ATC Planning Zone 4 Generation Integration Screening Study

December, 2017

ATC voluntarily performed a high level, steady-state screening of transmission facilities in ATC Planning Zone 4, which encompasses the northeastern portion of Wisconsin using the 2026 summer peak model from the 2016 10-Year Assessment. This was done to assist generation developers with the preliminary identification of potential locations where existing transmission facilities may be able to accommodate the addition of new and/or additional generation capacity.

All potential locations were screened for single contingency, steady-state limitations. Locations that could not accommodate generation for a single contingency were removed from the tables that were produced through this effort. ATC has not performed any analysis to identify the scope or cost of work to eliminate the limit(s) that were identified for any of the contingencies that were noted. ATC may choose to perform similar screening studies of other portions of its footprint in the future, as system conditions and circumstances warrant.

Additional steady state, multiple contingency analysis was performed for all 345 kV locations. Multiple contingency analysis was also performed for all 138 kV and 69 kV locations that appeared to be capable of hosting 100 MW or more of generation under steady-state, single contingency conditions. Multiple contingency analysis resulted in reduced generation capacity as compared to single contingency screening results. ATC has not performed any analysis to identify the scope or cost of work to eliminate the limit(s) that were identified for any of the contingencies that were noted.

ATC's initial screening did not include stability analysis. Since different types of generating units have substantially different stability performance characteristics, a stability analysis would not be generally applicable for this type of screening study. Additionally, the stability analysis would result in different and likely less potential capability than what is depicted in this steady-state screening study. Finally, the study analyzed only one potential generation site at a time and, as such, the results are not necessarily additive.

Tables that follow below identify the location, screening results and the Zone 4 sub-zone where the existing transmission facility is located. Figure 1 depicts six sub-zones to aid in identification of applicable locations, as follows:

- Table 1 illustrates the results of the analysis for 345 kV sites.
- Table 2 provides the results of the analysis for 138 kV sites where the generation capability appeared to be greater than 100 MW under single contingency conditions. The multiple contingency column is listed as "---"when there was zero generation capability under multiple contingency conditions. This occurs when there are only two outlets at the site.
- Table 3 provides the results of the analysis for 69 kV sites where the generation capability appeared to be greater than 100 MW under single contingency conditions. The multiple contingency column is listed as "---"when there was zero generation capability under multiple contingency conditions. This occurs when there are only two outlets at the site.

This was a high-level screening study using a single steady-state model and a particular set of assumptions, as described herein. The study results listed in the tables below may not be indicative of the results that would be produced via the MISO Tariff Attachment X Generation Interconnection

process which may use different generation dispatch and injection limit criteria based on the distribution factors. System stability, both angular and voltage, were not considered in this screening study. ATC makes no representations, either expressed or implied, that the scope of the interconnection facilities or transmission upgrades required to connect generation at these sites would be minimal, or even feasible. Single contingency screening results do not reflect any possible reductions required for multiple contingencies. The analysis considered 69 kV, 138 kV and 345 kV nodes in the power flow model, but did not consider actual bus configuration or the existence of buses for constructability at the locations that were studied. Corresponding interconnection facilities and transmission upgrades will be determined by the MISO Tariff Attachment X process. This non-binding, voluntary study is presented for informational purposes only and ATC makes no guarantee or warranty that the information presented herein is accurate or complete.

2026 Steady-State Analysis Power Flow Assumptions

- Bay Lake projects in service
- Presque Isle
    - Generating Plant Output: 0 MW,
    - Replacement generation J703, J704 and J711
- Interconnection with the City of Marquette
    - All units offline except Hydro
- Mackinac HVDC flow
    - 20 MW North to South
- West Marinette
    - 2 units online
- Pulliam
    - Units 7/8 offline
    - Unit 31 online
- Empire Mine Load:
    - 5 MW
    - Per latest load forecast
- Edgewater
    - Unit 4 retired
    - Unit 5 online
- Bayport-Pioneer (E-83/T-98) conversion to 138 kV included

Table 1: Generation Capability at 345 kV Sites – ATC Planning Zone 4

345 kV Site	Single contingency results (MW Capability)	Multiple contingency Results (MW Capability)	Sub-Zone
Morgan	1459.3	681.8	2
Highway 22	1983.5	1228.9	2
Werner West	1523.9	1262.0	3
North Appleton	1695.9	1043.2	3
Fox River	210.5	17.1	3
Forest Junction	263.5	109.5	3
Point Beach	151.5	35.9	4
Kewaunee	601.8	133.5	4
Branch River	162.5	37.3	4
Fitzgerald	615.7	330.9	5
Cypress	340.5	134.4	5
South Fond du Lac	789.5	28.1	6
Sheboygan Energy	232.4	50.6	6
Edgewater	702.1	216.5	6

Table 2: Generation Capability at 138 kV Sites – ATC Planning Zone 4

138 kV Site	Single contingency Results (MW Capability)	Multiple contingency results (MW Capability)	Sub-Zone
Amberg	876.3	549.9	1
Holmes	537.9	403.8	1
Bay de Noc	412.9	---	1
Ingalls	409.6	---	1
Menominee	377.7	50.3	1
Crivitz	281.0	145.0	1
West Marinette	239.9	52.5	1
Roosevelt	194.6	92.1	1
White Rapids	137.4	---	1
Morgan	992.9	290.1	2
Stiles	860.3	704.1	2
Pioneer	646.1	510.0	2
White Clay	494.6	261.2	2
Sobieski	421.6	---	2
Falls	408.9	---	2
Suamico	386.8	---	2
West Shawano	318.8	---	2
East Shawano	303.5	---	2
Badger	283.7	175.3	2
Sherwood	238.4	---	2
Clintonville	225.2	---	2
Oconto	219.2	---	2
Little Suamico	177.1	---	2
Cloverleaf	118.6	---	2
North Appleton	1230.1	483.1	3
Pulliam	852.1	704.2	3
Werner	705.5	488.4	3
Butte des Morts	519.3	332.2	3
Ellington	469.3	272.6	3
Forest Junction	426.6	77.4	3
City Limits	391.6	296.0	3
Bayport	384.3	---	3
Apple Hills	383.7	---	3
Hintz	342.0	---	3
Tower Drive	305.1	228.4	3
Casaloma	301.8	---	3
Liberty	291.1	113.3	3
Maes	280.8	---	3
7th Street	278.5	---	3

Table 2: Generation Capability at 138 kV Sites – ATC Planning Zone 4 (continued)

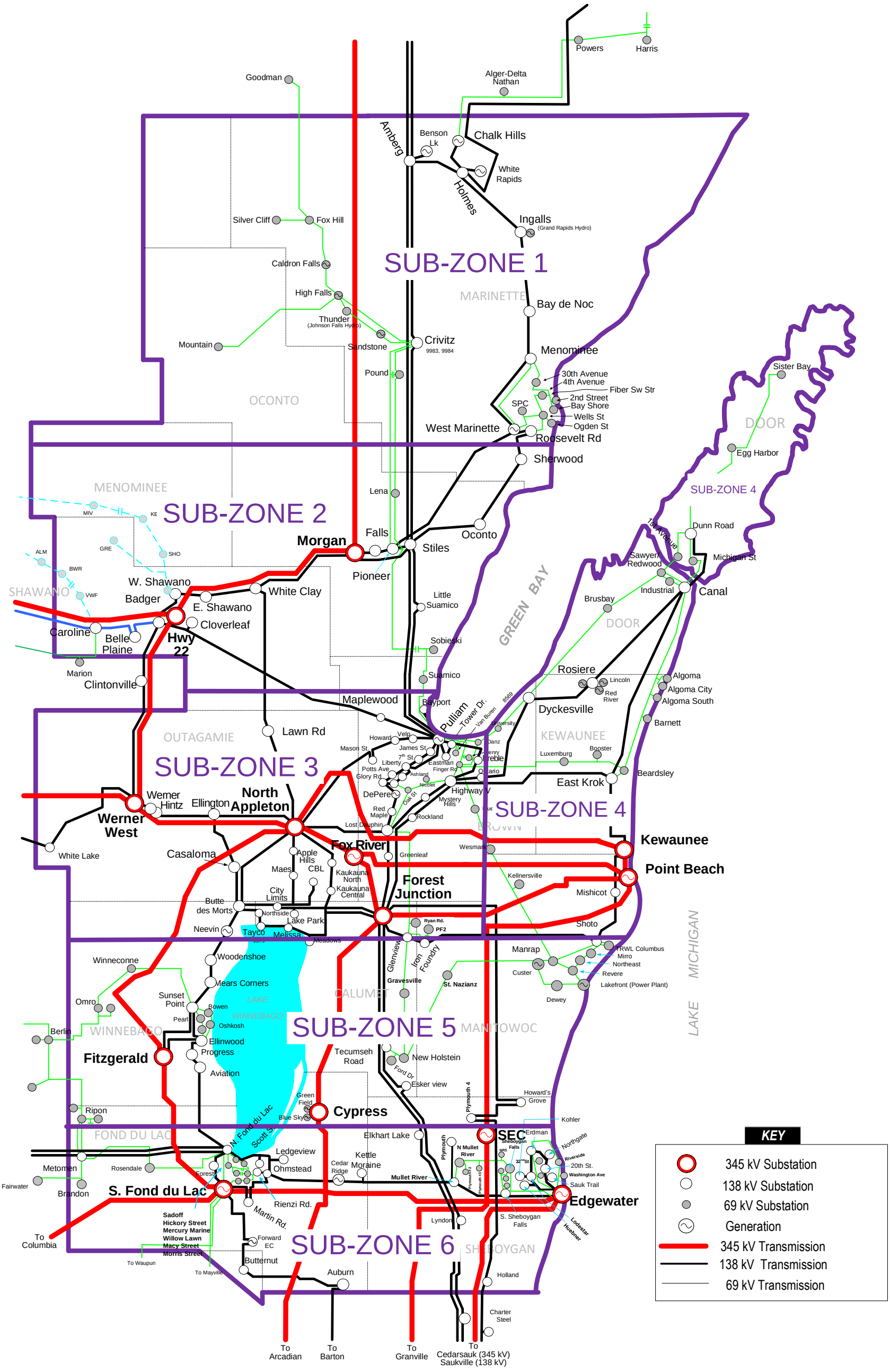
138 kV Site	Single contingency Results (MW Capability)	Multiple contingency results (MW Capability)	Sub-Zone
Lawn Road	269.0	---	3
James Street	258.3	---	3
Eastman	235.8	---	3
Ashland	210.6	---	3
Potts Avenue	173.4	---	3
Glory Road	158.9	16.3	3
Melissa	148.9	---	3
Lake Park	141.3	---	3
Maplewood	138.4	---	3
Greenleaf	138.2	---	3
NSS	129.6	---	3
Velp	125.9	---	3
Rockland	106.1	---	3
Neevin	100.5	---	3
Mishicot	270.0	---	4
Kewaunee	244.9	4.2	4
East Krok	152.4	9.7	4
Rosiere	112.5	---	4
Dyckesville	102.5	0	4
Ellinwood	477.1	351.3	5
Sunset Point	410.2	294.5	5
Fitzgerald	278.2	81.7	5
Shoto	264.5	58.5	5
Plymouth #4	257.7	---	5
Howards Grove	254.7	---	5
Aviation	245.2	---	5
Mears Corners	222.0	---	5
Progress	210.8	---	5
Glenview	193.7	123.2	5
Iron Foundry	170.7	95.0	5
Esker View	156.1	---	5
Tecumseh	149.3	42.6	5
Woodenshoe	111.7	---	5
Edgewater	790.5	98.6	6
North Fond du Lac	562.5	266.6	6
Kettle Moraine	356.4	---	6
South Sheboygan Falls	342.6	77.5	6
Cedar Ridge	339.7	---	6
Ohmstead	336.0	53.6	6

Table 2: Generation Capability at 138 kV Sites – ATC Planning Zone 4 (continued)

138 kV Site	Single contingency Results (MW Capability)	Multiple contingency results (MW Capability)	Sub-Zone
Holland	327.2	---	6
East Scott Street	305.4	---	6
Lodestar	246.2	---	6
Sauk Trail	235.9	---	6
Erdman	232.1	62.8	6
Ledgeview	231.7	---	6
20th Street	221.4	---	6
Creekview	219.2	---	6
Huebner	214.7	---	6
South Fond du Lac	206.9	29.0	6
Northgate	202.7	---	6
Forward Energy	198.6	---	6
Butternut	194.8	---	6
Martin Road	180.3	---	6
Auburn	175.1	---	6
Rienzi Road	155.1	---	6
Plymouth #1	151.2	---	6
Lyndon	138.8	---	6
Forest	132.1	---	6

Table 3: Generation Capability at 69 kV Sites – ATC Planning Zone 4

69 kV Site	Single contingency results (MW Capability)	Multiple contingency Results (MW Capability)	Sub-Zone
West Marinette	120.3	71.1	1
Wells	214.3	129.9	1
Ogden Street	139.0	---	1
4th Avenue	121.8	---	1
30th Avenue	125.6	---	1
Finger Road	109.8	72.0	3
Dunn Road	106.5	90.4	4
Brusbay	117.2	---	4
Sunset Point	228.0	226.0	5
Shoto	162.6	36.2	5
Revere	112.9	32.8	5
Rapids	110.7	79.0	5
Pearl Avenue	105.8	---	5
Glenview	104.5	91.0	5
Ellinwood	107.9	68.5	5
12th Street	111.4	---	5
South Fond du Lac	161.0	16.3	6
Sheboygan Falls	133.8	69.7	6
North Fond du Lac	166.7	86.5	6
Mercury Marine	132.8	---	6
Menominee	189.8	120.3	6
Edgewater 69	186.5	153.7	6


Goodman
Alger-Delta
Nathan
Powers
Harris
Amberg
Benson
Lk
Chalk Hills
White
Rapids
Holmes
Ingalls
(Grand Rapids Hydro)
Silver Cliff
Fox Hill
Caldron Falls
SUB-ZONE 1
High Falls
Thunder
(Johnson Falls Hydro)
Mountain
Sandstone
Crivitz
9983, 9984
Pound
MARINETTE
Bay de Noc
Menominee
30th Avenue
4th Avenue
Fiber Sw Str
2nd Street
Bay Shore
Wells St
Ogden St
SPC
West Marinette
Roosevelt Rd
Sherwood
Sister Bay
DOOR
Egg Harbor
OCONTO
Lena
Falls
Stiles
Oconto
SUB-ZONE 4
MENOMINEE
SUB-ZONE 2
MIV
KE
ALM
GRE
SHO
BWR
VWF
Morgan
Pioneer
Dunn Road
1st Avenue
Michigan St
Sawyer/
Redwood
Industrial
Canal
Brusbay
W. Shawano
Badger
E. Shawano
White Clay
Cloverleaf
Hwy
22
Caroline
Belle
Plaine
Marion
Clintonville
Little
Suamico
Sobieski
Suamico
GREEN BAY
Rosiere
Lincoln
Red
River
Algoma
Algoma City
Algoma South
Barnett
Maplewood
Bayport
Pulliam
Tower Dr.
Van Buren
University
8569
Dyckesville
Lawn Rd
OUTAGAMIE
Howard
Velp
Mason St.
James St.
7th St
Danz
Henry
Creble
Liberty
Potts Ave
Glory Rd
Eastman
Finger Rd
Ashland
Nicolet
Ontario
KEWAUNEE
Luxemburg
Booster
Beardsley
East Krok
SUB-ZONE 3
Highway V
Mystery
Hills
DePere
Oak St
Red
Maple
Rockland
Lost Dolphin
Werner
Hintz
Ellington
North
Appleton
Werner
West
SUB-ZONE 4
BROWN
Kewaunee
Point Beach
Wesmark
Fox River
Greenleaf
White Lake
Casaloma
Apple
Hills
CBL
Maes
Kaukauna
North
Kaukauna
Central
Forest
Junction
Kellnersville
Mishicot
City
Limits
Butte
des Morts
Northside
Lake Park
Neevin
Tayco
Melissa
Meadows
Ryan Rd.
PF2
Shoto
Glenview
Iron
Foundry
Gravesville
St. Nazianz
Manrap
TRWL Columbus
Mirro
Northeast
Revere
Lakefront (Power Plant)
Custer
Dewey
Winneconne
Woodenshoe
Mears Corners
LAKE
MICHIGAN
Omro
Sunset
Point
Bowen
Pearl
Oshkosh
WINNEBAGO
CALUMET
SUB-ZONE 5
MANITOWOC
Berlin
WINNEBAGO
Ellinwood
Progress
Aviation
Fitzgerald
Tecumseh
Road
New Holstein
Ford Dr.
Esker view
Howard's
Grove
Plymouth 4
Green
Field
Blue Sky
Cypress
Ripon
FOND DU LAC
N. Fond du Lac
Scott St.
Elkhart Lake
SEC
Sheboygan
Falls
Erdman
Kohler
Northgate
Riverside
20th St.
Washington Ave
Sauk Trail
Ledgeview
Ohmstead
Kettle
Moraine
Cedar
Ridge
Mullet River
N Mullet
River
Plymouth
Metomen
Rosendale
Forest
Fairwater
Brandon
S. Fond du Lac
Rienzi Rd.
Martin Rd.
Edgewater
Lodestar
Huebner
S. Sheboygan
Falls
Lyndon
Sadoff
Hickory Street
Mercury Marine
Willow Lawn
Macy Street
Morris Street
To
Columbia
To Waupun
To Mayville
Forward
EC
Butternut
SUB-ZONE 6
SHEBOYGAN
Auburn
Holland
Charter
Steel
To
Arcadian
To
Barton
To
Granville
To
Cedarsauk (345 kV)
Saukville (138 kV)
KEY
345 kV Substation
138 kV Substation
69 kV Substation
Generation
345 kV Transmission
138 kV Transmission
69 kV Transmission