



Zone 5 Updated Study Results

Refer to Table PR-22 Summary of Changes.

Cancelled projects

Reconductor Cornell-Range Line 138-kV line

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

Install series reactor at Cornell Substation

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

Elm Road Phase 3 generation cancellation:

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

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

Deferred projects

Install 200 MVAR capacitor bank at Bluemound Substation

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



Construct a 345-kV bus at Bain Substation

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

New projects

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

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

Upgrade St. Lawrence 138-kV bus (2007)

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

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

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

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

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

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

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

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

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

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

Table PR-17
Transmission System Additions for Zone 5

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

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

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

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

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

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

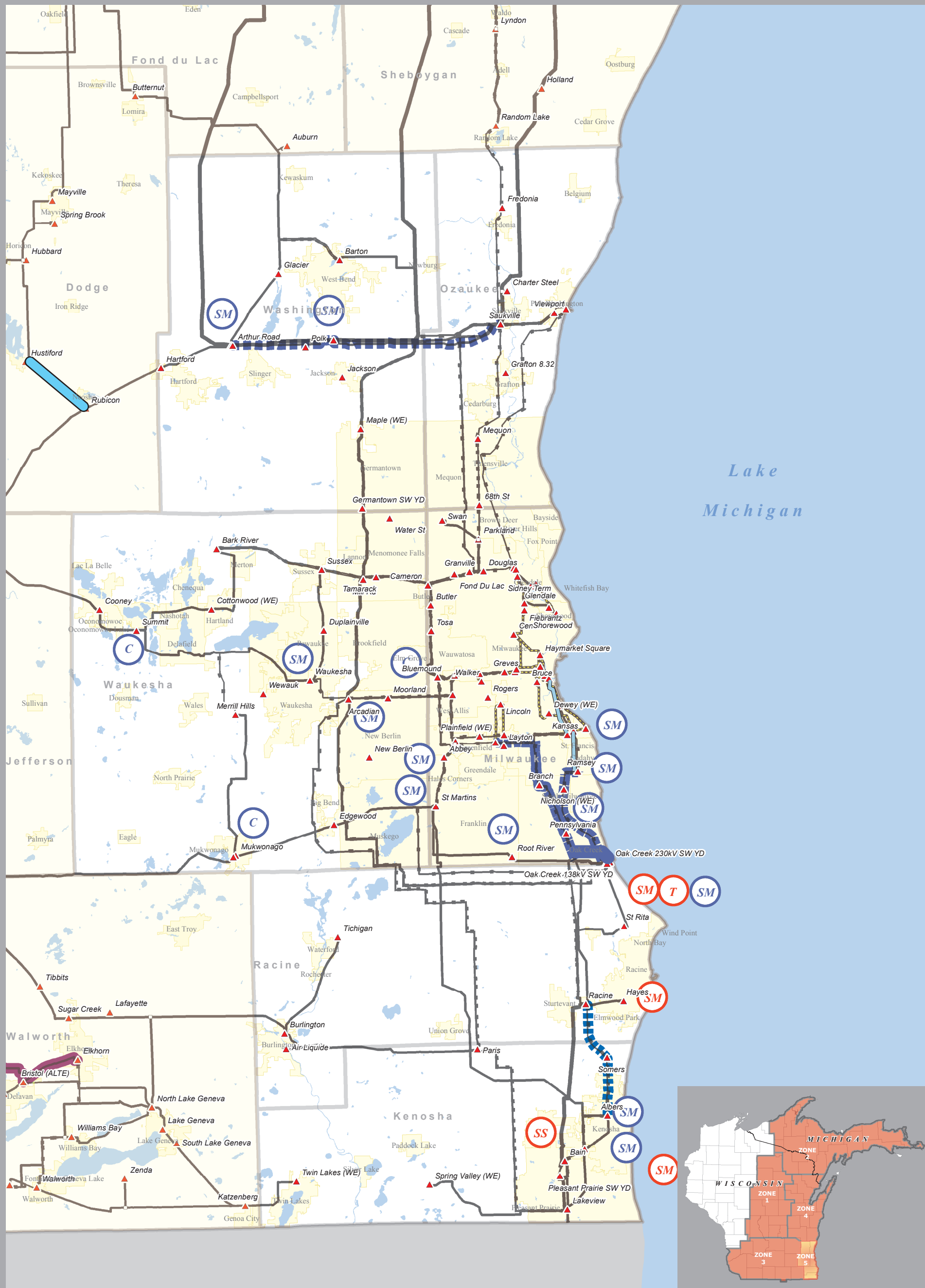
PROJECTS DEFERRED (continued)	New date	Planning Zone	Reason for Deferral
Rebuild Brodhead to South Monroe 69-kV line	2011	3	Was 2008; updated study results and resource availability
Construct Monroe County-Council Creek 161-kV line	2012	1	Was 2010; resource availability
Install a 161/138-kV transformer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

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

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

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

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



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

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

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

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