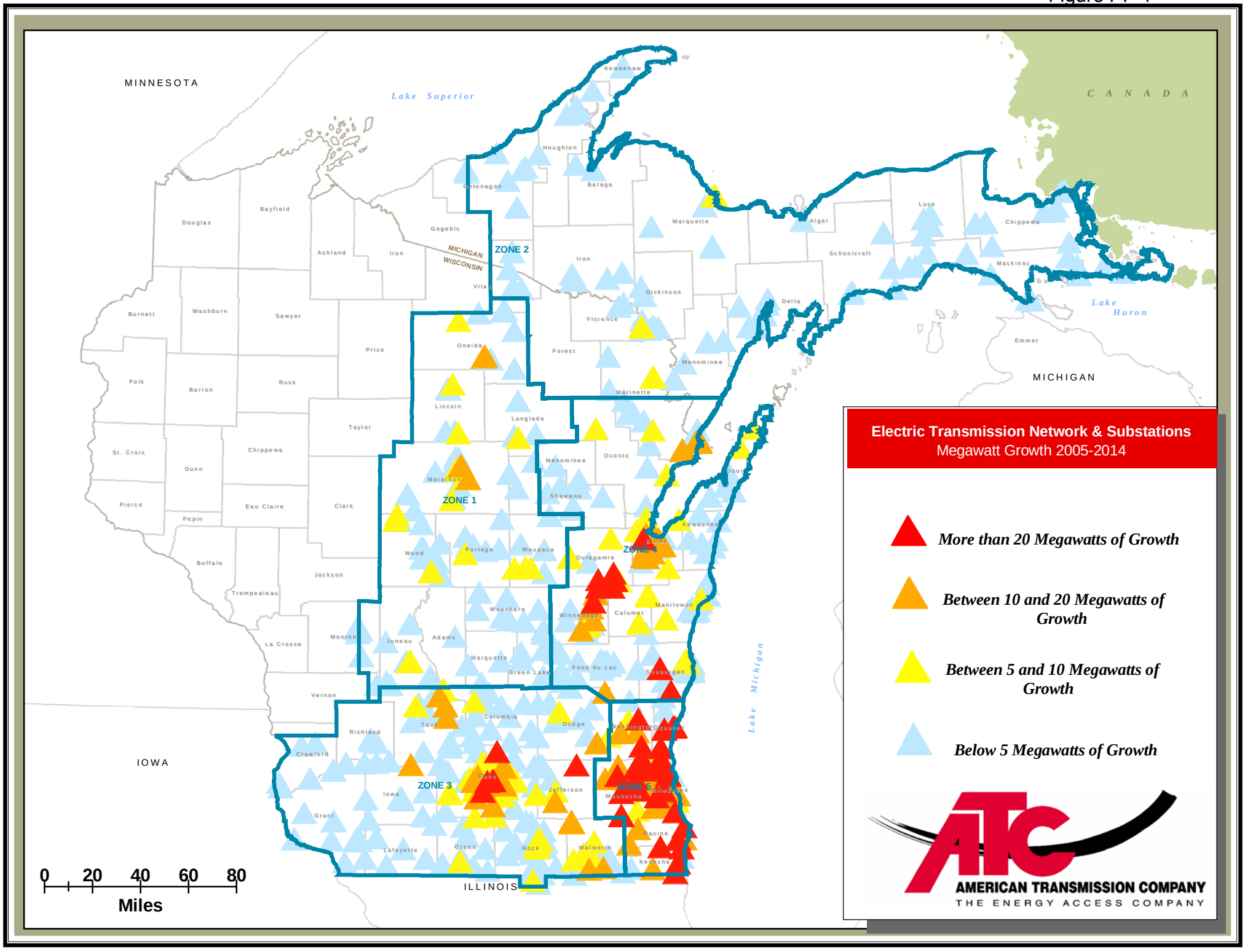
MINNESOTA
Lake Superior
CANADA
Keweenaw
Houghton
Ontonagon
Baraga
Marquette
Alger
Luce
Chippewa
Mackinac
Schoolcraft
Delta
Dickinson
Iron
Florence
Forest
Menominee
Marinette
Oconto
Gogebic
Bayfield
Douglas
Ashland
Iron
Vilas
Oneida
Lincoln
Langlade
Taylor
Price
Rusk
Sawyer
Burnett
Washburn
Barron
Polk
St. Croix
Dunn
Pierce
Pepin
Chippewa
Eau Claire
Clark
Buffalo
Jackson
Trempealeau
La Crosse
Monroe
Juneau
Adams
Marquette
Green Lake
Waushara
Portage
Wood
Marathon
Shawano
Menominee
Oconto
Kewaunee
Brown
Outagamie
Winnebago
Calumet
Manitowoc
Fond du Lac
Sheboygan
Ozaukee
Washington
Waukesha
Milwaukee
Racine
Kenosha
Walworth
Jefferson
Dodge
Columbia
Sauk
Dane
Iowa
Grant
Lafayette
Green
Rock
Richland
Crawford
Vernon
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
MICHIGAN
WISCONSIN
IOWA
ILLINOIS
Lake Michigan
Lake Huron
Emmet
0 20 40 60 80
Miles
Electric Transmission Network & Substations
Megawatt Growth 2005-2014
More than 20 Megawatts of Growth
Between 10 and 20 Megawatts of Growth
Between 5 and 10 Megawatts of Growth
Below 5 Megawatts of Growth
AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Figure PF-2

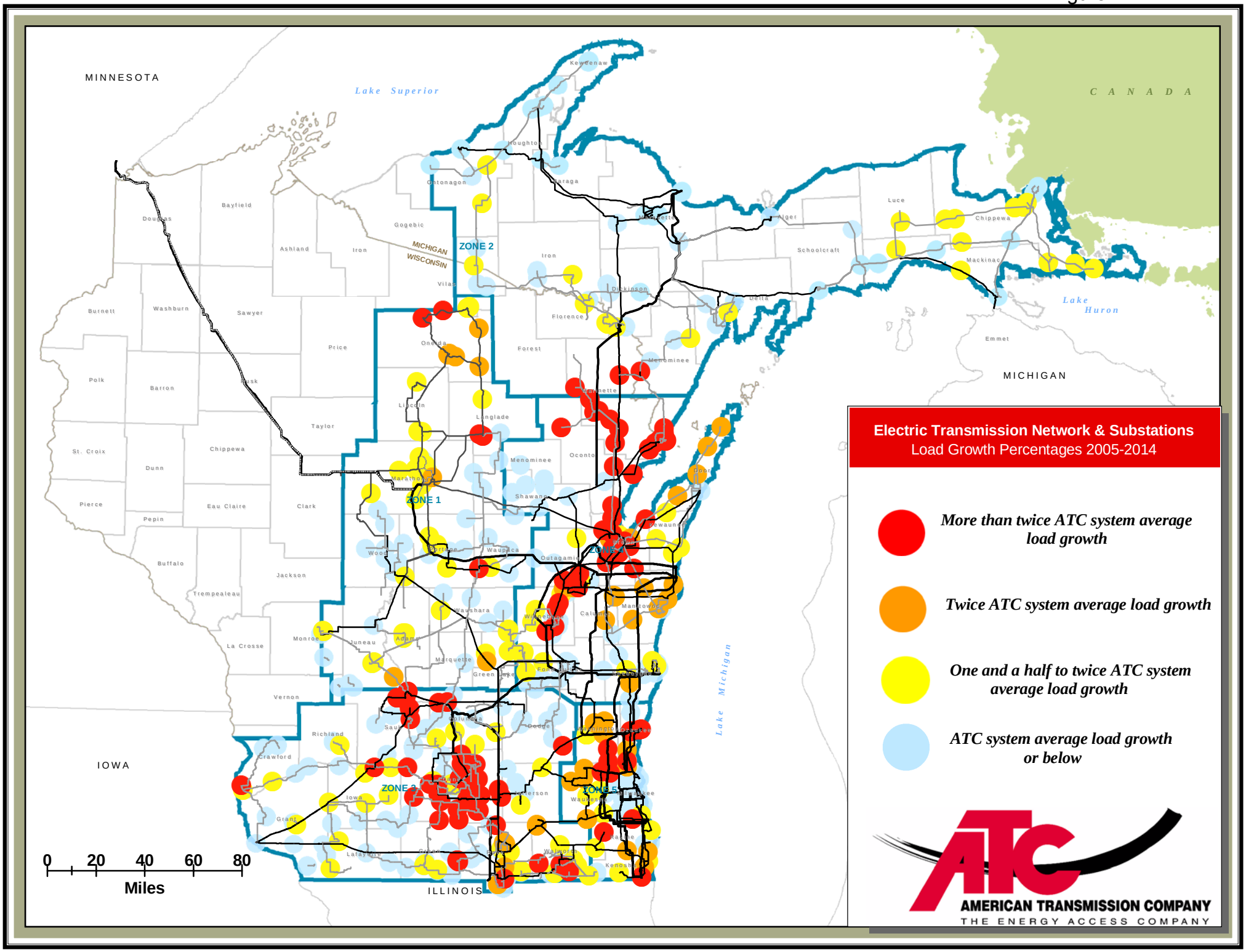
MINNESOTA
Lake Superior
CANADA
MICHIGAN
WISCONSIN
IOWA
ILLINOIS
Lake Michigan
Lake Huron
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
Houghton
Keweenaw
Ontonagon
Gogebic
Iron
Ashland
Bayfield
Douglas
Burnett
Washburn
Sawyer
Price
Oneida
Vilas
Florence
Forest
Dickinson
Menominee
Marinette
Delta
Schoolcraft
Luce
Alger
Chippewa
Mackinac
Emmet
Polk
Barron
Rusk
Taylor
Lincoln
Langlade
Oconto
Marathon
Shawano
Waupaca
Wood
Portage
Clark
Eau Claire
Chippewa
Dunn
St. Croix
Pierce
Pepin
Buffalo
Jackson
Trempealeau
La Crosse
Monroe
Juneau
Adams
Marquette
Green Lake
Waushara
Winnebago
Outagamie
Calumet
Manitowoc
Brown
Door
Kewaunee
Vernon
Richland
Crawford
Grant
Iowa
Lafayette
Green
Sauk
Columbia
Dodge
Jefferson
Waukesha
Milwaukee
Racine
Kenosha
Walworth
Washington
Ozaukee
0 20 40 60 80
Miles
Electric Transmission Network & Substations
Load Growth Percentages 2005-2014
More than twice ATC system average load growth
Twice ATC system average load growth
One and a half to twice ATC system average load growth
ATC system average load growth or below
AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Table PR-2
Transmission System Additions for 2005

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct new Eagle River Muni distribution Substation directly adjacent to the existing Cranberry 115-kV Substation	2005	2005	1	T-D interconnection	Planned	1.9
Uprate North Lake Geneva to Lake Geneva 69-kV line to 72 MVA	2004	2005	3	reliability	Proposed	0.1
Uprate Brick Church to Walworth 69-kV line to 48 MVA	2004	2005	3	reliability	Proposed	0.1
Uprate Brick Church to Katzenberg 69-kV line to 93 MVA	2004	2005	3	reliability	Proposed	0.1
Uprate Sun Prairie to Gaston Road 69-kV line to 48 MVA	2004	2005	3	reliability	Proposed	0.1
Uprate Colorado to Sun Prairie 69-kV line to 72 MVA	2004	2005	3	reliability	Proposed	0.1
Uprate Dane to Waunakee and Waunakee to Huiskamp 69-kV lines	2004	2005	3	reliability	Proposed	0.7
Uprate the North Appleton-Rocky Run 345-kV line	2005	2005	4	reliability	Planned	1
Construct a 138-kV substation at a new Forward Energy Center; loop existing Butternut-South Fond du Lac line into Forward Energy Center	2005	2005	4	new generation	Planned	3.2
Install 2-27 MVAR capacitor banks at Moorland 138 kV	2004	2005	5	reliability	Planned	1.1

Defined in Previous 10-Year Assessment
Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-3
Transmission System Additions for 2006

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Install 2-8.16 MVAR capacitor banks at Council Creek 138 kV	2005	2006	1	reliability	Planned	2.3
Reconductor Wien-McMillan 115-kV line (ATC,MEWD)	2006	2006	1	reliability	Planned	3.4
Reconductor Weston-Northpoint 115-kV line	2005	2006	1	achieve transfer capability associated with Arrowhead-Gardner Park, reliability, new generation	Planned	5.5
Construct new Gardner Park 345/115-kV Substation	2006	2006	1	service limitation, reliability, import capability & Weston stability	Planned	Included in Arrowhead-Gardner Park estimate
Replace 345/115-kV 200 MVA transformer at Weston with two 500 MVA units at the Gardner Park Substation	2005	2006	1	service limitation, reliability, import capability & Weston stability	Planned	Included in Arrowhead-Gardner Park estimate
Construct Gardner Park-Stone Lake 345-kV line	1997	2006	1	service limitation, reliability, import capability & Weston stability	Planned	262.1
Install 3-50 MVAR capacitor banks at Gardner Park 115 kV	2006	2006	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned	Included in Arrowhead-Gardner Park estimate
Install a 345/161-kV transformer at Stone Lake (temporary installation for construction outages)	2006	2006	1	reliability	Planned	Included in Arrowhead-Gardner Park estimate
Upgrade Weston-Kelly 115-kV line conductor clearances to 300F	2006	2006	1	new generation, reliability	Planned	1

Table PR-3
Transmission System Additions for 2006 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Increase size of existing Summit Lake 115-kV capacitor bank from 11.3 to 16.9 MVAR	2006	2006	1	reliability	Planned	1
Install 1-5.4 MVAR capacitor bank at Munising 69 kV	2006	2006	2	reliability	Proposed	0.4
Install 1-5.4 MVAR capacitor bank at Sawyer 69 kV	2006	2006	2	reliability	Proposed	0.9
Construct Hiawatha-Engadine 69-kV line	2003	2006	2	reliability	Planned	0
Rebuild and convert one Hiawatha-Indian Lake 69-kV circuit to double-circuit 138-kV standards, string two circuits initially and operate one at 69 kV	2004	2006	2	reliability, service limitation	Planned	44.2
Install 2-8.16 MVAR capacitor banks at Lincoln 69 kV	2006	2006	2	reliability	Proposed	1.1
Rebuild from Nordic to Randville Substation (5 miles) of single-circuit 69-kV line to double-circuit 69 kV	2005	2006	2	reliability, condition	Planned	5.2
Reconnect the 138/69-kV transformers at Kilbourn on separate breakers to operate individually	2006	2006	3	reliability	Provisional	0.3
Construct Butler Ridge 138-kV Substation	2006	2006	3	new generation	Planned	2.8
Install 36 MVAR capacitor bank at Hartford 138-kV Substation	2006	2006	3	reliability	Planned	1.2
Uprate Colley Road 138/69-kV transformer	2006	2006	3	reliability	Proposed	0.1
Uprate North Monroe 138/69-kV transformer	2006	2006	3	reliability	Proposed	0
Uprate Paddock-Shaw 69-kV line	2006	2006	3	reliability	Proposed	0
Uprate Brodhead-South Monroe 69-kV line	2006	2006	3	reliability	Provisional	0.1
Uprate McCue 138/69-kV transformer	2006	2006	3	reliability	Proposed	0.1

Table PR-3
Transmission System Additions for 2006 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct new 69-kV line from Columbia to Rio to feed the proposed Wyocena Substation	2004	2006	3	T-D interconnection, reliability	Planned	5
Rebuild Turtle-Bristol 69-kV line to 138 kV and operate at 69 kV	2004	2006	3	condition, reliability, new generation	Planned	5.9
Build new breaker and a half 345/138-kV substation on site adjacent to existing North Madison Substation and replace existing transformers with two new 500 MVA units	2006	2006	3	reliability, new generation	Planned	17.7
Reconfigure 345-kV bus at Columbia	2006	2006	3	reliability, new generation	Planned	2.5
Convert Columbia-North Madison 138-kV line to 345 kV	2005	2006	3	reliability, new generation	Planned	6
Construct new line from West Darien to Southwest Delavan at 138 kV, operate at 69 kV	2006	2006	3	T-D interconnection	Planned	4
Install a 138-kV series reactor at Highway V	2005	2006	4	reliability, service limitation, T-D interconnection	Planned	1.4
Upgrade 48 MVA RTU and CT at Mullet River 138/69 kV	2006	2006	4	reliability	Proposed	0
Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress	2006	2006	4	new generation	Planned	5.1
Construct a 345/138-kV switchyard at a new Werner West Substation; install a 345/138-kV transformer. Loop existing Rocky Run to North Appleton 345-kV and existing Werner to White Lake 138-kV lines into Werner West	2004	2006	4	reliability, service limitation	Planned	14.3

Table PR-3
Transmission System Additions for 2006 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct a Martin Road-South Fond du Lac/Ohmstead 138-kV line	2006	2006	4	T-D interconnection	Planned	1.6
Construct North Appleton 345-kV double breaker ring bus configuration	2006	2006	4	operations, maintenance and stability	Planned	8.4
Install 2-27 MVAR capacitor banks at Burlington 138 kV	2005	2006	5	reliability	Proposed	1.6
Rebuild Stiles-Amberg double-circuit 138-kV line	1996	2006	2 & 4	reliability, service limitation, condition	Planned	45.8

Defined in Previous 10-Year Assessment
Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-4
Transmission System Additions for 2007

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Uprate Metomen-North Fond du Lac 69-kV line terminal equipment	2006	2007	1	reliability	Planned	0.2
Install 2-16.3 MVAR capacitor banks at Wautoma 138 kV	2007	2007	1	reliability	Proposed	1.2
Construct Venus-Metonga 115-kV line	2007	2007	1	T-D interconnection	Planned	8
Rebuild Weston-Sherman St. and Sherman St-Hilltop 115-kV lines as double-circuits with a new Gardner Park-Hilltop 115-kV line	2007	2007	1	new generation, reliability	Proposed	7.3
Construct Brandon-Fairwater 69-kV line	2007	2007	1	T-D interconnection	Provisional	0.6
Construct Mackinac 138-kV Substation (new Straits Substation)	2005	2007	2	reliability, service limitation	Proposed	5.8
Relocate Cedar Substation (North Lake)	2005	2007	2	reliability, condition	Proposed	7.3
Relocate Brule Substation (Aspen)	2007	2007	2	reliability, condition	Proposed	5.7
Install 2-8.16 MVAR capacitor banks at Ontonagon 138 kV	2007	2007	2	reliability	Proposed	1.2
Uprate McCue-Janesville 69-kV line	2007	2007	3	reliability	Proposed	0
Rebuild the Verona to Oregon 69-kV line Y119	2006	2007	3	reliability	Proposed	3.8
Uprate Rockdale to Jefferson 138-kV line	2007	2007	3	reliability, service limitation	Planned	0.2
Uprate Rockdale to Boxelder 138-kV line	2007	2007	3	reliability, service limitation	Planned	0.2
Uprate Boxelder to Stonybrook 138-kV line	2007	2007	3	reliability, service limitation	Planned	0.2
Construct a Jefferson-Lake Mills-Stony Brook 138-kV line	2006	2007	3	reliability, T-D interconnection	Proposed	19.7
Convert Kegonsa-McFarland-Femrite 69-kV line to 138 kV	2007	2007	3	reliability, new generation	Proposed	3.4
Construct Sprecher-Femrite 138-kV line	2007	2007	3	reliability, new generation	Proposed	8.1
Install 138/69-kV transformer at Femrite	2007	2007	3	reliability, new generation	Proposed	3.4

Table PR-4
Transmission System Additions for 2007 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Install 138/69-kV transformer at Reiner	2007	2007	3	reliability, new generation	Proposed	3.4
Convert Sycamore-Reiner-Sprecher from 69-kV to 138 kV	2007	2007	3	reliability	Proposed	2.5
Install/upgrade capacitor bank at South Monroe 69 kV to 32 MVAR	2007	2007	3	reliability	Proposed	1.1
Construct new line from Southwest Delavan to Delavan or Bristol at 138 kV, operate at 69 kV	2007	2007	3	T-D interconnection	Proposed	4.3
String a new Ellinwood-Sunset Point 138-kV line on existing structures	2007	2007	4	reliability	Provisional	2.5
Install 2-16.3 MVAR capacitor bank at Canal 69 kV	2007	2007	4	reliability	Planned	1.8
Replace the 1200 A breaker at Edgewater T22 345/138 kV	2007	2007	4	reliability	Proposed	0.3
Construct double-circuit 138-kV line from Forest Junction/Howards Grove/Charter Steel to Plymouth #4	2007	2007	4	T-D interconnection	Proposed	2.5
Uprate North Appleton-Lawn Road-White Clay 138-kV line	2007	2007	4	reliability	Planned	0.6
Construct a 345-kV bus at Bain	2005	2007	5	reliability	Provisional	2.1
Install 200 MVAR capacitor bank at Bluemound	2007	2007	5	reliability	Provisional	3.3
Install series reactor at Cornell	2007	2007	5	reliability	Proposed	0.8

Defined in Previous 10-Year Assessment
Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-5
Transmission System Additions for 2008

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2008	2008	1	T-D interconnection	Provisional	0.6
Upgrade Kelly-Whitcomb 115-kV line conductor clearances to 300F	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned	1.9
Construct Stone Lake-Arrowhead 345-kV line	1997	2008	1	service limitation, reliability, import capability & Weston stability	Planned	158.2
Install 2-75 MVAR capacitor banks at Arrowhead 345 kV	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned	Included in Arrowhead-Gardner Park estimate
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	Included in Arrowhead-Gardner Park estimate
Install 1-50 MVAR capacitor bank at Arpin	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned	Included in Arrowhead-Gardner Park estimate
Construct the new permanent Stone Lake 345/161-kV Substation	2008	2008	1	reliability, import capability & Weston stability	Planned	8
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Berlin 69 kV	2008	2008	1	reliability	Proposed	0.5
Rebuild Atlantic-Osceola 69-kV line (Laurium #1)	2006	2008	2	reliability, condition	Planned	9.2
Increase ground clearance of Atlantic-Osceola (Laurium #2) 69-kV line from 120 to 167 degrees F	2008	2008	2	reliability	Proposed	2.1

Table PR-5
Transmission System Additions for 2008 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Install second 345/138-kV transformer at Plains	2008	2008	2	reliability	Provisional	5.4
Install 1-5.4 MVAR capacitor bank at L'Anse 69 kV	2008	2008	2	reliability	Provisional	0.5
Install 2-8.16 MVAR capacitor banks at M38 69 kV	2008	2008	2	reliability	Proposed	1.8
Install 2-5.4 MVAR capacitor banks at Osceola 69 kV	2008	2008	2	reliability	Proposed	1.3
Uprate Atlantic 138/69-kV transformer	2008	2008	2	reliability	Proposed	1.4
Construct a Rubicon-Hustisford 138-kV line	2008	2008	3	reliability	Proposed	4.8
Rebuild Hustisford-Horicon 69 kV to 138 kV	2008	2008	3	reliability	Proposed	2.4
Construct 138/69-kV substation at a site near Horicon and install a 138/69-kV transformer	2008	2008	3	reliability	Proposed	8.8
Convert Rock River to Bristol to Elkhorn 138 kV operation; rebuild Bristol with a new 138-kV bus	2008	2008	3	reliability	Proposed	5.1
Construct a new 138-kV line from North Madison to Waunakee	2005	2008	3	reliability	Proposed	10.1
Construct a new 138/69-kV substation near Waunakee and install a 100 MVA 138/69-kV transformer	2005	2008	3	reliability	Proposed	1
Install 1-8.16 MVAR capacitor bank at Richland Center 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2008	2008	3	reliability	Provisional	1.1
Construct 138-kV line from Canal to Dunn Road	2008	2008	4	reliability	Proposed	4.2

Table PR-5
Transmission System Additions for 2008 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Install 60 MVA 138/69-kV transformer at Dunn Road	2008	2008	4	reliability	Proposed	2.2
Rebuild/Convert Pulliam-New Suamico 69-kV line to 138 kV	2008	2008	4	reliability, condition, T-D interconnection	Provisional	12.9
Uprate North Appleton-Mason Street 138-kV line	2008	2008	4	reliability, service limitation	Proposed	1.7
Uprate North Appleton-Lost Dauphin 138-kV line	2008	2008	4	reliability, service limitation	Proposed	1.6
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	Provisional	2
Install 138/69-kV transformer at the expanded Menominee Substation	2008	2008	4	reliability	Provisional	2.1
Rebuild Crivitz-High Falls 69-kV double-circuit line	2008	2008	4	reliability	Provisional	7.8
Construct a new Mill Road Substation at intersection of Granville-Arcadian 345-kV, Forest Junction-Arcadian 345-kV, Sussex-Tamarack 138-kV and Sussex-Germantown 138-kV lines; install a 345/138-kV transformer	2008	2008	5	reliability	Proposed	29.2
Reconductor Pleasant Valley-Saukville 138-kV line	2008	2008	5	new generation	Proposed	3
Reconductor Pleasant Valley-St. Lawrence 138-kV line	2008	2008	5	new generation	Proposed	3.1

Table PR-5
Transmission System Additions for 2008 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Reconductor Cornell-Range Line 138-kV line	2008	2008	5	new generation	Proposed	6
Construct Cranberry-Conover 115-kV line	2008	2008	1 & 2	reliability, transfer capability	Proposed	17.1
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2008	2008	1 & 2	reliability, transfer capability	Proposed	69.1
Construct 138-kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover	2008	2008	1 & 2	reliability, transfer capability	Proposed	18.5
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove	2008	2008	1 & 2	reliability, transfer capability	Proposed	2.9
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen	2008	2008	1 & 2	reliability	Proposed	2.9
Relocate Iron River Substation (Iron Grove)	2008	2008	1 & 2	reliability	Proposed	5.9

Defined in Previous 10-Year Assessment
Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-6
Transmission System Additions for 2009

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Uprate Rocky Run-Plover 115-kV line terminal equipment	2009	2009	1	new generation	Proposed	0
Construct Gardner Park-Central Wisconsin 345-kV line	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned	90.2
Construct new Central Wisconsin 345-kV Substation	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned	12.2
Relocate 69-kV Rexton tap to 69-kV Hiawatha-Pine River line (6909)	2009	2009	2	condition	Provisional	0.3
Relocate 69-kV Trout Lake tap to 69-kV Hiawatha-Pine River line (6909)	2009	2009	2	condition	Provisional	0.3
Construct Mackinac 138-kV Substation additions (portions may be earlier for maintenance issues)	2009	2009	2	reliability, service limitation	Provisional	5.8
Rebuild Hiawatha-Pine River-Mackinac 69 kV to 138 kV	2009	2009	2	reliability, condition	Provisional	57.4
Construct 138-kV bus and install one 138/69-kV, 50 MVA transformer at Pine River	2009	2009	2	reliability	Provisional	10
Convert rebuilt Hiawatha-Indian Lake circuit (operated at 69 kV) to 138 kV	2009	2009	2	reliability, service limitation	Planned	0.2
Construct 138-kV ring bus at Hiawatha Substation	2009	2009	2	reliability, service limitation	Planned	3.3
Install 138-kV substation modifications at Indian Lake Substation	2009	2009	2	reliability, service limitation	Planned	1.9
Install 1-5.4 MVAR capacitor bank at MTU or Henry Street 69 kV	2009	2009	2	reliability	Proposed	0.6
Install 1-5.4 MVAR capacitor bank at Roberts 69 kV	2009	2009	2	reliability	Proposed	0.6

Table PR-6
Transmission System Additions for 2009 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Install 4-25 MVAR capacitor banks at Portage 138 kV	2009	2009	3	reliability	Provisional	2.2
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva	2009	2009	3	reliability	Provisional	6
Construct new 138-kV line from South Lake Geneva to White River	2009	2009	3	reliability, T-D interconnection	Provisional	2.5
Construct new 138-kV bus and 138/69-kV 100 MVA transformer at Montrose Substation	2009	2009	3	reliability	Proposed	1.4
Construct new Montrose-Sun Valley-Oak Ridge 138-kV line	2009	2009	3	reliability	Proposed	5.1
Uprate Colley Road to Brick Church 69-kV line to 72 MVA	2008	2009	3	reliability	Proposed	0.5
Install a second 138/69-kV transformer at Hillman	2009	2009	3	reliability	Proposed	3.9
Install a 69-kV 16.32 MVAR capacitor bank at Kilbourn Substation	2009	2009	3	reliability	Provisional	0.4
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2009	2009	4	reliability	Proposed	1
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	included in Morgan-Werner estimate
Construct Morgan-Werner West 345-kV line	2004	2009	4	reliability, service limitation	Planned	113.8
Reconductor Oak Creek-Ramsey 138-kV line	2009	2009	5	new generation	Proposed	0.4
Reconductor Oak Creek-Allerton 138-kV line	2009	2009	5	new generation	Proposed	2

Table PR-6
Transmission System Additions for 2009 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Replace relaying on 230-kV circuits at Oak Creek	2009	2009	5	new generation	Proposed	3
Replace two 345-kV circuit breakers at Pleasant Prairie on the Racine and Zion lines with IPO breakers and upgrade relaying	2009	2009	5	new generation	Proposed	2.1
Expand Oak Creek 345-kV switchyard to interconnect one new generator	2009	2009	5	new generation	Proposed	10.8
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	Provisional	4.1
Construct Rockdale-Concord 345-kV line in parallel with existing 138-kV on existing double-width right-of-way	2009	2009	3 & 5	reliability, service limitation	Proposed	22.2
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Concord	2009	2009	3 & 5	reliability	Proposed	12.9

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Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-7
Transmission System Additions for 2010

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Uprate Wautoma-Berlin 69-kV line terminal equipment at Wautoma	2010	2010	1	reliability	Provisional	0
Replace 138/69-kV transformer at Metomen	2010	2010	1	reliability	Provisional	2
Construct Monroe County-Council Creek 161-kV line	2010	2010	1	access initiative, reliability	Provisional	16.7
Install a 161/138-kV transformer at Council Creek	2010	2010	1	access initiative, reliability	Provisional	2.5
Uprate Council Creek-Petenwell 138-kV line	2010	2010	1	access initiative, reliability	Provisional	0.2
Rebuild/reconductor Petenwell-Saratoga 138-kV line	2010	2010	1	access initiative, reliability	Provisional	14.8
Install a 69-kV bus and 138/69-kV 100 MVA transformer at Northwest Beloit	2010	2010	3	reliability	Provisional	2
Reroute Paddock to Shirland Avenue 69-kV line into and out of Northwest Beloit	2010	2010	3	reliability	Provisional	0.5
Loop the Femrite to Royster 69-kV line into AGA Gas	2010	2010	3	reliability	Provisional	1.6
Convert Hillman to Eden 69-kV line to 138 kV	2010	2010	3	reliability	Proposed	16.5
Install 1-8.16 MVAR capacitor bank at Boscobel 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2010	2010	3	reliability	Provisional	1.2
Rebuild Brodhead to South Monroe 69-kV line using 477 ACSR	2010	2010	3	reliability	Provisional	4
Convert Waunakee-Blount 69-kV line to 138 kV	2010	2010	3	reliability	Proposed	20

Table PR-7
Transmission System Additions for 2010 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Uprate Darlington-Rock Branch 69-kV line	2010	2010	3	reliability	Provisional	0.1
Uprate existing 18 MVAR capacitor bank at Spring Green 138 kV with a 50 MVAR bank	2010	2010	3	reliability	Provisional	1.2
Retap 48 MVA CT at South Sheboygan Falls 138/69-kV transformer	2010	2010	4	reliability	Proposed	0
Rebuild/convert New Holstein-St. Nazianz-Custer-Lakefront 69-kV line to 138 kV (1225 Amps minimum)	2010	2010	4	access initiative	Provisional	7.7
Rebuild Tecumseh Road-New Holstein to double-circuit 138/69 kV, where 69 kV will serve Gravesville via New Holstein	2010	2010	4	access initiative	Provisional	2.4
Install 47 MVA 138/69-kV transformer at Custer	2010	2010	4	access initiative	Provisional	3.1
Install 100 MVA 138/69-kV transformer at Lakefront	2010	2010	4	access initiative	Provisional	2.5
Construct a second Dunn Road-Egg Harbor 69-kV line	2010	2010	4	reliability	Proposed	6.2
Uprate Kansas-Ramsey6 138-kV line	2009	2010	5	new generation	Proposed	0.1
Install second 500 MVA 345/138-kV transformer at Oak Creek	2010	2010	5	new generation	Proposed	6.6
Expand 345-kV switchyard at Oak Creek to interconnect one new generator	2010	2010	5	new generation	Proposed	10.8
Uprate Oak Creek-Root River 138-kV line	2010	2010	5	new generation	Proposed	0.6
Uprate Oak Creek-Nicholson 138-kV line	2010	2010	5	new generation	Proposed	1.2
Convert Bark River-Mill Road 138-kV line to 345 kV	2010	2010	3 & 5	reliability, new generation	Proposed	0.8

Table PR-7
Transmission System Additions for 2010 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct a Concord-Bark River 345-kV line	2010	2010	3 & 5	reliability, new generation	Proposed	50.3
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Bark River	2010	2010	3 & 5	reliability, new generation	Proposed	8.4

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New to this 10-Year Assessment

Table PR-8
Transmission System Additions for 2011

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69 kV	2011	2011	1	reliability	Provisional	0.5
Uprate Yahara-Token Creek 69-kV line	2011	2011	3	reliability	Provisional	0.1
Construct Evansville-Brooklyn 69-kV line	2011	2011	3	reliability	Provisional	7.9
Construct 345-kV line from Rockdale to West Middleton	2011	2011	3	reliability	Proposed	49
Construct a 345-kV bus and install a 345/138-kV 500 MVA transformer at West Middleton	2011	2011	3	reliability	Proposed	12
Install a 138/69-kV transformer and 69-kV bus at Yahara River Substation	2011	2011	3	reliability	Provisional	1.3
Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation	2011	2011	3	reliability	Provisional	1.2
Constuct a Lake Delton-Birchwood 138-kV line	2011	2011	3	reliability	Provisional	3
Install a second 138/69-kV transformer at Janesville Substation	2011	2011	3	reliability	Provisional	2
Uprate Northgate-20th Street 138-kV line	2011	2011	4	reliability	Provisional	0.1
Replace the 400 amp metering CT at North Mullet River 69 kV	2011	2011	4	reliability	Provisional	0.2

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New to this 10-Year Assessment

Table PR-9
Transmission System Additions for 2012

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Uprate Gardner Park-Black Brook 115-kV line - scope TBD	2012	2012	1	reliability	Provisional	0.6
Install a 12.2 MVAR capacitor bank at Hilltop 69 kV	2012	2012	1	reliability	Provisional	1.3
Uprate M38 138/69-kV transformer	2012	2012	2	reliability	Provisional	1.4
Rebuild Blaney Park-Munising 69 kV to 138 kV	2012	2012	2	reliability, condition	Provisional	53.7
Uprate Sun Prairie-Bird Street 69-kV line	2012	2012	3	reliability	Proposed	0.1
Uprate North Monroe-Idle Hour 69-kV line	2012	2012	3	reliability	Provisional	0.1
Install 138/69-kV transformer at Bass Creek	2012	2012	3	reliability	Provisional	4.5
Rebuild and convert West Middleton-Spring Green 69-kV line to 138 kV	2012	2012	3	reliability	Provisional	22.7
Construct West Middleton-Stagecoach double-circuit 138/69-kV line	2012	2012	3	reliability	Provisional	6.9
Construct 69-kV line Eden through Muscoda to Richland Center	2012	2012	3	reliability	Provisional	23.4
Move Lone Rock 69-kV phase shifter to Richland Center	2012	2012	3	reliability	Provisional	0.5
Retap 400A primary CT at Edgewater to 600A	2012	2012	4	reliability	Provisional	0

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Revised in scope from Previous 10-Year Assessment
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Table PR-10
Transmission System Additions for 2013

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Replace 300 A metering CT at Edgewater 69 kV	2013	2013	4	reliability	Proposed	0
Replace 300 A metering CT at Riverside 69 kV	2013	2013	4	reliability	Proposed	0
Uprate Port Edwards-Saratoga 138-kV line - Scope TBD	2013	2013	1	reliability	Provisional	0.1
Salem-Spring Green-West Middleton 345-kV proxy for Large Access Project, includes rebuild Nelson Dewey-Spring Green-West Middleton 138/69 kV to double-circuit 345/138 kV	2013	2013	3	access initiative	Provisional	343.9
Rebuild/convert Chalk Hills-Chandler 69 kV to 138 kV operation	2013	2013	2 & 4	reliability	Provisional	25.1
Expand 345 kV to 6 positions at Paddock	2013	2013	3	access initiative	Provisional	0.6
Expand 138 kV to 7 positions at Paddock	2013	2013	3	access initiative	Provisional	0.5
Install second 345/138-kV transformer at Paddock (500 MVA normal/625 MVA emergency)	2013	2013	3	access initiative	Provisional	1.9
Rebuild Paddock-Town Line Road 138 kV to double-circuit 1600 Amps minimum summer emergency each	2013	2013	3	access initiative	Provisional	5
Reconductor Town Line Road-Russell 138 kV to 1600 Amps minimum summer emergency	2013	2013	3	access initiative	Provisional	1.3
Construct new 69-kV line from South Lake Geneva to Lake Shore Substation	2013	2013	3	T-D interconnection	Provisional	2.4

Table PR-10
Transmission System Additions for 2013 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Convert South Lake Geneva to Twin Lakes 69-kV line to 138 kV	2013	2013	3	reliability	Provisional	3
Construct new 138-kV line from Twin Lakes to Spring Valley	2013	2013	3	reliability	Provisional	27
Construct a Horicon-East Beaver Dam 138-kV line	2013	2013	3	reliability	Provisional	6
Replace the 300A current transformer at Sheboygan Falls 69 kV	2013	2013	4	reliability	Provisional	0
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	2013	5	new generation	Provisional	15
Construct a 345/138-kV switchyard at Hale (Brookdale) to accommodate two 345-kV lines, a 500 MVA 345/138-kV transformer and four 138-kV lines plus two 138/26.2 kV transformers	2013	2013	5	new generation	Provisional	19.6
Install two 345-kV line terminations at Pleasant Prairie and loop Zion-Arcadian 345-kV line into Pleasant Prairie Substation	2013	2013	5	new generation	Provisional	15.2
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	2013	5	new generation	Provisional	40.7
Construct Oak Creek-St Martins 138-kV circuit #2 installing 16.6 mi. conductor on existing towers	2013	2013	5	new generation	Provisional	10.7

Table PR-10
Transmission System Additions for 2013 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Construct a Hale (Brookdale)-Granville 345-kV line converting/reconductoring 5.6 miles of 138 kV, rebuilding 7 miles of 138-kV double-circuit tower line and converting/reconductoring 3 miles of 138 kV on existing 345-kV structures	2013	2013	5	new generation	Provisional	41.9
Restring Bluemound-Butler 138-kV line (KK5051) on new 345-kV structures installed with Hale (Brookdale)-Granville line	2013	2013	5	new generation	Provisional	0.7
String Butler-Tamarack (Carmen) 138-kV line on new 345-kV structures installed with Hale (Brookdale)-Granville line	2013	2013	5	new generation	Provisional	0.9
Replace CTs at Racine 345-kV Substation	2013	2013	5	new generation	Provisional	0

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Table PR-11
Transmission System Additions for 2014

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Increase McKenna 69-kV capacitor bank from 6.3 to 10.8 MVAR	2014	2014	1	reliability	Provisional	0.3
Uprate Metomen-Ripon 69-kV line - scope TBD	2014	2014	1	reliability	Provisional	2.2
Install a second 138/69-kV transformer at North Monroe	2014	2014	3	reliability	Provisional	2.3
Construct West Middleton-Blount 138-kV line	2014	2014	3	reliability	Provisional	11
Construct West Middleton-North Madison 345-kV line	2014	2014	3	reliability, access initiative	Proposed	46.7
Install 1-16.32 MVAR capacitor bank at Burke 69 kV	2014	2014	3	reliability	Provisional	0.1
Install a second Femrite 138/69-kV transformer	2014	2014	3	reliability	Provisional	2.4
Replace the Kilbourn 47 MVA 138/69-kV transformer with a 100 MVA unit	2014	2014	3	reliability	Provisional	0.2
Uprate Colley Road to Park Street Tap 69-kV line to 114 MVA	2014	2014	3	reliability	Provisional	0.1
Replace the existing 46.7 MVA 138/69-kV transformer at South Sheboygan Falls with 100 MVA transformer	2014	2014	4	reliability	Provisional	1.3
Uprate the Melissa-Tayco to 229 MVA (300F)	2014	2014	4	reliability	Provisional	0.1

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Revised in scope from Previous 10-Year Assessment
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Table PR-12
Transmission System Additions for 2015

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Replace 138/69-kV transformer at Wautoma	2015	2015	1	reliability	Provisional	1.4
Construct Fitzgerald-Omro Industrial 69-kV line	2015	2015	1	reliability	Provisional	5.3
Install additional 13.6 MVAR capacitor bank at Clear Lake 115 kV	2015	2015	1	reliability	Provisional	0.5
Install 2-5.4 MVAR capacitor banks at M-38 69 kV	2015	2015	2	reliability	Provisional	0.3
Replace the Colley Road 138/69-kV transformer	2015	2015	3	reliability	Provisional	1.4
Install 28.8 MVAR capacitor bank at Butternut 138 kV	2015	2015	4	reliability	Provisional	1
Construct a Northside-City Limits 138-kV line	2015	2015	4	reliability	Provisional	5
Reconductor Pulliam-Danz 69-kV line	2015	2015	4	reliability	Provisional	2.2
Reconductor Danz-Henry Street 69-kV line	2015	2015	4	reliability	Provisional	0.1
Reconductor Pulliam-Van Buren 69-kV line	2015	2015	4	reliability	Provisional	0.1
Rebuild/Convert New Suamico-Pioneer 69-kV line to 138 kV	2015	2015	4	reliability, condition	Provisional	13.3

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Revised in scope from Previous 10-Year Assessment
New to this 10-Year Assessment

Table PR-13
Transmission System Additions for Zone 1

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct new Eagle River Muni distribution Substation directly adjacent to the existing Cranberry 115-kV Substation	2005	2005	1	T-D interconnection	Planned
Install 2-8.16 MVAR capacitor banks at Council Creek 138 kV	2005	2006	1	reliability	Planned
Reconductor Wien-McMillan 115-kV line (ATC,MEWD)	2006	2006	1	reliability	Planned
Reconductor Weston-Northpoint 115-kV line	2005	2006	1	achieve transfer capability associated with Arrowhead-Gardner Park, reliability, new generation	Planned
Construct new Gardner Park 345/115-kV Substation	2006	2006	1	service limitation, reliability, import capability & Weston stability	Planned
Replace 345/115-kV 200 MVA transformer at Weston with two 500 MVA units at the Gardner Park Substation	2005	2006	1	service limitation, reliability, import capability & Weston stability	Planned
Construct Gardner Park-Stone Lake 345-kV line	1997	2006	1	service limitation, reliability, import capability & Weston stability	Planned
Install 3-50 MVAR capacitor banks at Gardner Park 115 kV	2006	2006	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned
Install a 345/161-kV transformer at Stone Lake (temporary installation for construction outages)	2006	2006	1	reliability	Planned
Upgrade Weston-Kelly 115-kV line conductor clearances to 300F	2006	2006	1	new generation, reliability	Planned

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Increase size of existing Summit Lake 115-kV capacitor bank from 11.3 to 16.9 MVAR	2006	2006	1	reliability	Planned
Uprate Metomen-North Fond du Lac 69-kV line terminal equipment	2006	2007	1	reliability	Planned
Install 2-16.3 MVAR capacitor banks at Wautoma 138 kV	2007	2007	1	reliability	Proposed
Construct Venus-Metonga 115-kV line	2007	2007	1	T-D interconnection	Planned
Rebuild Weston-Sherman St. and Sherman St-Hilltop 115-kV lines as double-circuits with a new Gardner Park-Hilltop 115-kV line	2007	2007	1	new generation, reliability	Proposed
Construct Brandon-Fairwater 69-kV line	2007	2007	1	T-D interconnection	Provisional
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2008	2008	1	T-D interconnection	Provisional
Upgrade Kelly-Whitcomb 115-kV line conductor clearances to 300F	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned
Construct Stone Lake-Arrowhead 345-kV line	1997	2008	1	service limitation, reliability, import capability & Weston stability	Planned
Install 2-75 MVAR capacitor banks at Arrowhead 345 kV	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	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
Install 1-50 MVAR capacitor bank at Arpin	2008	2008	1	achieve transfer capability associated with Arrowhead-Gardner Park	Planned

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct the new permanent Stone Lake 345/161-kV Substation	2008	2008	1	reliability, import capability & Weston stability	Planned
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Berlin 69 kV	2008	2008	1	Reliability	Proposed
Construct Cranberry-Conover 115-kV line	2008	2008	1 & 2	reliability, transfer capability	Proposed
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install 138/69-kV, 60 MVA transformer at Aspen	2008	2008	1 & 2	reliability	Proposed
Relocate Iron River Substation (Iron Grove)	2008	2008	1 & 2	reliability	Proposed
Uprate Rocky Run-Plover 115-kV line terminal equipment	2009	2009	1	new generation	Proposed
Construct Gardner Park-Central Wisconsin 345-kV line	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned
Construct new Central Wisconsin 345-kV Substation	2009	2009	1	service limitation, reliability, import capability and Weston stability	Planned
Uprate Wautoma-Berlin 69-kV line terminal equipment at Wautoma	2010	2010	1	reliability	Provisional
Replace 138/69-kV transformer at Metomen	2010	2010	1	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct Monroe County-Council Creek 161-kV line	2010	2010	1	access initiative, reliability	Provisional
Install a 161/138-kV transformer at Council Creek	2010	2010	1	access initiative, reliability	Provisional
Uprate Council Creek-Petenwell 138-kV line	2010	2010	1	access initiative, reliability	Provisional
Rebuild/reconductor Petenwell-Saratoga 138-kV line	2010	2010	1	access initiative, reliability	Provisional
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69 kV	2011	2011	1	reliability	Provisional
Uprate Gardner Park-Black Brook 115-kV line - scope TBD	2012	2012	1	reliability	Provisional
Install a 12.2 MVAR capacitor bank at Hilltop 69 kV	2012	2012	1	reliability	Provisional
Uprate Port Edwards-Saratoga 138-kV line - Scope TBD	2013	2013	1	reliability	Provisional
Increase McKenna 69-kV capacitor bank from 6.3 to 10.8 MVAR	2014	2014	1	reliability	Provisional
Uprate Metomen-Ripon 69-kV line - scope TBD	2014	2014	1	reliability	Provisional
Replace 138/69-kV transformer at Wautoma	2015	2015	1	reliability	Provisional
Construct Fitzgerald-Omro Industrial 69-kV line	2015	2015	1	reliability	Provisional
Install additional 13.6 MVAR capacitor bank at Clear Lake 115 kV	2015	2015	1	reliability	Provisional

Table PR-14
Transmission System Additions for Zone 2

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Install 1-5.4 MVAR capacitor bank at Munising 69 kV	2006	2006	2	reliability	Proposed
Install 1-5.4 MVAR capacitor bank at Sawyer 69 kV	2006	2006	2	reliability	Proposed
Construct Hiawatha-Engadine 69-kV line	2003	2006	2	reliability	Planned
Rebuild and convert one Hiawatha-Indian Lake 69-kV circuit to double-circuit 138-kV standards, string two circuits initially and operate one at 69 kV	2004	2006	2	reliability, service limitation	Planned
Install 2-8.16 MVAR capacitor banks at Lincoln 69 kV	2006	2006	2	reliability	Proposed
Rebuild from Nordic to Randville Substation (5 miles) of single circuit 69-kV line to double-circuit 69 kV	2005	2006	2	reliability, condition	Planned
Rebuild Stiles-Amberg double-circuit 138-kV line	1996	2006	2 & 4	reliability, service limitation, condition	Planned
Construct Mackinac 138-kV Substation (new Straits Substation)	2005	2007	2	reliability, service limitation	Proposed
Relocate Cedar Substation (North Lake)	2005	2007	2	reliability, condition	Proposed
Relocate Brule Substation (Aspen)	2007	2007	2	reliability, condition	Proposed
Install 2-8.16 MVAR capacitor banks at Ontonagon 138 kV	2007	2007	2	reliability	Proposed
Rebuild Atlantic-Osceola 69-kV line (Laurium #1)	2006	2008	2	reliability, condition	Planned
Increase ground clearance of Atlantic-Osceola (Laurium #2) 69-kV line from 120 to 167 degrees F	2008	2008	2	reliability	Proposed
Install second 345/138-kV transformer at Plains	2008	2008	2	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Install 1-5.4 MVAR capacitor bank at L'Anse 69 kV	2008	2008	2	reliability	Provisional
Install 2-8.16 MVAR capacitor banks at M38 69 kV	2008	2008	2	reliability	Proposed
Install 2-5.4 MVAR capacitor banks at Osceola 69 kV	2008	2008	2	reliability	Proposed
Uprate Atlantic 138/69-kV transformer	2008	2008	2	reliability	Proposed
Construct Cranberry-Conover 115-kV line	2008	2008	1 & 2	reliability, transfer capability	Proposed
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove	2008	2008	1 & 2	reliability, transfer capability	Proposed
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen	2008	2008	1 & 2	reliability	Proposed
Relocate Iron River Substation (Iron Grove)	2008	2008	1 & 2	reliability	Proposed
Relocate 69-kV Rexton tap to 69-kV Hiawatha-Pine River line (6909)	2009	2009	2	condition	Provisional
Relocate 69-kV Trout Lake tap to 69-kV Hiawatha-Pine River line (6909)	2009	2009	2	condition	Provisional
Construct Mackinac 138-kV Substation additions (portions may be earlier for maintenance issues)	2009	2009	2	reliability, service limitation	Provisional
Rebuild Hiawatha-Pine River-Mackinac 69 kV to 138 kV	2009	2009	2	reliability, condition	Provisional
Construct 138-kV bus and install one 138/69-kV, 50 MVA transformer at Pine River	2009	2009	2	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Convert rebuilt Hiawatha-Indian Lake circuit (operated at 69 kV) to 138 kV	2009	2009	2	reliability, service limitation	Planned
Construct 138-kV ring bus at Hiawatha Substation	2009	2009	2	reliability, service limitation	Planned
Install 138-kV substation modifications at Indian Lake Substation	2009	2009	2	reliability, service limitation	Planned
Install 1-5.4 MVAR capacitor bank at MTU or Henry Street 69 kV	2009	2009	2	reliability	Proposed
Install 1-5.4 MVAR capacitor bank at Roberts 69 kV	2009	2009	2	reliability	Proposed
Uprate M38 138/69-kV transformer	2012	2012	2	reliability	Provisional
Rebuild Blaney Park-Munising 69 kV to 138 kV	2012	2012	2	reliability, condition	Provisional
Rebuild/convert Chalk Hills-Chandler 69 kV to 138 kV operation	2013	2013	2 & 4	reliability	Provisional
Install 2-5.4 MVAR capacitor banks at M-38 69 kV	2015	2015	2	reliability	Provisional

Table PR-15
Transmission System Additions for Zone 3

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Uprate North Lake Geneva to Lake Geneva 69-kV line to 72 MVA	2004	2005	3	reliability	Proposed
Uprate Brick Church to Walworth 69-kV line to 48 MVA	2004	2005	3	reliability	Proposed
Uprate Brick Church to Katzenberg 69-kV line to 93 MVA	2004	2005	3	reliability	Proposed
Uprate Sun Prairie to Gaston Road 69-kV line to 48 MVA	2004	2005	3	reliability	Proposed
Uprate Colorado to Sun Prairie 69-kV line to 72 MVA	2004	2005	3	reliability	Proposed
Uprate Dane to Waunakee and Waunakee to Huiskamp 69-kV lines	2004	2005	3	reliability	Proposed
Reconnect the 138/69-kV transformers at Kilbourn on separate breakers to operate individually	2006	2006	3	reliability	Provisional
Construct Butler Ridge 138-kV Substation	2006	2006	3	new generation	Planned
Install 36 MVAR capacitor bank at Hartford 138-kV Substation	2006	2006	3	reliability	Planned
Uprate Colley Road 138/69-kV transformer	2006	2006	3	reliability	Proposed
Uprate North Monroe 138/69-kV transformer	2006	2006	3	reliability	Proposed
Uprate Paddock-Shaw 69-kV line	2006	2006	3	reliability	Proposed
Uprate Brodhead-South Monroe 69-kV line	2006	2006	3	reliability	Provisional
Uprate McCue 138/69-kV transformer	2006	2006	3	reliability	Proposed
Construct new 69-kV line from Columbia to Rio to feed the proposed Wyocena Substation	2004	2006	3	T-D interconnection, reliability	Planned
Rebuild Turtle-Bristol 69-kV line to 138 kV and operate at 69 kV	2004	2006	3	condition, reliability, new generation	Planned

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Build new breaker and a half 345/138-kV substation on site adjacent to existing North Madison Substation and replace existing transformers with two new 500 MVA units	2006	2006	3	reliability, new generation	Planned
Reconfigure 345-kV bus at Columbia	2006	2006	3	reliability, new generation	Planned
Convert Columbia-North Madison 138-kV line to 345 kV	2005	2006	3	reliability, new generation	Planned
Construct new line from West Darien to Southwest Delavan at 138 kV, operate at 69 kV	2006	2006	3	T-D interconnection	Planned
Uprate McCue-Janesville 69-kV line	2007	2007	3	reliability	Proposed
Rebuild the Verona to Oregon 69-kV line Y119	2006	2007	3	reliability	Proposed
Uprate Rockdale to Jefferson 138-kV line	2007	2007	3	reliability, service limitation	Planned
Uprate Rockdale to Boxelder 138-kV line	2007	2007	3	reliability, service limitation	Planned
Uprate Boxelder to Stonybrook 138-kV line	2007	2007	3	reliability, service limitation	Planned
Construct a Jefferson-Lake Mills-Stony Brook 138-kV line	2006	2007	3	reliability, T-D interconnection	Proposed
Convert Kegonsa-McFarland-Femrite 69-kV line to 138 kV	2007	2007	3	reliability, new generation	Proposed
Construct Sprecher-Femrite 138-kV line	2007	2007	3	reliability, new generation	Proposed
Install 138/69-kV transformer at Femrite	2007	2007	3	reliability, new generation	Proposed
Install 138/69-kV transformer at Reiner	2007	2007	3	reliability, new generation	Proposed
Convert Sycamore-Reiner-Sprecher from 69 kV to 138 kV	2007	2007	3	reliability	Proposed
Install/upgrade capacitor bank at South Monroe 69 kV to 32 MVAR	2007	2007	3	reliability	Proposed
Construct new line from Southwest Delavan to Delavan or Bristol at 138 kV, operate at 69 kV	2007	2007	3	T-D interconnection	Proposed
Construct a Rubicon-Hustisford 138-kV line	2008	2008	3	reliability	Proposed
Rebuild Hustisford-Horicon 69 kV to 138 kV	2008	2008	3	reliability	Proposed

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct 138/69-kV substation at a site near Horicon and install a 138/69-kV transformer	2008	2008	3	reliability	Proposed
Convert Rock River to Bristol to Elkhorn 138 kV operation; rebuild Bristol with a new 138-kV bus	2008	2008	3	reliability	Proposed
Construct a new 138-kV line from North Madison to Waunakee	2005	2008	3	reliability	Proposed
Construct a new 138/69-kV substation near Waunakee and install a 100 MVA 138/69-kV transformer	2005	2008	3	reliability	Proposed
Install 1-8.16 MVAR capacitor bank at Richland Center 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2008	2008	3	reliability	Provisional
Install 4-25 MVAR capacitor banks at Portage 138 kV	2009	2009	3	reliability	Provisional
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva	2009	2009	3	reliability	Provisional
Construct new 138-kV line from South Lake Geneva to White River	2009	2009	3	reliability, T-D interconnection	Provisional
Construct new 138-kV bus and 138/69-kV 100 MVA transformer at Montrose Substation	2009	2009	3	reliability	Proposed
Construct new Montrose-Sun Valley-Oak Ridge 138-kV line	2009	2009	3	reliability	Proposed
Uprate Colley Road to Brick Church 69-kV line to 72 MVA	2008	2009	3	reliability	Proposed
Install a second 138/69-kV transformer at Hillman	2009	2009	3	reliability	Proposed
Install a 69-kV 16.32 MVAR capacitor bank at Kilbourn Substation	2009	2009	3	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct Rockdale-Concord 345-kV line in parallel with existing 138 kV on existing double-width right-of-way	2007	2009	3 & 5	reliability, service limitation	Proposed
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Concord	2007	2009	3 & 5	reliability	Proposed
Install a 69-kV bus and 138/69-kV 100 MVA transformer at Northwest Beloit	2010	2010	3	reliability	Provisional
Reroute Paddock to Shirland Avenue 69-kV line into and out of Northwest Beloit	2010	2010	3	reliability	Provisional
Loop the Femrite to Royster 69-kV line into AGA Gas	2010	2010	3	reliability	Provisional
Convert Hillman to Eden 69-kV line to 138 kV	2010	2010	3	reliability	Proposed
Install 1-8.16 MVAR capacitor bank at Boscobel 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2010	2010	3	reliability	Provisional
Rebuild Brodhead to South Monroe 69-kV line using 477 ACSR	2010	2010	3	reliability	Provisional
Convert Waunakee-Blount 69-kV line to 138 kV	2010	2010	3	reliability	Proposed
Uprate Darlington-Rock Branch 69-kV line	2010	2010	3	reliability	Provisional
Uprate existing 18 MVAR capacitor bank at Spring Green 138 kV with a 50 MVAR bank	2010	2010	3	reliability	Provisional
Convert Bark River-Mill Road 138-kV line to 345 kV	2009	2010	3 & 5	reliability, new generation	Proposed
Construct a Concord-Bark River 345-kV line	2009	2010	3 & 5	reliability, new generation	Proposed
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Bark River	2009	2010	3 & 5	reliability, new generation	Proposed
Uprate Yahara-Token Creek 69-kV line	2011	2011	3	reliability	Provisional
Construct Evansville-Brooklyn 69-kV line	2011	2011	3	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct 345-kV line from Rockdale to West Middleton	2011	2011	3	reliability	Proposed
Construct a 345-kV bus and install a 345/138-kV 500 MVA transformer at West Middleton	2011	2011	3	reliability	Proposed
Install a 138/69-kV transformer and 69-kV bus at Yahara River Substation	2011	2011	3	reliability	Provisional
Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation	2011	2011	3	reliability	Provisional
Constuct a Lake Delton-Birchwood 138-kV line	2011	2011	3	reliability	Provisional
Install a second 138/69-kV transformer at Janesville Substation	2011	2011	3	reliability	Provisional
Uprate Sun Prairie-Bird Street 69-kV line	2012	2012	3	reliability	Proposed
Uprate North Monroe-Idle Hour 69-kV line	2012	2012	3	reliability	Provisional
Install 138/69-kV transformer at Bass Creek	2012	2012	3	reliability	Provisional
Rebuild and convert West Middleton-Spring Green 69-kV line to 138 kV	2012	2012	3	reliability	Provisional
Construct West Middleton-Stagecoach double-circuit 138/69-kV line	2012	2012	3	reliability	Provisional
Construct 69-kV line Eden through Muscoda to Richland Center	2012	2012	3	reliability	Provisional
Move Lone Rock 69-kV phase shifter to Richland Center	2012	2012	3	reliability	Provisional
Salem-Spring Green-West Middleton 345-kV proxy for Large Access Project, includes rebuild Nelson Dewey-Spring Green-West Middleton 138/69 kV to double-circuit 345/138 kV	2013	2013	3	access initiative	Provisional
Expand 345 kV to 6 positions at Paddock	2013	2013	3	access initiative	Provisional
Expand 138 kV to 7 positions at Paddock	2013	2013	3	access initiative	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Install second 345/138-kV transformer at Paddock (500 MVA normal/625 MVA emergency)	2013	2013	3	access initiative	Provisional
Rebuild Paddock-Town Line Road 138 kV to double-circuit 1600 Amps minimum summer emergency each	2013	2013	3	access initiative	Provisional
Reconductor Town Line Road-Russell 138 kV to 1600 Amps minimum summer emergency	2013	2013	3	access initiative	Provisional
Construct new 69-kV line from South Lake Geneva to Lake Shore Substation	2013	2013	3	T-D interconnection	Provisional
Convert South Lake Geneva to Twin Lakes 69-kV line to 138 kV	2013	2013	3	reliability	Provisional
Construct new 138-kV line from Twin Lakes to Spring Valley	2013	2013	3	reliability	Provisional
Construct a Horicon-East Beaver Dam 138-kV line	2013	2013	3	reliability	Provisional
Install a second 138/69-kV transformer at North Monroe	2014	2014	3	reliability	Provisional
Construct West Middleton-Blount 138-kV line	2014	2014	3	reliability	Provisional
Construct West Middleton-North Madison 345-kV line	2014	2014	3	reliability, access initiative	Proposed
Install 1-16.32 MVAR capacitor bank at Burke 69 kV	2014	2014	3	reliability	Provisional
Install a second Femrite 138/69-kV transformer	2014	2014	3	reliability	Provisional
Replace the Kilbourn 47 MVA 138/69-kV transformer with a 100 MVA unit	2014	2014	3	reliability	Provisional
Uprate Colley Road to Park Street Tap 69-kV line to 114 MVA	2014	2014	3	reliability	Provisional
Replace the Colley Road 138/69-kV transformer	2015	2015	3	reliability	Provisional

Table PR-16
Transmission System Additions for Zone 4

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Uprate the North Appleton-Rocky Run 345-kV line	2005	2005	4	reliability	Planned
Construct a 138-kV substation at a new Forward Energy Center; loop existing Butternut-South Fond du Lac line into Forward Energy Center	2005	2005	4	new generation	Planned
Install a 138-kV series reactor at Highway V	2005	2006	4	reliability, service limitation, T-D interconnection	Planned
Upgrade 48 MVA RTU and CT at Mullet River 138/69 kV	2006	2006	4	reliability	Proposed
Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress	2006	2006	4	new generation	Planned
Construct a 345/138-kV switchyard at a new Werner West Substation; install a 345/138-kV transformer. Loop existing Rocky Run to North Appleton 345-kV and existing Werner to White Lake 138-kV lines into Werner West	2004	2006	4	reliability, service limitation	Planned
Construct a Martin Road-South Fond du Lac/Ohmstead 138-kV line	2006	2006	4	T-D interconnection	Planned
Construct North Appleton 345-kV double breaker ring bus configuration	2006	2006	4	operations, maintenance and stability	Planned
Rebuild Stiles-Amberg double-circuit 138-kV line	1996	2006	2 & 4	reliability, service limitation, condition	Planned
String a new Ellinwood-Sunset Point 138-kV line on existing structures	2007	2007	4	reliability	Provisional
Install 2-16.3 MVAR capacitor bank at Canal 69 kV	2007	2007	4	reliability	Planned
Replace the 1200 A breaker at Edgewater T22 345/138 kV	2007	2007	4	reliability	Proposed

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Construct double-circuit 138-kV line from Forest Junction/Howards Grove/Charter Steel to Plymouth #4	2007	2007	4	T-D interconnection	Proposed
Uprate North Appleton-Lawn Road-White Clay 138-kV line	2007	2007	4	reliability	Planned
Construct 138-kV line from Canal to Dunn Road	2008	2008	4	reliability	Proposed
Install 60 MVA 138/69-kV transformer at Dunn Road	2008	2008	4	reliability	Proposed
Rebuild/Convert Pulliam-New Suamico 69-kV line to 138 kV	2008	2008	4	reliability, condition, T-D interconnection	Provisional
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
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	Provisional
Install 138/69-kV transformer at the expanded Menominee Substation	2008	2008	4	reliability	Provisional
Rebuild Crivitz-High Falls 69-kV double-circuit line	2008	2008	4	reliability	Provisional
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2009	2009	4	reliability	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
Retap 48 MVA CT at South Sheboygan Falls 138/69-kV transformer	2010	2010	4	reliability	Proposed

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Rebuild/convert New Holstein-St Nazianz-Custer-Lakefront 69-kV line to 138 kV (1225 Amps minimum)	2010	2010	4	access initiative	Provisional
Rebuild Tecumseh Road-New Holstein to double-circuit 138/69 kV, where 69 kV will serve Gravesville via New Holstein	2010	2010	4	access initiative	Provisional
Install 47 MVA 138/69-kV transformer at Custer	2010	2010	4	access initiative	Provisional
Install 100 MVA 138/69-kV transformer at Lakefront	2010	2010	4	access initiative	Provisional
Construct a second Dunn Road-Egg Harbor 69-kV line	2010	2010	4	reliability	Proposed
Uprate Northgate-20th Street 138-kV line	2011	2011	4	reliability	Provisional
Replace the 400 amp metering CT at North Mullet River 69 kV	2011	2011	4	reliability	Provisional
Retap 400A primary CT at Edgewater to 600A	2012	2012	4	reliability	Provisional
Replace 300 A metering CT at Edgewater 69 kV	2013	2013	4	reliability	Proposed
Rebuild/convert Chalk Hills-Chandler 69 kV to 138 kV operation	2013	2013	2 & 4	reliability	Provisional
Replace 300 A metering CT at Riverside 69 kV	2013	2013	4	reliability	Proposed
Replace the 300A current transformer at Sheboygan Falls 69 kV	2013	2013	4	reliability	Provisional
Replace the existing 46.7 MVA 138/69-kV transformer at South Sheboygan Falls with 100 MVA transformer	2014	2014	4	reliability	Provisional
Uprate the Melissa-Tayco to 229 MVA (300F)	2014	2014	4	reliability	Provisional
Install 28.8 MVAR capacitor bank at Butternut 138 kV	2015	2015	4	reliability	Provisional
Construct a Northside-City Limits 138-kV line	2015	2015	4	reliability	Provisional

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

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or 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
Rebuild/Convert New Suamico-Pioneer 69-kV line to 138 kV	2015	2015	4	reliability, condition	Provisional

Table PR-17
Transmission System Additions for Zone 5

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Install 2-27 MVAR capacitor banks at Moorland 138 kV	2004	2005	5	reliability	Planned
Install 2-27 MVAR capacitor banks at Burlington 138 kV	2005	2006	5	reliability	Proposed
Install series reactor at Cornell	2007	2007	5	reliability	Proposed
Construct a 345-kV bus at Bain	2005	2007	5	reliability	Provisional
Install 200 MVAR capacitor bank at Bluemound	2007	2007	5	reliability	Provisional
Construct a new Mill Road Substation at intersection of Granville-Arcadian 345-kV, Forest Junction-Arcadian 345-kV, Sussex-Tamarack 138-kV and Sussex-Germantown 138-kV lines; install a 345/138-kV, 500 MVA transformer	2007	2008	5	reliability	Proposed
Reconductor Pleasant Valley-Saukville 138-kV line	2008	2008	5	new generation	Proposed
Reconductor Pleasant Valley-St. Lawrence 138-kV line	2008	2008	5	new generation	Proposed
Reconductor Cornell-Range Line 138-kV line	2008	2008	5	new generation	Proposed
Reconductor Oak Creek-Ramsey 138-kV line	2009	2009	5	new generation	Proposed
Reconductor Oak Creek-Allerton 138-kV line	2009	2009	5	new generation	Proposed
Replace relaying on 230-kV circuits at Oak Creek	2009	2009	5	new generation	Proposed
Replace two 345-kV circuit breakers at Pleasant Prairie on the Racine and Zion lines with IPO breakers and upgrade relaying	2009	2009	5	new generation	Proposed
Expand Oak Creek 345-kV switchyard to interconnect one new generator	2009	2009	5	new generation	Proposed

Table PR-17
Transmission System Additions for Zone 5 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
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	Provisional
Construct Rockdale-Concord 345-kV line in parallel with existing 138 kV on existing double-width right-of-way	2009	2009	3 & 5	reliability, service limitation	Proposed
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Concord	2009	2009	3 & 5	reliability	Proposed
Uprate Kansas-Ramsey6 138-kV line	2010	2010	5	new generation	Proposed
Install second 500 MVA 345/138-kV transformer at Oak Creek	2010	2010	5	new generation	Proposed
Expand 345-kV switchyard at Oak Creek to interconnect one new generator	2010	2010	5	new generation	Proposed
Uprate Oak Creek-Root River 138-kV line	2010	2010	5	new generation	Proposed
Uprate Oak Creek-Nicholson 138-kV line	2010	2010	5	new generation	Proposed
Convert Bark River-Mill Road 138-kV line to 345 kV	2010	2010	3 & 5	reliability, new generation	Proposed
Construct a Concord-Bark River 345-kV line	2010	2010	3 & 5	reliability, new generation	Proposed
Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Bark River	2010	2010	3 & 5	reliability, new generation	Proposed
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	2013	5	new generation	Provisional
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 two 138/26.2 kV transformers	2013	2013	5	new generation	Provisional

Table PR-17
Transmission System Additions for Zone 5 (continued)

System additions	System need year	Projected in-service year	Planning zone	Need category	Planned, Proposed or Provisional
Install two 345-kV line terminations at Pleasant Prairie and loop Zion-Arcadian 345-kV line into Pleasant Prairie Substation	2013	2013	5	new generation	Provisional
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	2013	5	new generation	Provisional
Construct Oak Creek-St. Martins 138-kV circuit #2 installing 16.6 mi. conductor on existing towers	2013	2013	5	new generation	Provisional
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	2013	5	new generation	Provisional
Restring Bluemound-Butler 138-kV line (KK5051) on new 345-kV structures installed with Hale (Brookdale)-Granville line	2013	2013	5	new generation	Provisional
String Butler-Tamarack (Carmen) 138-kV line on new 345-kV structures installed with Hale (Brookdale)-Granville line	2013	2013	5	new generation	Provisional
Replace CTs at Racine 345-kV Substation	2013	2013	5	new generation	Provisional

Table PR-18

Identified Needs and Transmission Lines Requiring New Right-of-Way

Identified need	Potential solutions	Approx. line mileage		System need year	Projected in-service year	Planning zone
		Total	New ROW			
Reduce service limitations, relieve overloads or low voltages under contingency, improve transfer capability & Weston stability	Construct Gardner Park-Stone Lake 345-kV line	140	73.4	1997	2006	1
Relieve overloads or low voltages under contingency, replace aging facilities	Rebuild from Nordic to Randville Substation (5 miles) of single circuit 69-kV line to double-circuit 69 kV	5	1	2005	2006	2
T-D interconnection request, relieve overloads or low voltages under contingency	Construct new 69-kV line from Columbia to Rio to feed the proposed Wyocena Substation	8.16	8.16	2004	2006	3
T-D interconnection request	Construct new line from West Darien to Southwest Delavan at 138 kV, operate at 69 kV	3	3	2006	2006	3
T-D interconnection request	Construct Venus-Metonga 115-kV line	12.5	11.5	2007	2007	1
T-D interconnection request	Construct Brandon-Fairwater 69-kV line	4	4	2007	2007	1
Relieve overloads or low voltages under contingency, T-D interconnection request	Construct a Jefferson-Lake Mills-Stony Brook 138-kV line	12	12	2006	2007	3
Relieve overloads or low voltages under contingency, accommodate new generation	Construct Sprecher-Femrite 138-kV line	2	2	2007	2007	3
T-D interconnection request	Construct new line from Southwest Delavan to Delavan or Bristol at 138 kV, operate at 69 kV	3.5	3.5	2007	2007	3
T-D interconnection request	Construct double-circuit 138-kV line from Forest Junction/Howards Grove/Charter Steel to Plymouth #4	1.25	1.25	2007	2007	4

Table PR-18

Identified Needs and Transmission Lines Requiring New Right-of-Way (continued)

Identified need	Potential solutions	Approx. line mileage		System need year	Projected in-service year	Planning zone
		Total	New ROW			
T-D interconnection request	Construct a 69-kV line from Southwest Ripon to the Ripon-Metomen 69-kV line	1.5	1.5	2008	2008	1
Reduce service limitations, relieve overloads or low voltages under contingency, improve transfer capability & Weston stability	Construct Stone Lake-Arrowhead 345-kV line	70	36.6	1997	2008	1
Relieve overloads or low voltages under contingency	Construct a Rubicon-Hustisford 138-kV line	5	5	2008	2008	3
Relieve overloads or low voltages under contingency	Construct a new 138-kV line from North Madison to Waunakee	5	5	2005	2008	3
Relieve overloads or low voltages under contingency, transfer capability	Construct Cranberry-Conover 115-kV line	14	14	2008	2008	1 & 2
Relieve overloads or low voltages under contingency, T-D interconnection request	Construct new 138-kV line from South Lake Geneva to White River	3	3	2009	2009	3
Relieve overloads or low voltages under contingency	Construct new Montrose-Sun Valley-Oak Ridge 138-kV line	9	3	2009	2009	3
Relieve overloads or low voltages under contingency, reduce service limitations	String a new 138-kV line from Clintonville-Werner West primarily on Morgan-Werner West 345-kV line structures	16	2	2004	2009	4
Relieve overloads or low voltages under contingency, reduce service limitations	Construct Morgan-Werner West 345-kV line	47	47	2004	2009	4
Relieve overloads or low voltages under contingency	Reroute Paddock to Shirland Avenue 69-kV line into and out of Northwest Beloit	1	0.5	2010	2010	3
Relieve overloads or low voltages under contingency	Loop the Femrite to Royster 69-kV line into AGA Gas	0.3	0.3	2010	2010	3

Table PR-18

Identified Needs and Transmission Lines Requiring New Right-of-Way (continued)

Identified need	Potential solutions	Approx. line mileage		System need year	Projected in-service year	Planning zone
		Total	New ROW			
Relieve overloads or low voltages under contingency	Construct a second Dunn Road-Egg Harbor 69-kV line	12.66	12.66	2010	2010	4
Relieve overloads or low voltages under contingency, accommodate new generation	Construct a Concord-Bark River 345-kV line	19	10	2009	2010	3 & 5
Relieve overloads or low voltages under contingency	Construct Evansville-Brooklyn 69-kV line	8	8	2011	2011	3
Relieve overloads or low voltages under contingency	Construct 345-kV line from Rockdale to West Middleton	35	35	2011	2011	3
Relieve overloads or low voltages under contingency	Loop the Deforest to Token Creek 69-kV line into the Yahara River Substation	1	1	2011	2011	3
Relieve overloads or low voltages under contingency	Constuct a Lake Delton-Birchwood 138-kV line	5	5	2011	2011	3
Relieve overloads or low voltages under contingency	Construct 69-kV line Eden through Muscoda to Richland Center	35	35	2012	2012	3
Access initiative	Salem-Spring Green-West Middleton 345-kV proxy for Large Access Project, includes rebuild Nelson Dewey-Spring Green-West Middleton 138/69 kV to double-circuit 345/138 kV	114	114	2013	2013	3
Relieve overloads or low voltages under contingency	Rebuild/convert Chalk Hills-Chandler 69 kV to 138 kV operation	54	14	2013	2013	2 & 4
T-D interconnection request	Construct new 69-kV line from South Lake Geneva to Lake Shore Substation	3.2	3.2	2013	2013	3
Relieve overloads or low voltages under contingency	Construct new 138-kV line from Twin Lakes to Spring Valley	9	9	2013	2013	3
Relieve overloads or low voltages under contingency	Construct a Horicon-East Beaver Dam 138-kV line	9	9	2013	2013	3

Table PR-18

Identified Needs and Transmission Lines Requiring New Right-of-Way (continued)

Identified need	Potential solutions	Approx. line mileage		System need year	Projected in-service year	Planning zone
		Total	New ROW			
Accommodate new generation	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	25.2	4	2010	2013	5
Relieve overloads or low voltages under contingency, access initiative	Construct West Middleton-North Madison 345-kV line	20	20	2014	2014	3
Relieve overloads or low voltages under contingency	Construct Fitzgerald-Omro Industrial 69-kV line	7	7	2015	2015	1

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Reconductor Wien-McMillan 115-kV line (ATC, MEWD)	20	2006	2006	1
Achieve transfer capability associated with Arrowhead-Gardner Park, relieve overloads or low voltages under contingency, accommodate new generation	Reconductor Weston-Northpoint 115-kV line	24	2005	2006	1
Relieve overloads or low voltages under contingency	Construct Hiawatha-Engadine 69-kV line	0.2	2003	2006	2
Relieve overloads or low voltages under contingency, reduce service limitations	Rebuild and convert one Hiawatha-Indian Lake 69-kV circuit to double-circuit 138-kV standards, string two circuits initially and operate one at 69 kV	40	2004	2006	2
Replace aging facilities, relieve overloads or low voltages under contingency, accommodate new generation	Rebuild Turtle-Bristol 69-kV line to 138 kV and operate at 69 kV	29	2004	2006	3
Relieve overloads or low voltages under contingency, accommodate new generation	Convert Columbia-North Madison 138-kV line to 345 kV	17.41	2005	2006	3
T-D interconnection request	Construct a Martin Road-South Fond du Lac/Ohmstead 138-kV line	0.5	2006	2006	4
Relieve overloads or low voltages under contingency, reduce service limitations, replace aging facilities	Rebuild Stiles-Amberg double-circuit 138-kV line	45	1996	2006	2 & 4

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Accommodate new generation, relieve overloads or low voltages under contingency	Rebuild Weston-Sherman St. and Sherman St-Hilltop 115-kV lines as double-circuits with a new Gardner Park-Hilltop 115-kV line	9.5	2007	2007	1
Relieve overloads or low voltages under contingency	Rebuild the Verona to Oregon 69-kV line Y119	11	2006	2007	3
Relieve overloads or low voltages under contingency, accommodate new generation	Convert Kegonsa-McFarland-Femrite 69-kV line to 138 kV	5.9	2007	2007	3
Relieve overloads or low voltages under contingency	Convert Sycamore-Reiner-Sprecher from 69 kV to 138 kV	6.5	2007	2007	3
Relieve overloads or low voltages under contingency	String a new Ellinwood-Sunset Point 138-kV line on existing structures	3.58	2007	2007	4
Relieve overloads or low voltages under contingency	Uprate North Appleton-Lawn Road-White Clay 138-kV line	29.8	2007	2007	4
Achieve transfer capability associated with Arrowhead-Gardner Park	Upgrade Kelly-Whitcomb 115-kV line conductor clearances to 300F	24	2008	2008	1
Relieve overloads or low voltages under contingency, replace aging facilities	Rebuild Atlantic-Osceola 69-kV line (Laurium #1)	13.7	2006	2008	2
Relieve overloads or low voltages under contingency	Rebuild Hustisford-Horicon 69 kV to 138 kV	8	2008	2008	3
Relieve overloads or low voltages under contingency	Convert Rock River to Bristol to Elkhorn 138-kV operation; rebuild Bristol with a new 138-kV bus	27.74	2008	2008	3
Relieve overloads or low voltages under contingency	Construct 138-kV line from Canal to Dunn Road	7.64	2008	2008	4

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency, replace aging facilities, T-D interconnection request	Rebuild/Convert Pulliam-New Suamico 69-kV line to 138 kV	8.4	2008	2008	4
Relieve overloads or low voltages under contingency, reduce service limitations	Uprate North Appleton-Mason Street 138-kV line	21	2008	2008	4
Relieve overloads or low voltages under contingency, reduce service limitations	Uprate North Appleton-Lost Dauphin 138-kV line	12	2008	2008	4
Relieve overloads or low voltages under contingency	Rebuild Crivitz-High Falls 69-kV double-circuit line	14.5	2008	2008	4
Accommodate new generation	Reconductor Pleasant Valley-Saukville 138-kV line	12	2008	2008	5
Accommodate new generation	Reconductor Pleasant Valley-St. Lawrence 138-kV line	7	2008	2008	5
Accommodate new generation	Reconductor Cornell-Range Line 138-kV line	2.43	2008	2008	5
Relieve overloads or low voltages under contingency, transfer capability	Rebuild/convert Conover-Plains 69-kV line to 138 kV	73	2008	2008	1 & 2
Reduce service limitations, relieve overloads or low voltages under contingency, improve transfer capability and Weston stability	Construct Gardner Park-Central Wisconsin 345-kV line	47	2009	2009	1
Replace aging facilities	Relocate 69-kV Rexton tap to 69-kV Hiawatha-Pine River line (6909)	0	2009	2009	2
Replace aging facilities	Relocate 69-kV Trout Lake tap to 69-kV Hiawatha-Pine River line (6909)	0	2009	2009	2

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency, replace aging facilities	Rebuild Hiawatha-Pine River-Mackinac 69 kV to 138 kV	75	2009	2009	2
Relieve overloads or low voltages under contingency, reduce service limitations	Convert rebuilt Hiawatha-Indian Lake circuit (operated at 69 kV) to 138 kV	40	2009	2009	2
Relieve overloads or low voltages under contingency	Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2.37	2009	2009	4
Accommodate new generation	Reconductor Oak Creek-Ramsey 138-kV line	8.5	2009	2009	5
Accommodate new generation	Reconductor Oak Creek-Allerton 138-kV line	5.41	2009	2009	5
Accommodate new generation	Loop Ramsey5-Harbor 138-kV line into Norwich and Kansas to form a new line from Ramsey-Norwich and Harbor-Kansas 138-kV lines	5.72	2009	2009	5
Relieve overloads or low voltages under contingency, reduce service limitations	Construct Rockdale-Concord 345-kV line in parallel with existing 138 kV on existing double-width right-of-way	22.6	2009	2009	3 & 5
Access initiative, relieve overloads or low voltages under contingency	Construct Monroe County-Council Creek 161-kV line	20	2010	2010	1
Access initiative, relieve overloads or low voltages under contingency	Uprate Council Creek-Petenwell 138-kV line	32	2010	2010	1
Access initiative, relieve overloads or low voltages under contingency	Rebuild/reconductor Petenwell-Saratoga 138-kV line	23	2010	2010	1
Relieve overloads or low voltages under contingency	Convert Hillman to Eden 69-kV line to 138 kV	28.13	2010	2010	3
Relieve overloads or low voltages under contingency	Rebuild Brodhead to South Monroe 69-kV line using 477 ACSR	18	2010	2010	3

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Convert Waunakee-Blount 69-kV line to 138 kV	5	2010	2010	3
Access initiative	Rebuild/convert New Holstein-St Nazianz-Custer-Lakefront 69-kV line to 138 kV (1225 Amps minimum)	20	2010	2010	4
Access initiative	Rebuild Tecumseh Road-New Holstein to double-circuit 138/69 kV, where 69 kV will serve Gravesville via New Holstein	2.5	2010	2010	4
Accommodate new generation	Uprate Kansas-Ramsey6 138-kV line	5.72	2010	2010	5
Accommodate new generation	Uprate Oak Creek-Nicholson 138-kV line	6.8	2010	2010	5
Relieve overloads or low voltages under contingency, accommodate new generation	Convert Bark River-Mill Road 138-kV line to 345 kV	11	2010	2010	3 & 5
Relieve overloads or low voltages under contingency, replace aging facilities	Rebuild Blaney Park-Munising 69 kV to 138 kV	50	2012	2012	2
Relieve overloads or low voltages under contingency	Rebuild and convert West Middleton-Spring Green 69-kV line to 138 kV	5.71	2012	2012	3
Relieve overloads or low voltages under contingency	Construct West Middleton-Stagecoach double-circuit 138/69-kV line	6	2012	2012	3
Access initiative	Rebuild Paddock-Town Line Road 138 kV to double-circuit 1600 Amps minimum summer emergency each	7	2013	2013	3
Access initiative	Reconductor Town Line Road-Russell 138 kV to 1600 Amps minimum summer emergency	8.3	2013	2013	3
Relieve overloads or low voltages under contingency	Convert South Lake Geneva to Twin Lakes 69-kV line to 138 kV	11.5	2013	2013	3

Table PR-19
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified need	Lines to be rebuilt/reconductored on existing ROW	Approx. mileage of rebuilt, reconductored or uprated lines	System need year	Projected in-service year	Planning zone
Accommodate new generation	Construct Oak Creek-St Martins 138-kV circuit #2 installing 16.6 mi. conductor on existing towers	16.6	2013	2013	5
Accommodate new generation	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	15.6	2013	2013	5
Accommodate new generation	Restring Bluemound-Butler 138-kV line (KK5051) on new 345-kV structures installed with Hale (Brookdale)-Granville line	5.41	2010	2013	5
Accommodate new generation	String Butler-Tamarack (Carmen) 138-kV line on new 345-kV structures installed with Hale (Brookdale)-Granville line	4.12	2013	2013	5
Relieve overloads or low voltages under contingency	Construct West Middleton-Blount 138-kV line	5	2014	2014	3
Relieve overloads or low voltages under contingency	Construct a Northside-City Limits 138-kV line	3.16	2015	2015	4
Relieve overloads or low voltages under contingency	Reconductor Pulliam-Danz 69-kV line	3	2015	2015	4
Relieve overloads or low voltages under contingency	Reconductor Danz-Henry Street 69-kV line	1.5	2015	2015	4
Relieve overloads or low voltages under contingency	Reconductor Pulliam-Van Buren 69-kV line	2	2015	2015	4
Relieve overloads or low voltages under contingency, replace aging facilities	Rebuild/Convert New Suamico-Pioneer 69-kV line to 138 kV	13.1	2015	2015	4

Table PR-20

New Substations, Transformer Additions and Replacements

Identified need	Potential additions or replacements	Transformer capacity (MVA)		System need year	Projected in-service year	Planning zone
		Install	Replace			
Accommodate new generation	Construct a 138-kV substation at a new Forward Energy Center; loop existing Butternut-South Fond du Lac line into Forward Energy Center	N/A	N/A	2005	2005	4
Reduce service limitations, relieve overloads under contingency, improve transfer capability & Weston stability	Construct new Gardner Park 345/115-kV Substation	N/A	N/A	2006	2006	1
Reduce service limitations, relieve overloads under contingency, improve transfer capability & Weston stability	Replace 345/115-kV 200 MVA transformer at Weston with two 500 MVA units at the Gardner Park Substation	1000	200	2006	2006	1
Relieve overloads under contingency	Install a 345/161-kV transformer at Stone Lake (temporary installation for construction outages)	300	0	2006	2006	1
Accommodate new generation	Construct Butler Ridge 138-kV Substation	N/A	N/A	2006	2006	3
Relieve overloads under contingency	Uprate Colley Road 138/69-kV transformer	120	96	2006	2006	3
Relieve overloads under contingency	Uprate North Monroe 138/69-kV transformer	130	93	2006	2006	3
Relieve overloads under contingency	Uprate McCue 138/69-kV transformer	143	116	2006	2006	3
Relieve overloads under contingency, accommodate new generation	Build new breaker and a half 345/138-kV substation on site adjacent to existing North Madison Substation and replace existing transformers with two new 500 MVA units	1000	510	2006	2006	3
Accommodate new generation	Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress	N/A	N/A	2006	2006	4
Relieve overloads under contingency, reduce service limitations	Construct a 345/138-kV switchyard at a new Werner West Substation; install a 345/138-kV transformer. Loop existing Rocky Run to North Appleton 345-kV and existing Werner to White Lake 138-kV lines into Werner West	500	0	2004	2006	4

Table PR-20

New Substations, Transformer Additions and Replacements (continued)

Identified need	Potential additions or replacements	Transformer capacity (MVA)		System need year	Projected in-service year	Planning zone
		Install	Replace			
Relieve overloads under contingency, reduce service limitations	Construct Mackinac 138-kV Substation (new Straits Substation)	N/A	N/A	2005	2007	2
Relieve overloads under contingency, replace aging facilities	Relocate Cedar Substation (North Lake)	N/A	N/A	2005	2007	2
Relieve overloads under contingency, replace aging facilities	Relocate Brule Substation (Aspen)	N/A	N/A	2007	2007	2
Relieve overloads under contingency, accommodate new generation	Install 138/69-kV transformer at Femrite	100	0	2007	2007	3
Relieve overloads under contingency, accommodate new generation	Install 138/69-kV transformer at Reiner	100	0	2007	2007	3
Relieve overloads under contingency	Construct a 345-kV bus at Bain	N/A	N/A	2005	2007	5
Relieve overloads under contingency, improve transfer capability & Weston stability	Construct the new permanent Stone Lake 345/161-kV Substation	N/A	N/A	2008	2008	1
Relieve overloads under contingency	Install second 345/138-kV transformer at Plains	500	0	2008	2008	2
Relieve overloads under contingency	Uprate Atlantic 138/69-kV transformer	64	47	2008	2008	2
Relieve overloads under contingency	Construct 138/69-kV substation at a site near Horicon and install a 138/69-kV transformer	100	0	2008	2008	3
Relieve overloads under contingency	Construct a new 138/69-kV substation near Waunakee and install a 100 MVA 138/69-kV transformer	100	0	2008	2008	3
Relieve overloads under contingency	Install 60 MVA 138/69-kV transformer at Dunn Road	60	0	2008	2008	4
Relieve overloads under contingency	Install 138/69-kV transformer at the expanded Menominee Substation	100	0	2008	2008	4

Table PR-20

New Substations, Transformer Additions and Replacements (continued)

Identified need	Potential additions or replacements	Transformer capacity (MVA)		System need year	Projected in-service year	Planning zone
		Install	Replace			
Relieve overloads under contingency	Construct a new Mill Road Substation at intersection of Granville-Arcadian 345-kV, Forest Junction-Arcadian 345-kV, Sussex-Tamarack 138-kV and Sussex-Germantown 138-kV lines; install a 345/138-kV, 500 MVA transformer	500	0	2008	2008	5
Relieve overloads under contingency, transfer capability	Construct 138-kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover	210	0	2008	2008	1 & 2
Relieve overloads under contingency, transfer capability	Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove	60	0	2008	2008	1 & 2
Relieve overloads under contingency	Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen	60	0	2008	2008	1 & 2
Relieve overloads under contingency	Relocate Iron River Substation (Iron Grove)	N/A	N/A	2008	2008	1 & 2
Reduce service limitations, relieve overloads under contingency, improve transfer capability and Weston stability	Construct new Central Wisconsin 345-kV Substation	N/A	N/A	2009	2009	1
Relieve overloads under contingency	Construct 138-kV bus and install one 138/69-kV, 50 MVA transformer at Pine River	50	0	2009	2009	2
Relieve overloads under contingency	Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva	100	0	2009	2009	3
Relieve overloads under contingency	Construct new 138-kV bus and 138/69-kV 100 MVA transformer at Montrose Substation	100	0	2009	2009	3
Relieve overloads under contingency	Install a second 138/69-kV transformer at Hillman	47	0	2009	2009	3

Table PR-20

New Substations, Transformer Additions and Replacements (continued)

Identified need	Potential additions or replacements	Transformer capacity (MVA)		System need year	Projected in-service year	Planning zone
		Install	Replace			
Relieve overloads under contingency	Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Concord	500	0	2009	2009	3 & 5
Relieve overloads under contingency	Replace 138/69-kV transformer at Metomen	100	47	2010	2010	1
Access initiative, relieve overloads under contingency	Install a 161/138-kV transformer at Council Creek	100	0	2010	2010	1
Relieve overloads under contingency	Install a 69-kV bus and 138/69-kV 100 MVA transformer at Northwest Beloit	100	0	2010	2010	3
Access initiative	Install 47 MVA 138/69-kV transformer at Custer	47	0	2010	2010	4
Access initiative	Install 100 MVA 138/69-kV transformer at Lakefront	100	0	2010	2010	4
Accommodate new generation	Install second 500 MVA 345/138-kV transformer at Oak Creek	500	0	2010	2010	5
Relieve overloads under contingency, accommodate new generation	Construct a 345-kV bus and install a 345/138-kV, 500 MVA transformer at Bark River	500	0	2010	2010	3 & 5
Relieve overloads under contingency	Construct a 345-kV bus and install a 345/138-kV 500 MVA transformer at West Middleton	500	0	2011	2011	3
Relieve overloads under contingency	Install a 138/69-kV transformer and 69-kV bus at Yahara River Substation	100	0	2011	2011	3
Relieve overloads under contingency	Install a second 138/69-kV transformer at Janesville Substation	100	0	2011	2011	3
Relieve overloads under contingency	Uprate M38 138/69-kV transformer	64	47	2012	2012	2
Relieve overloads under contingency	Install 138/69-kV transformer at Bass Creek	100	0	2012	2012	3
Access initiative	Install second 345/138-kV transformer at Paddock (500 MVA normal/625 MVA emergency)	500	0	2013	2013	3

Table PR-20

New Substations, Transformer Additions and Replacements (continued)

Identified need	Potential additions or replacements	Transformer capacity (MVA)		System need year	Projected in-service year	Planning zone
		Install	Replace			
Accommodate new generation	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 two 138/26.2 kV transformers	500	0	2013	2013	5
Relieve overloads under contingency	Install a second 138/69-kV transformer at North Monroe	100	0	2014	2014	3
Relieve overloads under contingency	Install a second Femrite 138/69-kV transformer	100	0	2014	2014	3
Relieve overloads under contingency	Replace the Kilbourn 47 MVA 138/69-kV transformer with a 100 MVA unit	100	47	2014	2014	3
Relieve overloads under contingency	Replace the existing 46.7 MVA 138/69-kV transformer at South Sheboygan Falls with 100 MVA transformer	100	46.7	2014	2014	4
Relieve overloads under contingency	Replace 138/69-kV transformer at Wautoma	100	47	2015	2015	1
Relieve overloads under contingency	Replace the Colley Road 138/69-kV transformer	187	100	2015	2015	3

Table PR-21

Substation Equipment Additions and Replacements

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
T-D interconnection request	Construct new Eagle River Muni distribution Substation directly adjacent to the existing Cranberry 115-kV Substation	N/A	2005	2005	1
Relieve overloads or low voltages under contingency	Uprate North Lake Geneva to Lake Geneva 69-kV line to 72 MVA	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate Brick Church to Walworth 69-kV line to 48 MVA	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate Brick Church to Katzenberg 69-kV line to 93 MVA	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate Sun Prairie to Gaston Road 69-kV line to 48 MVA	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate Colorado to Sun Prairie 69-kV line to 72 MVA	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate Dane to Waunakee and Waunakee to Huiskamp 69-kV lines	N/A	2005	2005	3
Relieve overloads or low voltages under contingency	Uprate the North Appleton-Rocky Run 345-kV line	N/A	2005	2005	4
Relieve overloads or low voltages under contingency	Install 2-27 MVAR capacitor banks at Moorland 138 kV	54	2004	2005	5
Relieve overloads or low voltages under contingency	Install 2-8.16 MVAR capacitor banks at Council Creek 138 kV	16.3	2005	2006	1
Achieve transfer capability associated with Arrowhead-Gardner Park	Install 3-50 MVAR capacitor banks at Gardner Park 115 kV	150	2006	2006	1
Accommodate new generation, relieve overloads or low voltages under contingency	Upgrade Weston-Kelly 115-kV line conductor clearances to 300F	N/A	2006	2006	1
Relieve overloads or low voltages under contingency	Increase size of existing Summit Lake 115-kV capacitor bank from 11.3 to 16.9 MVAR	5.6	2006	2006	1
Relieve overloads or low voltages under contingency	Install 1-5.4 MVAR capacitor bank at Munising 69 kV	5.4	2006	2006	2

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Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Install 1-5.4 MVAR capacitor bank at Sawyer 69 kV	5.4	2006	2006	2
Relieve overloads or low voltages under contingency	Install 2-8.16 MVAR capacitor banks at Lincoln 69 kV	16.32	2006	2006	2
Relieve overloads or low voltages under contingency	Reconnect the 138/69-kV transformers at Kilbourn on separate breakers to operate individually	N/A	2006	2006	3
Relieve overloads or low voltages under contingency	Install 36 MVAR capacitor bank at Hartford 138-kV Substation	36	2006	2006	3
Relieve overloads or low voltages under contingency	Uprate Paddock-Shaw 69-kV line	N/A	2006	2006	3
Relieve overloads or low voltages under contingency	Uprate Brodhead-South Monroe 69-kV line	N/A	2006	2006	3
Relieve overloads or low voltages under contingency, accommodate new generation	Reconfigure 345-kV bus at Columbia	N/A	2006	2006	3
Relieve overloads or low voltages under contingency, reduce service limitations, T-D interconnection request	Install a 138-kV series reactor at Highway V	N/A	2005	2006	4
Relieve overloads or low voltages under contingency	Upgrade 48 MVA RTU and CT at Mullet River 138/69 kV	N/A	2006	2006	4
Operations, maintenance and stability	Construct North Appleton 345-kV double breaker ring bus configuration	N/A	2006	2006	4
Relieve overloads or low voltages under contingency	Install 2-27 MVAR capacitor banks at Burlington 138 kV	54	2005	2006	5
Relieve overloads or low voltages under contingency	Install series reactor at Cornell	N/A	2007	2007	5
Relieve overloads or low voltages under contingency	Uprate Metomen-North Fond du Lac 69-kV line terminal equipment	N/A	2006	2007	1
Relieve overloads or low voltages under contingency	Install 2-16.3 MVAR capacitor banks at Wautoma 138 kV	32.6	2007	2007	1

Table PR-21

Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Install 2-8.16 MVAR capacitor banks at Ontonagon 138 kV	16.32	2007	2007	2
Relieve overloads or low voltages under contingency	Uprate McCue-Janesville 69-kV line	N/A	2007	2007	3
Relieve overloads or low voltages under contingency, reduce service limitations	Uprate Rockdale to Jefferson 138-kV line	N/A	2007	2007	3
Relieve overloads or low voltages under contingency, reduce service limitations	Uprate Rockdale to Boxelder 138-kV line	N/A	2007	2007	3
Relieve overloads or low voltages under contingency, reduce service limitations	Uprate Boxelder to Stonybrook 138-kV line	N/A	2007	2007	3
Relieve overloads or low voltages under contingency	Install/upgrade capacitor bank at South Monroe 69 kV to 32 MVAR	32	2007	2007	3
Relieve overloads or low voltages under contingency	Install 2-16.3 MVAR capacitor bank at Canal 69 kV	32.6	2007	2007	4
Relieve overloads or low voltages under contingency	Replace the 1200 A breaker at Edgewater T22 345/138 kV	N/A	2007	2007	4
Relieve overloads or low voltages under contingency	Install 200 MVAR capacitor bank at Bluemound	200	2007	2007	5
Achieve transfer capability associated with Arrowhead-Gardner Park	Install 2-75 MVAR capacitor banks at Arrowhead 345 kV	150	2008	2008	1
Achieve transfer capability associated with Arrowhead-Gardner Park	Install 1-75 MVAR capacitor bank and 1-45 MVAR inductor at Stone Lake 345 kV	75	2008	2008	1
Achieve transfer capability associated with Arrowhead-Gardner Park	Install 1-50 MVAR capacitor bank at Arpin	50	2008	2008	1
Relieve overloads or low voltages under contingency	Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Berlin 69 kV	12.3	2008	2008	1
Relieve overloads or low voltages under contingency	Increase ground clearance of Atlantic-Osceola (Laurium #2) 69-kV line from 120 to 167 degrees F	N/A	2008	2008	2

Table PR-21

Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Install 1-5.4 MVAR capacitor bank at L'Anse 69 kV	5.4	2008	2008	2
Relieve overloads or low voltages under contingency	Install 2-8.16 MVAR capacitor banks at M38 69 kV	16.32	2008	2008	2
Relieve overloads or low voltages under contingency	Install 2-5.4 MVAR capacitor banks at Osceola 69 kV	10.8	2008	2008	2
Relieve overloads or low voltages under contingency	Install 1-8.16 MVAR capacitor bank at Richland Center 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	10.8	2008	2008	3
Relieve overloads or low voltages under contingency	Expand the Menominee 69-kV Substation and install 138-kV terminals. Loop the West Marinette-Bay De Noc 138-kV line into the substation	N/A	2008	2008	4
Accommodate new generation	Uprate Rocky Run-Plover 115-kV line terminal equipment	N/A	2009	2009	1
Relieve overloads or low voltages under contingency, reduce service limitations	Construct Mackinac 138-kV Substation additions (portions may be earlier for maintenance issues)	N/A	2009	2009	2
Relieve overloads or low voltages under contingency, reduce service limitations	Construct 138-kV ring bus at Hiawatha Substation	N/A	2009	2009	2
Relieve overloads or low voltages under contingency, reduce service limitations	Install 138-kV substation modifications at Indian Lake Substation	N/A	2009	2009	2
Relieve overloads or low voltages under contingency	Install 1-5.4 MVAR capacitor bank at MTU or Henry Street 69 kV	5.4	2009	2009	2
Relieve overloads or low voltages under contingency	Install 1-5.4 MVAR capacitor bank at Roberts 69 kV	5.4	2009	2009	2
Relieve overloads or low voltages under contingency	Install 4-25 MVAR capacitor banks at Portage 138 kV	100	2009	2009	3
Relieve overloads or low voltages under contingency	Uprate Colley Road to Brick Church 69-kV line to 72 MVA	N/A	2009	2009	3

Table PR-21

Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Install a 69-kV 16.32 MVAR capacitor bank at Kilbourn Substation	16.32	2009	2009	3
Accommodate new generation	Replace relaying on 230-kV circuits at Oak Creek	N/A	2009	2009	5
Accommodate new generation	Replace two 345-kV circuit breakers at Pleasant Prairie on the Racine and Zion lines with IPO breakers and upgrade relaying	N/A	2009	2009	5
Accommodate new generation	Expand Oak Creek 345-kV switchyard to interconnect one new generator	N/A	2009	2009	5
Relieve overloads or low voltages under contingency	Uprate Wautoma-Berlin 69-kV line terminal equipment at Wautoma	N/A	2010	2010	1
Relieve overloads or low voltages under contingency	Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	10.8	2010	2010	3
Relieve overloads or low voltages under contingency	Uprate Darlington-Rock Branch 69-kV line	N/A	2010	2010	3
Relieve overloads or low voltages under contingency	Uprate existing 18 MVAR capacitor bank at Spring Green 138 kV with a 50 MVAR bank	32	2010	2010	3
Relieve overloads or low voltages under contingency	Retap 48 MVA CT at South Sheboygan Falls 138/69-kV transformer	N/A	2010	2010	4
Accommodate new generation	Expand 345-kV switchyard at Oak Creek to interconnect one new generator	N/A	2010	2010	5
Accommodate new generation	Uprate Oak Creek-Root River 138-kV line	N/A	2010	2010	5
Relieve overloads or low voltages under contingency	Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69 kV	12.3	2011	2011	1
Relieve overloads or low voltages under contingency	Uprate Yahara-Token Creek 69-kV line	N/A	2011	2011	3
Relieve overloads or low voltages under contingency	Uprate Northgate-20th Street 138-kV line	N/A	2011	2011	4

Table PR-21

Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Relieve overloads or low voltages under contingency	Replace the 400 amp metering CT at North Mullet River 69 kV	N/A	2011	2011	4
Relieve overloads or low voltages under contingency	Uprate Gardner Park-Black Brook 115-kV line - scope TBD	N/A	2012	2012	1
Relieve overloads or low voltages under contingency	Install a 12.2 MVAR capacitor bank at Hilltop 69 kV	12.2	2012	2012	1
Relieve overloads or low voltages under contingency	Uprate Sun Prairie-Bird Street 69-kV line	N/A	2012	2012	3
Relieve overloads or low voltages under contingency	Uprate North Monroe-Idle Hour 69-kV line	N/A	2012	2012	3
Relieve overloads or low voltages under contingency	Move Lone Rock 69-kV phase shifter to Richland Center	N/A	2012	2012	3
Relieve overloads or low voltages under contingency	Retap 400A primary CT at Edgewater to 600A	N/A	2012	2012	4
Relieve overloads or low voltages under contingency	Replace 300 A metering CT at Edgewater 69 kV	N/A	2013	2013	4
Relieve overloads or low voltages under contingency	Replace 300 A metering CT at Riverside 69 kV	N/A	2013	2013	4
Relieve overloads or low voltages under contingency	Uprate Port Edwards-Saratoga 138-kV line - Scope TBD	N/A	2013	2013	1
Access initiative	Expand 345 kV to 6 positions at Paddock	N/A	2013	2013	3
Access initiative	Expand 138 kV to 7 positions at Paddock	N/A	2013	2013	3
Relieve overloads or low voltages under contingency	Replace the 300A current transformer at Sheboygan Falls 69 kV	N/A	2013	2013	4
Accommodate new generation	Install two 345-kV line terminations at Pleasant Prairie and loop Zion-Arcadian 345-kV line into Pleasant Prairie Substation	N/A	2013	2013	5
Accommodate new generation	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	N/A	2013	2013	5

Table PR-21

Substation Equipment Additions and Replacements (continued)

Identified need	Potential additions or replacements	Capacitor bank capacity (MVAR)	System need year	Projected in-service year	Planning zone
Accommodate new generation	Replace CTs at Racine 345-kV Substation	N/A	2013	2013	5
Relieve overloads or low voltages under contingency	Increase McKenna 69-kV capacitor bank from 6.3 to 10.8 MVAR	4.5	2014	2014	1
Relieve overloads or low voltages under contingency	Uprate Metomen-Ripon 69-kV line - scope TBD	N/A	2014	2014	1
Relieve overloads or low voltages under contingency	Install 1-16.32 MVAR capacitor bank at Burke 69 kV	16.32	2014	2014	3
Relieve overloads or low voltages under contingency	Uprate Colley Road to Park Street Tap 69-kV line to 114 MVA	N/A	2014	2014	3
Relieve overloads or low voltages under contingency	Uprate the Melissa-Tayco line to 229 MVA (300F)	N/A	2014	2014	4
Relieve overloads or low voltages under contingency	Install additional 13.6 MVAR capacitor bank at Clear Lake 115 kV	13.6	2015	2015	1
Relieve overloads or low voltages under contingency	Install 2-5.4 MVAR capacitor banks at M-38 69 kV	10.8	2015	2015	2
Relieve overloads or low voltages under contingency	Install 28.8 MVAR capacitor bank at Butternut 138 kV	28.8	2015	2015	4

Table PR-22
Alternative Solutions to Proposed Additions

Primary solution(s)	Alternate solution(s)	Projected in-service year	Planning zone
New Cranberry-Conover 115-kV line and Convert Conover-Iron River-Plains 69-kV to 138 kV	1.) Weston-Venus 345-kV line 2.) Weston-Venus-Plains 345-kV line 3.) Cranberry-Conover 138-kV line and convert Conover-Winona to 138 kV 4.) Venus-Crandon-Laona-Goodman-Plains 138-kV line 5.) Venus-Crandon-Laona-Goodman-Amberg 138-kV line 6.) Generation in upper portion Rhinelander Loop 7.) Park Falls-Clear Lake 115-kV line 8.) Convert Whitcomb-Aurora Street 69 kV to 115 kV 9.) Gogebic-Watersmeet-Conover-Cranberry 138-kV line	2008	1
Berlin area reinforcements: New Omro Industrial-Fitzgerald 69-kV line, install capacitor banks at Ripon and Berlin	1.) Reconfigure N. Randolph-Ripon 69-kV line to N. Randolph-Metomen and Metomen-Ripon 69-kV lines. Cap bank installations at Berlin, Ripon and Winneconne and second 138/69-kV transformer at Metomen 2.) Convert Metomen-Ripon-Berlin 69-kV line to 138 kV with a new 138/69-kV transformer at Berlin 3.) Rebuild the Metomen-Ripon-Berlin 69-kV line to a 138/69-kV double-circuit line with new 138/69-kV transformer at Berlin	2005 - 2015	1
Rebuild Weston-Sherman St. and Sherman St-Hilltop 115-kV lines as double-circuits with a new Gardner Park-Hilltop 115-kV line	1). Convert WPS's 46 kV system from Maine-Brokaw-Strowbridge-Wausau Hydro-Townline-Kelly to 115 kV 2.) Convert WPS's 46 kV system from Sherman St.-Wausau Hydro-Strowbridge-Townline-Kelly to 115 kV 3.) Rebuilding/uprating both existing Weston-Sherman St. 115-kV lines and the Sherman St.-Hilltop 115-kV line along with the rebuild of the Sherman St. Substation	2007	1
Uprate Weston-Kelly 115-kV line	1.) Convert WPS's 46-kV system from Weston-Rothschild-Kelly to 115 kV 2.) Reroute/Reterminate Weston end of line to new Gardner Park 345/115-kV Substation 3.) New 115-kV substation at the intersection of Weston-Blackbrook and Kelly-Whitcomb 115-kV lines 4.) Rebuild the Weston-Kelly 115-kV line	2006	1

Table PR-22
Alternative Solutions to Proposed Additions (continued)

Primary solution(s)	Alternate solution(s)	Projected in-service year	Planning zone
Construct second Hiawatha-Pine River-Mackinac (Straits) 138-kV line	Rebuild Hiawatha-Pine River 69-kV line, Install a Phase Shifter at Mackinac to limit flows and add 138-kV capacitors at Brevort or Lakehead	2009	2
Install a 138/69-kV transformer at Yahara River Substation and loop the Token Creek 69-kV line into and out of Yahara River	1.) Reconfigure Sun Prairie 69-kV system, install second 138/69-kV transformer at North Madison 2.) Convert North Madison 69-kV line through Sun Prairie to Reiner to 138 kV	2011	3
Construct a new 345-kV line from Rockdale to West Middleton	1.) Construct a new 345-kV line from North Madison to West Middleton 2.) Rockdale to Sprecher/Femrite 138-kV double-circuit line 3) Numerous 138-kV and 69-kV capacitor banks, reconductor Kegonsa to Christiana, reconductor Fitchburg to Christiana, add a second 138/69-kV transformer at North Madison, add a third 345/138-kV transformer at North Madison, reconductor or uprate North Madison to Sycamore 138-kV line, install a second 138/69-kV transformer at Kegonsa, reconductor all three East Campus to Blount 69-kV lines, reconductor Blount to Gateway 69-kV line.	2011	3
Convert 69-kV line from West Middleton to Spring Green to 138 kV and Construct a new 345-kV line from Rockdale to West Middleton	Install several capacitor banks on 69-kV buses and on 138-kV buses	2012	3
Construct a new 138-kV line from North Madison to Waunakee and a new substation with a 138/69-kV transformer near Waunakee	1.) Install parallel transformers at Portage and North Madison 2.) Install line between Spring Green and Prairie du Sac to offload this line	2008	3
Construct a Canal-Dunn Road 138-kV line and add a 138/69-kV transformer at Dunn Road	1.) Add a third 138/69-kV transformer at Canal 2.) Add generation to the 69-kV system in Northern Door County 3.) Replace Canal 138/69-kV transformers 1 and 2	2008	4

Table PR-22
Alternative Solutions to Proposed Additions (continued)

Primary solution(s)	Alternate solution(s)	Projected in-service year	Planning zone
Add two 16.3 MVAR capacitor bank at Canal 69 kV	1.) Rebuild Pulliam-Brusbay-Sawyer-Canal 69-kV line for 138 kV 2.) Construct a 138-kV line from Egg Harbor to Menominee under the bay of Green Bay and operate at 69 kV 3.) Construct a 138-kV line from Sister Bay to Escanaba under the bay of Green Bay and operate at 69 kV 4.) Add generation to the 69-kV system in Door County	2007	4
Add 138-kV conductor for Ellinwood-Sunset Point 138-kV on existing structures	1.) Replace Ellinwood 138/69-kV transformer 2.) Add a third Ellinwood 138/69-kV transformer	2007	4
Construct the Morgan-Werner West 345-kV line and construct a 345/138-kV switchyard at a new Werner West; install a 345/138-kV transformer. Loop existing Rocky Run to North Appleton 345-kV and existing Werner to White Lake 138-kV lines into Werner West	1.) Construct a 345-kV line from Morgan to North Appleton, add a fourth 345/138-kV transformer at North Appleton, uprate the Kaukauna Central Tap-Melissa-Tayco 138-kV line, uprate Butte des Morts 138-kV bus tie, uprate Casaloma-Ellington-North Appleton 138-kV line. 2.) Add a fourth 345/138-kV transformer at North Appleton, uprate the Kaukauna Central Tap-Melissa-Tayco 138-kV line, uprate Butte des Morts 138-kV bus, uprate Casaloma-Ellington-North Appleton 138-kV line, uprate Ellington 138-kV bus, uprate Morgan-White Clay 138-kV line, and add a 14.4 MVAR capacitor bank at Casaloma 138-kV 3) Construct a new Morgan-North Appleton 345/138-kV double-circuit line 4) Add a fourth 345/138-kV transformer at North Appleton, construct Werner West-Clintonville 138-kV line, rebuild various 138-kV lines, replace terminal equipments at various 138-kV substations	2006, 2009	4
Construct a second Dunn Road-Egg Harbor 69-kV line	1.) Construct a new 138-kV line from Dunn Road to Egg Harbor 2.) Add generation to the 69-kV system in northern Door County	2010	4
Rebuild Crivitz-High Falls 69-kV double-circuit line	1.) Construct a new 138-kV line from Amberg to Goodman 3.) Construct a new Metonga-Goodman 115-kV line 4.) Construct a new 69-kV line from Pine to Goodman	2008	4
Replace South Sheboygan Falls 138/69-kV transformer with a minimum of 125 MVA unit	1.) Tap the Forest Junction-Cedarsauk 138-kV line to Sheboygan Falls and add a 138/69-kV transformer. 2.) Construct a 138-kV line to the 69-kV Plymouth Sub #2 and convert Plymouth Sub #2 to 138 kV 3.) Construct 2.5 miles of 138-kV line from Lodestar to Sheboygan Falls and install a 138/69-kV, 60 MVA transformer at Sheboygan Falls 4.) Construct 3 miles of 69-kV line from Plymouth #4 Substation to Plymouth #3 Substation. Install a 138/69-kV transformer at Plymouth #4 Substation	2014	4

Table PR-22
Alternative Solutions to Proposed Additions (continued)

Primary solution(s)	Alternate solution(s)	Projected in-service year	Planning zone
Construct a 345-kV bus at Bain Substation	Reconfigure 345-kV bus at Pleasant Prairie	2007	5
Install two 345-kV series breakers at Pleasant Prairie on lines to Racine (L631) and Zion (L2221)	Reconfigure 345-kV lines on bus sections 3 and 4. Reconfigure Pleasant Prairie 345-kV straight bus into ring bus. Construct a 345-kV bus at Bain Substation.	2009	5
Construct Rockdale-Concord-Bark River-Mill Road 345-kV line with 345/138-kV transformers at Concord, Bark River and Mill Road (Lannon Junction)	1.) Construct a 345-kV line from Rockdale-Concord-St. Lawrence 2.) Add a 345/138-kV transformer at St. Lawrence 3.) Add a 345/138-kV transformer at Concord 4.) Install a 4-position 345-kV ring bus and a 345/138-kV transformer at Germantown	2008/10	3 & 5
Construct Rockdale-Concord-Bark River-Mill Road 345-kV line with 345/138-kV transformers at Concord, Bark River and Mill Road (Lannon Junction)	1.) Construct a Bark River-Concord 138-kV line 2.) Construct a Bark River- Hartford 138-kV line 3.) Add a 138-kV switching station at Mill Road site 4.) Rebuild existing Rockdale-Concord-Cooney-Summit 138 kV to double-circuit 138 kV; construct 8-position ring buses at Jefferson and Concord 5.) Uprate Stonybrook-Boxelder 138-kV 6.) Install 32 MVAR capacitor bank at Summit and 75 MVAR at Hartford 138 kV	2008/10	3 & 5

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment

Projects cancelled	Former in-service date	Planning zone	Reason for removal
Install 2-5.4 MVAR capacitor banks at Iron River 69 kV	2006	2	Capacitors moved to Lincoln
Uprate Lewiston to Kilbourn 138-kV line to 286 MVA	2004	3	Updated rating information
Uprate South Beaver Dam to Juneau 69-kV line to 72 MVA	2004	3	Updated rating information
Uprate Saratoga-Baker 115-kV line terminal equipment at Saratoga	2009	1	Updated rating information
Install 2-16.3 MVAR capacitor bank at Apple Hills 138 kV	2015	4	Updated load/model information
Uprate Whitcomb-Deer Trail 69-kV line terminal equipment at Whitcomb	2012	1	Updated rating information
Reconfigure 345-kV bus at Pleasant Prairie	2006	5	Another alternative selected (Bain)
Install two 345-kV series breakers at Pleasant Prairie on lines to Racine (L631) and Zion (L2221)	2009	5	Oak Creek restudy results
Replace seven 138-kV overdutied breakers at Bluemound	2009	5	Oak Creek restudy results
Expand 345-kV switchyard at Bain and string Bain-Racine 345-kV circuit	2012	5	Oak Creek restudy results
Replace twenty-two 138-kV overdutied breakers at Harbor, Everett and Haymarket Substations	2014	5	Oak Creek restudy results
Remove Niagara Tap from 138-kV Plains-Amberg line and connect to new 138-kV line from Plains	2005	2	Improved reliability from line rebuild
Install two additional 5.4 MVAR capacitor banks at Iron River 69 kV	2013	2	Another alternative selected
Replace the two existing 33 MVA 138/69-kV transformers at Edgewater with two 60 MVA transformers	2006	4	Updated rating information
Replace the existing 46.7 MVA 138/69-kV transformer at Mullet River with 100 MVA transformer	2006	4	Updated rating information

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

Projects deferred	New date	Planning zone	Previous in-service year and reason for deferral
Install 2-8.16 MVAR capacitor banks at Council Creek 138 kV	2006	1	Originally 2005, budget considerations
Construct Hiawatha-Engadine 69-kV line	2006	2	Originally 2005, construction outage scheduling
Rebuild and convert one Hiawatha-Indian Lake 69-kV circuit to double-circuit 138-kV standards, string two circuits initially and operate one at 69 kV	2006	2	Originally 2005, construction outage scheduling
Construct Butler Ridge 138-kV Substation	2006	3	Originally 2005, additional design issues to be resolved
Install 36 MVAR capacitor bank at Hartford 138-kV Substation	2006	3	Originally 2005; was at Butler Ridge, additional design issues to be resolved
Construct a 345-kV substation at new Cypress; loop existing Forest Junction-Arcadian line into new Cypress	2006	4	Originally 2005, updated information from customer
Install series reactor at Cornell	2007	5	Originally 2006, budget considerations
Uprate Metomen-North Fond du Lac 69-kV line terminal equipment	2007	1	Originally 2006; updated load/model information and budget considerations
Construct Mackinac 138-kV Substation (new Straits Substation)	2007	2	Originally 2006, budget considerations
Construct new line from Southwest Delavan to Delavan or Bristol at 138 kV, operate at 69 kV	2007	3	Originally 2006, budget considerations
Install 2-16.3 MVAR capacitor bank at Canal 69 kV	2007	4	Originally 2006, budget considerations and updated load/model information
Install 200 MVAR capacitor bank at Bluemound	2007	5	Originally 2006, budget considerations
Rebuild Atlantic-Osceola 69-kV line (Laurium #1)	2008	2	Originally 2006, budget considerations
Construct 138-kV line from Canal to Dunn Road	2008	4	Originally 2007 and was previously on new right-of-way, updated load/model information

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

Projects deferred (continued)	New date	Planning zone	Previous in-service year and reason for deferral
Install 60 MVA 138/69-kV transformer at Dunn Road	2008	4	Originally 2007, updated load/model information
Construct a new Mill Road Substation at intersection of Granville-Arcadian 345-kV, Forest Junction-Arcadian 345-kV, Sussex-Tamarack 138-kV and Sussex-Germantown 138-kV lines; install a 345/138-kV, 500 MVA transformer	2008	5	Originally 2007; name change (was Lannon Junction), budget considerations
Uprate Colley Road to Brick Church 69-kV line to 72 MVA	2009	3	Originally 2005, updated load/model information
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2009	4	Originally 2007, updated load/model information
Replace 138/69-kV transformer at Metomen	2010	1	Originally 2009, updated load/model information
Construct Monroe County-Council Creek 161-kV line	2010	1	Originally 2009, updated load/model information
Install a 161/138-kV transformer at Council Creek	2010	1	Originally 2009, updated load/model information
Uprate Council Creek-Petenwell 138-kV line	2010	1	Originally 2009, updated load/model information
Rebuild/reconductor Petenwell-Saratoga 138-kV line	2010	1	Originally 2009, updated load/model information
Install 1-8.16 MVAR capacitor bank at Boscobel 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2010	3	Was Muscoda; originally 2008, updated load/model information
Uprate Gardner Park-Black Brook 115-kV line - scope TBD	2012	1	Originally 2011, updated load/model information
Expand 345 kV to 6 positions at Paddock	2013	3	Originally 2010, updated load/model information

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

Projects deferred (continued)	New date	Planning zone	Previous in-service year and reason for deferral
Expand 138 kV to 7 positions at Paddock	2013	3	Originally 2010, updated load/model information
Install second 345/138-kV transformer at Paddock (500 MVA normal/625 MVA emergency)	2013	3	Originally 2010, updated load/model information
Rebuild Paddock-Town Line Road 138 kV to double-circuit 1600 Amps minimum summer emergency each	2013	3	Originally 2010, updated load/model information
Reconductor Town Line Road-Russell 138 kV to 1600 Amps minimum summer emergency	2013	3	Originally 2010, updated load/model information
Install a second 138/69-kV transformer at North Monroe	2014	3	Originally 2010, updated load/model information
Replace the existing 46.7 MVA 138/69-kV transformer at South Sheboygan Falls with 100 MVA transformer	2014	4	Originally 2006, updated load/model information and updated rating information
Replace 138/69-kV transformer at Wautoma	2015	1	Originally 2013, updated load/model information
Install 2-5.4 MVAR capacitor banks at M-38 69 kV	2015	2	Originally 2013, updated load/model information
Install 28.8 MVAR capacitor bank at Butternut 138 kV	2015	4	Originally 2009, updated load/model information
Construct a Northside-City Limits 138-kV line	2015	4	Originally 2014, updated load/model information
Reconductor Pulliam-Danz 69-kV line	2015	4	Originally 2008, updated load/model information
Reconductor Danz-Henry Street 69-kV line	2015	4	Originally 2008, updated load/model information
Reconductor Pulliam-Van Buren 69-kV line	2015	4	Originally 2008, updated load/model information

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

Other project changes	Date	Planning zone	Reason for change or update
Construct new Eagle River Muni distribution Substation directly adjacent to the existing Cranberry 115-kV Substation	2005	1	Was new transformer at Cranberry
Rebuild and convert one Hiawatha-Indian Lake 69-kV circuit to double-circuit 138-kV standards, string two circuits initially and operate one at 69 kV	2006	2	in-service year, was 2005; previously: string one circuit initially and operate at 69 kV
Install 2-8.16 MVAR capacitor banks at Lincoln 69 kV	2006	2	Capacitors moved from Iron River
Install 36 MVAR capacitor bank at Hartford 138-kV Substation	2006	3	in-service year, was 2005; capacitors were previously at Butler Ridge
Relocate Brule Substation (Aspen)	2007	2	Previously: construct new Brule
Install/upgrade capacitor bank at South Monroe 69 kV to 32 MVAR	2007	3	in-service year, was 2008, previously: 24 MVAR capacitor bank
Install 2-75 MVAR capacitor banks at Arrowhead 345 kV	2008	1	Voltage changed from 230 to 345
Rebuild/Convert Pulliam-New Suamico 69-kV line to 138 kV	2008	4	This project was broken out separately from previous Pulliam-Pioneer project
Construct a new Mill Road Substation at intersection of Granville-Arcadian 345-kV, Forest Junction-Arcadian 345-kV, Sussex-Tamarack 138-kV and Sussex-Germantown 138-kV lines; install a 345/138-kV, 500 MVA transformer	2008	5	in-service year, was 2007; previously named Lannon Junction

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

Other project changes (continued)	Date	Planning zone	Reason for change or update
Construct Cranberry-Conover 115-kV line	2008	1 & 2	Previously a 138-kV line
Construct 138-kV bus and install 138/115-kV 150 MVA and 138/69-kV 60 MVA transformers at Conover	2008	1 & 2	150 MVA transformer was at Cranberry
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Iron Grove	2008	1 & 2	Previously named Iron River
Construct 138-kV bus and install one 138/69-kV, 50 MVA transformer at Pine River	2009	2	Was 2-50 MVA transformers at Pine River
Construct new 138-kV bus and 138/69-kV 100 MVA transformer at Montrose Substation	2009	3	Renamed, was Sugar River
Construct new Montrose-Sun Valley-Oak Ridge 138-kV line	2009	3	Renamed, was Sugar River-Lincoln-SE Fitchburg
Install 1-8.16 MVAR capacitor bank at Boscobel 69 kV and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2010	3	in-service year, was 2008, was Muscoda
Construct a second Dunn Road-Egg Harbor 69-kV line	2010	4	in-service year, was 2011; previously under existing right-of-way
Install a second 138/69-kV transformer at Janesville Substation	2011	3	Previously at McCue
Rebuild/Convert New Suamico-Pioneer 69-kV line to 138 kV	2015	4	Broken out separately from previous Pulliam-Pioneer project

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

New projects	In-service date	Planning zone	Need for project
Install 1-5.4 MVAR capacitor bank at Munising 69 kV	2006	2	Improve voltage profile
Install 1-5.4 MVAR capacitor bank at Sawyer 69 kV	2006	2	Improve voltage profile
Uprate Colley Road 138/69-kV transformer	2006	3	Improve reliability
Uprate North Monroe 138/69-kV transformer	2006	3	Improve reliability
Uprate Paddock-Shaw 69-kV line	2006	3	Improve reliability
Uprate Brodhead-South Monroe 69-kV line	2006	3	Improve reliability
Uprate McCue 138/69-kV transformer	2006	3	Improve reliability
Upgrade 48 MVA RTU and CT at Mullet River 138/69-kV	2006	4	Improve reliability
Construct Brandon-Fairwater 69-kV line	2007	1	T-D interconnection request
Install 2-8.16 MVAR capacitor banks at Ontonagon 138 kV	2007	2	Improve voltage profile
Uprate McCue-Janesville 69-kV line	2007	3	Improve reliability
Uprate Boxelder to Stonybrook 138-kV line	2007	3	T-D interconnection request
Replace the 1200 A breaker at Edgewater T22 345/138 kV	2007	4	Improve reliability
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2008	1	T-D interconnection request
Increase ground clearance of Atlantic-Osceola (Laurium #2) 69-kV line from 120 to 167 degrees F	2008	2	Improve reliability
Install 1-5.4 MVAR capacitor bank at L'Anse 69 kV	2008	2	Improve voltage profile
Install 2-8.16 MVAR capacitor banks at M38 69 kV	2008	2	Improve voltage profile
Install 2-5.4 MVAR capacitor banks at Osceola 69 kV	2008	2	Improve voltage profile
Uprate Atlantic 138/69-kV transformer	2008	2	Improve reliability

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

New projects (continued)	In-service Date	Planning zone	Need for project
Uprate North Appleton-Mason Street 138-kV line	2008	4	Accommodate new generation
Uprate North Appleton-Lost Dauphin 138-kV line	2008	4	Accommodate new generation
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen	2008	1 & 2	Improve reliability
Relocate Iron River Substation (Iron Grove)	2008	1 & 2	Improve reliability
Uprate Rocky Run-Plover 115-kV line terminal equipment	2009	1	Improve reliability
Install 1-5.4 MVAR capacitor bank at MTU or Henry Street 69 kV	2009	2	Improve voltage profile
Install 1-5.4 MVAR capacitor bank at Roberts 69 kV	2009	2	Improve voltage profile
Install 4-25 MVAR capacitor banks at Portage 138 kV	2009	3	Improve voltage profile
Uprate Darlington-Rock Branch 69-kV line	2010	3	Improve reliability
Uprate existing 18 MVAR capacitor bank at Spring Green 138 kV with a 50 MVAR bank	2010	3	Improve voltage profile
Retap 48 MVA CT at South Sheboygan Falls 138/69-kV transformer	2010	4	Improve reliability
Uprate Yahara-Token Creek 69-kV line	2011	3	Improve reliability
Construct Evansville-Brooklyn 69-kV line	2011	3	Improve reliability
Uprate Northgate-20th Street 138-kV line	2011	4	Improve reliability
Replace the 400 amp metering CT at North Mullet River 69 kV	2011	4	Improve reliability
Install a 12.2 MVAR capacitor bank at Hilltop 69 kV	2012	1	Improve voltage profile
Uprate M38 138/69-kV transformer	2012	2	Improve reliability
Uprate Sun Prairie-Bird Street 69-kV line	2012	3	Improve reliability
Uprate North Monroe-Idle Hour 69-kV line	2012	3	Improve reliability
Install 138/69-kV transformer at Bass Creek	2012	3	Improve reliability

Table PR-23
Summary of Cancellations, Deferrals, Changes and New Projects to the 2005 10-Year Assessment (continued)

New projects (continued)	In-service Date	Planning zone	Need for project
Retap 400A primary CT at Edgewater to 600A	2012	4	Improve reliability
Uprate Port Edwards-Saratoga 138-kV line - Scope TBD	2013	1	Improve reliability
Replace the 300A current transformer at Sheboygan Falls 69 kV	2013	4	Improve reliability
Replace CTs at Racine 345-kV Substation	2013	5	Accommodate new generation
Increase McKenna 69-kV capacitor bank from 6.3 to 10.8 MVAR	2014	1	Improve voltage profile
Install 1-16.32 MVAR capacitor bank at Burke 69 kV	2014	3	Improve voltage profile
Install a second Femrite 138/69-kV transformer	2014	3	Improve reliability
Replace the Kilbourn 47 MVA 138/69-kV transformer with a 100 MVA unit	2014	3	Improve reliability
Uprate Colley Road to Park Street Tap 69-kV line to 114 MVA	2014	3	Improve reliability
Uprate the Melissa-Tayco line to 229 MVA (300F)	2014	4	Improve reliability
Replace the Colley Road 138/69-kV transformer	2015	3	Improve reliability

Table PR-24
Maintenance, Operations or Protection Projects over $0.5 Million (2006-2010)

Project description	System need year	In-service year	Initiated	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Wautoma breaker replacement	2006	2006	Maintenance	1	Poor condition	Planned	2.1
Whitcomb relay upgrades	2006	2006	Operation	1	Improve reliability	Planned	1.3
Port Edwards substation upgrades	2006	2006	Maintenance	1	Poor condition	Planned	1.2
Endeavor tap on Y17	2006	2006	Maintenance	1	Poor condition	Planned	1.0
Chaffee Creek-Kilbourn (Y100) lline	2006	2006	Maintenance	1	Poor condition	Planned	0.6
Nordic-Sagola line rebuild	2006	2006	Maintenance	2	Reliability, cascading, update	Planned	1.7
Nordic-Felch line rebuild	2006	2006	Maintenance	2	Reliability, cascading, update	Planned	1.5
Wood Structures – Zone 2 blanket	2006	2006	Maintenance	2	Poor condition	Provisional	1.0
Straits equipment removal	2006	2006	Maintenance	2	Poor condition	Planned	0.5
Empire relay replacement	2006	2006	Protection	2	Improve protection	Planned	0.6
Hillman-Nelson Dewey (X15) line repair	2006	2006	Maintenance	3	Equipment damage	Planned	2.2
Eden-Spring Green (X17) pole replacement	2006	2006	Maintenance	3	Poor condition	Planned	1.9
Eden-Nelsen Dewey (X16) pole replacement	2006	2006	Maintenance	3	Poor condition	Planned	1.8
Kirkwood-Spring Green (X18) line maintenance	2006	2006	Maintenance	3	Poor condition	Planned	1.0
Eden-Rock Branch (Y106) line rebuild	2006	2006	Maintenance	3	Poor condition	Planned	0.9
Colley Road substation upgrades	2006	2006	Maintenance	3	Poor condition	Provisional	0.6
Caroline substation upgrade	2006	2006	Operation	4	Improve reliability	Provisional	1.6
Tecumseh-Elkhart Lake line update	2006	2006	Maintenance	4	Poor condition	Planned	0.6
Crivitz - RTU	2006	2006	Protection	4	Improve reliability	Provisional	0.6
Bluemound breaker replacement	2006	2006	Maintenance	5	Poor condition	Proposed	0.7
Enbridge-Portage (Y17) line rebuild	2006	2006	Maintenance	1-3	Poor condition	Planned	1.4
Y17 double circuit construct	2006	2006	Maintenance	1-3	Poor condition	Planned	1.7
Spare 138/69-kV transformer	2006	2006	Maintenance	-	Improve availability	Planned	0.9
Montello-Wautoma (Y17) line rebuild	2007	2007	Maintenance	1	Poor condition	Planned	3.9
Rozelleville-Sigel (Y107) line rebuild	2007	2007	Maintenance	1	Poor condition	Planned	3.5
RTU -Zone 1 blanket	2007	2007	Protection	1	Improve reliability	Provisional	1.8

Table PR-24
Maintenance, Operations or Protection Projects over $0.5 Million (2006-2010)

Project description	System need year	In-service year	Initiated	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Relay improvements - Zone 1 blanket	2007	2007	Maintenance	1	Improve protection	Provisional	1.0
Montello breaker replacement	2007	2007	Maintenance	1	Poor condition	Planned	0.6
Iola breaker replacement	2007	2007	Maintenance	1	Poor condition	Provisional	0.6
Laurium-Franklin 69-kV line rebuild	2007	2007	Maintenance	2	Poor condition	Planned	3.1
Laurium-Osceola 69-kV line rebuild	2007	2007	Maintenance	2	Poor condition	Planned	2.2
Laurium-Adams 69-kV line rebuild	2007	2007	Maintenance	2	Poor condition	Planned	1.5
Laurium-Hancock 69-kV line rebuild	2007	2007	Maintenance	2	Poor condition	Planned	1.4
Wood structures - Zone 2 blanket	2007	2007	Maintenance	2	Poor condition	Provisional	0.8
Relay improvements - Zone 2 blanket	2007	2007	Maintenance	2	Improve protection	Provisional	0.8
Cedar substation removal	2007	2007	Maintenance	2	Poor condition	Planned	0.7
Breaker improvements - Zone 2 blanket	2007	2007	Maintenance	2	Poor condition	Provisional	0.5
Oregon-Verona (Y119) line rebuild	2007	2007	Maintenance	3	Poor condition	Planned	3.5
Spring Green-Stagecoach (Y62) line rebuild	2007	2007	Maintenance	3	Poor condition	Planned	3.2
Mount Horeb-Rock Branch (Y135) line rebuild	2007	2007	Maintenance	3	Poor condition	Planned	2.3
Boscobel-Lone Rock (Y124) line rebuild	2007	2007	Maintenance	3	Poor condition	Planned	2.1
Dam Height-Dane (Y8) line rebuild	2007	2007	Maintenance	3	Poor condition	Planned	1.0
RTU -Zone 4 blanket	2007	2007	Protection	4	Improve reliability	Provisional	2.1
North Fond du Lac relay upgrades	2007	2007	Protection	4	Improve protection	Planned	1.3
Elkhart Lake-Random Lake line reinsulated	2007	2007	Maintenance	4	Poor condition	Planned	1.0
Breaker improvements - Zone 4 blanket	2007	2007	Maintenance	4	Poor condition	Provisional	0.5
Relay improvements - Zone 4 blanket	2007	2007	Maintenance	4	Improve protection	Provisional	0.5
Relay improvements - Zone 5 blanket	2007	2007	Protection	5	Improve protection	Provisional	0.7
Breaker improvements - Zone 5 blanket	2007	2007	Maintenance	5	Poor condition	Provisional	0.8
RTU -Zone 5 blanket	2007	2007	Protection	5	Improve reliability	Provisional	0.8

Table PR-24
Maintenance, Operations or Protection Projects over $0.5 Million (2006-2010)

Project description	System need year	In-service year	Initiated	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Switch improvements - Zone 5 blanket	2007	2007	Maintenance	5	Poor condition	Provisional	0.6
Breaker improvements - blanket	2007	2007	Maintenance	-	Poor condition	Provisional	1.0
Relay improvements - West blanket	2007	2007	Protection	-	Improve protection	Provisional	1.0
Substation improvements - blanket	2007	2007	Maintenance	-	Poor condition	Provisional	0.7
Chaffee Creek-Hancock (Y90) line rebuild	2008	2008	Maintenance	1	Poor condition	Planned	3.2
Relay improvements - Zone 1 blanket	2008	2008	Protection	1	Improve protection	Provisional	0.5
Breaker improvements - Zone 2 blanket	2008	2008	Maintenance	2	Poor condition	Provisional	0.5
Wood structures - Zone 2 blanket	2008	2008	Maintenance	2	Poor condition	Provisional	0.8
Relay improvements - Zone 2 blanket	2008	2008	Maintenance	2	Improve protection	Provisional	0.5
Relay improvements - Zone 4 blanket	2008	2008	Protection	4	Improve protection	Provisional	1.2
Random Lake-Saukville line reinsulate	2008	2008	Maintenance	4	Poor condition	Planned	1.0
Breaker improvements - Zone 4 blanket	2008	2008	Maintenance	4	Poor condition	Provisional	0.5
Breaker improvements - Zone 5 blanket	2008	2008	Maintenance	5	Poor condition	Provisional	0.8
Relay improvements - Zone 5 blanket	2008	2008	Protection	5	Improve protection	Provisional	0.7
Switch improvements - Zone 5 blanket	2008	2008	Maintenance	5	Poor condition	Provisional	0.7
RTU -Zone 5 blanket	2008	2008	Protection	5	Improve reliability	Provisional	0.5
Breaker improvements - blanket	2008	2008	Maintenance	-	Poor condition	Provisional	1.0
Relay improvement - West blanket	2008	2008	Protection	-	Improve protection	Provisional	1.0
Substation improvements - blanket	2008	2008	Maintenance	-	Poor condition	Provisional	0.7
Relay improvements - Zone 1 blanket	2009	2009	Protection	1	Improve protection	Provisional	0.5
Breaker improvements - Zone 2 blanket	2009	2009	Maintenance	2	Poor condition	Provisional	0.5
Wood structures - Zone 2 blanket	2009	2009	Maintenance	2	Poor condition	Provisional	0.8
Relay improvements - Zone 2 blanket	2009	2009	Maintenance	2	Improve protection	Provisional	0.5
Relay improvements - Zone 4 blanket	2009	2009	Protection	4	Improve protection	Provisional	1.1

Table PR-24
Maintenance, Operations or Protection Projects over $0.5 Million (2006-2010)

Project description	System need year	In-service year	Initiated	Planning zone	Need category	Planned, Proposed or Provisional	Capital cost estimate (in millions)
Breaker improvements - Zone 4 blanket	2009	2009	Maintenance	4	Poor condition	Provisional	0.6
Switch improvements - Zone 5 blanket	2009	2009	Maintenance	5	Poor condition	Provisional	0.9
Breaker improvements - Zone 5 blanket	2009	2009	Maintenance	5	Poor condition	Provisional	0.8
Relay improvements - Zone 5 blanket	2009	2009	Protection	5	Improve reliability	Provisional	0.8
RTU -Zone 5 blanket	2009	2009	Protection	5	Improve protection	Provisional	0.5
Breaker improvements - blanket	2009	2009	Maintenance	-	Poor condition	Provisional	1.0
Relay improvement - west blanket	2009	2009	Protection	-	Improve protection	Provisional	1.0
Substation improvements - blanket	2009	2009	Maintenance	-	Poor condition	Provisional	0.7
Relay improvements - Zone 1 blanket	2010	2010	Protection	1	Improve protection	Provisional	0.5
Breaker improvements - Zone 2 blanket	2010	2010	Maintenance	2	Poor condition	Provisional	0.5
Wood structures - Zone 2 blanket	2010	2010	Maintenance	2	Poor condition	Provisional	0.8
Relay improvements - Zone 2 blanket	2010	2010	Maintenance	2	Improve protection	Provisional	0.6
Breaker improvements - Zone 4 blanket	2010	2010	Maintenance	4	Poor condition	Provisional	0.6
Relay Improvements - Zone 4 blanket	2010	2010	Protection	4	Improve protection	Provisional	1.1
Breaker Improvements - Zone 5 blanket	2010	2010	Maintenance	5	Poor condition	Provisional	0.8
Relay Improvements - Zone 5 blanket	2010	2010	Protection	5	Improve protection	Provisional	0.8
RTU -Zone 5 blanket	2010	2010	Protection	5	Improve reliability	Provisional	0.5
Inland 69 kV line rebuild	2010	2010	Maintenance	-	Poor condition	Strategic	11.1
Breaker improvements - blanket	2010	2010	Maintenance	-	Poor condition	Provisional	1.0
Relay improvement - west blanket	2010	2010	Protection	-	Improve protection	Provisional	1.0
Substation improvements - blanket	2010	2010	Maintenance	-	Poor condition	Provisional	0.7

Table ZS-4 Summary of Transmission Loading Relief Incidents - 2004					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Albers-Paris 138-kV	Wempletown-Paddock 345-kV	26	3		29
Arpin 345/138-kV transformer	Arpin-Rocky Run 345-kV	2			2
Badger-Caroline 115-kV	North Appleton-Rocky Run 345-kV		1		1
Butler-Granville 138-kV	Arcadian-Granville 345-kV	2	1		3
Butler-Granville 138-kV	Bluemound-Tosa 138-kV	1	3		4
Center-Fiebrantz 138-kV	Arcadian-Granville 345-kV		1		1
Columbia 345/138-kV transformer	Columbia-North Madison 345-kV		1		1
Eau Claire-Arpin 345-kV		10			10
Eau Claire-Arpin 345-kV	Wempletown-Paddock 345-kV	1			1
Ellinwood 138/69 kV transformer	Fitzgerald-Sunset Point 138-kV	4	4		8
Fitchburg-Wingra 69 kV	West Middleton-Blackhawk 69 kV		1		1
Fitzgerald-Sunset Point 138-kV	Edgewater-Saukville 345-kV	3	5		8
Fitzgerald 345/138-kV transformer	Edgewater-Saukville 345-kV	1			1
Highway V-Preble 138-kV	DePere-Glory Road 138-kV		2		2
Highway V-Preble 138-kV	Lost Dauphin-Red Maple 138-kV	9	20		29
Highway V-Preble 138-kV	North Appleton-Mason Street 138-kV		1		1
Highway V-Preble 138-kV	North Appleton-White Clay 138-kV		9		9
Kenosha-Albers 138-kV	Wempletown-Paddock 345-kV	2			2
Mukwonago-Merrill Hills 138-kV	Waukesha-Merrill Hills 138-kV		2		2
Mukwonago-Merrill Hills 138-kV	Rockdale-Lakehead Cambridge-Jefferson 138-kV		3		3
North Appleton-Rocky Run 345-kV		6			6
Oak Creek 345/230-kV transformer	Oak Creek banks T851/T895	2	22		24
Paddock 345/138-kV transformer	Paddock-Rockdale 345-kV	8			8
Paris-Burlington 138-kV	Wempletown-Paddock 345-kV	2			2
Pleasant Prairie-Racine 345-kV	Wempletown-Paddock 345-kV	5			5
Pulliam4-Stiles 138-kV	Pulliam5-Stiles 138-kV		2		2
Rhinelander area voltages			1		1
Rockdale 345/138-kV transformer #2	Rockdale 345/138-kV transformer #3	1			1
Rocky Run-Northpoint 115-kV	Weston-Rocky Run 345-kV	4	5		9
Rocky Run-Weston 115-kV	Weston-Rocky Run 345-kV	1	2		3

Table ZS-4 Summary of Transmission Loading Relief Incidents – 2004 (continued)					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Rocky Run-Weston 345-kV		2	5		7
Rosebush 138/69 kV transformer			1		1
Stiles-Amberg 138 & Stiles-Crivitz 138-kV	Morgan-Plains 345-kV	8	142	4	154
Stiles-Pioneer 138-kV	White Clay-Morgan 138-kV	6	13		19
Stiles-Pioneer 138-kV	North Appleton-White Clay 138-kV		7		7
Wempletown-Paddock 345-kV		4			4
White Clay-Morgan 138-kV	Stiles-Sherwood 138-kV		4		4
White Clay-Morgan 138-kV	Pulliam-Stiles 138-kV	3	19		22
Whitewater-Mukwonago 138-kV	Rockdale-Jefferson 138-kV		1		1

Note: * -Sum of number of declarations is based on determining the highest service limitation level for a given occurrence so that each is counted once

Level 3: non-firm transmission service curttailments

Level 4: transmission system reconfiguration/redispatch

Level 5: firm transmission service curttailments/redispatch

Table ZS-5 Summary of Transmission Loading Relief Incidents - 2003					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Albers-Paris 138-kV	Wempletown-Paddock 345-kV	52	13		65
Albers-Paris 138-kV	Pleasant Prairie-Racine 345-kV		3		3
Badger-Caroline 115-kV	North Appleton-Rocky Run 345-kV		2		2
Center-Cornell 138-kV	Arcadian-Granville 345-kV		1		1
Christiana-Kegonsa 138-kV	Christiana-Fitchburg 138-kV		2		2
DePere-Glory Road 138-kV	Kewaunee-East Krok 138-kV		4		4
Eau Claire-Arpin 345-kV		5			5
Fiebrantz-Center 138-kV	Arcadian-Granville 345-kV		1		1
Forest Junction-Kaukauna 138-kV	City Limits-Butte Des Morts 138-kV		1		1
Forest Junction-Rockland 138-kV	Kewaunee-East Krok 138-kV	1			1
Forest Junction-Rockland 138-kV	North Appleton-White Clay 138-kV	1			1
Granville-Swan 138-kV	Saukville 345/138-kV transformer		1		1
Green Lake-Roeder 138-kV	North Appleton-Rocky Run 345-kV	1			1
Highway V-Preble 138-kV	Lost Dauphin-Red Maple 138-kV	12	10		22
Highway V-Preble 138-kV	North Appleton-White Clay 138-kV	2	8		10
Kenosha-Albers 138-kV	Wempletown-Paddock 345-kV		1		1
Lost Dauphin-Highway V 138-kV	DePere-Glory Road 138-kV		1		1
Lost Dauphin-Red Maple 138-kV	Kewaunee-East Krok 138-kV		4		4
Manistique-Hiawatha 69 kV			7		7
Mukwonago-Merrill Hills 138-kV	Merrill Hills-Waukesha 138-kV	1			1
North Appleton-Rocky Run 345-kV		4			4
N. Appleton-White Clay 138-kV	Stiles-Pulliam 138-kV	4	4		8
North Lake Geneva-Sugar Creek 138-kV			1		1
Paddock 345/138-kV transformer		1			1
Paddock 345/138-kV transformer	Paddock-Rockdale 345-kV	38			38
Paddock-Townline 138-kV	Paddock-Rockdale 345-kV	3	1		4
Paris-Burlington 138-kV	Wempletown-Paddock 345-kV	1			1
Paris-St Martins 138-kV		1			1
Perch Lake-M38 138-kV	Cedar-M38 138-kV		1		1
Pleasant Prairie-Racine 345-kV	Wempletown-Paddock 345-kV	2			2
Pleasant Valley-St. Lawrence 138-kV	Jefferson-Lakehead 138-kV		1		1
Pulliam4-Stiles 138-kV	Pulliam5-Stiles 138-kV	1	1		2

Table ZS-5 Summary of Transmission Loading Relief Incidents – 2003 (continued)					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Rhinelander area voltages			27		27
Rockdale 345/138-kV transformer #2	Rockdale 345/138-kV transformer #3	7	7		14
Rockdale 345/138-kV transformer	Paddock 345/138-kV transformer	2	1		3
Rock River-Janesville 138-kV	Paddock-Rockdale 345-kV	2			2
Rocky Run-Northpoint 115-kV	Weston-Rocky Run 345-kV	6	17		23
Russell-Rockdale 138-kV	Paddock-Rockdale 345-kV	5	1		6
Stiles-Amberg 138 & Stiles-Crivitz 138-kV	Morgan-Plains 345-kV	1	148	4	153
Stiles4-Pulliam 138-kV	Stiles5-Pulliam 138-kV	1	11		12
Stiles-Pulliam 138-kV	Morgan White Clay 138		1		1
Stiles-Amberg 138-kV	Morgan-Plains 345-kV		1		1
Stiles-Pioneer 138-kV	Morgan-White Clay 138-kV	2	16		18
Stiles-Pioneer 138-kV	North Appleton-White Clay 138	8	12		20
Straits 138/69 kV transformer	Hiawatha-Straits 138-kV		1		1
Wempletown-Paddock 345-kV		2			2
White Clay-Morgan 138-kV	Pulliam-Stiles 138-kV		3	1	4
Weston-Kelly 115-kV		1			1

Note: * -Sum of number of declarations is based on determining the highest service limitation level for a given occurrence so that each is counted once

Level 3: non-firm transmission service curttailments

Level 4: transmission system reconfiguration/redispatch

Level 5: firm transmission service curttailments/redispatch

Table ZS-6 Summary of Transmission Loading Relief Incidents - 2002					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Albers-Paris 138-kV	Wempletown-Paddock 345-kV	24			24
Amberg-Plains 138-kV	Plains-Morgan 345-kV		1		1
Blackhawk-Colley Road 138-kV	Paddock-Rockdale 345-kV	5			5
Blackhawk-Colley Road 138-kV	Paddock-Rock River 138-kV	21	1		22
Butler-Granville 345-kV	Arcadian-Granville 345-kV	3			3
Christiana-Kegonsa 138-kV	Christiana-Fitchburg 138-kV	2	1		3
Eau Claire-Arpin 345-kV		54		4	58
Granville-Swan 138-kV	Saukville 345/138-kV transformer	1			1
Hillman-Darlington 138-kV	Wempletown-Paddock 345-kV	1			1
Janesville-Rock River 138-kV	Paddock-Rockdale 345-kV		1		1
Kewaunee 345/138-kV transformer	Kewaunee-North Appleton 345-kV	33	60		93
Kewaunee 345/138-kV transformer			2		2
Manistique-Hiawatha 69 kV			148		148
Mukwonago-St. Martins 138-kV	Wempletown-Paddock 345-kV	1			1
Mass-Bruce Crossing 69 kV	M38-Cedar 138-kV		1		1
N. Appleton-Lost Dauphin 138-kV	Kewaunee 345/138-kV transformer	28	37		65
N.Appleton 345/138 transformer #1	N. Appleton 345/138-kV transformer #2		2		2
N. Appleton 345/138-kV transformer #1	N. Appleton 345/138-kV transformer #3		1		1
N. Appleton-White Clay 138-kV	Stiles-Pulliam 138-kV	1			1
Nelson-Dewey transformer	Wempletown-Paddock 345-kV	1			1
Paddock 345/138-kV transformer	Paddock-Rockdale 345-kV	98			98
Paris-Burlington 138-kV	Wempletown-Paddock 345-kV	2			2
Paris-St Martins 138-kV			1		1
Pleasant Prairie-Racine 345-kV	Wempletown-Paddock 345-kV	2			2
Rhinelander area voltages	Aurora-Black Brook 115-kV		21		21
Rockdale 345/138-kV transformer	Paddock 345/138-kV transformer	8	2	1	11
Rock River-Janesville 138-kV	Paddock-Rockdale 345-kV	2			2
Rocky Run-Northpoint 115-kV	Weston-Rocky Run 345-kV	2	17		19
Rocky Run-Northpoint 115-kV	Rocky Run-N. Appleton 345-kV		1		1
Russell-Rockdale 138-kV	Paddock-Rockdale 345-kV	12	4		16
Russell-Rockdale 138-kV	King-Eau Claire-Arpin 345-kV		1		1

Table ZS-6 Summary of Transmission Loading Relief Incidents – 2002 (continued)					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Stiles-Amberg 138 and Stiles-Crivitz 138-kV	Morgan-Plains 345-kV	2	96		98
Stiles-Amberg 138-kV	Morgan-Plains 345-kV	1	10		11
Stiles-Pioneer 138-kV	N.Appleton-White Clay 138-kV	16	30		46
Whitewater-Mukwonago 138-kV	Cherry Valley-Silver Lake 345-kV		1		1
Whitewater-Mukwonago 138-kV	Rockdale-Jefferson 138-kV		2		2
Valley-Haymarket 138-kV	Granville-Arcadian 345-kV	1			1
W. Marinette-Menominee 69 kV	Pioneer-W. Marinette 138-kV		1		1
Weston-Kelly 115-kV			1		1
Weston-Rocky Run 115-kV	Weston-Rocky Run 345-kV	1	1		2

Note: * -Sum of number of declarations is based on determining the highest service limitation level for a given occurrence so that each is counted once

Level 3: non-firm transmission service curttailments

Level 4: transmission system reconfiguration/redispatch

Level 5: firm transmission service curttailments/redispatch

Table ZS-7 Summary of Transmission Loading Relief Incidents - 2001					
Limiting Element	**Anticipated Element Outage**	**# of Level 3**	**# of Level 4**	**# of Level 5**	**Total Declarations at 3, 4 or 5***
Albers - Paris 138-kV	Wempletown - Paddock 345-kV	20	1		21
Albers - Paris 138-kV		1			1
Blackhawk - Colley Road 138-kV	Paddock - Rock River 138-kV	8	1	3	12
Butler - Granville 345-kV	Arcadian - Granville 345-kV	1			1
Christiana - Kegonsa 138-kV	Christiana - Fitchburg 138-kV	1			1
Eau Claire - Arpin 345-kV		5	5		10
Ellington - Hintz 138-kV	North Appleton - Rocky Run 345-kV	1			1
Green Lake - Roeder 138-kV	North Appleton - Rocky Run 345-kV	1		8	9
Kewaunee 345/138-kV Transformer	Point Beach - North Appleton 345-kV			5	5
Kewaunee 345/138-kV Transformer		2			2
Manistique - Hiawatha 69kV		2	203		205
Mukwonago - Whitewater 138-kV	South Fond du Lac - Columbia 345-kV	1	1		2
North Appleton - Apple Hills 138-kV	North Appleton - Ellington 138-kV	1			1
North Appleton - Lost Dauphin 138-kV	Kewaunee 345/138-kV Transformer	35	5	6	46
North Appleton - Lost Dauphin 138-kV	North Appleton - White Clay 138-kV		2		2
North Appleton - White Clay 138-kV	Stiles - Pulliam 138-kV	1			1
North Appleton 345/138-kV Transformer #1	North Appleton 345/138-kV Transformer #3		2		2
Paddock - Blackhawk 138-kV	Paddock - Rock River 138-kV	4			4
Paddock 345/138kV Transformer	Paddock - Rockdale 345-kV	22			22
Pleasant Prairie - Racine 345kV	Wempletown - Paddock 345-kV	1			1
Rockdale 345/138-kV Transformer #1	Rockdale 345/138-kV Transformer #2	1			1
Rockdale 345/138-kV Transformer #2	Paddock 345/138-kV Transformer	1			1
Rockdale 345/138-kV Transformer #2	Rockdale 345/138-kV Transformer #1	1			1
Rocky Run - North Appleton 345-kV		6			6
Russell - Rockdale 138-kV	Paddock - Rockdale 345-kV	8			8
Stiles - Amberg 138-kV	Morgan - Plains 345-kV	14	67	4	85
Stiles - Pioneer 138-kV	North Appleton - White Clay 138-kV	7	2	1	10
Wempletown - Paddock 345kV		7			7

Note: * -Sum of number of declarations is based on determining the highest service limitation level for a given occurrence so that each is counted once

Level 3: non-firm transmission service curttailments

Level 4: transmission system reconfiguration/redispatch

Level 5: firm transmission service curttailments/redispatch

PLANNING FACTORS > Midwest developments

There have been a number of developments in the Upper Midwest that could affect us and/or our customers. Among the more relevant of these include potential changes in state regulations, exploratory transmission initiatives being investigated by MISO and generation developments.

- **State regulations –** The Public Service Commission of Wisconsin compiles information on utility plans every other year in its Strategic Energy Assessment. The SEA evaluates the plans of utilities for the following seven years. In addition, the PSC is considering methods for better integrating generation and transmission planning efforts.

- **MISO exploratory study –** MISO completed its second Transmission Expansion Plan in 2005. As part of that effort, MISO identified several potential transmission expansion scenarios that it intended to further explore. One of those scenarios was predicated on the potential for significant amounts of new wind generation development in southern Minnesota and northern Iowa. The purpose of the exploratory study was to identify the transmission facilities that would be required to interconnect and deliver the output of this potential wind generation. One of the anticipated delivery points for the wind generation is Wisconsin. We have been participating in this effort to determine what impact these plans would have on transmission development in and around Wisconsin.

- **Generation developments** – Since ATC's beginning, the trend in generation development in Wisconsin has moved away from just natural-gas fired generation, which dominated the development picture in the last 15 years, to include coal-fired and wind generation. Thus far, two 650-MW coal-fired units and another 550-MW unit have been approved. We have identified transmission expansion requirements for these units. In addition, a utility has announced intentions to construct another 500-MW unit, though no preferred site has been specified.

  Currently, there are 15 proposals to install a total of 1,416.25 MW of wind turbines in Wisconsin in the MISO generation queue. We have identified the transmission requirements associated with six of these proposals totaling 638 MW. We are reviewing the feasibility of studying several of these proposals simultaneously.

  For more on generation developments in Wisconsin and Michigan's Upper Peninsula, see Generation Interconnections.

PLANNING FACTORS > Regional and national developments

There are a number of recent and ongoing developments that could affect our customers and us. Changes in the way transmission service is provided within the MISO footprint and changes to the methods for evaluating the impact of new generation and initiatives in the wake of the Aug. 14, 2003 blackout are described below.

MISO Day 2 Market

On April 1, 2005, MISO implemented the Day 2 Market, which provides generation and transmission service to its load-serving customers, as well as manages congestion on the MISO transmission system. The market-based method, which was approved by the Federal Energy Regulatory Commission, is a significant change from how these functions were handled.

In the past, curtailing or interrupting transmission service was necessary. But in the Day 2 Market, system operators are instructed to re-dispatch generating units on a least-cost basis in order to reconfigure the transmission system. In Day 2, market prices are produced at various points in the MISO footprint. These prices represent the congestion cost and the marginal cost of generation at the various points in the MISO footprint.

There is uncertainty about the implementation of the market and the market prices that will result. For example, some market participants speculate how the resulting market prices will impact them financially and how the rights to transmission service will be allocated going forward. An additional uncertainty is whether the market-driven congestion management process will provide the incentives to eliminate congestion on the transmission system.

Due to the uncertainties of the market, FERC has allowed the Wisconsin and Michigan load-serving utilities that make up ATC to join together to delay in part the effect of the Day 2 congestion management process for five years. While still participating in the Day 2 energy market, FERC has allowed ATC-specific Wisconsin and Michigan utilities to address congestion costs differently from the rest of MISO.

Generation deliverability

Prior to the Day 2 Market**,** a generator-to-load deliverability test was required before obtaining transmission service and designation as a Network Resource; however in Day 2 Market, MISO uses an aggregate deliverability test, which requires showing that the output of a resource is deliverable to the “aggregate” energy pool without overloading the transmission system. If the resource passes the deliverability test, it is designated a Network Resource.

Reliability initiatives

In the wake of the August 2003 blackout that affected the northeastern portion of the U.S. and adjacent portions of Canada, several root cause investigations have been conducted and preventive initiatives have been proposed. In particular, better documentation on vegetation management in transmission line rights-of-way will be required by FERC. In addition, FERC issued a proposed policy statement on reliability, indicating that federal legislation may be necessary to make adherence to reliability standards mandatory and enforceable.

We have initiated or continue to pursue several measures aimed at improving the capability of our system to withstand major disturbances and avoid widespread blackouts. Key measures include:

- implementing specific projects aimed at lowering vulnerability to extreme disturbances,
- devising new, faster protection schemes to improve system stability during disturbances,
- replacing several circuit breakers, particularly at generating stations, to improve system stability during disturbances,
- implementing complete global positioning system synchronization of relays to capture and analyze disturbance data,
- completing multiple contingency analyses of our system,
- working with MAIN on extreme disturbance studies to consider the effectiveness of under-voltage load shedding,
- investigating enhanced visualization tools for ATC's control rooms and
- investigating use of high technology reactive control devices at critical locations on the ATC system.

PLANNING FACTORS > Customer needs

Our customers provide us with input on their needs and suggestions about areas on which we should focus. Some of the most prevalent issues are described below.

Improved access

Virtually all of our customers have indicated a desire to have better transmission access to out-of-state markets as well as fewer constraints in transacting with their neighboring utilities within the ATC footprint. In response, we launched an Access Initiative, taking a comprehensive look at the economic and technical feasibility of constructing new transmission lines to neighboring states.

Transmission-distribution interconnection process

In response to the relatively large number of planned T-D interconnections by our customers, we have been working on refining that process. Part of the refinement to this process includes incorporating our customers' desire to better coordinate planning for these future interconnections. While these interconnections ultimately are evaluated on a case-by-case basis, there is the potential for looking at groups of interconnections collectively to develop more optimal solutions for particular areas.

Control of transmission construction costs

Many of our customers have expressed concern about the cost of our construction forecast. To this end, we are looking at our processes for public planning and asset delivery in an effort to find more efficient and economical ways to provide the reliable system that our customers need to keep their costs down. We also are working on prioritization methods to help us identify the projects that best meet the needs of our customers.

Least-cost planning

Our transmission system does not have significant excess transmission capacity. As a consequence, generation interconnection cannot be effectively pre-analyzed on a generic basis. Rather, our planning analyses and identification of required upgrades to the transmission system requires specific data about the electric and physical characteristics of the generator, and the specific point of delivery for the output of the generator, among other data. This is one reason why, as the Public Service Commission of Wisconsin noted in its last Strategic Energy Assessment, effective integration of generation and transmission planning is difficult. Further complicating the issue, construction of generation facilities can occur through regulated or unregulated entities, subject to varying levels of state regulatory requirements. Federal regulations require that we be responsive to all requests for generation interconnection in a consistent and non-discriminatory manner.

While many of our customers appear to be interested in a more integrated approach to generation and transmission planning, some also are wary of sharing market-sensitive long-range plans for generation procurement. As a result, we currently are exploring potential methods to allow more effective integration of these areas, in a way that recognizes the limitations of generic analysis and is consistent with both federal regulatory obligations and the confidentiality of market-sensitive generation information.

PLANNING FACTORS > New technologies

We believe that research and development and the appropriate application of new technologies will bring value to our customers and stakeholders by enabling us to achieve best-in-class performance. In 2005 we are continuing to support collaborative research through our memberships in:

- Electric Power Research Institute (EPRI), http://www.epri.com/;
- Power Systems Engineering Research Center (PSERC), http://www.pserc.org/;
- and Canadian Electric Association Technologies (CEATech), http://www.ceatech.ca/.

Many of the new technologies that were identified in the 2004 10-Year Assessment still are under investigation or have been successfully applied. These include:

- Seven Distributed Superconducting Magnetic Energy Storage devices (DSMES), which have a total capacity of 24 MVA, are installed in the Rhinelander area to assure acceptable voltage stability until crucial long lead-time transmission facilities can be built.
- We are using Production Modeling (PROMOD) software to perform economic analyses of system projects and outage plans for system operating scenarios based on locational margin pricing.
- We are testing commercially available high-temperature, low-sag conductors that could be used to re-conductor existing lines to achieve a higher thermal rating with little or no structure replacement or modification.

In addition to the technologies that were developed or installed in 2004, new technologies under development or review this year include:

- We deployed two new tools for developing dynamic circuit equipment and line conductor ratings. A video sagometer was installed on the Paris-Albers 138-kV line in late 2004 and preliminary results indicate that it may provide valuable transmission line capability information under various ambient conditions. We installed and tested a Dynamic Rating Unit on the Rocky Run 345/138-kV transformer in summer 2005, and it will provide real-time data on the transformer's condition to allow its capability to be forecasted for projected load and ambient conditions.
- We are investigating power electronic control device applications. A mobile dynamic VAR control device was considered for the Council Creek area to assure acceptable voltage regulation. A mobile dynamic VAR control device is still under study in the Munising area to assure acceptable voltage regulation. The application of several types of power electronic control devices, including the new Magnetically Controlled Reactor, is being investigated in the Presque Isle area to improve generator stability and voltage stability performance.

- We are participating in a PSERC study to determine the optimum allocation of static and dynamic reactive power resources. This study will provide methodologies and criteria to help us optimize the selection and placement of equipment that provides either static or dynamic reactive power.
- We are participating in a MISO study to enhance grid performance by installing Phasor Measuring Units. The PMUs would be used to obtain advance warning of system overloads and instabilities by monitoring the phase angles at critical locations across MISO.
- We are researching the impact of high temperature operation of conductors and splices, and the development of new technology to facilitate proper cleaning of conductors and installation of splices.
- We are developing low cost, durable sensors for high voltage and high temperature applications. These sensors would be used to monitor conductor and equipment to determine dynamic ratings and for condition assessment.
- In addition, we are monitoring more then 35 new and emerging technologies that might improve our system practices or performance.

PLANNING FACTORS > Planning criteria

We utilize various system planning criteria to ensure that our transmission system is adequate to support effective competition in energy markets, can reliably deliver power to systems connected to and customers dependent upon our transmission system, provides support to distribution facilities connected to our system and delivers energy from existing and new generation facilities connected to our system.

These criteria may be revised from time to time. Situations that could precipitate such a change could include, but are not limited to, new system conditions, new technologies, new operating procedures, extraordinary events, safety issues, operational issues, maintenance issues, customer requests, regulatory requirements and reliability council or NERC requirements.

The planning criteria include:

- System performance criteria
- Capacity benefit margin criteria
- Transmission reserve margin criteria
- Facility rating criteria
- Model building criteria
- Facility condition criteria
- Planning zones
- System alternatives
- Load forecast criteria
- Economic criteria
- Environmental criteria
- Other considerations

PLANNING FACTORS > Planning criteria > System performance criteria

System performance will be assessed at least annually. Such assessments will involve steady state simulations and, as appropriate, dynamic simulations. Steady state assessments will include consideration of the following system load conditions:

1) Summer peak
2) Winter peak
3) Summer shoulder peak
4) Fall/spring off-peak
5) Summer 90/10 peak

The first three load conditions above will be assessed in all long-range planning studies. The last two load conditions will be considered when more detailed analyses are being conducted of specific alternatives developed to solve a particular problem. The specific criterion associated with each of the load conditions above is provided in Load forecast criteria.

Steady state performance assessment

The steady state system performance criteria to be utilized by ATC shall include:

1) No system element (line, transformer, terminal equipment, etc.) should experience loading in excess of its normal rating for NERC Category A (normal) conditions, that is, with all transmission facilities in service. This criterion should apply for a reasonably broad range of generation dispatch conditions.
   (Applicable NERC Standard: TPL-001-0-R1)
2) No voltage levels that could cause damage to ATC or ATC customer facilities should be tolerated on a sustained basis. The acceptable voltage range is 95 percent to 105 percent of nominal voltage for NERC Category A (normal) conditions. Such measurements shall be made at the high side of transmission-to-distribution transformers.
   (Applicable NERC Standards: TPL-001-0-R1)
3) Operating procedures (operating guides) may be employed by ATC and/or entities with generation and/or distribution facilities interconnected with the ATC transmission system to avoid transmission facility loadings in excess of normal ratings provided such procedures are practical for sustained periods, that is, such procedures do not impose on personnel or public safety, do not significantly degrade system reliability, do not result in a significant loss of life or significant risk of damage to a transmission facility and/or do not unduly burden any entity financially. Manual switching of circuits or other facilities should not normally be utilized in such an operating procedure.
4) No transmission element should experience loading in excess of its applicable emergency rating for applicable Category B (loss of single element) contingencies. This criterion should be applied for a reasonably broad range of generation dispatch conditions. Overload relief methods may include manual or automatic switching of

circuits and generation redispatch. However, load shedding may not be utilized in planning studies for overload relief.
(Applicable NERC Standard: TPL-002-0-R1)

5) Under applicable Category B (loss of single element) contingencies, the temporary acceptable voltage range is 90 percent to 110 percent of the system nominal voltage. Voltage restoration methods may include supervisory control of capacitor banks, load tap changers, generating unit voltage regulation, generation redispatch, or line switching. However, load shedding may not be utilized in planning studies for voltage restoration. Transmission corrective measures should be considered, if the voltage criteria cannot be met by correcting the applicable distribution loads to at least 95 percent power factor.
(Applicable NERC Standard: TPL-002-0-R1)
6) Generation real power output should not be limited under Category A (normal) or Category B (loss of single element) contingency conditions. ATC will consider a lower level of service if requested by a transmission customer.
7) No transmission element should experience loading in excess of its applicable emergency rating for applicable Category C (loss of multiple elements) contingencies. This criterion should be applied for a reasonably broad range of generation dispatch conditions. Overload relief methods may include manual or automatic switching of circuits, generation redispatch, or firm service curtailments, as well as minimal planned load shedding.
(Applicable NERC Standard: TPL-003-0-R1)
8) Under applicable Category C (loss of multiple elements) contingencies, the temporary acceptable voltage range is 90 percent to 110 percent of the system nominal voltage. Voltage restoration methods may include supervisory control of capacitor banks, load tap changers, generating unit voltage regulation, generation redispatch, line switching or firm service curtailments. Minimal planned load shedding may also be used for voltage restoration.
(Applicable NERC Standard: TPL-003-0-R1)
9) The MAIN Extreme Disturbance Criteria and NERC Category D criteria should be used to assess system performance. These criteria may include examining loss of all circuits on a right-of-way and loss of an entire substation, including generation at that substation. These criteria should be used to determine system vulnerabilities, but may not necessarily dictate that potential problems identified need to be remedied with system additions.
(Applicable NERC Standard: TPL-004-0-R1)

Transient and dynamic stability performance assessment

The transient dynamic system performance criteria to be utilized by ATC shall include:

1) For generator transient stability, faults will be modeled on the high side bus at generating plants.
2) For generating units with actual “as built” or “field setting” dynamic data, add a 0.5 cycle margin to the expected clearing time (ECT) for dynamic contingency simulations. For generating units with assumed, typical, or proposed dynamic data,

add a 1.0 cycle margin to the ECT for dynamic contingency simulations. The total clearing time (ECT + margin) must be equal to or less than the calculated critical clearing time (CCT) from the simulation.

3) Generator transient stability will be demonstrated for at least one key contingency for each applicable NERC Category B (loss of single element) contingencies. These contingencies typically will be sustained three-phase faults of a single generator, transmission line, or transmission transformer with normal fault clearing.
(Applicable NERC Standards: TPL-002-0-R1)
4) Generator transient stability will be demonstrated for at least one key contingency for each applicable NERC Category C (loss of multiple elements) contingencies. These contingencies typically will be three-phase faults of single elements with prior outage of a generator, line or transformer with normal clearing; single line-to-ground faults on a transmission bus or breaker with normal clearing; single line-to-ground faults on two transmission lines on a common structure with normal clearing; or single line-to-ground faults on a single generator, transmission line, transmission transformer or transmission bus section with delayed clearing.
(Applicable NERC Standards: TPL-003-0-R1)
5) Generator transient stability will be demonstrated for at least one key contingency for two types of NERC Category D (extreme event) contingencies. These contingencies are three-phase faults on a transmission line with delayed clearing (D2) and three-phase faults on a transmission transformer with delayed clearing (D3). This ATC criterion is more severe than NERC Category D criteria because it requires every generating unit to maintain transient stability for this condition.
(Applicable NERC Standards: TPL-004-0-R1)
6) Generator transient stability will be reviewed for any other NERC Category D (extreme event) contingencies that are judged to be potentially critical to transmission system adequacy and security.
(Applicable NERC Standards: TPL-004-0-R1)
7) Unacceptable system transient stability performance for NERC Category A, B, and C outages and for ATC'S more severe Category D2 and D3 outages includes the following conditions:
    a) generating unit loses synchronism with the transmission system, unless it is deliberately islanded,
    b) cascading tripping of transmission lines or uncontrolled loss of load,
    c) Voltage excursions outside of 20 percent of nominal voltage for more than 30 cycles,
    d) voltage instability (collapse) at any time after a disturbance,
    e) voltage recovery of less than 70 percent of nominal immediately following the clearing of a disturbance or less than 80 percent of nominal 0.5 seconds following the clearing of a disturbance, and
    f) poorly damped angular oscillations, as defined below.

    (Applicable NERC Standard: TPL-001-0-R1, TPL-002-0-R1, TPL-003-0-R1, TPL-004-0-R1)

The dynamic (switching) stability performance criteria to be utilized by ATC will include:

1) With all generating units at their prescribed base case (normally full) real power output, no unit will exhibit poorly damped angular oscillations [as defined below] or unacceptable power swings in response to a (non-fault) loss of a generator, transmission circuit, or transmission transformer.
   (Applicable NERC Standard: TPL-002-0-R1)
2) With all generating units at their prescribed base case (normally full) real power output, no unit will exhibit poorly damped angular oscillations [as defined below] or unacceptable power swings in response to a (non-fault) loss of any two transmission circuits on a common structure.

Note: Poorly damped angular oscillations are ones that do not meet either of the following criteria:

a. The generator rotor angle peak-to-peak magnitude is within 1.0 degree or less at 20 seconds after the switching event.
b. The generator average damping ratio is 15.0 % or greater at 20 seconds after the switching event. The average damping ratio = (d1+d2+d3+d4)/4 * 100%. d1 = p5-p4/p5, d2 = p4-p3/p4, d3 = p3-p2/p3, d4 = p2-p1/p2.

Voltage flicker

The criteria for acceptable voltage flicker levels are defined by the requirements of regulatory entities in the states in which ATC owns and operates transmission facilities, IEEE recommended practices and requirements, and the judgment of ATC.

The following flicker level criteria are to be observed at minimum system strength with all transmission facilities in service. Minimum system strength shall be defined as the condition produced by the generation that is in service in 50 percent peak load case models, minus any generation that is:

1) near the actual or proposed flicker-producing load,
2) could significantly affect flicker levels, or
3) could reasonably be expected to be out of service under light system load conditions. The effect of planned or unplanned system element outages should not be included in the application of the flicker criteria.

All ATC buses are required to adhere to the following three criteria:

1) *Relative steady-state voltage change* is limited to 3 percent of the nominal voltage for intact system condition simulations. The relative steady-state voltage change is the difference in voltage before and after an event, such as capacitor switching or large motor starting. These events should occur at least 10 minutes apart and take less than 0.2 seconds (12 cycles) to go from an initial to a final voltage level.
2) *Single frequency flicker* is to be below the flicker curve “border line of irritation.” Single frequency flicker is created by voltage-affecting events that occur at a regular interval and superimpose a single frequency waveform between 0 and 30 Hz on the

fundamental frequency 60 Hz voltage waveform. Depending on frequency (the human eye is most sensitive to frequencies in the 5 to10 Hz range) sub-synchronous frequencies with magnitudes from 0.5 percent to 3 percent can cause irritable flicker. ATC uses the flicker curve in IEEE Standard 141 (commonly referred to as "The Modified GE Flicker Curve") to determine the acceptability of single frequency flicker.

3) *Multiple frequency flicker* is to be a limited to a weighted average flicker Pst of 1.0 for short-term flicker and Plt 0.65 for long-term flicker using the calculation methods outlined in International Electrotechnical Commission standards modified for use on 120 V systems. The cause of most flicker problems, has the same frequency range as single frequency flicker, but contains multiple flicker frequencies making it much more complex to analyze. By weighting the magnitudes of each flicker frequency component with a flicker weighting curve and taking the square root of the sum of the squares, a single "weighted average flicker" can be calculated. This calculation can become very complicated, as flicker magnitudes and frequencies change over time, and is best done using a flicker meter. The criteria may be changed when the IEEE Flicker Standard is revised.

Harmonic voltage distortion

In general, it is the responsibility of ATC to meet harmonic voltage limits and the responsibility of the load customers to meet harmonic current limits. The level of harmonics acceptable on the ATC system is defined by state regulations, IEEE Standard 519-1992 (Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems) and the judgment of ATC. Usually, if harmonic current limits are met, then harmonic voltage limits also will be met.

The observance of harmonic limits should be verified whenever a harmonic- related problem is discovered or a new harmonic-producing load with a reasonable possibility of causing harmonic problems is connected to our system. The following process is utilized by ATC when managing an existing harmonic-related problem or a new harmonic-producing load:

1) *Existing problems* – When a harmonic related problem is found on the ATC system, it is our responsibility to determine the source of the harmonics. If harmonic current limits are violated, the source of the harmonics will be required to decrease their harmonic currents to below the limits specified in the ATC Planning and Service Guide. If, after the harmonic current has been reduced to an acceptable level, the harmonic voltage still is causing a problem and/or above specified levels, it shall be the responsibility of ATC to bring the harmonic voltages within limits. If limits are not violated and there is still a harmonic-related problem (an unlikely situation), it is the responsibility of the entity experiencing the problem to harden its equipment to the effect of harmonics or reduce the harmonics at their location. An existing violation of these harmonic limits that is not causing any problems does not necessarily require harmonic mitigation.

2) *New harmonic-producing loads* – It is the responsibility of any customer wanting to connect a harmonic-producing load to the ATC system to determine if the proposed load will violate the harmonic current limits and, if these limits are violated, to determine and implement steps necessary to reduce the harmonic currents to acceptable levels. If harmonic voltage limits are not met after harmonic current limits have been met, it is the responsibility of ATC to determine if the harmonic voltage distortion will cause any system problems and if they will, it is ATC's responsibility to develop and implement a plan to meet the harmonic voltage limits.

PLANNING FACTORS > Planning criteria > Capacity benefit margin criteria

Capacity Benefit Margin (CBM) is the amount of firm transmission transfer capability preserved by the transmission provider for load-serving entities (LSEs), whose loads are located on that transmission provider's system, to enable access by the LSEs to generation from interconnected systems to meet generation reliability requirements. Preservation of CBM for an LSE allows that entity to reduce its installed generating capacity below that which may otherwise have been necessary without interconnections to meet its generation reliability requirements. The transmission transfer capability preserved as CBM is intended to be used by the LSE only in times of emergency generation deficiencies.

ATC planning studies, except those required for MISO transmission service, will not model CBM.

MISO performs annual studies to determine the import requirement of each study area operated as an isolated system to meet a Loss of Load Expectation (LOLE) of 0.1 day per year. All of ATC is defined as a single stand-alone study area. MISO then compares the flowgate CBM with the Automatic Reserve Sharing (ARS) component of the Transmission Reserve Margin (TRM) for that same flowgate. If the ARS component is greater, no CBM will be preserved on that flowgate. If the ARS component is less, the incremental amount of CBM that is needed above the ARS component will be preserved as CBM for that flowgate.

All MISO transmission service studies use CBM in the flow-based analysis of transmission service studies performed by ATC. The network analysis for transmission service studies does not use reductions in equipment ratings for CBM.

ATC will perform periodic analyses to evaluate (considering planned summer peak load and generation, as well as load forecast error and generator outage characteristics) the probable requirement to import power from external sources to meet a LOLE of 0.1 day per year, and ATC's ability to simultaneously import sufficient power from external sources to meet the 0.1 day per year LOLE reliability standard. If a deficiency is identified, ATC will incorporate any resulting incremental import capability requirements into ATC's overall transmission expansion plan.

PLANNING FACTORS > Planning criteria >Transmission reliability margin criteria

Transmission Reliability Margin (TRM) is the amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.

ATC planning studies, except those required for MISO transmission service, will consider a 3 percent reduction in normal and emergency ratings for assessments within one year in the future and a 5 percent reduction for the assessments beyond one year in the future. However, the recommended timing of the resultant mitigation measures may be based on less than 3 percent and 5 percent reductions.

In the planning horizon, anytime beyond 48 hours, MISO uses reservations from other transmission providers and control area generation merit orders to reduce uncertainty. MISO will apply a 2 percent reduction in normal and emergency ratings for input uncertainties in the planning horizon. This often is referred to as the uncertainty portion of the TRM.

The operating reserve component of TRM is the amount of transmission transfer capability on a constrained interface to provide the amount of regional operating reserves associated with 100 percent of the greatest single contingency impacting the flowgate. For determining the operating reserve portion of TRM, MISO performs analyses to identify the required reserve for each flowgate. The worst case will be determined by tripping units (or line outages when a reserve sharing member can request emergency energy for the line trip) within the region and picking up each reserve sharing member's share of the emergency energy to replace the unit that tripped. The distribution of each reserve sharing member's share of the emergency energy among its individual generating units should be a realistic estimate for the conditions for which the TRM is being determined. The worst case will be the case that has the greatest incremental flow over the flowgate in the direction of the constraint. The highest incremental flow on the flowgates for the contingencies evaluated (generation and transmission) will be the amount of Automatic Reserve Sharing (ARS) TRM required to reserve transmission service for operating reserves.

All MISO transmission service studies use the summation of ARS TRM and the 2 percent uncertainty TRM in the flow-based analysis of transmission service studies. The network analysis for transmission service studies does not use the ARS or 2 percent TRM, but requires for all network elements a 3 percent reduction in normal and emergency ratings for requests in the next 13 months and a 5 percent reduction in normal and emergency ratings for requests extending beyond the next 13 months.

PLANNING FACTORS > Planning criteria > Facility rating criteria

ATC operating instructions:
- ❑ 01-03 Facility Ratings Update and Application,
- ❑ 02-02 Conductor Ampacity Ratings for Overhead Transmission Lines,
- ❑ 02-03 Substation Equipment Ampacity Ratings, and
- ❑ 03-01 Ampacity Ratings of Underground Transmission Lines

provide documentation of ATC's facility ratings criteria. We are actively reviewing, replacing and documenting legacy ratings with ratings based upon ATC criteria in its Substation Equipment and Line Database (SELD). The legacy ratings from the previous transmission facilities owner's planning models will be used in ATC planning models until valid SELD ratings, which are consistent with ATC facility rating criteria become available. The facility ratings criteria for legacy ratings are those of the corresponding contributing utility (e.g. Alliant East, Madison Gas & Electric, Wisconsin Public Service, and We Energies). The ATC facility ratings criteria are consistently applied among ATC Planning, Engineering and Operations.

Facilities to be considered include, but are not limited to – overhead line conductors, underground cable, bus conductors, transformers, autotransformers, circuit breakers, disconnect switches, series and shunt reactive elements, VAR compensators, current transformers, wave traps, jumpers, meters, and relays (both overcurrent/directional overcurrent/impedance settings and thermal limits). ATC facility rating criteria are to be consistent with the following NERC standard.
(Applicable NERC Standards: FAC-004-0-R1)

PLANNING FACTORS > Planning criteria >Model building criteria

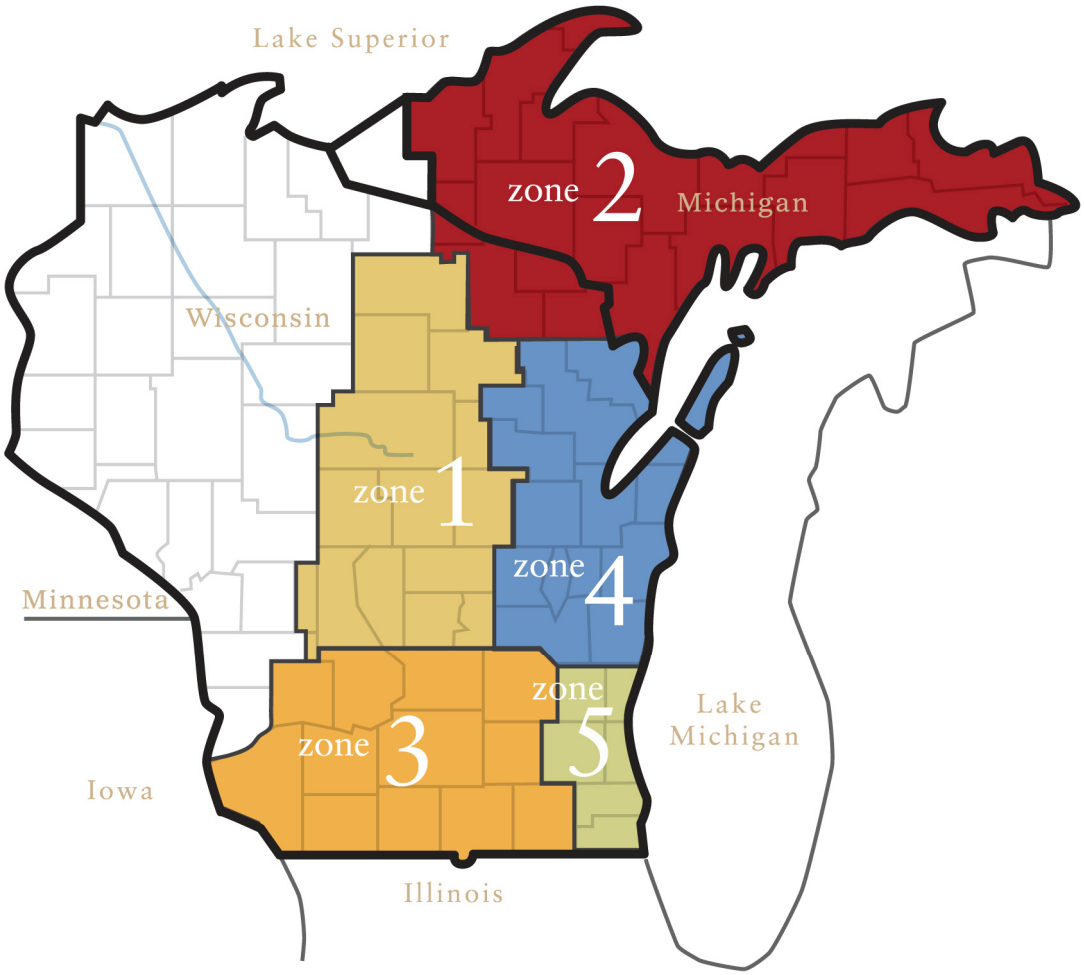
We will strive to develop and maintain consistency in the power flow models used for our planning efforts and in assessing whether and under what conditions transmission service is available. Our starting point for power flow models are models contained in NERC and regional data banks. We will use load forecasts provided by our end-use load-serving customers as input into future model building efforts, both internally and in conjunction with the NERC, Regional Reliability Organization (RRO) and Regional Transmission Operator (RTO). All of our power flow models will be developed using PTI PSS/E software. All of our power flow models will be publicly available; such models will be posted on our OASIS Web site.
(Applicable NERC Standards: MOD-010-0-B, MOD-011-B, MOD-012-0-B)

PLANNING FACTORS > Planning criteria > Facility condition criteria

The facility condition criteria to be utilized by ATC for system planning purposes will include:

1) Any transmission line on structures that are beyond their design life, any transmission line that has exhibited below-average availability or any transmission line that has required above-average maintenance will be considered a candidate for replacement. In assessing potential line replacements, consideration will be given to other needs in the area of the candidate line to determine whether rebuilding the line to a higher voltage would fit into the "umbrella" plan for that planning zone. ATC engineering, operations, maintenance and environmental employees will work together to coordinate such assessments.
2) Any substation bus that is beyond its design life, has exhibited below- average availability or has required above-average maintenance will be considered a candidate for rebuilding and potential redesign. In assessing potential bus rebuilds, consideration will be given to likely and potential expansion at candidate substations, including consideration of the "umbrella" plan for the planning zone. ATC engineering, operations and maintenance employees will work together to coordinate such assessments.
3) Any substation whose design or configuration prevents maintenance, in a safe manner, on substation equipment or lines terminating at the substation will be considered a candidate for rebuilding and/or potential redesign/reconfiguration. In assessing such rebuilds/redesigns/reconfigurations, consideration will be given to likely and potential expansion at candidate substations, including consideration of the "umbrella" plan for the planning zone. ATC engineering, operations and maintenance employees will work together to coordinate such assessments.
4) Any underground cable that is beyond its design life, has exhibited below- average availability or has required above-average maintenance will be considered a candidate for replacement. In assessing potential cable replacements, consideration will be given to other needs in the area of the candidate cable to determine whether replacing the cable with a cable with a higher ampacity or with a cable capable of a higher voltage would fit into the "umbrella" plan for that planning zone. ATC engineering, operations and maintenance employees will work together to coordinate such assessments.
5) We will strive to verify the efficacy of all operating guides that require on-site operations.

Our Service Territory

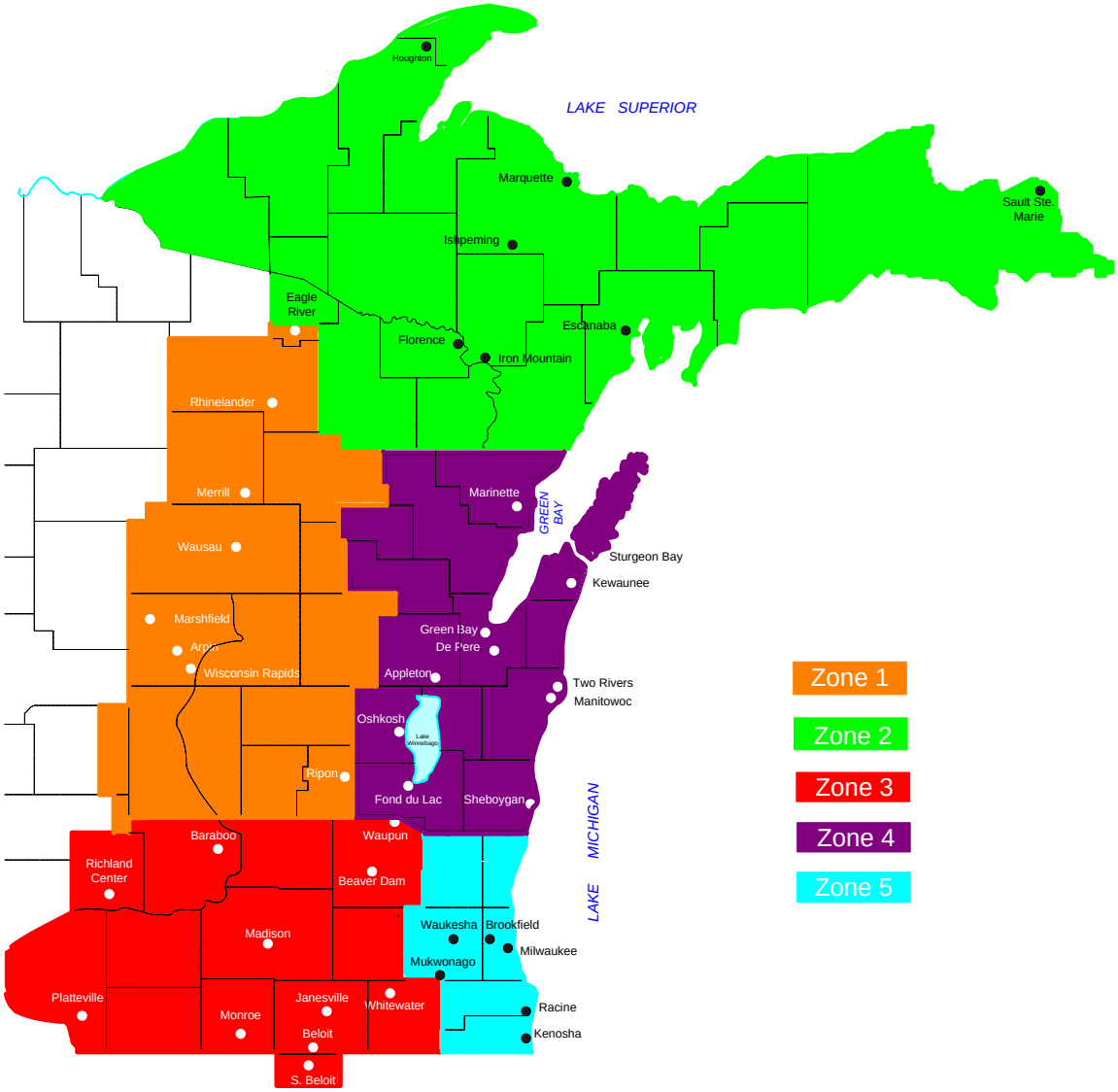


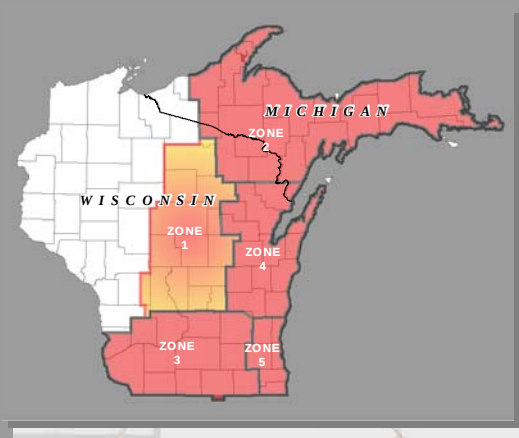
PLANNING FACTORS > Planning criteria > Planning zones

We conduct system planning on a long-range basis by developing plans for our transmission system as a whole, as well as plans for each of the five zones within our system. These zones are shown in Figures ZS-17 through ZS-22. The idea behind our zone approach to long-range planning is to develop plans that consider all of the needs/problems/developments within each zone. The goal within each zone is to develop an "umbrella" plan for the zone; that is, a plan that emphasizes projects that serve multiple purposes or solve multiple problems within the zone. The zone approach is intended to address requirements for support to the local distribution systems in that zone on a least-cost basis. It is not uncommon for several projects to span more than one zone or even the ATC transmission system boundaries. Such projects call for coordination with other transmission owners or regional transmission organizations.

The planning zones shown in Figures ZS-17 through ZS-22 deviate significantly from existing control area boundaries and from planning zones traditionally used for joint planning in conjunction with the Wisconsin PSC. The zones were selected considering the need for a manageable number of planning areas and to consolidate areas within the state with similar topology and load characteristics.

Figure ZS-17


Houghton
LAKE SUPERIOR
Marquette
Sault Ste. Marie
Ishpeming
Eagle River
Florence
Escanaba
Iron Mountain
Rhinelander
Merrill
Marinette
GREEN BAY
Wausau
Sturgeon Bay
Kewaunee
Marshfield
Green Bay
De Pere
Appleton
Wisconsin Rapids
Two Rivers
Manitowoc
Oshkosh
Lake Winnebago
Ripon
Fond du Lac
Sheboygan
LAKE MICHIGAN
Baraboo
Waupun
Richland Center
Beaver Dam
Waukesha
Brookfield
Madison
Milwaukee
Mukwonago
Platteville
Janesville
Whitewater
Racine
Monroe
Beloit
Kenosha
S. Beloit
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5



Iron
Vilas
Florence
Oneida
Forest
Marinette
Rusk
Taylor
Lincoln
Langlade
Oconto
Menominee
Marathon
Shawano
Clark
Wood
Portage
Waupaca
Outagamie
Jackson
Monroe
Juneau
Adams
Marquette
Green Lake
Fond du Lac
Ohmstead
Vernon
Sauk
Columbia
Waushara
Winnebago
Calumet
Dodge
Washington
Richland

6220
50632
43025

Skanawan SW STA
Fox Hills SW STA
Bunker Hill SW STA
Blackbrook SW STA
WAUSAU
Wien SW STA
F-110
I-20
Whitcomb
Y-44
Caroline
Badger
Arpin
Sigel
Rocky Run
Coyne SW STA
West Wisconsin Rapids
Y-70
Y-19
Sand Lake
Petenwell
Y-90
Fitzgerald
C-107
Lincoln Pump STA
Chaffee Creek
Mckenna
Castle Rock
Metomen
X-77 X-4
Y-68
Y-27
Green Lake SW STA
X-30
X-3
North Randolph
Y-17
X-6

I-9
L-42

Electric Transmission Network & Substations

PLANNING ZONE 1

0 2.5 5 10 15 Miles

N W E S

Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:

- *Approximately 8900 miles of transmission lines*
- *98 wholly owned substations*
- *358 jointly owned substations*
- *Offices in Madison (2), Cottage Grove, Pewaukee, De Pere Wausau and Kingsford, MI*

Transmission Line Voltage

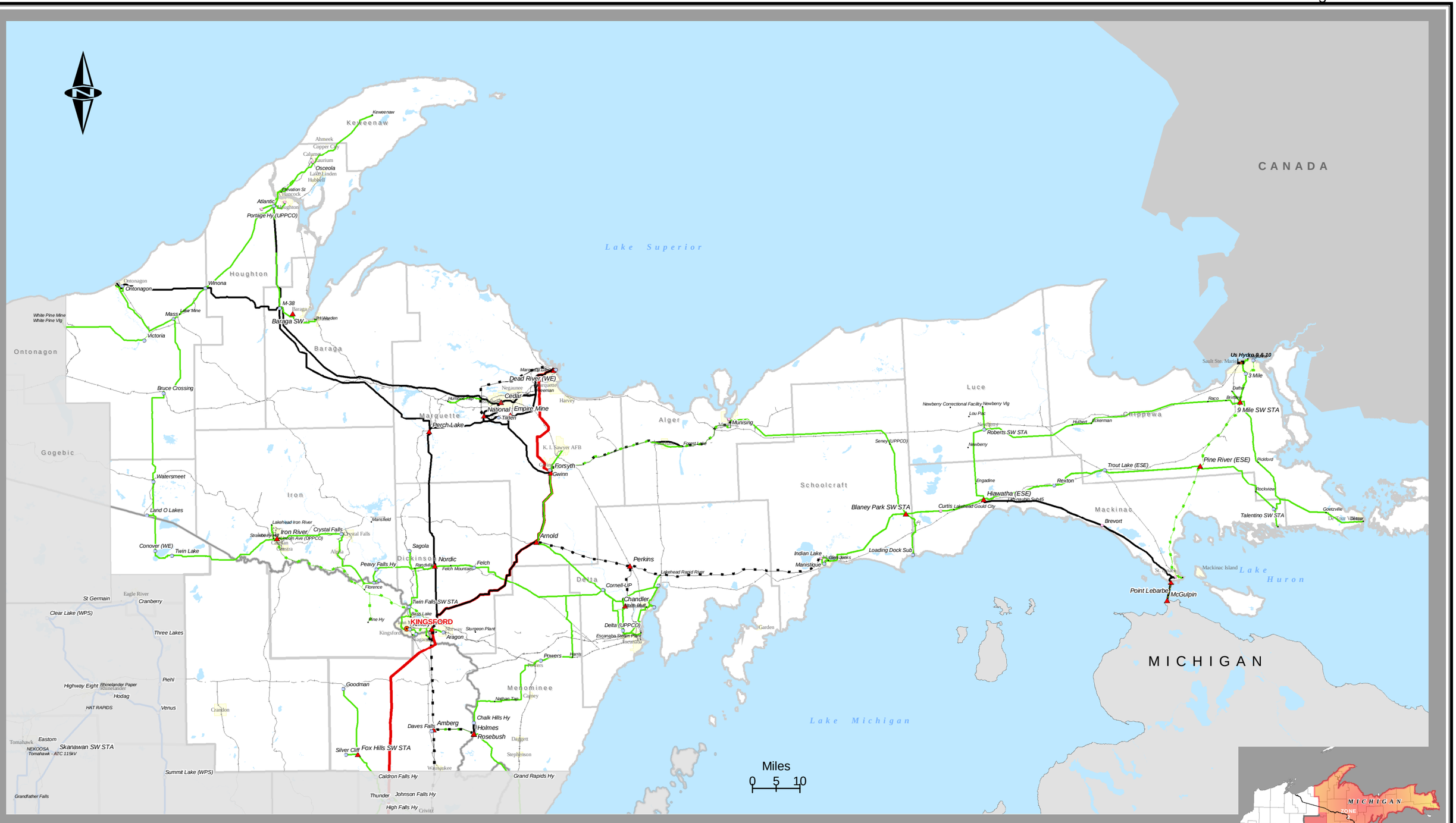
- 69 kV
- 115 kV
- 138 kV
- 230 kV
- 345 kV
- 69 kV Double Circuit
- 115 kV Double Circuit
- 138 kV Double Circuit
- 230 kV Double Circuit
- 345 kV Double Circuit
- 69 kV Underground
- 138 kV Underground
- Non-ATC Line

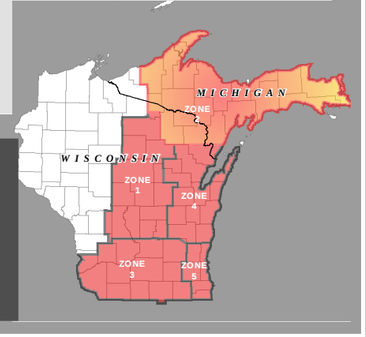
Transmission Related Facilities

- ATC Owned Substation
- Joint Owned Substation - Assets Conveyed
- Joint Owned Substation - Assets Retained
- 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.

Zone1 11x17.mxd Modified: April 15, 2005





AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Electric Transmission Network & Substations

PLANNING ZONE 2

Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:

- *Approximately 8900 miles of transmission lines*
- *98 wholly owned substations*
- *358 jointly owned substations*
- *ATC offices in Madison (2), Cottage Grove, Pewaukee, De Pere, Wausau and Kingsford, MI*

Transmission Line Voltage

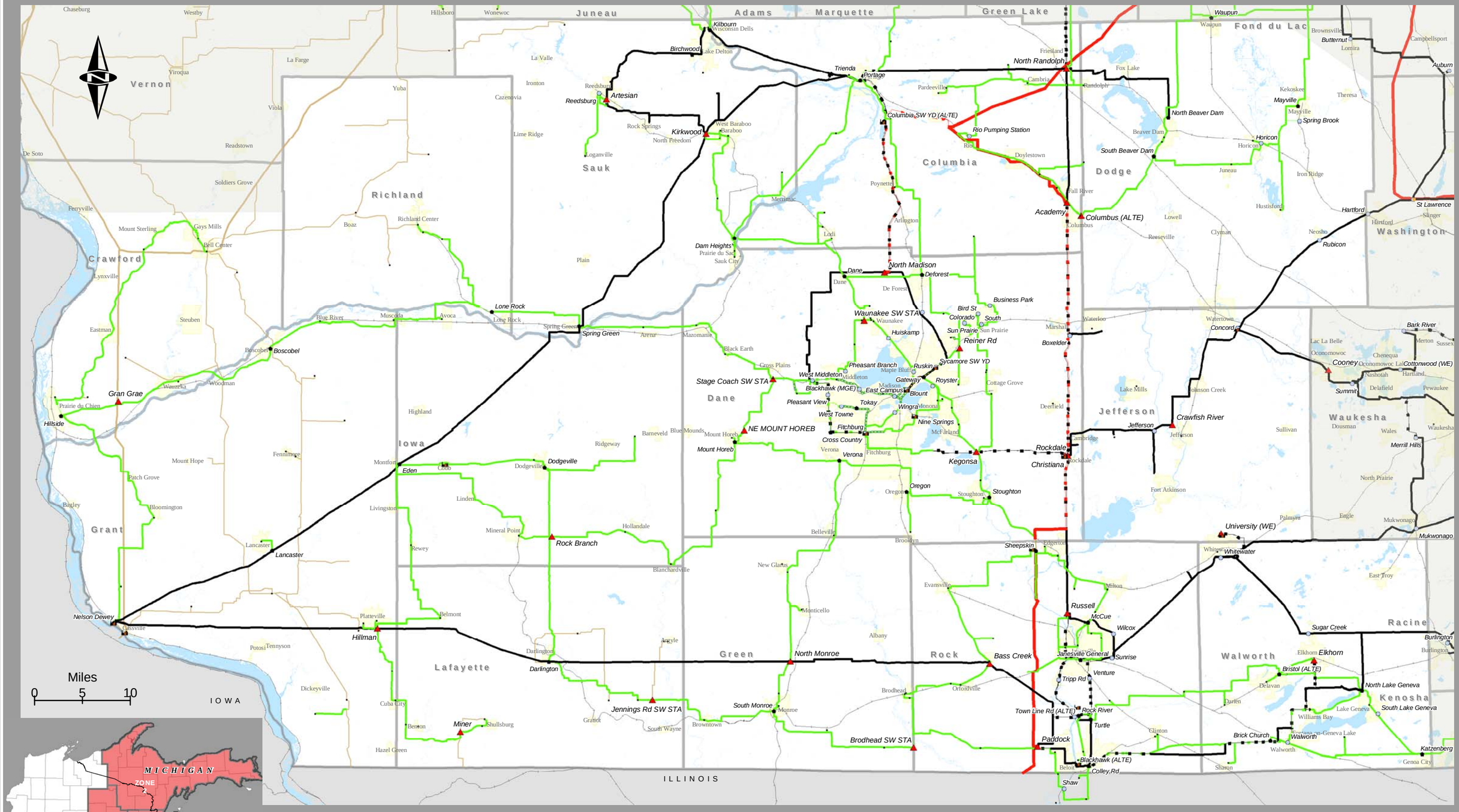
- 69 kV
- 115 kV
- 138 kV
- 230 kV
- 345 kV
- 69 kV Double Circuit
- 115 kV Double Circuit
- 138 kV Double Circuit
- 230 kV Double Circuit
- 345 kV Double Circuit
- 69 kV Underground
- 138 kV Underground
- Non-ATC Line

Transmission Related Facilities

- ATC Owned Substation
- Joint Owned Substation - Assets Conveyed
- Joint Owned Substation - Assets Retained
- 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.

Figure ZS-20



AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Electric Transmission Network & Substations

PLANNING ZONE 3

Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:

- *Approximately 8900 miles of transmission lines*
- *98 wholly owned substations*
- *358 jointly owned substations*
- *ATC offices in Madison (2), Cottage Grove, Pewaukee, De Pere, Wausau and Kingsford, MI*

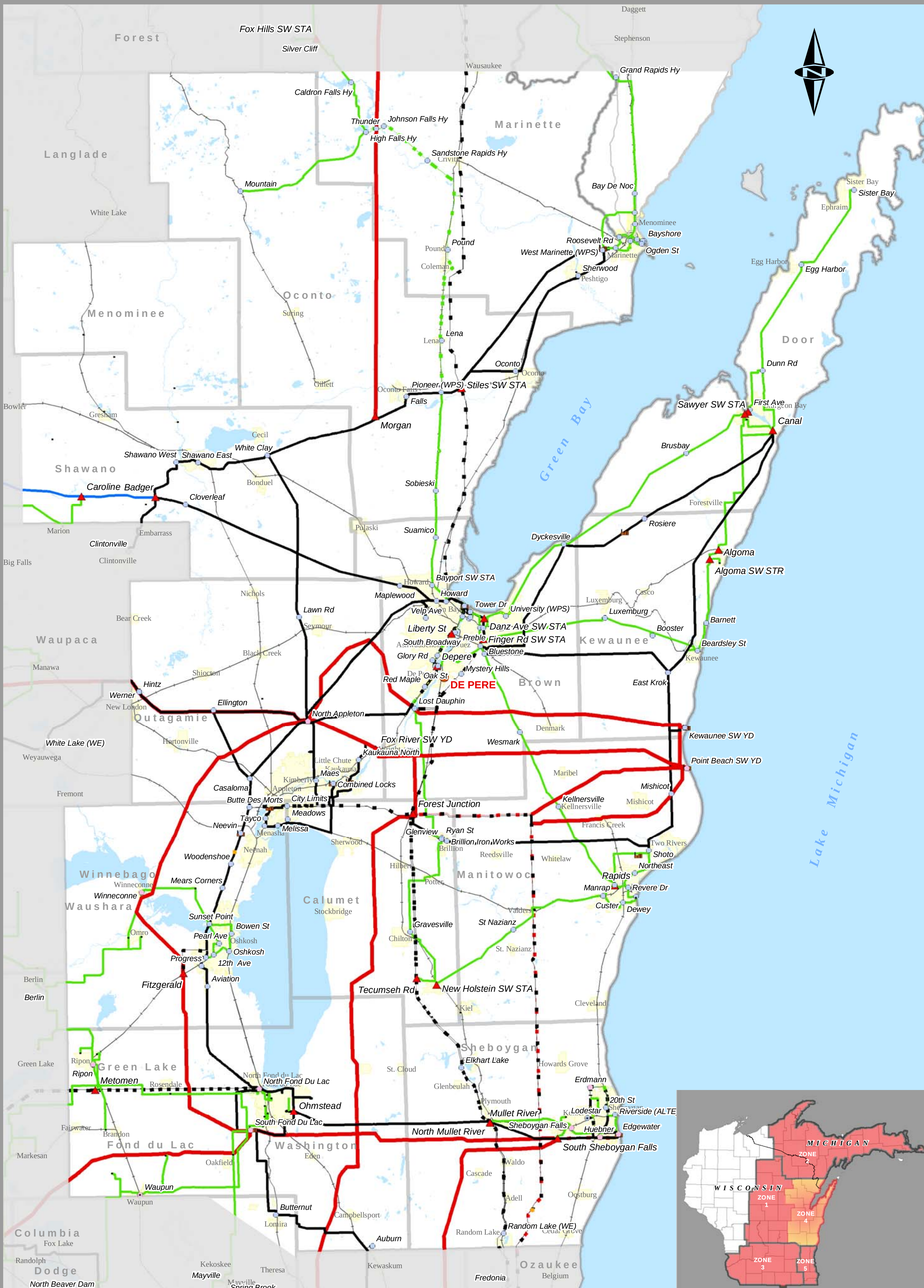
Transmission Line Voltage

- 69 kV
- 115 kV
- 138 kV
- 230 kV
- 345 kV
- 69 kV Double Circuit
- 115 kV Double Circuit
- 138 kV Double Circuit
- 230 kV Double Circuit
- 345 kV Double Circuit
- 69 kV Underground
- 138 kV Underground
- Non-ATC Line

Transmission Related Facilities

- ATC Owned Substation
- Joint Owned Substation - Assets Conveyed
- Joint Owned Substation - Assets Retained
- 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.



AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Electric Transmission Network & Substations
PLANNING ZONE 4

0 5 10 20 Miles

Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:
- *Approximately 8900 miles of transmission lines*
- *98 wholly owned substations*
- *358 jointly owned substations*
- *Offices in Madison (2), Cottage Grove, Pewaukee, De Pere Wausau and Kingsford, MI*

Transmission Line Voltage

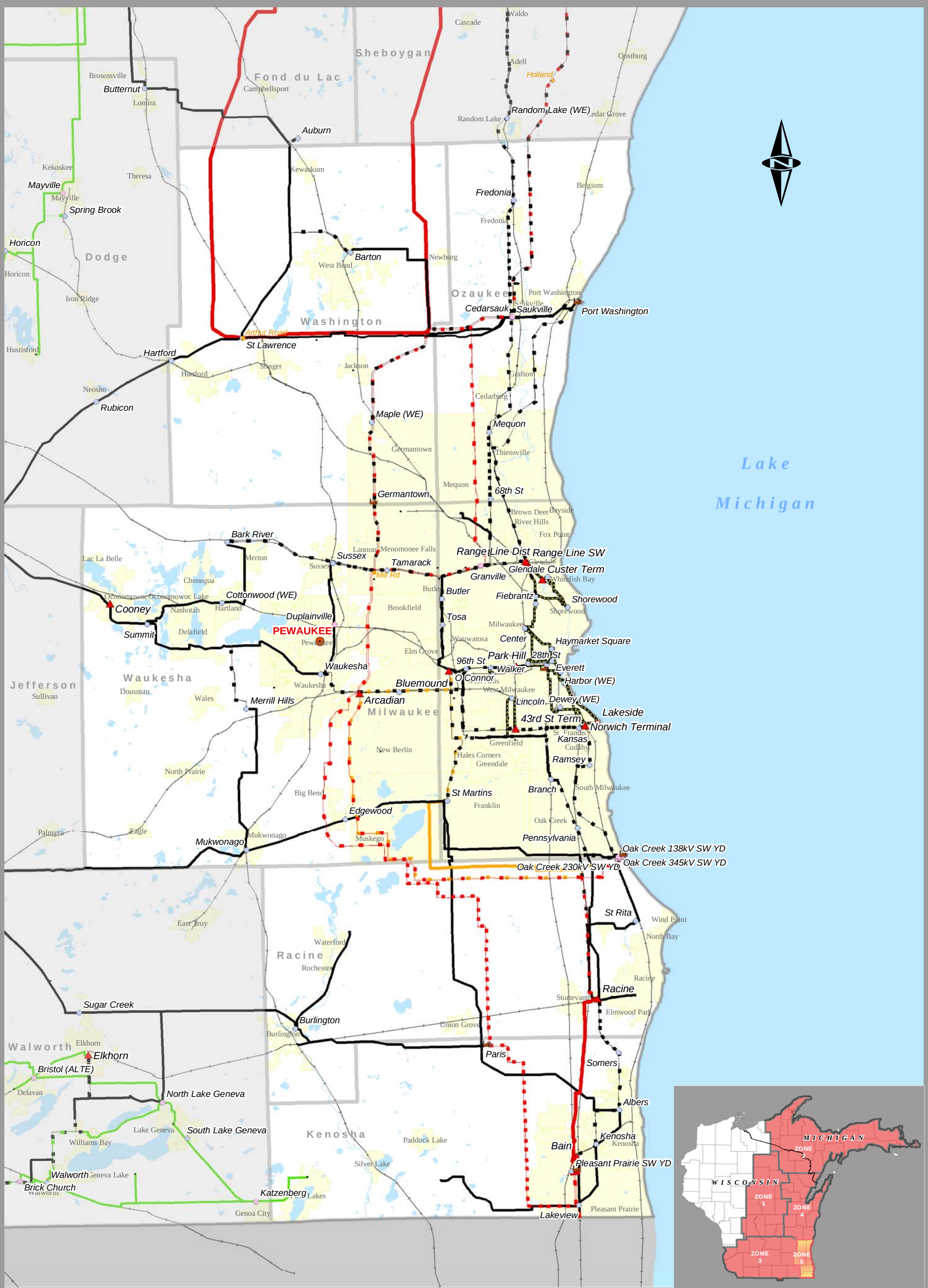
69 kV — 69 kV Double Circuit — 69 kV Underground
115 kV — 115 kV Double Circuit — 138 kV Underground
138 kV — 138 kV Double Circuit — Non-ATC Line
230 kV — 230 kV Double Circuit
345 kV — 345 kV Double Circuit

Transmission Related Facilities

ATC Owned Substation
Joint Owned Substation - Assets Conveyed
Joint Owned Substation - Assets Retained
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.

Zone4 11x17.mxd Modified: April 15, 2005



AMERICAN TRANSMISSION COMPANY
THE ENERGY ACCESS COMPANY

Electric Transmission Network and Substations

PLANNING ZONE 5

0 5 10 Miles

Currently, ATC owns or operates transmission facilities in 50 Wisconsin counties and in 15 Michigan counties. Facilities include:

- *Approximately 8900 miles of transmission lines*
- *98 wholly owned substations*
- *358 jointly owned substations*
- *Offices in Madison (2), Cottage Grove, Pewaukee, De Pere Wausau and Kingsford, MI*

Transmission Line Voltage

- 69 kV
- 115 kV
- 138 kV
- 230 kV
- 345 kV
- 69 kV Double Circuit
- 115 kV Double Circuit
- 138 kV Double Circuit
- 230 kV Double Circuit
- 345 kV Double Circuit
- 69 kV Underground
- 138 kV Underground
- Non-ATC Line

Transmission Related Facilities

- ATC Owned Substation
- Joint Owned Substation - Assets Conveyed
- Joint Owned Substation - Assets Retained
- 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.

Zone5 11x17.mxd Modified: January 14, 2005

PLANNING FACTORS > Planning criteria > System alternatives

We consider alternatives to transmission-only solutions to problems on the transmission system as appropriate. Such alternatives could include, but are not limited to, central station generation, distributed generation, load management and conservation measures. We use sound judgment in assessing whether non-transmission solutions are applicable on a case-by-case basis, keeping in mind that we are not a vertically integrated utility and do not own generation nor serve as a load-serving entity for retail load.

PLANNING FACTORS > Planning criteria > Load forecasting criteria

We initially use load forecasts provided by our end-use load-serving customers. Such customers are required, under ATC's Distribution-Transmission Interconnection Agreements and Network Operating Agreements, to provide us with monthly peak demand forecasts for the next ten years. We may, in the future, develop load forecasts either concurrent with or independent of our load-serving customers. In addition, in coordination with our load-serving customers, we may develop representative load duration curves based on actual and normalized load conditions. Our methodology for developing, aggregating and maintaining load forecast information would be in accordance with NERC Standard MOD-010-0-B and MOD-011-0-B.

In utilizing or developing load forecasts, the following criteria are used:

1) **Summer peak** demand forecasts will be calculated in such a way that there is an almost equal probability of exceeding or falling short of the forecast when average peak making weather does occur.
2) **Winter peak** demand forecasts will be calculated in such a way that there is an almost equal probability of exceeding or falling short of the forecast when average peak making weather does occur.
3) **Summer shoulder peak** demand forecasts will be developed reflecting moderate weather days (75 F-80 F). Such forecasts will be based on a load level that, within a reasonable range, captures as many shoulder peak hours within a representative load duration curve of load connected to the ATC transmission system. These demand forecasts will be developed to evaluate high power transfer conditions.
4) **Fall/spring off-peak** forecasts will be based on a load level that, within a reasonable range, captures as many off-peak hours within a representative load duration curve of load connected to the ATC transmission system.
5) **Summer 90/10 peak** forecasts will be developed that reflect above-average summer weather and peak demand conditions. This peak demand forecast will be calculated in such a way that there is a 90 percent probability of falling short of and a 10 percent probability of exceeding the forecast due to weather conditions.

PLANNING FACTORS > Planning criteria > Economic criteria

We conduct appropriate economic analyses when evaluating transmission additions, replacement and modifications. The criteria to be used in such economic analyses for purposes of system planning will include the following:

1) In developing screening-level capital cost estimates for transmission lines and substations, terrain, geology and land use will be considered.
2) In conducting transmission system loss analysis, a sufficient number of power flow cases will be developed to cover a reasonable range of load conditions from which to assess system losses. In addition, the value of losses shall be projected based on the energy futures market or on a credible energy price forecast.
3) In conducting analysis of generation redispatch precipitated by transmission constraints, a sufficient number of power flow cases will be developed in order to reasonably estimate the amount of time that such redispatch may be warranted. In addition, the cost of such redispatch will be projected based on marginal production costs and/or historical redispatch cost data of generating units dispatched to relieve the constraint. We will determine the economic feasibility of eliminating generation must-run situations based on these analyses.

PLANNING FACTORS > Planning criteria > Environmental criteria

The overriding environmental criterion that we use in system planning is that environmental analyses will be conducted at a screening level as opposed to a detailed siting/routing analysis level. The goal of such environmental analyses is to identify potential environmental impacts, avoid such impacts where possible and, where it is not possible, minimize and mitigate such impacts to the extent possible. More detailed analyses will be undertaken to support an application to siting authorities of specific transmission alternatives.

PLANNING FACTORS > Planning criteria > Variations on ATC planning criteria

Our transmission system consists of assets contributed by entities within the five control areas of the Wisconsin Upper Michigan System. Each of the original asset owners planned their system to separate planning criteria, particularly in regard to transient and dynamic performance. Therefore, as we have implemented our own planning criteria, portions of the system may require upgrades to meet our more stringent criteria.

This section describes the philosophy that is followed for completing projects in a portion of the system identified as deficient with respect to our criteria.

1) Area does not meet NERC Planning Standards with respect to stability.
   a. Complete projects required for bringing the existing system into compliance with NERC standards with no intentional delay.
   b. New generator interconnections are **not** permitted until NERC standards are met with the addition of the generator, if the new generator interconnection aggravates the stability condition. [A new generation interconnection is deemed to aggravate the stability performance of an area if a change in scope is required to meet NERC Planning Standards.]
   c. Depending on the level of risk associated with the deficiency, special operating procedures (restrictions or guides) may be required to mitigate the risk until the system is in compliance. If a new generator interconnection is permitted but still negatively influences the stability condition, the operating restriction may follow a “last interconnected, first restricted” approach.

2) Area meets NERC Planning Standards but not ATC criteria with respect to stability.
   a. Normal schedule for projects required for bringing the existing system into compliance with ATC criteria.
   b. New generator interconnections are permitted as long as the system continues to meet the NERC Planning Standards. If the new generator interconnection causes a violation of NERC standards, 1.b above applies.
   c. Operating procedures will not be required in the interim period until the projects to meet ATC criteria are completed.

3) Area meets ATC planning criteria for existing system but a new generator interconnection causes a violation of:
   a. ATC planning criteria – New generator interconnection is not permitted until ATC criteria is met with the addition of the new generator.
   b. NERC Planning Standards – New generator interconnection is not permitted until both NERC standards and ATC criteria are met.

PLANNING FACTORS > Planning criteria > Other considerations

Project constructability

We will consider the constructability of proposed additions, replacements or modifications to the transmission system as part of our system planning process. In particular, we will consider:

1) Whether addition, replacement or modification of a transmission line, transformer or other facility would result in violation of the System performance criteria above, and
2) Whether addition, replacement or modification of a transmission line, transformer or other facility precludes the ability of our operations staff to conduct maintenance activities on other transmission facilities.

Multiple contingency planning

We will conduct our system planning in accordance with the System performance criteria above, including planning for single contingency events. There may be circumstances, however, where the risk to us and/or our customers of a multiple contingency event is sufficiently severe to warrant consideration for planning purposes. Examples of such an event would include:

1) the loss of a transmission facility during the period of maintenance or repair of another transmission facility,
2) a multiple contingency arising from a common cause such as a fire, flood, etc., or
3) failure of a transmission structure supporting multiple circuits.

We will evaluate the probability and consequences of certain selected multiple contingency scenarios to determine whether to apply a multiple contingency standard.

Such multiple contingency scenarios may warrant consideration of operating guides or reinforcements. In these circumstances, we will document the potential event(s), the associated risks and potential mitigation measures, and will coordinate with affected customers, as appropriate.
(Applicable NERC Standard: TPL-003-0-B, TPL-004-0-B)

Terminal equipment limitations

Substation terminal equipment should not limit transmission facility ratings under Category A (normal) or Category B (loss of single element) contingency conditions. This criterion would apply to new transmission facilities and should be reviewed when proposing modifications to existing facilities.

Maximization of existing rights-of-way

We will attempt to maximize use of existing rights-of-way. Existing electric transmission, gas pipeline, railroad and highway corridors will be identified in all comparisons of alternatives and utilized where feasible. As a starting point in each environmental analysis, we will utilize the broad-brush environmental review employed for all of the new transmission line alternatives considered in prior Advance Plan processes.

Reduction of transmission system losses

We will strive to plan our transmission system such that transmission system losses are minimized. We will undertake this goal by considering system losses along with all other cost factors in all evaluations of alternative transmission projects or plans. See Economic criteria.

Operating flexibility

We will strive to plan our transmission system such that operating flexibility is maximized. We will accomplish this by considering as wide a variety of scenarios as practical, including maintenance scenarios, when evaluating alternative transmission projects or plans.

Radial transmission service

We will evaluate the risk of serving customer load from radial facilities. Such evaluations will consider the amount of load being served, the capability of the underlying distribution system and the amount of time that service is likely to be interrupted for the loss/failure of the radial facility.