Zone 2 Overview

Zone 2 includes the counties of:

- Alger, Mich.
- Baraga, Mich.
- Chippewa, Mich.
- Delta, Mich.
- Dickinson, Mich.
- Florence, Wis.
- Forest, Wis. (northern portion)
- Gogebic, Mich. (eastern portion)
- Houghton, Mich.
- Iron, Mich.
- Keweenaw, Mich.
- Luce, Mich.
- Mackinac, Mich.
- Marinette, Wis. (northern portion)
- Marquette, Mich.
- Menominee, Mich. (northern portion)
- Ontonagon, Mich. (eastern portion)
- Schoolcraft, Mich.
- Vilas, Wis. (northern portion)

The physical boundaries of Zone 2 and transmission facilities located in Zone 2 are shown in Figure ZS-23.

Land use in Zone 2 is largely rural and heavily forested.

Zone 2 typically experiences peak electric demands during the winter months. Ore mining and paper mills are the largest electricity users in the zone.

Demographics

The population of the counties in Zone 2 experienced slightly negative growth from 1998 to 2008. The highest growth rate of 0.9 percent per year and the largest increase in population of 1,800 occurred in Vilas County.

During the same period, the annual employment growth rate was 0.8%. The highest growth rate and the highest increase in employment occurred in Marquette County (Michigan).

Future Population and Employment Projections

Population in Zone 2 is projected to grow on an annual basis slightly between 2008 and 2013 and only 0.4 percent from 2013 through 2018. From 2008 to 2013, Chippewa County (Michigan) is projected to realize the largest increase in population and Florence County has the highest growth rate.

Employment in Zone 2 is projected to grow at 1.5 percent annually between 2008 and 2013 and at 1.4 percent from 2013 through 2018. From 2008 to 2013, Marquette County (Michigan) is projected to realize the largest increase in employment, while Vilas County is projected to have the highest growth rate.

	1998-2008	2008-2013	2013-2018	1998-2008	2008-2013	2013-2018
Employment	Annual Growth Rate			Increase		
Zone 2	0.76	1.52	1.41	13,245	14,170	14,171
Marquette County (MI)	1.76			6,077	3,176	3,174
Vilas County		2.29	2.04			
Population						
Zone 2	-0.13	0.29	0.35	-4,265	4,798	5,897
Vilas County	0.86			1,834		
Florence County		1.15	1.13			
Chippewa County (MI)					1,415	1,533

Zone 2 environmental considerations

Zone 2 includes a small part of the far northeast portion of Wisconsin and approximately the eastern two-thirds of the Upper Peninsula of Michigan. The Wisconsin portions of the zone fall into the Northeast Sands and North Central Forest ecological landscape regions. The portions of the zone located in Michigan are part of the Eastern Upper Peninsula eco-region. A description of the characteristics of the Eastern Upper Peninsula eco-region may be found on the Michigan Department of Environmental Quality Web page at http://www.michigan.gov/dnr/0,1607,7-153-10366_11865-31471--,00.html.

Large expanses of this zone are forested and there are large numbers of streams, lakes and wetlands throughout the zone. The Niagara Escarpment is situated in the Eastern Upper Peninsula. Lakes Superior, Huron and Michigan form the northern and eastern boundaries of the zone. Two Michigan State Natural Rivers (Fox and Two-Hearted) and nine National Wild and Scenic Rivers (Tahquamenon, Indian, Sturgeon, Whitefish, Yellow Dog, Ontonagon, Paint, Carp and North Sturgeon) are found in this zone. Portions of the Nicolet, Ottawa, and Hiawatha national forests, and numerous state forests and parks are found in this zone. Several Indian reservations are found in this zone. The Seney National Wildlife Area, Pictured Rocks National Lakeshore and numerous federal wilderness areas also are found in this zone.

Zone 2 electricity demand and generation

The coincident peak load forecasts for Zone 2 for 2009, 2013, 2018 and 2023 are shown in Table ZS-9. Existing generation along with proposed generation based on projected in-service year also are shown. The resultant capacity margins, with or without the proposed generation, are shown as well.

This table shows that load is projected to decrease at roughly 0.2 percent annually from 2009 through 2018. Comparing load with generation (at maximum output) within the zone indicates that Zone 2 has more generation than peak load, though actual operating experience indicates that during most periods, Zone 2 is a net importer of power.

Zone 2 transmission system issues

Key transmission facilities in Zone 2 include:

- the Morgan-Plains and Plains-Dead River 345-kV lines,
- the Plains-Stiles 138-kV double-circuit line and
- the 138-kV facilities tying the Upper Peninsula of Michigan to the Lower Peninsula.

Key system performance issues in Zone 2 include:

- limited import and export capability,
- aging 69-kV and 138-kV infrastructure throughout the Upper Peninsula,
- generator stability at the Presque Isle Power Plant,
- parallel path flow around Lake Michigan that contributes to heavy loading on the 138-kV and 69-kV systems, and results in the need for transmission loading relief incidents and reconfiguration of the system,
- record low Lake Superior water levels have resulted in reduced hydro generation output in the eastern U.P., magnifying reliability concerns in this area,
- low voltages, most pronounced in the western and eastern Upper Peninsula,
- potential low voltages and overloads in the northwestern U.P. due to recent load increases, and
- potential marginal voltages and overloads in the central U.P. due to recent load increases.

Zone 2 - 2009 study results

Refer to Table ZS-1 and Figure ZS-5

Summary of key findings

- Low voltages for many critical outages in Zone 2 may be adequately addressed with capacitor bank installations or distribution power factor correction, and the addition of the Cranberry-Conover-Plains line project in 2010.
- Potential load additions in Delta County may necessitate the need for several thermal upgrades.

First contingency overloads of one Atlantic-Osceola 69-kV line, for the loss of the parallel Atlantic-Osceola 69-kV line, were observed in the 2009 study. One of the lines was rebuilt in 2008 to address existing condition issues. Clearances are also being increased on the Mass-Winona-Atlantic and M38-Atlantic 69-kV lines in the 2008-2009 timeframe.

Various first-contingency outages are expected to result in voltages less than 90 percent of nominal at the Munising, Roberts, Osceola and L'Anse 69-kV buses. To address first-contingency low voltages elsewhere in Zone 2, 138-kV capacitor bank additions are needed at the M38, Hiawatha and Perkins Substations in the 2009-2010 timeframe. The M38 capacitor bank is new to this Assessment due to higher load forecasts in the western U.P.

An approved Transmission Service Request for 35 MW from the White Pine Mine in 2008 was modeled in the 2009 study case, including the uprates of numerous 69-kV lines in that area to accommodate that service. The studies showed that the addition of this generation in the northwestern portion of the U.P. provided an additional voltage profile benefit due to the reduced level of import to this portion of the system.

Two transmission lines were identified to be limiting elements under specific shoulder peak conditions by 2009. As a result, uprates of the Empire-Forsyth 138-kV and Chandler-Cornell 69-kV lines will be completed in the 2008-2009 timeframe.

Due to age and condition issues associated with the existing facilities, the Cedar Substation is currently being rebuilt and relocated. The new Cedar Substation, renamed North Lake, will also address reliability issues in the north central Upper Peninsula.

The construction of a ring bus at Pine River and associated capacitor bank upgrades in 2009 will bolster the voltage in the Eastern Upper Peninsula under normal and single

contingency conditions to acceptable levels until additional reinforcements can be implemented in the area.

In response to customer requests for new distribution interconnections, the Atlantic and M38 138/69-kV transformers will be uprated in 2009.

Projects whose "Need date" doesn't match the "In-service date"

- ❑ Uprate the Delta-North Bluff 69-kV line summer normal and emergency ratings from 120 to 167 degrees F
- ❑ Uprate the North Bluff-Gladstone 69-kV line summer normal and emergency ratings from 120 to 167 degrees F
- ❑ Uprate the Masonville-Gladstone 69-kV line summer normal and emergency ratings from 120 to 167 degrees F
- ❑ Uprate the Chandler-Masonville 69-kV line summer normal and emergency ratings from 120 to 167 degrees F
- ❑ Uprate the Chandler-Delta #1 69-kV line summer emergency rating from 120 to 167 degrees F
- ❑ Uprate the Chandler-Delta #2 69-kV line summer emergency rating to from 120 to 167 degrees F

New to this Assessment and as a result of a potential load increase in Delta County, potential thermal overloads were discovered on the above six lines under single-contingency conditions. LIDAR surveys and ratings reviews on these lines will be done to determine the scope of these projects. ATC Planning will work with Project Management to determine the ultimate in-service dates of these line uprates. This will also depend upon whether there will be additional load that requires transmission service. Until transmission service is needed and can be provided, generation redispatch will be used to avert overloads.

- ❑ Uprate the Straits-Pine River ESE_6904 69-kV line ratings to 35/50 MVA summer normal/summer emergency
- ❑ Uprate the Straits-Pine River 6905 69-kV line ratings to 35/50 MVA summer normal/summer emergency

New in this Assessment, thermal overloads were discovered on the above two lines under single-contingency conditions. LIDAR surveys and ratings reviews on these lines will be done to determine the scope of these projects. ATC Planning will work with Project Management to determine the ultimate in-service dates of these line uprates.
These overloads were observed in the 2008 Assessment due to projected low hydroelectric generation in the eastern U.P. which was modeled in the study cases. Dispatching local diesel generation or a return to normal hydro levels would mitigate these potential overloads.

Projects whose "Need" and "In-service" dates are to be determined

- ❑ Convert Indian Lake-Hiawatha 69-kV line to double-circuit 138-kV operation, construct new Hiawatha 138-kV Substation
- ❑ Uprate overhead portions of Straits-McGulpin 138-kV circuits #1 & #3 to 230 F degree summer emergency ratings

The above projects require further study to determine when and if the project(s) should be implemented.

Zone 2 - 2013 study results

Refer to Table ZS-2 and Figure ZS-6

Summary of key findings

- ❑ The completion of the Morgan-Werner West and Northern Umbrella Plan projects will result in dramatic increases in Wisconsin-Michigan transfer capability, likely reducing the locational marginal price of energy. In addition, substantial reliability benefits will be realized with these sets of projects.
- ❑ Low voltages were observed in the Eastern U.P. which will be addressed as part of the review performed for this portion of the ATC system.
- ❑ The poor condition of the line and system reliability considerations will require developing a plan to replace the Blaney Park-Munising 69-kV line.

A complete review of ATC's needs in the Eastern Upper Peninsula (U.P.) is underway. Earlier 10-Year Assessments specified various projects in the Eastern U.P., including the creation of a double-circuit 138-kV conduit from Indian Lake to Hiawatha. This review will assess if all or some of those projects should still be constructed in the near-term, constructed in a phased manner, or perhaps a different set of projects proposed.

A collaborative planning effort is underway in Zone 2 to assess the needs of the Upper Peninsula of Michigan. The ATC Energy Collaborative – Michigan will include participation from ATC stakeholders and customers, as well as other regional utilities and entities which have an impact on ATC's northern system performance and needs. This collaborative is scheduled to be completed by late 2008/early 2009 and will result in a plan to address the immediate and long-term energy needs in the Upper Peninsula.

Conversion of the Conover to Plains 69-kV corridor to 138 kV, along with the addition of 138/69-kV transformations at Iron Grove (formerly Iron River Substation) and Aspen (formerly Brule Substation) will greatly improve the reliability and voltage profile on the western U.P. 69-kV system.

The 2010 addition of the North Bluff 69-kV and Indian Lake 138-kV capacitor banks will address remaining voltage violations in the Upper Peninsula.

Portions of the Blaney Park-Munising 69-kV line will need to be rebuilt due to poor physical condition. Reliability of service to customers served by this line is also a concern because this relatively long line is currently operated radially from Munising (open at Blaney Park). The condition and rating of the line prevents us from closing both ends at the same time. This provisional project has been deferred from 2013 to at least 2014 to allow time to

establish an appropriate long-term plan for the area that considers whether the line should be rebuilt at 138 kV or at 69 kV.

Zone 2 - 2018 study results

Refer to Table ZS-3 and Figure ZS-7

Summary of key findings

- ❑ Uprating the Forsyth 138/69-kV transformer will be required because future load increases will exceed the maximum capability of the existing transformer.

The summer emergency rating of the Forsyth 138/69-kV transformer will need to be increased to 57 MVA to accommodate increased loading in the Gwinn and Munising areas. It is anticipated at this time that this work will include an uprate of existing equipment within the transformer, and not require a transformer replacement.

Zone 2 - 2023 study results

Refer to Table ZS-4 and Figure ZS-8

Summary of key findings

- ❑ None

TABLE ZS-1

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
1	Sigel and Lakehead Vesper 138-kV bus voltages	–	91 – 92%	–	–	–		Arpin-Sigel 138-kV line	Publicly announced load curtailments
1	Council Creek and Petenwell 138-kV bus voltage	–	90 – 95%	–	–	–	91%	Base Case Saratoga-Petenwell 138-kV line	Monroe County – Council Creek 161-kV line
1	Necedah, Whistling Wings, Dellwood, and Friendship 69-kV bus voltages	–	90 – 92%	–	–	–	91 – 92%	Petenwell 138/69-kV transformer Petenwell-Big Pond 69-kV line Big Pond-Necedah tap 69-kV line	Mckenna capacitor bank expansion
1	Wien – Stratford 115-kV line	99 – 105%		103.5%	–	–	–	Arpin 345/138-kV transformer Arpin 138/115-kV transformer Arpin-Galvin 115-kV line Galvin-Hume 115-kV line	Use recently validated circuit ratings
2	Delta – Mead 69-kV line	103-163 %	-	95-111%	-	103-161%	-	Base Case Chandler-Lakehead Tap 69-kV line Lakehead Tap-Masonville 69-kV line Masonville-Gladstone 69-kV line Gladstone-North Bluff 69-kV line North Bluff-Bay Tap 69-kV line Bay Tap-Mead 69-kV line	Dispatch local generation
2	Chandler – Delta 69-kV #1 line	109%	-	118%	-	109%	-	Chandler-Delta 69-kV #2 line	Dispatch local generation
2	Chandler – Delta 69-kV #2 line	103%	-	113%	-	103%	-	Chandler-Delta 69-kV #1 line	Dispatch local generation
2	Chandler 138/69-kV transformer	95-104%	-	101-102%	-	98-104%	-	Nordic-Mountain 69-kV line Mountain-Harris Tap 69-kV line Forsyth 138/69-kV transformer	Increased existing summer emergency rating from SELD
2	Chandler – Lakehead Tap 69-kV line Masonville – Lakehead Tap 69-kV line Masonville – Gladstone 69-kV line Gladstone – North Bluff 69-kV line North Bluff – Bay Tap 69-kV line Mead – Bay Tap 69-kV line	124-162%	-	98%-109%	-	121%-158%	-	Delta-Mead 69-kV line	Dispatch local generation
2	Pine River – Straits 69-kV line	104%-108%	-	-	-	103%-106%	-	Hiawatha-Lakehead 138-kV line Lakehead-Brevort 138-kV line Brevort-Straits 138-kV line	Dispatch of hydro and/or diesel generation
2	Straits– Evergreen 69-kV line Evergreen-Pine River 69-kV line	95%-105%	-	-	-	96%-104%	-	Hiawatha-Lakehead 138-kV line Lakehead-Brevort 138-kV line Brevort-Straits 138-kV line	Dispatch of hydro and/or diesel generation
2	Valley, Evergreen, Indian Lake, St. Ignace, Blaney Park, Curtis, Gould City, Straits, Engadine, Hiawatha 69-kV bus voltages	-	105.2%-105.8%	-	105.0%-105.6%	-	105.1% - 105.7%	Base Case	Operating guide
2	Engadine, Newberry Village, Lou Pac, Newberry, Newberry Hospital, Newberry Hospital Tap, Roberts, Hulbert, Eckerman, Raco 69 kV bus voltages	-	80.9%-91.4%	-	-	-	80.3%-91.3%	Hiawatha-Engadine 69-kV line Engadine-Newberry 69-kV line	9 Mile/Roberts 69-kV capacitor banks
2	Atlantic 138-kV bus voltage	-	88.9%	-	-	-	-	Atlantic-M-38 138-kV line outage	Operating guide
2	Iron Grove, Twin Lake 69-kV bus voltages	-	88.0%-88.9%	-	-	-	-	Twin Lake -Lakota Rd 138-kV line Twin Lake-Iron Grove 138-kV line	Operating guide
3	North Stoughton-Stoughton East – Stoughton 69-kV line	136.3% - 96.9%	–	–	–	119.4% - 103.2%	–	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line Lamar-Fulton 69-kV line	Rebuild Stoughton Substation bus

TABLE ZS-1 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Verona-Sun Valley-Oregon 69-kV line	121.3%	–	–	–	105.9%	–	Stoughton-Aaker 69-kV line	Rebuild the Y-119 Verona to Oregon 69-kV line
3	McCue-Harmony-Lamar 69-kV line	111.6% - 95.2%	–	–	–	99.6% - 97.2%	–	Kegonsa 138/69-kV transformer Kegonsa-North Stoughton 69-kV line North-Stoughton-Stoughton E 69-kV line	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
3	Fitchburg-Syene 69-kV line	101.1%	–	–	–	–	–	Royster-Pflaum Tap 69-kV line	Loop 6947 Nine Springs-Pflaum 69-kV line into Femrite Substation
3	Stage Coach-Black Earth 69-kV line	98.3%	–	–	–	97.7%	–	Spring Green 138/69-kV transformer	Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Royster-Pflaum Tap 69-kV line	97.8%	–	–	–		–	Fitchburg-Syene 69-kV line	Loop 6947 Nine Springs-Pflaum 69-kV line into Femrite Substation
3	Enzyme Bio Systems-RC3 69-kV line	97.7%	–	–	–	98.1% - 95.5%	–	Colley Road – Dickinson 138-kV line	Operating guide
3	McCue-Harmony 69-kV line	95.2%	–	–	–		–	Brodhead Switching Station-Brodhead South 69-kV line	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
3	Concord, Rubicon, Hustisford, Hubbard and Butler Ridge 138-kV buses	–	93.4% - 94.7%	–	–	–	94.1% -94.8%	Base Case	Dispatch local generation
3	Harmony, Lamar, Fulton, Saunders Creek, Dana Corp, Sheepskin and Evansville 69-kV buses	–	83.6% - 91.8%	–	90.5% - 91.5%	–	86.8% - 91.5%	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line Lamar-Fulton 69-kV line	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
3	Lakehead Cambridge Tap, Fort Atkinson, Jefferson, Crawfish, Concord ,Hubbard, Hustisford, Rubicon and Butler Ridge 138-kV buses	–	86.4% - 91.5%	–	–	–	88.3% - 91.8%	Rockdale to Lakehead Cambridge Tap 138-kV line Lakehead Cambridge Tap-Jefferson4 138-kV line Jefferson4-Jefferson 5 Bus outage Jefferson5-Crawfish 138-kV line Crawfish-Concord4 138-kV line Plus other less severe outages	Dispatch local generation

TABLE ZS-1 (continued)
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Brodhead Muni 3, Brodhead Muni 2, Brodhead, Brodhead Muni 1, RCEC Orfordville, Orfordville, Bass Creek, Footville, RCEC Center, Evansville 69-kV bus voltages	–	88.2% - 91.7%	–	–	–	90.7% - 92%	Brodhead Switching Station-Brodhead Muni 3 69-kV line Brodhead Muni 2 – Brodhead Muni 3 69-kV line Brodhead Muni 2-Brodhead 69-kV line	Upgrade Sheepskin capacitor bank from 10.8 MVAR to 16.2 MVAR and Install 5.7 MVAR distribution capacitor bank at Union Townline 69-kV Substation
3	Aaker, Oregon and Brooklyn 69-kV buses	–	88.2% - 89.5%	–	–	–		Stoughton-Aaker 69-kV line	Rebuild the Y-119 Verona to Oregon 69-kV line
3	Spring Green, Arena, Mazomanie, Mazomanie Industrial, Lone Rock, Muscoda, Avoca, Blue River, Boscobel, Boscobel Muni 69-kV bus voltages	–	88.5% - 91.4%	–	–	–	90.5% - 91.7%	Spring Green 138/69-kV transformer	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation
3	Hubbard and Hustisford 138-kV buses	–	89.1% - 89.7%	–	88.5% -89.3%	–		Rubicon-Hustisford 138-kV line Hubbard-Hustisford 138-kV line	Adjust load tap changer at Hubbard
3	Dickinson, Global Renewable Energy, William Bay and Brick Church 138-kV buses	–	90.0% - 91.2%	–	89% - 91.5%	–	89.1% - 91.7%	Colley Road – Dickinson 138-kV line Dickinson-Global Renewable Energy 138-kV line Global Renewable Energy-Brick Church 138-kV line	Install a total of 6.3 MVAR distribution capacitor banks at Dickinson Substation and Install one temporary 12.45 MVAR 69-kV mobile capacitor bank at Brick Church Substation
3	Eden and Lancaster 138-kV buses	–	90.4% - 91.7%	–	–	–	–	Nelson Dewey-Lancaster 138-kV line Lancaster-Eden 138-kV line	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation
3	N Stoughton, Stoughton E, Stoughton and Aaker 69-kV buses	–	91.2% - 91.5%	–	–	–	–	N Stoughton-Kegonsa 69-kV line	Rebuild the Y-119 Verona to Oregon 69-kV line and Construct new Oak Ridge-Verona 138-kV line and install a 138/69-kV transformer at Verona with a 100 MVA summer normal rating
3	Muscoda and Avoca 69-kV buses	–	91.3% - 91.7%	–	–	–	91.9%	Spring Green-Lone Rock 69-kV line	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
3	Paddock 345/138 kV transformer	–	–	107.7%	–	–	–	Base case	Dispatch local generation
3	Paddock-Townline 138-kV line	–	–	103.1%	–	–	–	Base case	Dispatch local generation
3	Paddock-Townline 138-kV line	–	–	123.3% - 113.8%	–	–	–	Paddock-NW Beloit 138-kV line NW Beloit-Blackhawk 138-kV line Blackhawk-Colley Road 138-kV line	Dispatch local generation
3	Paddock-NW Beloit-Blackhawk-Colley Road 138-kV line	–	–	116.8% - 105.5%	–	–	–	Paddock-Townline 138-kV line	Dispatch local generation

TABLE ZS-1 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Huiskamp-Mendota-Ruskin 69-kV line	–	–	106.5% - 98.9%	–	–	–	North Madison-Vienna 138-kV line Vienna-Yahara River 138-kV line Yahara River-American Center 138-kV line American Center-Sycamore 138-kV line	Dispatch local generation
3	N Stoughton-Stoughton E-Stoughton 69-kV line	–	–	113.9% - 104.4%	–	–	–	Paddock 345/138 kV transformer Paddock-Wempletown 345-kV lines	Dispatch local generation
3	North Monroe-Darlington 138-kV line	–	–	100.8%	–	–	–	Paddock 345/138 kV transformer Paddock-Wempletown 345-kV lines	Dispatch local generation
3	Brick Church 138-kV bus	–	–	–	94.9%			Base case	Dispatch local generation
3	Brick Church. Global Renewable Energy, North lake Geneva, William Bay, Elkhorn, Bristol, Sugar Creek and Bluff Creek 138-kV buses	–	–	–	90.8% - 91.8%	–	–	Burlington 138-kV Bus tie outage	Dispatch local generation
3	Potosi, Hillman, Lafayette wind, Darlington, Albany and North Monroe 138-kV buses	–	–	–	87.3% - 91.8%	–	–	Nelson Dewey-Potosi 138-kV line Potosi-Hillman 138-kV line Hillman-Lafayette Wind 138-kV line	Dispatch local generation
3	Entire Rock County and Walworth County 138-kV bus voltages	–	–	–	86.8% - 91%	–	–	Paddock 345/138 kV transformer Byron-Wempletown 345 kV line Paddock-Wempletown 345-kV line	Dispatch local generation
3	McCue-Harmony 69-kV line	96.5%	--	--	--	--	--	Columbia generator unit 1 or 2	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
4	West Marinette 138/69-kV transformer #1	96.6-95.1%	–	–	–	–	–	Wells St-Roosevelt 69-kV line Roosevelt 138/69-kV transformer	- Expand the Menominee 69-kV Substation and install 138-kV terminals. Loop the West Marinette-Bay De Noc 138-kV line into the Substation - Install 138/69-kV transformer at the expanded Menominee Substation
4	Sunset Point-Pearl Ave 69-kV line	104.8%	–	–	–	–	–	Ellinwood-Twelfth Ave 69-kV line	- Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR
4	Pioneer-Sobieski 69-kV line	99.6%	–	–	–	–	–	Pulliam-Suamico 69-kV line outage followed by Sobieski-Pioneer 69-kV line close	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	Sobieski 69-kV bus	–	93.9%	–	–	–	94.8%	Base Case	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV

TABLE ZS-1 (continued)
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
4	Suamico 69-kV bus	–	91.6%	–	–	–	–	Pulliam-Suamico 69-kV line outage followed by Sobieski-Pioneer 69-kV line close	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	Bluestone, Wesmark 69-kV buses	–	89.3-91.5%	–	–	–	–	Finger Rd-Bluestone 69-kV line outage	Construct a new 138-kV substation and loop Highway V-East Krok 138-kV line into the substation
5	Concord 138 kV bus Bark River 138 kV bus Cooney 138 kV bus Cottonwood 138 kV bus Germantown 138 kV bus Hartford 138 kV bus Merrill Hills 138 kV Maple 138 kV bus Summit 138kV bus	–	93.5 % 94.2 % 92.8 % 93.1 % 93.6 % 94.9 % 94.7 % 94.1 % 92.9 %	–	–	–	–	Intact System	Dispatch local generation
5	Concord, Cooney, Cottonwood, Summit, Bark River 138-kV bus voltages	–	90.6 – 91.8% 87.8 – 90.6 % 87.7 – 91.0 % 88.0 – 91.4 % 89.1 - 91.0 %	–	– – – – –	–	91.8 -- 91.9% 89.5 -- 91.9% 88.9 – 90.4 % 89.5 – 90.7 % 91.1 – 91.7 %	Jefferson–Lakehead – Rockdale 138-kV line Jefferson-Crawfish River – Concord 138-kV line Bark River – Cottonwood 138-kV line Bark River – Sussex 138-kV line Maple – Saukville 138kV line Plus other less severe outages	Dispatch local generation
5	Germantown and Maple 138-kV bus voltages	–	88.7% 83.8 – 84.1% 89.4 – 90.4%	–	–	–	91.1 % 87.3 – 87.6 % 91.1 – 91.9%	Germantown – Maple 138kV line Maple - Saukville 138kV line Bark River – Sussex 138kV line	Dispatch local generation
5	Hartford 138-kV bus voltage	–	86.8%	-	–	–	88.6 %	Hartford – St. Lawrence 138kV line	Load shifting
5	Bain 345/138-kV transformer	159.0%	–	130.7%	–	159.1%	–	Pleasant Prairie bus split between buses 3 and 4	Dispatch local generation
5	Albers – Bain 138-kV line	97.6%	–	–	–	102.7%	–	Bain – Kenosha 138-kV line	Dispatch local generation
5	Oak Creek 345/230-kV transformer (T884)	97.5%	–	–	–	–	–	Oak Creek 230-kV bus split between buses 6 & 7	Dispatch local generation
5	Arcadian4 – Waukesha1 138-kV line	–	–	–	–	98.2%	–	Arcadian6 – Waukesha3 138-kV line	Dispatch local generation
5	Arcadian6 – Waukesha3 138-kV line	–	–	–	–	97.4%	–	Arcadian4 – Waukesha1 138-kV line	Dispatch local generation
5	Albers – Paris 138-kV line	–	–	100.7%	–	–	–	Paddock 345/138-kV transformer	Dispatch local generation
5	Harbor – Kansas 138-kV line	–	–	92.6% 93.2% 93.6% 94.6%	–	–	–	Montana – Dewey 138-kV line Dewey 138-kV bus tie outage Dewey – Norwich 138-kV line Kansas – Norwich 138-kV line	Dispatch local generation
5	Tichigan and Burlington 138-kV buses	–	–		89.3-89.6%	–	91.6%	Burlington 138-kV bus split	Load shift
5	Albers- Kenosha 138-kV line	–	–	111.3%	–	113.3%	–	Albers – Bain 138-kV line	Dispatch local generation
5	Root River – Oak Creek 138-kV line	–	–	–	–	101.2%	–	Albers – Paris 138-kV line	Dispatch local generation
5	Tichigan, Burlington and Air Liquide 138-kV buses	–	–	–	91.3-92.0%	–	–	Paddock 345/138-kV transformer	Load shift

TABLE ZS-1 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 Summer Peak, 70% High Transfer and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2009 Summer Peak Case		2009 High Transfer Case		2009 90% E-W Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
5	Arcadian 345/138-kV transformer #3	- 106.0%	–	108.0% 94.1%	–	100.2% 106.4%	-	Arcadian 345-kV bus and Arcadian transformer #2 Arcadian transformer #1	Dispatch local generation (temporary) Arcadian transformer (provisional permanent solution)
5	Arcadian 345/138-kV transformer #2	96.0 %	--	--	--	97.5%	-	Arcadian transformer #1	Generation redispatch (temporary) Arcadian transformer (provisional permanent solution

TABLE ZS-2

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
1	Eagle River Muni 115-kV bus voltage	–	111.4%	–	110.1%	–	104.2%	–	113.6%	Eagle River Muni – Cranberry 115-kV line	Take Lakota Road capacitor out of service
1	Arrowhead 345-kV bus voltage	–	110.5%	–	110.6%	–	111.7%	–	110.8%	Arrowhead 345/230-kV Transformer Arrowhead 230-kV PST	Place Stone Lake inductor in-service
1	Stone Lake 345-kV bus voltage	–	–	–	–	–	–	–	105.8%	Base Case	Place Stone Lake inductor in-service
1	Rocky Run 345/115-kV transformer #3	–	–	95.6 – 95.9%	–	–	–	–	–	Rocky Run 345/115-kV transformer #2 Sigel – Arpin 115-kV line	No project required as yet (pending overload under high load growth scenario)
1	Wien – Stratford 115-kV line	104.4 – 105.7%	–	95.5 – 110.9%	–	105.1%	–	95.3 – 98.2%	–	Arpin 345/138-kV transformer Arpin 138/115-kV transformer Arpin-Galvin 115-kV line Glavin-Hume 115-kV line Hume-Wildwood 115-kV line	Use recently validated circuit ratings
1	Stratford - McMillan 115-kV line	–	–	99.5%	–	–	–	–	–	Galvin-Hume 115-kV line	Use recently validated circuit ratings
1	Sigel, Lakehead Vesper and Port Edwards 138-kV bus voltages	–	90.0 – 91.0%	–	89.6 – 90.7%	–	–	–	90.9 – 91.8%	Arpin-Sigel 138-kV line	Publicly announced load curtailments
1	Vulcan, Hollywood and Saratoga 138-kV bus voltages	–	91.0 – 91.6%	–	90.7 – 91.3%	–	–	–	91.8%	Arpin-Sigel 138-kV line	Publicly announced load curtailments
1	Petenwell 138/68 kV transformer	97.0%	–	98.0%	–	–	–	–	–	North Fond du Lac – Rosendale 69-kV line	No project needed yet
1	Castle Rock – Quincy 69-kV line	101.3 – 101.4%	–	101.2-101.3%	–	–	–	–	–	Petenwell 138/69-kV transformer Petenwell-Big Pond 69-kV line Big Pond-Necedah tap 69-kV line	Uprate Castle Rock-McKenna 69-kV circuit
1	McKenna – Quincy 69-kV line	95.8%	–	95.4%	–	–	–	–	–	Petenwell 138/69-kV transformer Petenwell-Big Pond 69-kV line Big Pond-Necedah tap 69-kV line	Uprate Castle Rock-McKenna 69-kV circuit
1	Council Creek and Petenwell 138-kV bus voltages	–	87.4 – 94.1%	–	87.0 – 93.8%	–	–	–	89.2 – 95.8%	Base Case Saratoga-Petenwell 138-kV line Arpin-Sigel 138-kV line Sigel-Lakehead Vesper 138-kV line Hillsboro 161/69-kV transformer	Monroe County – Council Creek 161-kV line
1	Petenwell, Necedah, Whistling Wings, Dellwood, Friendship, Houghton Rock and Mckenna 69-kV bus voltages	–	85.6 – 92.0%	–	84.7 – 91.5%	–	91.8 – 91.9%	–	87.7 – 91.7%	Petenwell 138/69-kV transformer Petenwell-Big Pond 69-kV line Big Pond-Necedah tap 69-kV line Necedah tap-Whistling Wings tap 69-kV line	McKenna capacitor bank expansion
1	Metomen 138/69-kV transformer	–	–	95.2 – 102.6%	–	–	–	–	–	Metomen-Rosendale 69-kV line Rosendale-North Fond du Lac 69-kV line Winneconne-Sunset Point 69-kV line North Randolph-Markesan tap 69-kV line	Metomen transformer replacement
1	Columa(ACEC), Lincoln Pumping Station, Brooks and Grand Marsh 69 kV bus voltages	–	92.0%	–	91.4 – 92.0%	–	–	–	–	Chafee Creek-Coloma tap 69-kV line Lincoln PS-Coloma tap 69-kV line	McKenna capacitor bank expansion
2	Delta – Mead 69-kV line	103%-164%	-	108-173%	-	95-112%	-	107-146%	-	Base Case Chandler-Lakehead Tap 69-kV line Lakehead Tap-Masonville 69-kV line Masonville-Gladstone 69-kV line Gladstone-North Bluff 69-kV line North Bluff-Bay Tap 69-kV line Bay Tap-Mead 69-kV line	Uprate Delta-Mead-North Bluff 69-kV line, or dispatch local generation
2	Chandler – Delta 69-kV #1 line	111%	-	120%	-	120%	-	-	-	Chandler-Delta 69-kV #2 line	Uprate Chandler-Delta 69-kV line #1, or dispatch local generation
2	Chandler – Delta 69-kV #2 line	105%	-	114%	-	114%	-	-	-	Chandler-Delta 69-kV #1 line	Uprate Chandler-Delta 69-kV line #2, or dispatch local generation
2	Chandler 138/69-kV transformer	95-104%	-	98-109%	-	95-104%	-	-	-	Nordic-Mountain 69 kV Mountain-Harris Tap 69-kV line Forsyth 138/69-kV transformer	Increased existing summer emergency rating from SELD
2	Chandler – Lakehead Tap 69-kV line Masonville – Lakehead Tap 69-kV line Masonville – Gladstone 69-kV line Gladstone – North Bluff 69-kV line North Bluff – Bay Tap 69-kV line Mead – Bay Tap 69-kV line	128-163%	-	133-173%	-	98-109%	-	110-144%	-	Delta-Mead 69-kV line	Uprate Chandler-Masonville, Masonville-Gladstone, Gladstone-North Bluff, Delta-Mead-North Bluff 69-kV lines; or dispatch local generation
2	Pine River-Straits 69-kV line	-	-	-	-	-	-	96%	-	Straits-Brevort 138-kV line	Dispatch of hydro and/or diesel generation
2	Forsyth 138/69-kV transformer	-	-	97%	-	-	-	-	-	Chandler 138/69-kV transformer	Uprate the Forsyth 138/69-kV transformer

TABLE ZS-2 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
2	Ontonagon-UPPSCO Tap 69-kV line Line, Ontonagon 138/69-kV transformer	-	-	-	-	-	-	97-100%	-	Mass-Rockland 69-kV line Rockland-Rockland Junction 2 69-kV line Rockland Junction 2-Victoria 69-kV line	Dispatch local generation
2	Indian Lake 138/69-kV transformers 1, 2	-	-	-	-	-	-	102%	-	Indian Lake 138/69-kV transformer 1, 2	Operating guide
2	Lakota Road 115-kV bus voltage Engadine, Straits, Hiawatha 69-kV bus voltages	-	105.0-105.2%	-	105.0%	-	-	-	-	Base Case	Operating guide
2	Lakota Road 115-kV bus voltage Indian Lake, Perkins, Atlantic 138-kV bus voltages, Munising, Alger 69-kV bus voltages	-	-	-	-	-	105.1-106.0%	-	-	Base Case	Operating guide
2	Lakota Road 115-kV bus voltage	-	-	-	-	-	-	-	105.1%	Base Case	Operating guide
2	Delta, West Side, Escanaba, Masonville, Mead, Gladstone, Bay View, North Bluff, Harris 69-kV bus voltages	-	91.7%-92.0%	-	90.4-92.0%	-	90.9-91.8%	-	-	Chandler 138/69-kV transformer	North Bluff 69-kV capacitor bank, or dispatch local generation
2	Atlantic 138-kV bus voltage	-	88.4%	-	86.8%	-	115.1%	-	-	Atlantic-M-38 138-kV line	M38 138-kV capacitor bank
2	Engadine, Newberry Village, Lou Pac, Newberry, Newberry Hospital, Newberry Hospital Tap, Roberts, Hulbert, Eckerman, Raco 69-kV bus voltages	-	-	-	Eastern U.P. Votlage Collapse	-	-	-	-	Hiawatha-Engadine 69-kV line Engadine-Newberry 69-kV line	9 Mile/Roberts 69-kV capacitor banks, and/or dispatch local generation
2	Engadine, Newberry Village, Lou Pac, Newberry, Newberry Hospital, Newberry Hospital Tap, Roberts, Hulbert, Eckerman, Raco 69-kV bus voltages	-	-	-	-	-	-	-	Eastern U.P. Votlage Collapse	Hiawatha-Engadine 69-kV line	9 Mile/Roberts 69-kV capacitor banks, and/or dispatch local generation
2	Engadine, Newberry Village, Lou Pac, Newberry, Newberry Hospital, Newberry Hospital Tap, Roberts, Hulbert, Eckerman, Raco 69-kV bus voltages	-	-	-	-	-	-	-	86.4-91.0%	Engadine-Newberry 69-kV line	9 Mile/Roberts 69-kV capacitor banks, and/or dispatch local generation
2	L'Anse 69-kV bus voltage	-	-	-	91.6%	-	-	-	-	M38 138/69-kV transformer	L'Anse 69-kV capacitor bank
3	North Stoughton-Stoughton East– Stoughton 69-kV line	131.9%-110.7%	-	143.3%-98.3%	-	-	-	115.7%-97.6%	-	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line	Rebuild Stoughton Substation bus
3	Sheepskin-Dana Tap 69-kV line	110.2%-105%	-	120.5%-114.4%	-	-	-	-	-	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line	Sheepskin Substation protection project
3	Enzyme Bio Systems-RC3 69-kV line	109.6%-96.1%	-	114.1%-96.6%	-	-	-	109.4%-95.7%	-	Colley Road-Dickinson 138-kV line Dickinson-Global Renewable Energy 138-kV line Brick Church 138/69-kV transformer Global Renewable Energy-Brick Church 138-kV line	Rebuild Y-32 Colley Road-Brick Church 69-kV line
3	Stoughton-Sheepskin 69-kV line	107.4%-102.8%	-	118.1%-112.6%	-	-	-		-	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	North Lake Geneva-Lake Geneva 69-kV line	105.7%	-	111.1%-96.6%	-	-	-		-	Brick Church-Cobble Stone 69-kV line	Uprate Y-152 North Lake Geneva-Lake Geneva 69-kV line to achieve a 115 MVA summer emergency rating
3	Fitchburg-Syene 69-kV line	105.5%	-	110.9%	-	-	-	95.7%	-	Royster-Pflaum Tap 69-kV line	Loop 6947 Nine Springs-Pflaum 69-kV line into Femrite Substation
3	Academy-Columbus Muni 2 Tap 69-kV line and Columbus Muni 2 Tap- Columbus 69-kV line	103.2%-98%	-	105-100.8%	-	-	-	100.6%-97.1%	-	N Randolph-Fox Lake 138-kV line Fox Lake-N Beaver Dam 138-kV line	Construct a Horicon-East Beaver Dam 138-kV line
3	McCue-Harmony-Lamar 69-kV line	102.5%-96.8%	-	108%-95.2%	-	-	-	-	-	Kegonsa 138/69-kV transformer Kegonsa-N Stoughton 69-kV line	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
3	Royster-Pflaum Tap 69-kV line	102.4%	-	107.4%	-	-	-	-	-	Fitchburg-Syene 69-kV line	Loop 6947 Nine Springs-Pflaum 69-kV line into Femrite Substation
3	Colley Road-Marine 138-kV line	98.6%	-	101.3%-95.5%	-	-	-	-	-	Paddock-NW Beloit 138-kV line	Colley Road protection project in 2010
3	McCue-Milton Lawn 69-kV line	97.7%	-	102.6%	-	-	-	-	-	Janesville 138/69-kV transformer	Uprate terminal limitations at McCue for the Y-79 McCue-Milton Lawns 69-kV line
3	N Monroe-Idle Hour 69-kV line	97.6%-95.3%	-	102.1%-95.4%	-	-	-	-	-	Darlington-Gratiot 69-kV line Gratiot-Wiota 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line and Rebuild Y-33 Brodhead to South Monroe 69-kV line

TABLE ZS-2 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Walworth-Schofield 69-kV line	97.1%	-	101.5%	-	-	-	-	-	N Lake Geneva-138/69-kV transformer	Uprate Y-41 Walworth- North Lake Geneva 69-kV to achieve a 69 MVA summer emergency rating
3	Gran Grae-Wauzeka-Boscobel 69-kV line	97.1%-96.8%	-	100.9%-96%	-	-	-	-	-	Spring Green 138/69-kV transformer Nelson Dewey-Lancaster 138-kV line Spring Green-Lone Rock 69-kV line	Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating
3	Rock Springs Tap – Artesian 138-kV line	96.7%-95.8%	-	98.2%-95.7%	-	-	-	-	-	Trienda-Lewiston 138-kV line East Dells-Lewiston 138-kV line	Construct a Lake Delton-Birchwood 138-kV line
3	Colley Road 138/69-kV transformer	96.4%	-	100.1%	-	-	-	-	-	Paddock 138/69-kV transformer	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	Dane-Lodi Tap 69-kV line	95.7%	-	99.9%	-	-	-	-	-	Kirkwood-Island 69-kV line	Rebuild part of the Y-8 Dane-Dam Heights 69-kV line
3	Shaw-Shirland Ave 69-kV line	95.2%	-	98.8%	-	-	-	-	-	Colley Road 138/69-kV transformer	Rating increase after SELD validation
3	Jefferson, Lake Mills, Fort Atkinson, Crawfish, Concord, Rubicon, Hustisford, Hubbard and Butler Ridge 138-kV buses	-	91.4%-95.8%	-	90.8%-95.1%	-	-	-	93.1%-95.9%	Base Case	Install 4-49 MVAR 138-kV capacitor banks at Concord Substation
3	Brick Church 138-kV bus	-	95.6%	-		-	-	-		Base Case	Install 2-24.5 Mvar 138-kV capacitor banks and 1-18 Mvar 69-kV capacitor bank at Brick Church substation
3	Harmony, Lamar, Fulton, Saunders Creek, Dana Corp, Sheepskin and Evansville 69-kV buses	-	78.7%-91.8%	-	75.3%-92%	-	88.8%-91.8%	-	83.9%-91.9%	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line Lamar-Fulton 69-kV line	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 and Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	Lakehead Cambridge Tap, Fort Atkinson, Jefferson, Crawfish, Concord ,Hubbard, Hustisford, Rubicon and Butler Ridge 138-kV buses	-	83.6%-91.3%	-	87.1%-91.9%	-	91.4%-91.8%	-	86.4%-91.8%	Rockdale to Lakehead Cambridge Tap 138-kV line Lakehead Cambridge Tap-Jefferson4 138-kV line Jefferson4-Jefferson 5 Bus outage Jefferson5-Crawfish 138-kV line Crawfish-Concord4 138-kV line Plus other less severe outages	Install 4-49 MVAR 138-kV capacitor banks at Concord Substation
3	Spring Green, Arena, Mazomanie, Mazomanie Industrial, Lone Rock, Muscoda, Avoca, Blue River, Boscobel, Boscobel Muni 69-kV bus voltages	-	85.9%-91.4%	-	84.5%-91.8%	-	-	-	89.1%-91.8%	Spring Green 138/69-kV transformer	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Brodhead Muni 3, Brodhead Muni 2, Brodhead, Brodhead Muni 1, RCEC Orfordville, Orfordville, Bass Creek, Footville, RCEC Center, Evansville 69-kV bus voltages	-	86%-92%	-	84.2%-91.3%	-	-	-	89.2%-91.5%	Brodhead Switching Sta-Brodhead Muni 3 69-kV line Brodhead Muni 2 -Brodhead Muni 3 69-kV line Brodhead Muni 2-Brodhead 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	Dickinson, Global Renewable Energy, William Bay and Brick Church 138-kV buses	-	87.1%-91.5%	-	86.1%-91.8%	-	87.1%-91.7%	-	86.6%-91.9%	Colley Road – Dickinson 138-kV line Dickinson-Global Renewable Energy 138-kV line Global Renewable Energy-Brick Church 138-kV line	Install 2-24.5 Mvar 138-kV capacitor bank and 1-18 Mvar 69-kV capacitor bank at Brick Church Substation
3	Hubbard and Hustisford 138-kV buses	-	88.5%-89.1%	-	88.1%-88.8%	-	88.3%-88.6%	-	88.3%-88.8%	Rubicon-Hustisford 138-kV line Hubbard-Hustisford 138-kV line	Construct a Horicon-East Beaver Dam 138-kV line
3	Evansville 69-kV bus	-	90.6%	-	89.5%-91.9%	-	-	-	-	Evansville-Sheepskin 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	Lake Geneva and Twin Lake 69-kV buses	-	91.9%-92%	-	89.6%-90.6%	-	-	-	-	N Lake Geneva-Lake Geneva 69-kV line	Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation and construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation
3	Eden, Wyoming Valley and Lancaster 138-kV buses	-	89.7%-91.6%	-	89%-91.8%	-	-	-	91.2%-91.9%	Nelson Dewey-Lancaster 138-kV line Lancaster-Eden 138-kV line	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating

TABLE ZS-2 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Lone Rock, Muscoda, Avoca, Blue River, Boscobel, Boscobel Muni 69-kV bus voltages	-	89.7%-91.9%	-	88.7%-91%	-	-	-	91.9%	Lone Rock-Spring Green 69-kV line	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
3	Cobblestone and Zenda 69-kV buses	-	90.5%-91.7%	-	90.2%-91.6%	-	-	-	-	Brick Church-Cobblestone 69-kV line	North Lake Geneva-South Lake Geneva 138-kV line project in 2014. The need year is determined by Cobblestone voltage problem.
3	Idle Hour, Monroe and S Monroe 69-kV buses		91.6%-92%	-	90.3%-90.7%	-	-	-	-	N Monroe-Idle Hour 69-kV line	Rebuild Y-33 Brodhead to South Monroe 69-kV line
3	Avoca, Muscoda 69-kV buses		91.9%	-	90.2-91.4%	-	-	-	-	Lone Rock-Avoca 69-kV line	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
3	Troy 138-kV bus	-	92%	-	91.2%-91.9%	-	-	-	-	Kirkwood-Troy 138-kV line Troy-Spring Green 138-kV line	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Burke and Reiner 69-kV buses	-	-	-	90.9%-91.6%	--	92%			Reiner Road 138/69-kV transformer	Install 2-16.33 Mvar 69-kV capacitor banks at Sun Prairie
3	West Middleton-Black Hawk 69-kV line	-	-	-	-	101.6%	-	-	-	Base Case	Dispatch local generation
3	Nelson Dewey 161/138-kV transformer	-	-	-	-	115.3%	-	-	-	Base Case	2nd Nelson Dewey 161/138 kV transformer
3	Paddock 345/138-kV transformer	-	-	-	-	97.1%	-	-	-	Base Case	Dispatch local generation
3	Benton-Miner 69-kV line	-	-	-	-	109%	-	-	-	Nelson Dewey 161/138-kV transformer	2nd Nelson Dewey 161/138 kV transformer
3	Paddock-NW Beloit-Blackhawk 138-kV line	-	-	-	-	100.7%-98%	-	-	-	Paddock-Townline 138-kV line	Dispatch local generation
3	North Stoughton-Stoughton East-Stoughton 69-kV line	-	-	-	-	118.5%-107.4%	-	-	-	Paddock 345/138 kV transformer and Paddock-Wempletown 345-kV lines	Dispatch local generation
3	West Middleton-Black Hawk 69-kV line	-	-	-	-	108.4%-95%	-	-	-	North Madison-Vienna 138-kV line Vienna-Yahara 138-kV line Yahara-American Center 138-kV line Kegonsa-McFarland 138-kV line McFarland-Femrite 138-kV line Plus other less severe outages	Dispatch local generation
3	Nelson Dewey 161/138-kV transformer	-	-	-	-	100.6%-96.5%	-	-	-	Paddock 345/138-kV transformer Paddock-Wempletown 345-kV line Rockdale-Wempletown 345-kV line Byron-Wempletown 345-kV line	2nd Nelson Dewey 161/138-kV transformer
3	North Monroe-Darlington 138-kV line	-	-	-	-	103.7%	-	-	-	Paddock 345/138 kV transformer	Dispatch local generation
3	Paddock-Townline 138-kV line	-	-	-	-	105.2%-96.1%	-	-	-	Paddock-NW Beloit 138-kV line NW Beloit-Blackhawk 138-kV line Blackhawk-Colley Road 138-kV line	Dispatch local generation
3	Entire Rock County and Walworth County 138-kV bus voltages	-	-	-	-	-	92.5%-96%	-	-	Base Case	Dispatch local generation
3	Fitchburg, Oakridge 138-kV buses	-	-	-	95.5%	-	95.8%-95.9%	-	-	Base Case	Dispatch local generation
3	Concord 138-kV buses	-	-	-	-	-	95.4%	-	-	Base Case	Install 4-49 MVAR 138-kV capacitor banks at Concord Substation
3	Entire Rock County and Walworth County 138-kV bus voltages	-	-	-	-	-	82.7%-92%	-	-	Paddock 345/138 kV transformer Paddock-Wempletown 345-kV line Rockdale-Wempletown 345-kV line Byron-Wempletown 345-kV line	Dispatch local generation
3	Entire Rock County and Walworth County 138-kV bus voltages	-	-	-	-	-	87.7%-92%	-	-	Burlington 138-kV bus 1-2 outage Burlington-Air Liquide 138-kV line Air Llquide-Paris 138-kV line	Dispatch local generation
3	Williams Bay 138-kV bus	-	-	-	-	-	90.7%	-	-	Elkhorn-Williams Bay 138-kV line	Dispatch local generation
3	La Prairie, Bradford, West Darien, SW Delavan and North Shore 138-kV buses	-	-	-	91.7%-91.9%	-	91.8%	-	-	Rock River-La Prairie 138-kV line La Prairie-Bradford 138-kV line Bradford-West Darien 138-kV line	Dispatch local generation
3	Sugar Creek 138-kV bus	-	-	-	-	-	91.9%	-	-	Burlington-N Lake Geneva Tap 138-kV line	Dispatch local generation
3	Brick Church, Williams Bay, Elkhorn and North Lake Geneva 138-kV buses	-	-	-	-	-	90.8%-91.8%	-	-	North Lake Geneva Tap-North Lake Geneva 138-kV line	Dispatch local generation
3	North Lake Geneva Tap 138-kV bus voltage	-	-	-	-	-	-	-	92%	Burlington 138-kV bus 1-2 outage	Dispatch local generation
3	Whitewater 138-kV bus	-	-	-	-	-	-	-	91.7%	Whitewater 138-kV bus 4-5 outage Whitewater-Lakehead Tap 138-kV line	Dispatch local generation
3	Whitewater, Lakehead, University and Bluff Creek 138-kV buses	-	-	-	-	-	-	-	90.7%-91.9%	Sunrise-Lakehead Tap 138-kV line	Dispatch local generation

TABLE ZS-2 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Spring Green and Wyoming Valley 138-kV buses	-	-	-	95.9%	-	-	-	-	Base Case	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Cobblestone- Zenda 69-kV line	-	-	95.5%	-	-	-	-	-	North Lake Geneva-Lake Geneva 69-kV line	Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation and construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation
3	Spring Green 138/69-kV transformer	-	-	99.5%-97.4%	-	-	-	-	-	Gran Grae-Wauzeka 69-kV line Wauzeka-Boscobel 69-kV line	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Stage Coach-Black Earth 69-kV line	-	-	97%	-	-	-	-	-	Spring Green 138/69-kV transformer	Install 2-16.33 MVAR 69-kV capacitor banks at Spring Green Substation and install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Nine Springs-Syene 69-kV line	-	-	97%	-	-	-	-	-	Royster-Pflaum 69-kV line	Loop 6947 Nine Springs-Pflaum 69-kV line into Femrite Substation
3	South Fond Du Lac-Waupun 69-kV line	-	-	103.6%-102.5%	-	-	-	-	-	North Randolph-Fox Lake 138-kV line Fox Lake-N Beaver Dam 138-kV line	Construct a Horicon-East Beaver Dam 138-kV line
3	Bluff Creek and Sugar Creek 138-kV buses	-	-	91.3%-91.7%	-	-	-	-	-	University-Bluff Creek 138-kV line	Dispatch local generation
3	Brodhead Muni 3, Brodhead Muni 2, Brodhead, Brodhead Muni 1, RCEC Orfordville, Orfordville, Bass Creek, Footville, RCEC Center, Evansville 69-kV bus voltages	-	-	91.1%-92%	-	-	-	-	-	Paddock-Newark 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation and rebuild/reconductor X-12 Town Line Road-Bass Creek 138-kV line
3	Rockdale-Lakehead Cambridge 138-kV line	95.2%	--	--	--	--	--	--	--	Oak Creek generation unit 1 or 2	Construct new 138-kV line from North Lake Geneva to South Lake Geneva Substation and construct new 138-kV bus and install a 138/69-kV 100 MVA transformer at South Lake Geneva Substation Construct Spring Valley-Twin Lakes-South Lake Geneva 138-kV line
4	Pulliam-Suamico 69-kV line	100.8%	-	105.6%	-	-	-	-	-	Base case	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	West Marinette 138/69-kV transformer #1	97.8-96.3%	-	100-101.9%	-	-	-	-	-	Wells St-Roosevelt 69-kV line Roosevelt 138/69-kV transformer	Expand the Menominee 69-kV Substation and install 138 kV terminals. Loop the West Marinette-Bay De Noc 138-kV line into the Substation Install 138/69-kV transformer at the expanded Menominee Substation
4	Pioneer-Sobieski 69-kV line	110.3%	-	116.5%	-	-	-	99.4%	-	Pulliam-Suamico 69-kV line followed by Sobieski-Pioneer 69-kV line close	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	Sunset Point-Pearl Ave 69-kV line	104.4%	-	109.5%	-	-	-	-	-	Ellinwood-Twelfth Avenue 69-kV line	Rebuild 2.37 miles of 69 kV from Sunset Point to Pearl Ave with 477 ACSR
4	Melissa-Tayco 138-kV line	103.8%	-	-	-	-	-	-	-	Butte Des Morts 138-kV bus tie 1-2 outage	Uprate the Melissa-Tayco to 229 MVA (300F)
4	North Appleton-Fox River 345-kV line	-	-	-	-	-	-	95.6%		North Appleton-Kewaunee 345-kV line	Uprate North Appleton-Fox River 345-kV line
4	Sobieski, Suamico 69-kV bus voltages	-	94.2-92.2%	-	94.3-92.2%	-	-	-	95.7-93.9%	Base case	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	Sobieski 69-kV bus voltage	-	91.8%	-		-	-	-	-	Morgan-Highway 22 345-kV line	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV
4	Bluestone, Wesmark 69-kV bus voltages	-	90.1-87.6%	-	86.4-88.9%	-	-	-	90.3%	Finger Rd-Bluestone 69-kV line	Construct a new 138-kV substation and loop Highway V-East Krok 138-kV line into the substation
4	East Krok, Beardsley St 69-kV bus voltages	-	91.9-91.5%	-	90.8-91.2%	-	-	-	-	East Krok 138/69-kV transformer	No provisional project Additional study is being conducted.
4	Hickory, Forward Energy Center, Butternut 4, and Butternut 5 138-kV bus voltages	-	91.9%	-	91%	-	-	-	-	Hickory-South Fond du Lac 138-kV line	Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation
4	Holland 138-kV bus voltage	-	91.8%	-	91.4%	-	-	-	-	Charter Steel Industry-Holland 138-kV line	No provisional project. Additional study is being conducted.
4	Suamico 69-kV bus	-	90.7%	-	89.8%	-	-	-	91.5	Pulliam-Suamico 69-kV line followed by Sobieski-Pioneer 69-kV line close	Rebuild/Convert Bayport-Suamico-Sobieski-Pioneer 69-kV line to 138 kV

TABLE ZS-2 (continued)

PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2013 Summer Peak, High Growth, 3000 MW Import and 90% East-to-West Bias Cases

Planning Zone	Criteria Exceeded/Need	2013 Summer Peak Case		2013 High Load Growth		2013-70% - 3000 MW Import Case		2013-90% - E-W Bias Case		Facility Outage(s)	Project
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
4	Edgewater-Washington Ave 69-kV line	-	-	95.6%		-	-	-	-	Edgewater-Nicolet 69-kV line	No provisional project. Additional study is being conducted.
4	City Limits-Combined Locks Tap 138-kV line	-	-	98.1%		-	-	-	-	North Appleton-Apple Hills 138-kV line	No provisional project. Additional study is being conducted.
4	Barnett 69-kV bus voltage	-	-	-	91.8%	-	-	-	-	East Krok 138/69-kV transformer	No provisional project. Additional study is being conducted.
4	Auburn 138-kV bus voltage	-	-	-	91.7%	-	-	-	-	Hickory-South Fond du Lac 138-kV line	Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation
4	Forward Energy Center, Butternut 4, and Butternut 5 138-kV bus voltages	-	-	-	91.6%	-	-	-	-	Hickory-Forward Energy Center 138-kV line	Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation
4	Butternut 4, Butternut 5 138-kV bus voltages	-	-	-	91.8%	-	-	-	-	Butternut 5-Forward Energy Center 138-kV line	Install 28.8 MVAR capacitor bank at Butternut 138-kV Substation
4	Holland 138-kV bus voltage	-	-	-	91.9%	-	-	-	-	Charter Steel Industry 138-kV bus plus Charter Steel-Cedarsauk 138-kV line	No provisional project. Additional study is being conducted.
5	Concord 138-kV bus voltage Allerton 138-kV bus voltage Bark River 138-kV bus voltage Brookdale (East) 138-kV bus voltage Edgewood 138-kV bus voltage Cooney 138-kV bus voltage Cottonwood 138-kV bus voltage Germantown 138-kV bus voltage Hartford 138-kV bus voltage Merrill Hills 138-kV bus voltage Mukwonago 138-kV bus voltage Maple 138-kV bus voltage Pleasant Valley 138-kV bus voltage St. Lawrence 138-kV bus voltage Summit 138-kV bus voltage Sussex 138-kV bus voltage Arthur Road 138-kV bus voltage Glacier 138-kV bus voltage Albers – Paris 138-kV line	--	90.6% 94.7% 91.8% > 96.0% 94.4% 90.0% 90.5% 91.7% 92.6% 92.7% 93.8% 92.3% > 95.0% 94.0% 90.2% 94.9% 94.0% 94.5% 97.7%		89.9% 93.9% 91.9% 94.6% 93.7% 89.4% 90.3% 93.6% 92.0% 92.1% 93.2% 93.9% 94.6% 93.5% 89.7% 94.6% 93.5% 94.2% 95.6%	--	--	94.1% --- 94.9% --- --- 93.4% 93.9% 94.7% --- 94.9% --- --- --- --- 93.5% --- --- --- --	Intact System (No Concord or Germantown generation is on line in the summer peak model. One Germantown unit is on line in the high load growth model. Voltages are based on 90% machine Q. Contingencies based on 95% Q) * Two 32 MVar capacitors were placed in service at Summit prior to 2013 summer peak contingency analysis and high load growth contingency analysis. Intact system voltages are prior to capacitor installation.	Dispatch local generation
5	Concord, Cooney, Cottonwood, Summit, Bark River 138-kV bus voltages	--	86.6 – 89.8% 87.2 – 89.7% 86.8 – 89.6% 87.4 – 89.4% 88.7 – 89.9% --	--	85.6 – 89.4% 84.7 – 87.9% 87.5 – 89.2% 86.1 – 89.5 % 87.2 – 88.6% --	--	--	--	89.8 % -- -- -- -- --	Jefferson-Crawfish River - Concord 138-kV line Bark River – Cottonwood 138-kV line Bark River – Sussex 138-kV line Hartford – St. Lawrence 138-kV line Cooney – Summit 138-kV line Plus other less severe outages	Summit, Mukwonago caps & Dispatch local generation
5	Germantown and Maple 138-kV bus voltages	--	88.1 – 89.2% 87.3% 82.2 – 82.5%	--	-- -- 88.8 – 89.2 %	--	--	--	-- -- 87.6 87.9%	Bark River – Sussex 138-kV line Germantown – Maple 138-kV line Maple – Saukville 138-kV line	Dispatch local generation
5	Hartford 138-kV bus voltage	--	83.9% 89.3%	--	82.3 % 88.3 %	--	--	--	89.1 % --	Hartford – St. Lawrence 138-kV line Pleasant Valley – Saukville 138-kV line	Load shifting
5	St. Lawrence, Arthur Road 138-kV bus voltage	--	--	--	89.1%	--	--	--	--	Pleasant Valley – Saukville 138-kV line	No Project Yet Load shifting
5	Pleasant Valley 138-kV bus voltage	--	89.4%	--	--	--	--	--	--	Pleasant Valley – Saukville 138-kV line	Load Shifting
5	Bain 345/138-kV transformer T5	159.9% 99.6% 100.4%	--	160.3% 98.8% 103.9%	--	139.2% -- --	--	159.1% -- 97.0%	--	Pleasant Prairie bus split between 3 and 4 Pleasant Prairie bus split between 2 and 3 Pleasant Prairie - Bain transformer T4	Dispatch local generation
5	Bain 345/138-kV transformer T4	99.6%	--	103.1%	--	--	--	96.2%	--	Pleasant Prairie - Bain transformer T5	Dispatch local generation
5	Albers – Bain 138-kV line	118.2%	--	121.6%	--	101.8%	--	117.5%	--	Bain – Kenosha 138-kV line	Uprate Albers – Bain 138-kV line Dispatch local generation
5	Edgewood – St. Martins 138-kV line	--	--	--	--	98.7% 103.6 % 107.3% 106.0% 101.2%	--	--- --- --- 96.5% ---	--	Split Burlington 138-kV bus Burlington – Air Liquide – Paris Paddock 345/138-kV transformer Merrill Hills – Waukesha 138-kV line Wempletown – Paddock 345-kV line	No project yet Dispatch local generation
5	Bain – Kenosha 138-kV line	95.6%	--	98.8	--	--	--	--	--	Albers – Bain 138-kV line	No project yet – Dispatch local generation