



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 improved 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.

1. Transmission system 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
 - Regional needs
 - Economic strategic expansion
- Electric load growth** – The load growth driver in this Assessment is slightly lower than in the previous Assessment. Demand for electricity during peak load periods is projected to grow at a rate of 1.7 percent across our service territory from 2009 through 2019. However, load growth rates in some areas are projected to grow by 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 enhancements and/or expansion.

Figure PF-1 shows the projected growth in peak demand, in MW, from 2009 through 2019 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>. Please refer to our Transmission-Distribution Interconnections section for more information.

- **New generation** – When entities plan to construct new generating facilities, there are two key considerations from the transmission owner's 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)?



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For each entity that plans to construct a new generating facility, the transmission provider will conduct an interconnection 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 Midwest Independent System Operator, Inc. (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. Transmission service providers, or transmission owners like ATC, 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. 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. Facilities being planned or constructed to address condition or obsolescence issues can be found in Tables PR-2 through PR-23. In the Need Category column, look for “condition.” Please also refer to Tables AR-1 through AR-3 for a listing of our asset renewal projects.
- ❑ **Regional needs** - Our transmission system is interconnected directly with neighboring systems and is operated in conjunction with all transmission systems within MISO and ultimately the eastern interconnection. Because these transmission systems work together and not independently, regional planning to identify and plan for needs at a regional level is necessary.



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ATC provides its system plan to MISO for coordination within MISO's regional plan, known as MISO's Transmission Expansion Plan (MTEP). ATC and MISO collaborate to facilitate MISO's review of the projects. MISO reviews the transmission projects, and alternatives where applicable, submitted by ATC to verify the reliability or economic needs, to ensure they do not have an reliability adverse affect over MISO footprint and to determine if they could be combined in conjunction with transmission projects from other transmission owners to develop the most cost-effective alternatives.

ATC also participates in regional studies that investigate transmission needs across footprints of multiple transmission owners. For example, ATC participates in regional studies coordinated by MISO such as the Regional Generation Outlet Study (RGOS) that investigates transmission plans to integrate wind generation that supports the MISO state Renewable Portfolio Standard (RPS) requirements and beyond. ATC also meets with adjacent transmission owners to coordinate planning in an effort to develop transmission solutions that resolve reliability issues that impact multiple transmission owners at the lowest reasonable cost. Please refer to the [Policy & Regional Analyses](#) section for more information on ATC's participation in regional planning activities.

- ❑ **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. 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 and compliant, they must have the flexibility to take advantage of trends that have the potential to lower costs and to comply with renewable portfolio requirements. 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 its customers more ways to lower costs. The primary outgrowth of this effort is outlined further in our [Economic Planning](#) section.

2. 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 Economic Planning Initiative, taking a comprehensive look at the technical feasibility and economic impacts of constructing new transmission lines within ATC and/or to neighboring states.



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- ❑ **Transmission-distribution interconnection process** – In response to the relatively large number of proposed T-D interconnections, we have developed a process that provides guidelines for our joint Best Value Planning (BVP) efforts. Four BVP levels have been identified to help ATC and its customers identify the appropriate effort to develop potential interconnections. BVP levels are determined based on the assumed scope of work for ATC according to the most likely option for interconnecting the customer facility(ies). A level one BVP assumes that ATC has virtually no capital costs to interconnect the customer. A level four BVP assumes that ATC has to develop a project that requires PSCW regulatory approval (CA or CPCN). Please refer to [ATC's D-T Interconnection Business Practice](#) for details.
- ❑ **Control of transmission construction costs** – Our customers desire reliable access to the transmission system as cost-effectively as possible. To accomplish this, ATC has partnered with the industry's leading design, construction, and materials sourcing companies. Our partners' expertise helps ATC maintain and construct transmission system assets with a focus on low long-term costs. Also, our recent addition of a Project Controls Office ensures that we are continually reviewing projects for cost-saving opportunities.
- ❑ **Integration of transmission and generation planning** – Our transmission system does not have significant transmission capacity beyond current network needs. As a consequence, generation interconnections cannot be effectively pre-analyzed on a generic basis. 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.

We continue to explore potential methods to allow more effective integration of generation and transmission planning in a way that recognizes the limitations of generic analysis and is consistent with federal regulatory obligations. In addition, we continue to work concurrently with our customers to balance market-sensitive long-range plans, confidential market-sensitive information, and the desire to better integrate these plans.

Table PR-2
Transmission System Additions for 2009

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Uprate the Chandler-Masonville 69-kV line summer normal and emergency ratings from 120 deg F to 167 deg F	2009	2009	2	reliability	Proposed	F2532
Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV	2008	2009	2	reliability	Proposed	F1819
Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks	2008	2009	2	reliability, condition	Proposed	F1282
Install 1-8.16 MVAR capacitor banks at the M38 138-kV Substation	2009	2009	2	reliability	Proposed	F2485
Uprate Chandler-Cornell 69-kV line clearance from 120 to 167 deg F	2009	2009	2	reliability	Proposed	F2016
Install 1-8.2 MVAR capacitor bank at Hiawatha 138-kV Substation	2009	2009	2	reliability	Proposed	F2222
Install 1-4.08 MVAR capacitor banks at Osceola 69 kV	2009	2009	2	reliability	Proposed	F2468
Uprate the Chandler-Delta #1 69-kV line summer emergency rating from 120 deg F to 167 deg F	2009	2009	2	reliability	Proposed	F2534

Table PR-2
Transmission System Additions for 2009 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Uprate the Chandler-Delta #2 69-kV line summer emergency rating to from 120 deg F 167 deg F	2009	2009	2	reliability	Proposed	F2535
Construct a Jefferson-Tyranena-Stony Brook 138-kV line	2006	2009	3	reliability	Planned	F0924
Uprate X-8 Rockdale to Boxelder 138-kV line	2008	2009	3	reliability	Planned	F0924
Uprate Y-41 Walworth- North Lake Geneva 69-kV to achieve a 69 MVA summer emergency rating	2009	2009	3	reliability	Planned	F2154
Install a second 138-kV reserve auxiliary transformer (RAT) at Kewaunee and remove tertiary auxiliary transformer (TAT)	2009	2009	4	reliability	Proposed	F2371

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Table PR-3
Transmission System Additions for 2010

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Rebuild Arpin-Rocky Run 345-kV line	2010	2010	1	condition	Planned	F2252
Construct 69-kV line from new Warrens Substation to the Council Creek-Tunnel City 69-kV line	2010	2010	1	T-D interconnection	Planned	F2173
Construct Brandon-Fairwater 69-kV line	2010	2010	1	T-D interconnection	Planned	F1844
Replace Metomen 69-kV breaker	2010	2010	1	reliability, condition	Planned	F2398
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2010	2010	2	reliability, transfer capability	Planned	F1363
Construct 138-kV bus and install a 138/69-kV, 60 MVA transformer at Aspen Substation	2010	2010	2	reliability	Planned	F1363
Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation	2010	2010	2	reliability	Proposed	F2223
Uprate Y-61 McCue-Lamar 69-kV line to achieve 300 deg F line ratings and install 2-12.45 MVAR 69-kV capacitor banks at Lamar Substation	2008	2010	3	reliability	Proposed	F2324
Uprate X-23 Colley Road-Marine 138-kV line terminals*	2014	2010	3	reliability	Proposed	F1670
Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona with a 100 MVA summer normal rating	2009	2010	3	reliability	Planned	F1407

Table PR-3
Transmission System Additions for 2010 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Upgrade Sheepskin capacitor bank from 10.8 MVAR to 16.2 MVAR	2009	2010	3	reliability	Planned	F2248
Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation	2010	2010	3	economics	Planned	F1981
Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation	2010	2010	3	reliability	Planned	F2327
Uprate the Royster Substation terminals	2010	2010	3	reliability	Planned	F2317
Uprate Point Beach-Sheboygan Energy Center 345-kV circuit L111 to 167 degrees F	2010	2010	4	economics	Proposed	F1988
Install 2-32 MVAR capacitor banks at Summit 138-kV Substation	2010	2010	5	reliability	Proposed	F2256
Expand 345-kV switchyard at Oak Creek to interconnect one new generator	2010	2010	5	new generation	Planned	F1729
Uprate Oak Creek-Root River 138-kV line	2010	2010	5	new generation	Planned	F2140
Uprate Oak Creek-Nicholson 138-kV line	2010	2010	5	new generation	Planned	F2112
Upgrade Bain-Albers 138-kV line	2010	2010	5	reliability	Proposed	F2461

Table PR-3
Transmission System Additions for 2010 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct a 138-kV bus at Pleasant Valley Substation to permit second distribution transformer interconnection	2010	2010	5	T-D interconnection	Planned	F2086
Construct second Shorewood-Humboldt 138-kV underground cable*	2012	2010	5	reliability	Proposed	F2487

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Table PR-4
Transmission System Additions for 2011

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Install 1-4.08 MVAR capacitor bank at North Bluff 69-kV Substation	2010	2011	2	reliability	Provisional	F2490
Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	2010	2011	3	Completion of earlier project per agreement with the City of Madison	Proposed	F2628
Rebuild the Y-119 Verona to Oregon 69-kV line	2008	2011	3	reliability, condition	Proposed	F2469
Rebuild Y-33 Brodhead to South Monroe 69-kV line	2011	2011	3	generation interconnection, reliability	Planned	F2526
Uprate terminal limitations at McCue for the Y-79 McCue-Milton Lawns 69-kV line	2011	2011	3	reliability	Proposed	F2405
Install 2-24.5 MVAR 138-kV capacitor bank and 1-18 MVAR 69-kV capacitor bank at Brick Church substation	2011	2011	3	reliability	Provisional	F2404
Reconfigure Kewaunee 345/138-kV switchyard and install a second 500 MVA 345/138-kV transformer	2011	2011	4	reliability, condition	Proposed	F2437
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2011	2011	4	reliability	Planned	F1361

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New to this 10-Year Assessment

Table PR-5
Transmission System Additions for 2012

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct 115-kV line from new Woodmin Substation to the Clear Lake Substation	2012	2012	1	T-D interconnection	Proposed	F2495
Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings	2012	2012	2	reliability	Provisional	TBD
Rebuild/convert Straits-Pine River 138-kV lines 6904/5	2012	2012	2	reliability	Provisional	F2833
Install 138/69-kV 150 MVA transformer at Pine River	2012	2012	2	reliability	Provisional	F2834
Install 138/69-kV 150 MVA transformer at Nine Mile	2012	2012	2	reliability	Provisional	F2834
Install 138/69-kV 150 MVA transformer at Lakehead Rapid River	2012	2012	2	reliability	Provisional	TBD
Construct tap from the Kinross load to Pine River/Nine Mile 69-kV line	2012	2012	2	T-D interconnection, reliability	Provisional	F2836
Construct/convert Pine River-Nine Mile 138/69-kV double-circuit line	2012	2012	2	reliability	Provisional	F2836
Rebuild part of the Y-8 Dane-Dam Heights 69-kV line*	2015	2012	3	reliability, asset renewal, potential T-D interconnection	Provisional	F1602
Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating*	2017	2012	3	reliability	Proposed	F1444

Table PR-5
Transmission System Additions for 2012 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct Canal-Dunn Road 138-kV line	2012	2012	4	reliability	Proposed	F1358
Install 60 MVA 138/69-kV transformer at Dunn Road	2012	2012	4	reliability	Proposed	F1358
Install 3-75 MVAR capacitor banks at Bluemound Substation	2012	2012	5	reliability	Proposed	F2650

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Table PR-6
Transmission System Additions for 2013

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct Monroe County-Council Creek 161-kV line and Timberwolf 69-kV switching station	2013	2013	1	economics, reliability	Proposed	F2454
Install a 161/138-kV transformer at Council Creek Substation	2013	2013	1	economics, reliability	Proposed	F2454
Uprate Council Creek-Petenwell 138-kV line	2013	2013	1	economics, reliability	Proposed	F2849
Upgrade Mckenna 6.3 MVAR capacitor bank to 12.25 MVAR and install a second new 12.25 MVAR capacitor bank	2013	2013	1	reliability	Provisional	F2519
Install second Chandler 138/69-kV transformer	2013	2013	2	reliability	Provisional	TBD
Increase ground clearance of M38-Atlantic 69-kV line from 120 to 167 degrees F	2009	2013	2	reliability	Provisional	TBD
Uprate Fitchburg-Nine Springs 69-kV and Royster-Pflaum 69-kV lines and move AGA load to the Royster-Femrite 69-kV line	2006	2013	3	reliability	Proposed	F2088
Rebuild Y-32 Colley Road-Brick Church 69-kV line	2013	2013	3	reliability, condition	Provisional	F1670
Install 2-16.33 MVAR 69-kV capacitor banks at Nine Springs Substation	2013	2013	3	reliability	Proposed	F2088
Install a 138/69-kV transformer at Bass Creek Substation	2010	2013	3	reliability	Proposed	F1869

Table PR-6
Transmission System Additions for 2013 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Uprate X-12 Town Line Road-Bass Creek 138-kV line to 300 deg F	2010	2013	3	reliability	Proposed	F1869
Construct 345-kV line from Rockdale to West Middleton	2013	2013	3	reliability	Planned	F1435
Construct a 345-kV bus and install a 345/138 kV 500 MVA transformer at West Middleton Substation	2013	2013	3	reliability	Planned	F1435
Uprate Y-61 Sheepskin-Dana 69-kV line to 95 MVA	2013	2013	3	reliability	Proposed	F2583
Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	2010	2013	5	reliability	Provisional	F2142
Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer	2010	2013	5	reliability	Provisional	F2539

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New to this 10-Year Assessment

Table PR-7
Transmission System Additions for 2014

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2014	2014	1	T-D interconnection	Provisional	F2053
Uprate Munising-Seney-Blaney Park 69-kV line to 167 degrees F	2014	2014	2	reliability	Provisional	TBD
Construct Gwinn-Forsyth second 69-kV line	2014	2014	2	reliability	Provisional	TBD
Install 2-16.33 MVAR 69-kV capacitor banks and 2-24.5 MVAR 138-kV capacitor banks at Femrite Substation	2014	2014	3	reliability	Provisional	F2516
Install 1-16.33 MVAR 69-kV capacitor bank at Verona Substation	2014	2014	3	reliability	Provisional	F2520

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Table PR-8
Transmission System Additions for 2015

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer	2015	2015	3	reliability	Provisional	F0339
Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2015	2015	3	reliability	Provisional	F2518
Upgrade Columbia 345/138-kV transformer T-22 to 527 MVA	2015	2015	3	reliability	Provisional	F2135
Upgrade Oak Creek-Pennsylvania 138-kV line	2015	2015	5	reliability	Provisional	F2473

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New to this 10-Year Assessment

Table PR-9
Transmission System Additions for 2016

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69-kV Substation	2016	2016	1	reliability	Provisional	F2477
Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating	2016	2016	3	reliability	Provisional	F2445
Upgrade X-67 Portage-Trienda 138-kV line to 373 MVA	2016	2016	3	reliability	Provisional	F2092
Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation	2016	2016	3	reliability, T-D interconnection	Provisional	F2587
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation	2016	2016	3	reliability	Provisional	F2587
Install 2-16.33 MVAR 69-kV capacitor banks at Eden Substation	2016	2016	3	reliability	Provisional	F2515
Install 4-49 MVAR 138-kV capacitor banks at Concord Substation	2016	2016	3	reliability, economics	Provisional	F2489
Upgrade the 6986 Royster to Sycamore 69-kV line to 115 MVA	2016	2016	3	reliability	Provisional	F2471
Install 2-16.33 MVAR 69-kV capacitor banks at Sun Prairie	2016	2016	3	reliability	Provisional	F2475
Replace two existing 138/69-kV transformers at Glenview Substation with 100 MVA transformers	2016	2016	4	reliability	Provisional	F2079

Table PR-9
Transmission System Additions for 2016 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct second Dunn Road-Egg Harbor 69-kV line	2016	2016	4	reliability	Provisional	F0181

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Table PR-10
Transmission System Additions for 2017

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Install a second 138/69-kV transformer at Wautoma Substation	2017	2017	1	reliability	Provisional	F2480
Replace 138/69-kV transformer at Metomen Substation	2017	2017	1	reliability	Proposed	F1867
Uprate Castle Rock-Mckenna 69-kV line	2017	2017	1	reliability, economic benefits	Provisional	F2491
Uprate Y159 Brick Church-Walworth 69-kV line to 115 MVA	2017	2017	3	reliability	Provisional	F2153
Construct West Middleton-Blount 138-kV line	2017	2017	3	reliability	Provisional	F2466
Construct a Lake Delton-Birchwood 138-kV line	2017	2017	3	reliability	Provisional	F1638
Install 2-12.25 MVAR 69-kV capacitor banks at Mazomanie Substation	2017	2017	3	reliability	Provisional	F2517
Construct 69-kV double-circuit line between McCue and Lamar substations	2017	2017	3	reliability		F2558

Table PR-10
Transmission System Additions for 2017 (continued)

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Install 2-16.33 MVAR 69-kV capacitor banks at Dam Heights	2017	2017	3	reliability	Provisional	F2474

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

Table PR-11
Transmission System Additions for 2018

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Convert Necedah distribution substation from 69 kV to 138 kV	2018	2018	1	reliability	Provisional	F2560
Construct Fairwater-Mackford Prairie 69-kV line	2018	2018	1	reliability	Provisional	F2105
Install 2-16.33 Mvar 69-kV capacitor banks at North Monroe	2018	2018	3	reliability	Provisional	F2472
Construct Spring Valley-Twin Lakes-South Lake Geneva 138-kV line	2018	2018	3	T-D interconnection, reliability	Provisional	F2570
Replace two existing 138/69-kV transformers at Sunset Point Substation with 100 MVA transformers	2018	2018	4	economic benefits	Provisional	F2080

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

Table PR-12
Transmission System Additions for 2019

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Construct a Horicon-East Beaver Dam 138-kV line	2019	2019	3	reliability	Provisional	F1640
Install 2-32 MVAR capacitor banks at Mukwonago 138-kV Substation	2019	2019	5	reliability	Provisional	F2493

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

Table PR-13
Transmission System Additions beyond 2019

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation	2020	2020	4	reliability	Provisional	F1403
Uprate the Melissa-Tayco to 229 MVA (300F)	2020	2020	4	reliability, economics	Provisional	F2434
Install 138/69-kV transformer at Custer Substation	2020	2020	4	reliability, economics	Provisional	F2081
Construct Shoto to Custer 138-kV line	2020	2020	4	reliability, economics	Provisional	F2081
Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV	2020	2020	4	reliability, condition	Provisional	F1619
Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap	2021	2021	1	reliability	Provisional	F2105
Construct a 345-kV bus, install a 345/138-kV 500 MVA transformer at North Randolph and loop the Columbia to South Fond Du Lac 345-kV line into the substation	2021	2021	3	reliability	Provisional	F2093
Install 2-16.33 MVAR 69-kV capacitor banks at Rio	2022	2022	3	reliability	Provisional	F2557
Install a 12.2 MVAR capacitor bank at Hilltop 69-kV Substation	2023	2023	1	reliability	Provisional	F2476

Table PR-13
Transmission System Additions beyond 2019

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2009-2018)</i> in <i>Financial Table</i>
Reconductor Ramsey-Harbor 138-kV line	TBD	TBD	5	reliability	Provisional	TBD

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

Table PR-14
Zone 1 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Rebuild Arpin-Rocky Run 345-kV line	2010	2010	1	condition	Planned
Construct 69-kV line from new Warrens Substation to the Council Creek-Tunnel City 69-kV line	2010	2010	1	T-D interconnection	Planned
Construct Brandon-Fairwater 69-kV line	2010	2010	1	T-D interconnection	Planned
Replace Metomen 69-kV breaker	2010	2010	1	reliability, condition	Planned
Construct 115-kV line from new Woodmin Substation to the Clear Lake Substation	2012	2012	1	T-D interconnection	Proposed
Construct Monroe County-Council Creek 161-kV line and Timberwolf 69-kV switching station	2013	2013	1	economics, reliability	Proposed
Install a 161/138-kV transformer at Council Creek Substation	2013	2013	1	economics, reliability	Proposed
Uprate Council Creek-Petenwell 138-kV line	2013	2013	1	economics, reliability	Proposed
Upgrade Mckenna 6.3 MVAR capacitor bank to 12.25 MVAR and install a second new 12.25 MVAR capacitor bank	2013	2013	1	reliability	Provisional
Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	2014	2014	1	T-D interconnection	Provisional
Upgrade 4.1 MVAR capacitor bank to 8.2 MVAR and install a new 8.2 MVAR capacitor bank at Ripon 69-kV Substation	2016	2016	1	reliability	Provisional

Table PR-14 (continued)
Zone 1 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Install a second 138/69-kV transformer at Wautoma Substation	2017	2017	1	reliability	Provisional
Replace 138/69-kV transformer at Metomen Substation	2017	2017	1	reliability	Proposed
Uprate Castle Rock-Mckenna 69-kV line	2017	2017	1	reliability, economic benefits	Provisional
Convert Necedah distribution substation from 69 kV to 138 kV	2018	2018	1	reliability	Provisional
Construct Fairwater-Mackford Prairie 69-kV line	2018	2018	1	reliability	Provisional
Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap	2021	2021	1	reliability	Provisional
Install a 12.2 MVAR capacitor bank at Hilltop 69-kV Substation	2023	2023	1	reliability	Provisional

Table PR-15
Zone 2 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Uprate the Chandler-Masonville 69-kV line summer normal and emergency ratings from 120 deg F to 167 deg F	2009	2009	2	reliability	Proposed
Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV	2008	2009	2	reliability	Proposed
Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks	2008	2009	2	reliability, condition	Proposed
Install 1-8.16 MVAR capacitor banks at the M38 138-kV Substation	2009	2009	2	reliability	Proposed
Uprate Chandler-Cornell 69-kV line clearance from 120 to 167 deg F	2009	2009	2	reliability	Proposed
Install 1-8.2 MVAR capacitor bank at Hiawatha 138-kV Substation	2009	2009	2	reliability	Proposed
Install 1-4.08 MVAR capacitor banks at Osceola 69 kV	2009	2009	2	reliability	Proposed
Uprate the Chandler-Delta #1 69-kV line summer emergency rating from 120 deg F to 167 deg F	2009	2009	2	reliability	Proposed

Table PR-15 (continued)
Zone 2 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Uprate the Chandler-Delta #2 69-kV line summer emergency rating to from 120 deg F 167 deg F	2009	2009	2	reliability	Proposed
Rebuild/convert Conover-Plains 69-kV line to 138 kV	2010	2010	2	reliability, transfer capability	Planned
Construct 138 kV bus and install a 138/69 kV, 60 MVA transformer at Aspen Substation	2010	2010	2	reliability	Planned
Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation	2010	2010	2	reliability	Proposed
Install 1-4.08 MVAR capacitor bank at North Bluff 69-kV Substation	2010	2011	2	reliability	Provisional
Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings	2012	2012	2	reliability	Provisional
Rebuild/convert Straits-Pine River 138-kV lines 6904/5	2012	2012	2	reliability	Provisional
Install 138/69-kV 150 MVA transformer at Pine River	2012	2012	2	reliability	Provisional
Install 138/69-kV 150 MVA transformer at Nine Mile	2012	2012	2	reliability	Provisional
Install 138/69-kV 150 MVA transformer at Lakehead Rapid River	2012	2012	2	reliability	Provisional

Table PR-15 (continued)
Zone 2 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Construct tap from the Kinross load to Pine River/Nine Mile 69-kV line	2012	2012	2	T-D interconnection, reliability	Provisional
Construct/convert Pine River-Nine Mile 138/69-kV double-circuit line	2012	2012	2	reliability	Provisional
Install second Chandler 138/69-kV transformer	2013	2013	2	reliability	Provisional
Increase ground clearance of M38-Atlantic 69-kV line from 120 to 167 degrees F	2009	2013	2	reliability	Provisional
Uprate Munising-Seney-Blaney Park 69-kV line to 167 degrees F	2014	2014	2	reliability	Provisional
Construct Gwinn-Forsyth second 69-kV line	2014	2014	2	reliability	Provisional

Table PR-16
Zone 3 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Construct a Jefferson-Tyrannena-Stony Brook 138-kV line	2006	2009	3	reliability	Planned
Uprate X-8 Rockdale to Boxelder 138-kV line	2008	2009	3	reliability	Planned
Uprate Y-41 Walworth- North Lake Geneva 69-kV to achieve a 69 MVA summer emergency rating	2009	2009	3	reliability	Planned
Uprate Y-61 McCue-Lamar 69-kV line to achieve 300 deg F line ratings and install 2-12.45 Mvar 69 kV capacitor banks at Lamar Substation	2008	2010	3	reliability	Proposed
Uprate X-23 Colley Road-Marine 138-kV line terminals	2014	2010	3	reliability	Proposed
Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona with a 100 MVA summer normal rating	2009	2010	3	reliability	Planned
Upgrade Sheepskin capacitor bank from 10.8 MVAR to 16.2 MVAR	2009	2010	3	reliability	Planned
Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation	2010	2010	3	economics	Planned
Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation	2010	2010	3	reliability	Planned
Uprate the Royster Substation terminals	2010	2010	3	reliability	Planned

Table PR-16 (continued)
Zone 3 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	2010	2011	3	completion of earlier project per agreement with the City of Madison	Proposed
Rebuild the Y-119 Verona to Oregon 69-kV line	2008	2011	3	reliability, condition	Proposed
Rebuild Y-33 Brodhead to South Monroe 69-kV line	2011	2011	3	generation interconnection, reliability	Planned
Uprate terminal limitations at McCue for the Y-79 McCue-Milton Lawns 69-kV line	2011	2011	3	reliability	Proposed
Install 2-24.5 MVAR 138-kV capacitor bank and 1-18 MVAR 69-kV capacitor bank at Brick Church substation	2011	2011	3	reliability	Provisional
Rebuild part of the Y-8 Dane-Dam Heights 69-kV line	2015	2012	3	reliability, asset renewal, potential T-D interconnection	Provisional
Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating	2017	2012	3	reliability	Proposed
Uprate Fitchburg-Nine Springs 69-kV and Royster-Pflaum 69-kV lines and move AGA load to the Royster-Femrite 69-kV line	2006	2013	3	reliability	Proposed
Rebuild Y-32 Colley Road-Brick Church 69-kV line	2013	2013	3	reliability, condition	Provisional

Table PR-16 (continued)
Zone 3 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Nine Springs Substation	2013	2013	3	reliability	Proposed
Install a 138/69-kV transformer at Bass Creek Substation	2010	2013	3	reliability	Proposed
Uprate X-12 Town Line Road-Bass Creek 138-kV line to 300 deg F	2010	2013	3	reliability	Proposed
Construct 345-kV line from Rockdale to West Middleton	2013	2013	3	reliability	Planned
Construct a 345-kV bus and install a 345/138 kV 500 MVA transformer at West Middleton Substation	2013	2013	3	reliability	Planned
Uprate Y-61 Sheepskin-Dana 69-kV line to 95 MVA	2013	2013	3	reliability	Proposed
Install 2-16.33 MVAR 69-kV capacitor banks and 2-24.5 MVAR 138-kV capacitor banks at Femrite Substation	2014	2014	3	reliability	Provisional
Install 1-16.33 MVAR 69-kV capacitor bank at Verona Substation	2014	2014	3	reliability	Provisional
Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer	2015	2015	3	reliability	Provisional
Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2015	2015	3	reliability	Provisional
Uprate Columbia 345/138-kV transformer T-22 to 527 MVA	2015	2015	3	reliability	Provisional

Table PR-16 (continued)
Zone 3 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating	2016	2016	3	reliability	Provisional
Uprate X-67 Portage-Trienda 138-kV line to 373 MVA	2016	2016	3	reliability	Provisional
Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation	2016	2016	3	reliability, T-D interconnection	Provisional
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation	2016	2016	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Eden Substation	2016	2016	3	reliability	Provisional
Install 4-49 MVAR 138-kV capacitor banks at Concord Substation	2016	2016	3	reliability, economics	Provisional
Uprate the 6986 Royster to Sycamore 69-kV line to 115 MVA	2016	2016	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Sun Prairie	2016	2016	3	reliability	Provisional
Uprate Y159 Brick Church-Walworth 69-kV line to 115 MVA	2017	2017	3	reliability	Provisional
Construct West Middleton-Blount 138-kV line	2017	2017	3	reliability	Provisional
Construct a Lake Delton-Birchwood 138-kV line	2017	2017	3	reliability	Provisional

Table PR-16 (continued)
Zone 3 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Install 2-12.25 MVAR 69-kV capacitor banks at Mazomanie Substation	2017	2017	3	reliability	Provisional
Construct 69-kV double-circuit line between McCue and Lamar substations	2017	2017	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Dam Heights	2017	2017	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at North Monroe	2018	2018	3	reliability	Provisional
Construct Spring Valley-Twin Lakes-South Lake Geneva 138-kV line	2018	2018	3	T-D interconnection, reliability	Provisional
Construct a Horicon-East Beaver Dam 138-kV line	2019	2019	3	reliability	Provisional
Construct a 345-kV bus, install a 345/138-kV 500 MVA transformer at North Randolph and loop the Columbia to South Fond Du Lac 345-kV line into the substation	2021	2021	3	reliability	Provisional
Install 2-16.33 MVAR 69-kV capacitor banks at Rio	2022	2022	3	reliability	Provisional

Table PR-17
Zone 4 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Install a second 138-kV reserve auxiliary transformer (RAT) at Kewaunee and remove tertiary auxiliary transformer (TAT)	2009	2009	4	reliability	Proposed
Uprate Point Beach-Sheboygan Energy Center 345-kV circuit L111 to 167 degrees F	2010	2010	4	economics	Proposed
Reconfigure Kewaunee 345/138-kV switchyard and install a second 500 MVA 345/138-kV transformer	2011	2011	4	reliability, condition	Proposed
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2011	2011	4	reliability	Planned
Construct Canal-Dunn Road 138-kV line	2012	2012	4	reliability	Proposed
Install 60 MVA 138/69-kV transformer at Dunn Road	2012	2012	4	reliability	Proposed
Replace two existing 138/69-kV transformers at Glenview Substation with 100 MVA transformers	2016	2016	4	reliability	Provisional
Construct second Dunn Road-Egg Harbor 69-kV line	2016	2016	4	reliability	Provisional
Replace two existing 138/69-kV transformers at Sunset Point Substation with 100 MVA transformers	2018	2018	4	economic benefits	Provisional
Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation	2020	2020	4	reliability	Provisional

Table PR-17 (continued)
Zone 4 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Uprate the Melissa-Tayco to 229 MVA (300F)	2020	2020	4	reliability, economics	Provisional
Install 138/69-kV transformer at Custer Substation	2020	2020	4	reliability, economics	Provisional
Construct Shoto to Custer 138-kV line	2020	2020	4	reliability, economics	Provisional
Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV	2020	2020	4	reliability, condition	Provisional

Table PR-18
Zone 5 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Construct a 138-kV bus at Pleasant Valley Substation to permit second distribution transformer interconnection	2010	2010	5	T-D interconnection	Planned
Install 2-32 MVAR capacitor banks at Summit 138-kV Substation	2010	2010	5	reliability	Proposed
Expand 345-kV switchyard at Oak Creek to interconnect one new generator	2010	2010	5	new generation	Planned
Uprate Oak Creek-Root River 138-kV line	2010	2010	5	new generation	Planned
Uprate Oak Creek-Nicholson 138-kV line	2010	2010	5	new generation	Planned
Upgrade Bain-Albers 138-kV line	2010	2010	5	reliability	Proposed
Construct second Shorewood-Humboldt 138-kV underground cable	2012	2010	5	reliability	Proposed
Install 3-75 MVAR capacitor banks at Bluemound Substation	2012	2012	5	reliability	Proposed
Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	2010	2013	5	reliability	Provisional
Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer	2010	2013	5	reliability	Provisional

Table PR-18 (continued)
Zone 5 Transmission System Additions

System Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category	Planned, Proposed or Provisional
Upgrade Oak Creek-Pennsylvania 138-kV line	2015	2015	5	reliability	Provisional
Install 2-32 MVAR capacitor banks at Mukwonago 138-kV Substation	2019	2019	5	reliability	Provisional
Reconductor Ramsey-Harbor 138-kV line	TBD	TBD	5	reliability	Provisional

Table PR-19
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			
relieve overloads or low voltages under contingency	Construct a Jefferson-Tyranena-Stony Brook 138-kV line	13.9	13.9	2006	2009	35
T-D interconnection request	Construct 69-kV line from new Warrens Substation to the Council Creek-Tunnel City 69-kV line	4.5	4.5	2010	2010	1
T-D interconnection request	Construct Brandon-Fairwater 69-kV line	4	4	2010	2010	1
relieve overloads or low voltages under contingency	Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona with a 100 MVA summer normal rating	6.1	3	2009	2010	3
T-D interconnection request	Construct 115-kV line from new Woodmin Substation to the Clear Lake Substation	7.5	7.5	2012	2012	1
T-D interconnection request, relieve overloads or low voltages under contingency	Construct tap from the Kinross load to Pine River/Nine Mile 69-kV line	2	2	2012	2012	2
relieve overloads or low voltages under contingency	Construct 345-kV line from Rockdale to West Middleton	32.4	32.4	2013	2013	3
T-D interconnection request	Construct a 69-kV line from SW Ripon to the Ripon-Metomen 69-kV line	1.5	1.5	2014	2014	1
relieve overloads or low voltages under contingency, T-D interconnection request	Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation	5.1	5.1	2016	2016	35
relieve overloads or low voltages under contingency	Construct second Dunn Road-Egg Harbor 69-kV line	12.66	12.66	2016	2016	4
relieve overloads or low voltages under contingency	Construct a Lake Delton-Birchwood 138-kV line	5	5	2017	2017	31
relieve overloads or low voltages under contingency	Construct Fairwater-Mackford Prairie 69-kV line	0	5	2018	2018	1
T-D interconnection request,relieve overloads or low voltages under contingency	Construct Spring Valley-Twin Lakes-South Lake Geneva 138-kV line	24.0	15	2018	2018	35
relieve overloads or low voltages under contingency	Construct a Horicon-East Beaver Dam 138-kV line	10	10	2019	2019	34
relieve overloads or low voltages under contingency, economics	Construct Shoto to Custer 138-kV line	9.94	9.94	2020	2020	4

**Table PR-20
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on
Existing Right-of-Way**

Identified need	Lines to be rebuilt/reconducted on existing ROW	Approx. mileage of rebuilt, reconducted or uprated lines	System need year	Projected In-service year	Planning zone
asset renewal	Rebuild Arpin-Rocky Run 345-kV line	20	2010	2010	1
relieve overloads or low voltages under contingency, transfer capability	Rebuild/convert Conover-Plains 69-kV line to 138 kV	71	2010	2010	2
economics	Construct second Paddock-Rockdale 345-kV line and replace 345/138-kV transformer T22 at Rockdale Substation	30	2010	2010	3
accommodate new generation	Uprate Oak Creek-Nicholson 138-kV line	6.8	2010	2010	5
relieve overloads or low voltages under contingency	Construct second Shorewood-Humboldt 138-kV underground cable	0.75	2012	2010	5
Completion of earlier project per agreement with the City of Madison	Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	2	2010	2011	3
relieve overloads or low voltages under contingency, asset renewal	Rebuild the Y-119 Verona to Oregon 69-kV line	11	2008	2011	3
generation interconnection, relieve overloads or low voltages under contingency	Rebuild Y-33 Brodhead to South Monroe 69-kV line	18	2011	2011	3
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	2011	2011	4
relieve overloads or low voltages under contingency	Rebuild/convert Straits-Pine River 138-kV lines 6904/5	50	2012	2012	2
relieve overloads or low voltages under contingency	Construct/convert Pine River-Nine Mile 138/69-kV double-circuit line	40	2012	2012	2
relieve overloads or low voltages under contingency, asset renewal, potential T-D interconnection request	Rebuild part of the Y-8 Dane-Dam Heights 69-kV line	5	2015	2012	31
relieve overloads or low voltages under contingency	Construct Canal-Dunn Road 138-kV line	7.64	2012	2012	4
economics, relieve overloads or low voltages under contingency	Construct Monroe County-Council Creek 161-kV line and Timberwolf 69-kV switching station	17.9	2013	2013	1
economics, relieve overloads or low voltages under contingency	Uprate Council Creek-Petenwell 138-kV line	32	2013	2013	1

Table PR-20
Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way

Identified need	Lines to be rebuilt/reconstructed on existing ROW	Approx. mileage of rebuilt, reconstructed or updated lines	System need year	Projected In-service year	Planning zone
relieve overloads or low voltages under contingency	Increase ground clearance of M38-Atlantic 69-kV line from 120 to 167 degrees F	22	2009	2013	2
relieve overloads or low voltages under contingency, asset renewal	Rebuild Y-32 Colley Road-Brick Church 69-kV line	19.7	2013	2013	3
relieve overloads or low voltages under contingency	Construct Gwinn-Forsyth second 69-kV line	1	2014	2014	2
relieve overloads or low voltages under contingency	Upgrade the 6986 Royster to Sycamore 69-kV line to 115 MVA	3.35	2016	2016	3
relieve overloads or low voltages under contingency	Construct West Middleton-Blount 138-kV line	5	2017	2017	3
relieve overloads or low voltages under contingency	Construct 69-kV double-circuit line between McCue and Lamar substations	4.0	2017	2017	3
relieve overloads or low voltages under contingency, asset renewal	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV	21.2	2020	2020	4
relieve overloads or low voltages under contingency	Reconductor Ramsey-Harbor 138-kV line	8.4	TBD	TBD	5

**Table PR-21
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			
relieve overloads under contingency	Construct 138 kV bus and install a 138/69 kV, 60 MVA transformer at Aspen Substation	60	0	2010	2010	2
relieve overloads under contingency, replace aging facilities	Reconfigure Kewaunee 345/138-kV switchyard and install a second 500 MVA 345/138-kV transformer	500	0	2011	2011	4
relieve overloads under contingency	Install 138/69-kV 150 MVA transformer at Pine River	150	0	2012	2012	2
relieve overloads under contingency	Install 138/69-kV 150 MVA transformer at Nine Mile	150	0	2012	2012	2
relieve overloads under contingency	Install 138/69-kV 150 MVA transformer at Lakehead Rapid River	150	0	2012	2012	2
relieve overloads under contingency	Install 60 MVA 138/69-kV transformer at Dunn Road	60	0	2012	2012	4
economics, relieve overloads under contingency	Install a 161/138-kV transformer at Council Creek Substation	100	0	2013	2013	1
relieve overloads under contingency	Install second Chandler 138/69-kV transformer	0	40	2013	2013	2
relieve overloads under contingency	Install a 138/69-kV transformer at Bass Creek Substation	100	0	2010	2013	3
relieve overloads under contingency	Construct a 345-kV bus and install a 345/138 kV 500 MVA transformer at West Middleton Substation	500	0	2013	2013	3
relieve overloads under contingency	Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer	500	672	2010	2013	5
relieve overloads under contingency	Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer	47	0	2015	2015	3
relieve overloads under contingency	Uprate Columbia 345/138-kV transformer T-22 to 527 MVA	527	400	2015	2015	3
relieve overloads under contingency	Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating	100	0	2016	2016	3
relieve overloads under contingency	Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation	100	0	2016	2016	35
relieve overloads under contingency	Replace two existing 138/69-kV transformers at Glenview Substation with 100 MVA transformers	200	116	2016	2016	4

**Table PR-21
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			
relieve overloads under contingency	Install a second 138/69-kV transformer at Wautoma Substation	100	0	2017	2017	1
relieve overloads under contingency	Replace 138/69-kV transformer at Metomen Substation	100	47	2017	2017	1
relieve overloads under contingency	Convert Necedah distribution substation from 69 kV to 138 kV	N/A	N/A	2018	2018	1
economic benefits	Replace two existing 138/69-kV transformers at Sunset Point Substation with 100 MVA transformers	200	142	2018	2018	4
relieve overloads under contingency, economics	Install 138/69-kV transformer at Custer Substation	100	0	2020	2020	4
relieve overloads under contingency	Construct a 345-kV bus, install a 345/138-kV 500 MVA transformer at North Randolph and loop the Columbia to South Fond Du Lac 345-kV line into the substation	500	0	2021	2021	34

**Table PR-22
Substation Equipment Additions and Replacements**

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	Uprate the Chandler-Masonville 69-kV line summer normal and emergency ratings from 120 deg F to 167 deg F	N/A	2009	2009	2
relieve overloads or low voltages under contingency	Install 1-4.08 MVAR capacitor bank at L'Anse 69 kV	4.08	2008	2009	2
relieve overloads or low voltages under contingency, asset renewal	Construct ring bus at the Pine River 69-kV Substation and replace 1-5.4 MVAR capacitor bank with 2-4.08 MVAR banks	2.76	2008	2009	2
relieve overloads or low voltages under contingency	Install 1-8.16 MVAR capacitor banks at the M38 138-kV Substation	8.16	2009	2009	2
relieve overloads or low voltages under contingency	Uprate Chandler-Cornell 69-kV line clearance from 120 to 167 deg F	N/A	2009	2009	2
relieve overloads or low voltages under contingency	Install 1-8.2 MVAR capacitor bank at Hiawatha 138-kV Substation	8.2	2009	2009	2
relieve overloads or low voltages under contingency	Install 1-4.08 MVAR capacitor banks at Osceola 69 kV	4.08	2009	2009	2
relieve overloads or low voltages under contingency	Uprate the Chandler-Delta #1 69-kV line summer emergency rating from 120 deg F to 167 deg F	N/A	2009	2009	2
relieve overloads or low voltages under contingency	Uprate the Chandler-Delta #2 69-kV line summer emergency rating to from 120 deg F 167 deg F	N/A	2009	2009	2
relieve overloads or low voltages under contingency	Uprate X-8 Rockdale to Boxelder 138-kV line	N/A	2008	2009	35
relieve overloads or low voltages under contingency	Uprate Y-41 Walworth-North Lake Geneva 69-kV to achieve a 69 MVA summer emergency rating	N/A	2009	2009	3
relieve overloads or low voltages under contingency	Install a second 138-kV reserve auxiliary transformer (RAT) at Kewaunee and remove tertiary auxiliary transformer (TAT)	N/A	2009	2009	4
T-D interconnection request	Construct a 138-kV bus at Pleasant Valley Substation to permit second distribution transformer interconnection	N/A	2010	2010	5
relieve overloads or low voltages under contingency, asset renewal	Replace Metomen 69-kV breaker	N/A	2010	2010	1
relieve overloads or low voltages under contingency	Install 1-16.33 MVAR capacitor bank at Indian Lake 138-kV Substation	16.33	2010	2010	2
relieve overloads or low voltages under contingency	Uprate Y-61 McCue-Lamar 69-kV line to achieve 300 deg F line ratings and install 2-12.45 Mvar 69 kV capacitor banks at Lamar Substation	24.9	2008	2010	3

**Table PR-22
Substation Equipment Additions and Replacements**

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	Uprate X-23 Colley Road-Marine 138-kV line terminals	N/A	2014	2010	3
relieve overloads or low voltages under contingency	Upgrade Sheepskin capacitor bank from 10.8 MVAR to 16.2 MVAR	5.4	2009	2010	3
relieve overloads or low voltages under contingency	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation	32	2010	2010	3
relieve overloads or low voltages under contingency	Uprate the Royster Substation terminals	N/A	2010	2010	3
relieve overloads or low voltages under contingency	Install 2-32 MVAR capacitor banks at Summit 138-kV Substation	64	2010	2010	5
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
economics	Uprate Point Beach-Sheboygan Energy Center 345-kV circuit L111 to 167 degrees F	N/A	2010	2010	4
relieve overloads or low voltages under contingency	Upgrade Bain-Albers 138-kV line	N/A	2010	2010	5
relieve overloads or low voltages under contingency	Install 1-4.08 MVAR capacitor bank at North Bluff 69-kV Substation	4.08	2010	2011	2
relieve overloads or low voltages under contingency	Uprate terminal limitations at McCue for the Y-79 McCue-Milton Lawns 69-kV line	N/A	2011	2011	35
relieve overloads or low voltages under contingency	Install 2-24.5 MVAR 138-kV capacitor bank and 1-18 MVAR 69-kV capacitor bank at Brick Church substation	67	2011	2011	35
relieve overloads or low voltages under contingency	Install 3-75 MVAR capacitor banks at Bluemound Substation	200	2012	2012	5
relieve overloads or low voltages under contingency	Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings	N/A	2012	2012	2
relieve overloads or low voltages under contingency	Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating	N/A	2017	2012	3
relieve overloads or low voltages under contingency	Upgrade McKenna 6.3 MVAR capacitor bank to 12.25 MVAR and install a second new 12.25 MVAR capacitor bank	15.3	2013	2013	1
relieve overloads or low voltages under contingency	Uprate Fitchburg-Nine Springs 69-kV and Royster-Pflaum 69-kV lines and move AGA load to the Royster-Femrite 69-kV line	N/A	2006	2013	3

**Table PR-22
Substation Equipment Additions and Replacements**

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 2-16.33 MVAR 69-kV capacitor banks at Nine Springs Substation	32.66	2013	2013	3
relieve overloads or low voltages under contingency	Uprate X-12 Town Line Road-Bass Creek 138-kV line to 300 deg F	N/A	2010	2013	3
relieve overloads or low voltages under contingency	Uprate Y-61 Sheepskin-Dana 69-kV line to 95 MVA	N/A	2013	2013	3
relieve overloads or low voltages under contingency	Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	N/A	2010	2013	5
relieve overloads or low voltages under contingency	Uprate Munising-Seney-Blanney Park 69-kV line to 167 degrees F	N/A	2014	2014	2
relieve overloads or low voltages under contingency	Install 2-16.33 MVAR 69-kV capacitor banks and 2-24.5 MVAR 138-kV capacitor banks at Femrite Substation	81.66	2014	2014	3
relieve overloads or low voltages under contingency	Install 1-16.33 MVAR 69-kV capacitor bank at Verona Substation	16.33	2014	2014	3
relieve overloads or low voltages under contingency	Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	10.8	2015	2015	3
relieve overloads or low voltages under contingency	Upgrade Oak Creek-Pennsylvania 138-kV line	N/A	2015	2015	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 Substation	12.3	2016	2016	1
relieve overloads or low voltages under contingency	Uprate X-67 Portage-Trienda 138-kV line to 373 MVA	N/A	2016	2016	31
relieve overloads or low voltages under contingency	Install 2-16.33 MVAR 69-kV capacitor banks at Eden Substation	32.66	2016	2016	3
relieve overloads or low voltages under contingency, economics	Install 4-49 MVAR 138-kV capacitor banks at Concord Substation	196	2016	2016	35
relieve overloads or low voltages under contingency	Install 2-16.33 Mvar 69-kV capacitor banks at Sun Prairie	32.66	2016	2016	3
relieve overloads or low voltages under contingency, economic benefits	Uprate Castle Rock-Mckenna 69-kV line	N/A	2017	2017	1
relieve overloads or low voltages under contingency	Uprate Y159 Brick Church-Walworth 69-kV line to 115 MVA	N/A	2017	2017	35
relieve overloads or low voltages under contingency	Install 2-12.25 MVAR 69-kV capacitor banks at Mazomanie Substation	24.5	2017	2017	3

**Table PR-22
Substation Equipment Additions and Replacements**

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 2-16.33 Mvar 69-kV capacitor banks at Dam Heights	32.66	2017	2017	31
relieve overloads or low voltages under contingency	Install 2-16.33 Mvar 69-kV capacitor banks at North Monroe	32.66	2018	2018	3
relieve overloads or low voltages under contingency	Install 2-32 Mvar capacitor banks at Mukwonago 138-kV Substation	64	2019	2019	5
relieve overloads or low voltages under contingency	Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation	28.8	2020	2020	4
relieve overloads or low voltages under contingency, economics	Uprate the Melissa-Tayco to 229 MVA (300F)	N/A	2020	2020	4
relieve overloads or low voltages under contingency	Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap	N/A	2021	2021	1
relieve overloads or low voltages under contingency	Install 2-16.33 Mvar 69-kV capacitor banks at Rio	32.66	2022	2022	34
relieve overloads or low voltages under contingency	Install a 12.2 MVAR capacitor bank at Hilltop 69-kV Substation	12.2	2023	2023	1

Table PR-23

Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment

PROJECTS CANCELED	Former In-Service Date	Planning Zone	Reason for Removal
A second distribution transformer at Somers Substation requires a rebuild of the Racine-Somers-Albers 138-kV line; extend Albers 138-kV bus to permit connecting the Racine-Somers-Albers radial line to the Albers 138-kV bus	2011	5	Updated study results
Construct a 345-kV bus at Bain Substation	2008	5	Updated study results
Install a second 138/69-kV transformer at McCue Substation	2016	3	Updated study results
Upgrade Bain-Kenosha 138-kV line	2013	5	Equipment replaced during construction of another project
Install 2-16.3 MVAR capacitor bank at Mears Corners 138-kV Substation	TBD	4	Updated load/model information
Install 2-16.3 MVAR capacitor bank at Rosiere 138-kV Substation	TBD	4	Updated load/model information
Construct Evansville-Brooklyn 69-kV line	TBD	3	Updated load/model information
Construct Verona-North Monroe 138-kV line	TBD	3	Updated load/model information
Replace the 1200 A breaker at Edgewater T22 345/138-kV transformer	TBD	4	Equipment replaced during construction of another project
Uprate 138-kV line from Kewaunee to East Krok	TBD	4	Updated load/model information
Rebuild Blaney Park-Munising 69 kV to 138 kV	2014	2	Upper Peninsula Collaborative updated study results
Install 2-16.3 MVAR capacitor bank at Aviation Substation	TBD	4	Updated load/model information
PROJECTS DEFERRED	New Date	Planning Zone	Reason for Deferral
Construct a 138-kV bus at Pleasant Valley Substation to permit second distribution transformer interconnection	2010	5	Was 2009; Resource scheduling requirements
Uprate Y-61 McCue-Lamar 69-kV line to achieve 300 deg F line ratings and install 2-12.45 Mvar 69-kV capacitor banks at Lamar Substation	2010	3	Was 2009 and provisional status; now proposed; delay due to resource scheduling requirements
Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR	2011	4	Was 2009; Resource scheduling requirements

Table PR-23**Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment**

PROJECTS DEFERRED	New date	Planning Zone	Reason for Deferral
Install 3-75 MVAR capacitor banks at Bluemound Substation	2012	5	Was 2010; Resource scheduling requirements
Construct Monroe County-Council Creek 161-kV line and Timberwolf 69-kV switching station	2013	1	Was 2012; coordination with other entities
Install a 161/138-kV transformer at Council Creek Substation	2013	1	Was 2012; coordination with other entities
Uprate Council Creek-Petenwell 138-kV line	2013	1	Was 2012; coordination with other entities
Rebuild Y-32 Colley Road-Brick Church 69-kV line	2013	3	Was 2012; Resource scheduling requirements
Uprate X-12 Town Line Road-Bass Creek 138-kV line to 300 deg F	2013	3	Was 2012; Resource scheduling requirements
Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962	2013	5	Was 2010 proposed status, now provisional; updated study results
Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer	2013	5	Was 2010, Resource scheduling requirements
Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank	2015	3	Was 2013; updated load/model information
Upgrade Oak Creek-Pennsylvania 138-kV line	2015	5	Was 2014; updated load/model information
Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating	2016	3	Was 2013; updated load/model information
Uprate X-67 Portage-Trienda 138-kV line to 373 MVA	2016	3	Was 2014; updated load/model information
Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation	2016	3	Was 2015; updated study results
Construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation	2016	3	Was 2015; updated study results

Table PR-23**Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment**

PROJECTS DEFERRED (continued)	New date	Planning Zone	Reason for Deferral
Install 2-16.33 MVAR 69-kV capacitor banks at Eden Substation	2016	3	Was 2014; updated load/model information
Install 4-49 MVAR 138-kV capacitor banks at Concord Substation	2016	3	Was 2011; updated load/model information
Replace two existing 138/69-kV transformers at Glenview Substation with 100 MVA transformers	2016	4	Was 2014; updated load/model information
Replace 138/69-kV transformer at Metomen Substation	2017	1	Was 2013; now a two-phased approach – breaker replaced in 2010, transformer in 2017
Uprate Y159 Brick Church-Walworth 69-kV line to 115 MVA	2017	3	Was 2015; updated load/model information
Construct a Lake Delton-Birchwood 138-kV line	2017	3	Was 2015; updated load/model information
Install 2-12.25 MVAR 69-kV capacitor banks at Mazomanie Substation	2017	3	Was 2014; updated load/model information
Construct a Horicon-East Beaver Dam 138-kV line	2019	3	Was 2014; updated load/model information
Install 2-32 Mvar capacitor banks at Mukwonago 138-kV Substation	2019	5	Was 2014; updated load/model information
Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation	2020	4	Was 2016; updated load/model information
Uprate the Melissa-Tayco to 229 MVA (300F)	2020	4	Was 2016; updated load/model information
Install 138/69-kV transformer at Custer Substation	2020	4	Was 2016; updated load/model information
Construct Shoto to Custer 138-kV line	2020	4	Was 2016; updated load/model information
Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV	2020	4	Was 2016; updated load/model information

Table PR-23

Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment

PROJECTS DEFERRED (continued)	New date	Planning Zone	Reason for Deferral
Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap	2021	1	Was 2018; updated load/model information
Construct a 345-kV bus, install a 345/138-kV 500 MVA transformer at North Randolph and loop the Columbia to South Fond Du Lac 345-kV line into the substation	2021	3	Was 2018; updated load/model information
Install 2-16.33 Mvar 69-kV capacitor banks at Rio	2022	3	Was 2019; updated load/model information
OTHER PROJECT CHANGES AND POSSIBLE CHANGES	Date	Planning Zone	Nature of Change or Update
Install 1-8.2 MVAR capacitor bank at Hiawatha 138-kV Substation	2009	2	Was 16.33 MVAR capacitor bank
Uprate the Chandler-Delta #1 69-kV line summer emergency rating from 120 deg F to 167 deg F	2009	2	Was 2010 in-service date
Uprate the Chandler-Delta #2 69-kV line summer emergency rating to from 120 deg F 167 deg F	2009	2	Was 2010 in-service date
Replace Metomen 69-kV breaker	2010	1	Metomen xfmr project broken into two pieces; Phase I 2010 and Phase II 2017
Uprate X-23 Colley Road-Marine 138-kV line terminals	2010	3	Was 2014 in-service date
Construct second Shorewood-Humboldt 138-kV underground cable	2010	5	Was 2012 in-service date
Install 1-4.08 MVAR capacitor bank at North Bluff 69-kV Substation	2011	2	Was yet to be determined in-service date
Replace two overhead Blount-Ruskin 69-kV lines with one underground 69-kV line	2011	3	Was yet to be determined in-service date, provisional status now proposed

Table PR-23**Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment**

OTHER PROJECT CHANGES AND POSSIBLE CHANGES (continued)	Date	Planning Zone	Nature of Change or Update
Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings	2012	2	Was yet to be determined in-service date
Rebuild part of the Y-8 Dane-Dam Heights 69-kV line	2012	3	Was 2015 in-service date; now combined with earlier maintenance project
Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating	2012	3	Was 2014 in-service date
Uprate Fitchburg-Nine Springs 69-kV and Royster-Pflaum 69-kV lines and move AGA load to the Royster-Femrite 69-kV line	2013	3	Was loop Nine Springs-Pflaum into Femrite
Construct second Dunn Road-Egg Harbor 69-kV line	2016	4	Was proposed status, now provisional
Uprate Castle Rock-Mckenna 69-kV line	2017	1	Was 2018 in-service date
NEW PROJECTS	In-Service Date	Planning Zone	Reason for Project
Uprate Point Beach-Sheboygan Energy Center 345-kV circuit L111 to 167 degrees F	2010	4	Market congestion
Rebuild/convert Straits-Pine River 138-kV lines 6904/5	2012	2	Upper Peninsula Collaborative study results
Install 138/69-kV 150 MVA transformer at Pine River	2012	2	Upper Peninsula Collaborative study results
Install 138/69-kV 150 MVA transformer at Nine Mile	2012	2	Upper Peninsula Collaborative study results
Install 138/69-kV 150 MVA transformer at Lakehead Rapid River	2012	2	Upper Peninsula Collaborative study results
Construct tap from the Kinross load to Pine River/Nine Mile 69-kV line	2012	2	Upper Peninsula Collaborative study results
Construct/convert Pine River-Nine Mile 138/69-kV double-circuit line	2012	2	Upper Peninsula Collaborative study results
Install second Chandler 138/69-kV transformer	2013	2	Upper Peninsula Collaborative study results
Install 2-16.33 MVAR 69-kV capacitor banks at Nine Springs Substation	2013	3	Upper Peninsula Collaborative study results

Table PR-23

Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2009 10-Year Assessment

NEW PROJECTS (continued)	In-Service Date	Planning Zone	Reason for Project
Uprate Munising-Seney-Blaney Park 69-kV line to 167 degrees F	2014	2	Upper Peninsula Collaborative study results
Construct Gwinn-Forsyth second 69-kV line	2014	2	Upper Peninsula Collaborative study results

*Table AR-1
Transmission System Additions – Asset Renewal Line Work*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Rebuild Plainfield-Chaffee Creek 69-kV line Y-90	2010	1	Improve condition and increase reliability performance of existing line	F1699
Rebuild Auburndale-Sigel 69-kV line Y-107	2010	1	Improve condition and increase reliability performance of existing line	F1732
Rebuild Rocky Run-Arpin 345-kV line W-8	2010	1	Improve condition and increase reliability performance of existing line	F2252
Rebuild Deer Trail-Whitcomb 69-kV line Y-86	2010	1	Improve condition and increase reliability performance of existing line	F2410
Rebuild Mauston-Hilltop 69-kV line Y-89	2010	1	Improve condition and increase reliability performance of existing line	F2345
Rebuild Wautoma-Berlin 69-kV line Y-95	2011	1	Improve condition and increase reliability performance of existing line	F2386
Re-insulate Winneconne-Berlin 69-kV line Y-80	2012	1	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Harrison-Iola 69-kV line Y56 CWEC Iola Tap	2012	1	Improve condition and increase reliability performance of existing line.	TBD
Rebuild North Point-Rocky Run 115-kV line T-20	2016	1	Improve condition and increase reliability performance of existing line.	TBD

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Rebuild Wautoma-Portage 69-kV line Y17	2017	1	Improve condition and increase reliability performance of existing line	TBD
Planning to reconfigure with Fairwater/Ripon to North Randolph, 69-kV line Y26	2018	1	Improve condition and increase reliability performance of existing line	TBD
Rebuild Whiting Avenue-Plover 115-kV line B-106	2019	1	Improve condition and increase reliability performance of existing line	TBD
Replace select poles on Coyne-Saratoga 115-kV line T-72	2020	1	Improve condition and increase reliability performance of existing line	TBD
Re-insulate top phase and add additional arresters on Chandler-Forsyth 69-kV line (Chandler line)	2010	2	Improve condition and increase reliability performance of existing line	F2786
Improve clearances, install arresters on portions of line, replace select components on Roberts-9 Mile 69-kV line 6952	2011	2	Improve condition and increase reliability performance of existing line	F2037
Re-insulate and improve grounding on Munising-Forsyth 138-kV line (Munising 138 line)	2012	2	Improve condition and increase reliability performance of existing line	TBD
Reinsulate, add arresters, replace select poles on Munising-Gwinn 69-kV line (Autrain line)	2013	2	Improve condition and increase reliability performance of existing line	TBD
Reinsulate, add arresters, replace select poles on Blaney Park-Munising 69-kV line (Inland line)	2014	2	Improve condition and increase reliability performance of existing line	TBD

Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Re-insulate Portage-9 Mile 69-kV lines 6901/6902	2014	2	Improve condition and increase reliability performance of existing line	TBD
Re-insulate and install arresters on KI Sawyer-Gwinn 69-kV line (Sawyer line)	2014	2	Improve condition and increase reliability performance of existing line	TBD
Install new cross arms on Atlantic-M38 69-kV line (Atlantic 69 line)	2014	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and cross arms on Rexton-Hiawatha 69-kV line ESE_6908	2015	2	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on Magazine-Nine Mile/Three Mile 69-kV line ESE_6903	2015	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and re-insulate Conover-Mass 69-kV line 6530	2018	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and re-insulate Powers-Chalk Hill 69-kV line 6910	2018	2	Improve condition and increase reliability performance of existing line	TBD
Replace one circuit with new 3C XPLE submarine cable on McGulpin-Straits 138-kV line 9901	2020	2	Improve condition and increase reliability performance of existing line	TBD
Replace one circuit with new 3C XPLE submarine cable on McGulpin-Straits 138-kV line 9903	2020	2	Improve condition and increase reliability performance of existing line	TBD

Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Remove the wishbone arms and install HLP insulators on Venture-Janesville 138-kV line X-24	2009	3	Improve condition and increase reliability performance of existing line	F2761
Rebuild Miner-Hillman 69-kV line Y-130	2010	3	Improve condition and increase reliability performance of existing line	F2346
Rebuild Forward-Rock Branch 69-kV line Y-135	2010	3	Improve condition and increase reliability performance of existing line	F1715
Rebuild Stage Coach-Spring Green 69-kV line Y-62	2010	3	Improve condition and increase reliability performance of existing line	F1656
Rebuild Dane-Dam Heights 69-kV line Y-8	2010	3	Improve condition and increase reliability performance of existing line	F1602
Rebuild Boscobel-Gran Grae 69-kV line Y-40	2010	3	Improve condition and increase reliability performance of existing line	F1444
Install anti-galloping and grounding improvements on Columbia-South Fond Du Lac 345-kV line W5	2011	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Pardeeville Tap-North Randolph/Rio 69-kV line Y-64	2011	3	Improve condition and increase reliability performance of existing line	F2389
Replace underground cable on East Towne-Sycamore 69-kV line 6987	2012	3	Improve condition and increase reliability performance of existing line.	TBD

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Replace underground cable on East Towne to Sycamore 69-kV line 6988	2012	3	Improve condition and increase reliability performance of existing line.	TBD
Replace underground with overhead cable on Pheasant Branch-West Middleton 69-kV line 6963	2012	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Portage-Dam Heights 69-kV line Y16	2013	3	Improve condition and increase reliability performance of existing line.	TBD
Rebuild Rubicon-Concord 138-kV line 9061	2013	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Eden-Hillman 69-kV line Y105	2018	3	Improve condition and increase reliability performance of existing line.	TBD
Replace underground cable on Stagecoach-West Middleton 69-kV line 6927	2019	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild and reconductor Sauk Trail-20 th Street 138-kV line X-37	2009	4	Improve condition and increase reliability performance of existing line.	F2684
Re-insulate South Fond du Lac-Edgewater 345-kV line W1	2010	4	Improve condition and increase reliability performance of existing line	F2765
Replace shield wire on Stiles-Pulliam 138-kV lines KK64441-64451	2011	4	Improve condition and increase reliability performance of existing line	F2383

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Rebuild Mears-Woodenshoe 138-kV line A-79	2012	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Sunset Point-Mears 138-kV line MCRG21	2012	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Highway V-Oak Street 69-kV line Z-26	2013	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Manrap-Wesmark 69-kV line R-44	2013	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Finger Road-Highway V 69-kV line U-47	2014	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Sawyer-Dykesville 69-kV line DYKY21	2015	4	Improve condition and increase reliability performance of existing line	F2801
Replace the submarine cable on First Avenue-Redwood 69-kV line T-46	2015	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Neevin-Butte Des Morts 138-kV line 43021	2015	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Pioneer-Sobieski 69-kV line E-83 Tap	2016	4	Improve condition and increase reliability performance of existing line	TBD

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Rebuild Sobieski-Bayport 69-kV line T-98	2016	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Danz-Finger Road 69-kV line L-64	2016	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Woodenshoe-Neevin 138-kV line 80952	2016	4	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on University-Danz Avenue 69-kV line O-15	2017	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Butte des Morts-North Appleton 138-kV line 6853	2017	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Custer-New Holstein 69-kV line P-68	2019	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Goodman-Caldron Falls 69-kV line J-88	2019	4	Improve condition and increase reliability performance of existing line	TBD
Replace select poles on Howard-Pulliam 138-kV line D-82	2019	4	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on Erdman-Lodestar 138-kV line X-48	2019	4	Improve condition and increase reliability performance of existing line	TBD

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Replace underground cable on Edgewater-Erdman 69-kV line Y-31	2021	4	Improve condition and increase reliability performance of existing line	TBD
Shield wire replacement Norwich-43 rd St Terminal 138-kV line NWHG61	2012	5	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Racine-Somers 138-kV line 1645	2012	5	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Racine-Kenosha 138-kV line 1651	2012	5	Improve condition and increase reliability performance of existing line	TBD
Replace shield wire on Granville-Tosa 138-kV line 3452	2013	5	Improve condition and increase reliability performance of existing line	TBD
Replace shield wire on Butler-Bluemound 138-kV line 5061	2013	5	Improve condition and increase reliability performance of existing line	TBD
Replace shield wire on Tosa-Bluemound 138-kV line 5041	2013	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild St. Martins-Edgewood 138-kV line 3013	2014	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild and add breaker on Edgewood-Mukwonago 138-kV line 671K61	2014	5	Improve condition and increase reliability performance of existing line	TBD

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Rebuild Hartford-St. Lawrence 138-kV line 8031	2014	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Cooney-Concord 138-kV line 9042	2014	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Summit-Waukesha 138-kV line 7021	2015	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Summit-Merrill Hills 138-kV line 3551	2017	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Albers-Paris 138-kV line 3124	2018	5	Improve condition and increase reliability performance of existing line	TBD

Table AR-2
Asset Renewal Transformer Replacements

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category	Cost Estimate – Refer to <i>Funding Project</i> and Sum of Total (2009-2018) in Asset Renewal Financial Table
Council Creek T31	2010	138/69-kV	1	Improve condition, reliability	F2340
North Fond du Lac T31 and T32	2010	138/69-kV	4	Improve condition, reliability	F2343
Ellinwood T2	2011	138/69-kV	4	Improve condition, reliability	F2024
Aurora T3	2011	138/69-kV	1	Improve condition, reliability	F2419
Bluemound T3	2011	230/138-kV	5	Improve condition, reliability	F2604
Bluemound T1	2012	230/138-kV	5	Improve condition, reliability	F2799
Edgewater T31 and T32	2012	138/69-kV	4	Improve condition, reliability	TBD
North Appleton T3	2012	345/138-kV	4	Improve condition, reliability	TBD
Replace two transformers	2013	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2014	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2014	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2015	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2016	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2016	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2017	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2018	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2018	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2019	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2020	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2020	345/138-kV	various	Improve condition, reliability	TBD

Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Circuit breaker replacements	2010	Various	CT Deficiency, Control scheme incompatibility (2 units) 69 kV	Various
Circuit breaker replacements	2010	Various	End of life, parts obsolescence (1 unit) 69 kV	Various
Circuit breaker replacements	2010	Various	Mechanism design issues (2 units) 69 kV	Various
Circuit breaker replacements	2010	Various	Type S bushings (1 unit) 69 kV	Various
Circuit breaker replacements	2010	Various	Type U bushings (29 units) 69 kV	Various
Circuit breaker replacements	2010	Various	End of life, part obsolescence (4 units) 138 kV	Various
Circuit breaker replacements	2010	Various	Type U bushings (17 units) 138 kV	Various
Circuit breaker replacements	2010	Various	CT deficiency, control scheme incompatibility (1 unit) 230 kV	Various
Circuit breaker replacements	2010	Various	Type U bushing (9 units) 230 kV	Various

Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers (continued)

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Circuit breaker replacements	2010	Various	EPA SF6 emission reduction (2 units) 345 kV	Various
Circuit breaker replacements	2011	Various	Mechanism design issues (4 units) 69 kV	Various
Circuit breaker replacements	2011	Various	Type U bushings (26 units) 69 kV	Various
Circuit breaker replacements	2011	Various	End of life, parts obsolescence (1 unit) 138 kV	Various
Circuit breaker replacements	2011	Various	Type U bushings (18 units) 138 kV	Various
Circuit breaker replacements	2011	Various	CT deficiency, control scheme incompatibility (2 units) 230 kV	Various
Circuit breaker replacements	2011	Various	Over duty rating (2 units) 230 kV	Various
Circuit breaker replacements	2012	Various	End of life, parts obsolescence (2 units) 69 kV	TBD
Circuit breaker replacements	2012	Various	Type U bushings (40 units) 69 kV	TBD

Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers (continued)

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2009-2018) in Asset Renewal Financial Table
Circuit breaker replacements	2012	Various	Type U bushings (8 units) 138 kV	TBD
Circuit breaker replacements	2012-2020	Various	End of life, parts obsolescence (12 units) 69 kV	TBD
Circuit breaker replacements	2012-2020	Various	Mechanism design issues (64 units) 69 kV	TBD
Circuit breaker replacements	2012-2020	Various	End of life, parts obsolescence (13 units) 138 kV	TBD
Circuit breaker replacements	2012-2020	Various	Over duty rating (4 units) 138 kV	TBD
Circuit breaker replacements	2012-2020	Various	Bushing flange oil leak (27 units) 345 kV	TBD
Circuit breaker replacements	2012-2020	Various	End of life, parts obsolescence (8 units) 345 kV	TBD
Circuit breaker replacements	2012-2020	Various	EPA SF6 emission reduction (8 units) 345 kV	TBD

Figure PF-1

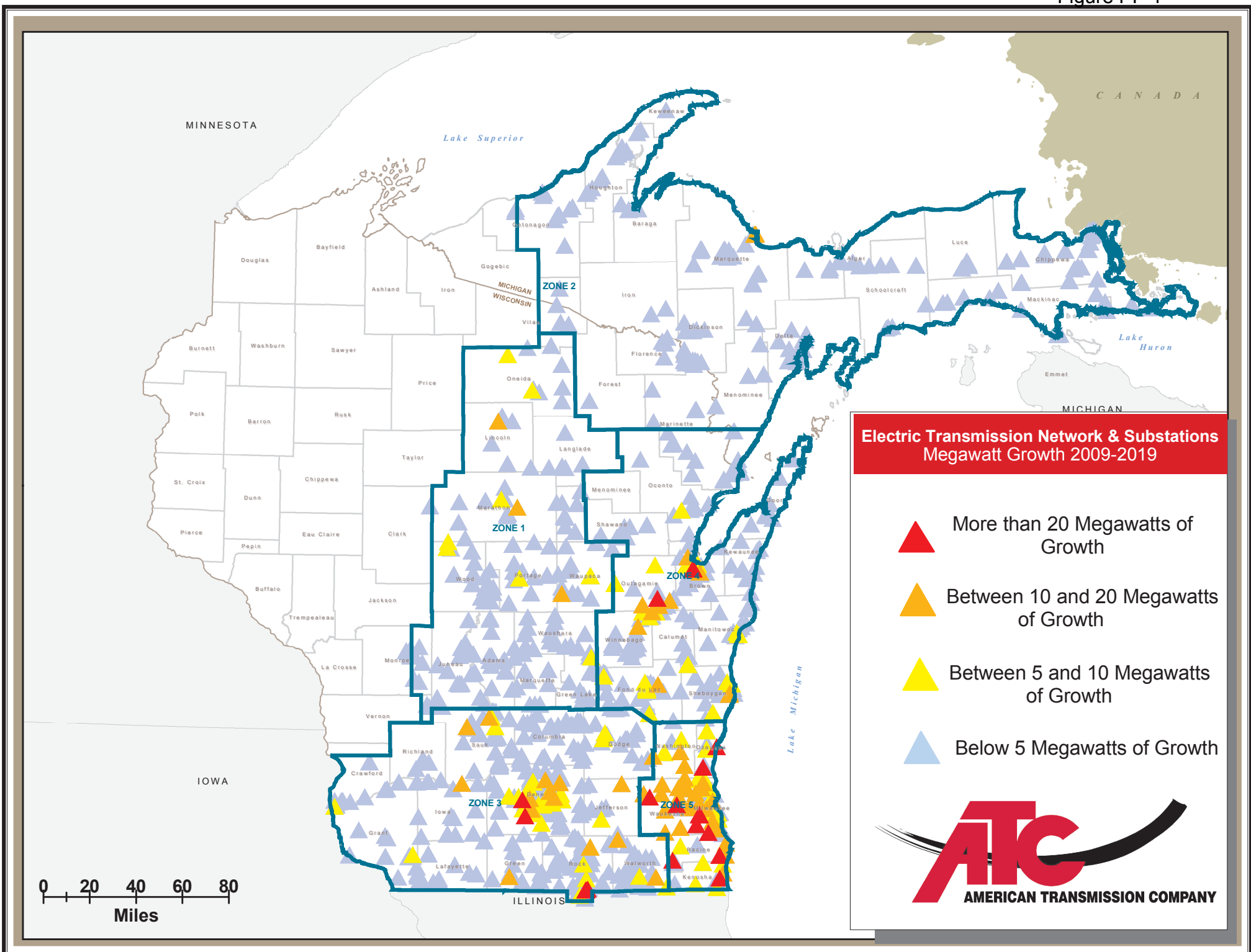


Figure PF-2

