September 2011 10-Year Assessment
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Overview

Planning for the Upper Peninsula transmission system has been a unique challenge. For example, small changes in existing or planned load or generation can push the system beyond reasonable limits. Even with significant transmission system upgrades in the last several years, operational challenges remain in this region due to the delicate balance among generation, load, market flows and transmission facilities that currently exists. There are also continuing asset renewal needs.

An exhaustive study was completed to identify the long-term needs and required solutions for the U.P. using strategic flexibility planning. Numerous core projects were identified and have been moved forward into the project development process. The study process and core projects are described in the following sections.

Collaborative

ATC decided to apply strategic flexibility planning principals to better understand the core and contingent needs and solutions in this specific area of our system. To develop our strategic flexibility assumptions for the intermediate (3-5 year) and long term (10-15 year) periods, we engaged Upper Peninsula stakeholders in the Collaborative process to examine the bounds of six plausible futures. Similar to ATC's past economic benefits studies, the futures included:

- Robust Economy
- High Retirements
- High Environmental
- Slow Growth
- DOE 20% Wind
- Fuel & Investment Limitations.

A cross-functional internal team was formed at ATC to identify needs and develop solutions. As appropriate this team was also supplemented with external participation from entities like ITC and MISO. The cross functional team integrated multiple need drivers into the solution development process, including NERC transmission planning standards, generation and distribution interconnections, asset renewal, and system operating driven needs. To establish NERC transmission planning driven needs, planning models were developed and analyzed for the years 2018 and 2024 for each future, we gathered information on ATC asset renewal needs, and we reviewed loop flow impacts and operating outage coordination concerns. This allowed us to establish sets of core and contingent transmission system needs across the Upper Peninsula. Core needs occurred in most futures. Contingent needs occurred only in a few futures. The needs were reviewed with stakeholders for feedback.

Solutions

As the system needs analysis and solution development proceeded we found it convenient to identify four critical areas within the U.P. These four areas are:

- Eastern
- Escanaba
- Munising/Newberry
- Western

Figure UP-MCP-1 identifies where core solutions were developed. Table UP-1 lists the core projects, estimated in-service dates, and estimated costs. These solutions were shared with stakeholders in a variety of settings. Estimated costs for the sum of the core projects in each area are listed below.

Eastern	145 M$
Escanaba	67 M$
Munising/Newberry	37 M$
Western	19 M$
Total	269 M$

Benefits

Benefits of the core solutions include:

- Coordinated Plan across region
- Flow control
- Asset Renewal (all areas)
- Enhanced Network Service in all areas
- Increased Operating Flexibility for multiple outages in all areas

Contingencies

The collaborative process identified the following contingencies that could give rise to additional projects if the appropriate drivers appear.

- East – Kinross load or unknown generation additions would require additional 138 kV facilities

- Escanaba – unknown generation additions/retirements
- Munising/Newberry – unknown load/generation additions
- West – Asset Renewal needs will eventually appear for the Conover-Winona 69 kV line, unknown load load/generation additions may require additional 138 kV transmission
- High retirements, if it occurred, could lead to extensive transmission or possibly generation solutions in the central portion of the U.P.

For a summary of results reported in our previous Assessments, please refer to our 2009 and 2010 Collaborative web pages.

Project development progress

Below is a summary of our project development progress since the last Assessment was published.

Eastern area core solutions

The major efforts to report since our last Assessment are as follows:

1) *Straits Reactors* – This inexpensive project was placed in service in 2010 as a short term way to help control high voltages at Straits and McGulpin substations. Flow control is still needed to deal with the concerns caused by relatively large power flow swings for the area's 69 kV system.

The complete list of core projects that ATC identified and reviewed with stakeholders is depicted in Figure UP-8C-E and includes:

1. Uprate both Straits-McGulpin 138-kV overhead lines (E2) scheduled to be complete in 2012,
2. Rebuild the Pine River-Straits 69-kV lines as 138-kV double circuit, operate at 69 kV (E4) in 2014,
3. Uprate Pine River-9 Mile 69-kV line 6923 to 167 degrees F and asset renewal projects (E6, E-AR2) in 2016,
4. Nine Mile-Edison Sault Hydro Asset Renewal Projects (E-AR4),
5. Power Flow Control on the Straits-McGulpin 138-kV Lines (E3 or E31),
6. Energize the second Indian Lake-Hiawatha line at 138 kV (E8) in 2014,
7. Install flow control at the Straits substation in the form of back-to-back HVDC (E3) in 2014, and
8. Add reactors to the tertiary windings of the Straits 138-69 kV transformers (complete).

However, if the Kinross load is confirmed then projects E4, E6, and E-AR2 will be replaced with project E23:

1. Rebuild Pine River-Straits 69-kV lines as 138-kV double circuit, rebuild Pine River-9 Mile as 138/69-kV double circuit, add a new 138/69-kV transformer each at Pine River and 9 Mile substations (E23) in 2015, and
2. Other core projects are E2, E-AR4, E3 or E31, and E8 with in-service dates as described above.

The earliest the Kinross load could be connected to required transmission projects would be 2015. Please refer to Zone 2 – 2016 study results and our Asset Renewal section for further details related to the above projects.

Escanaba area core solutions
Since our 2010 Assessment, we have focused on refining the core solutions in this area particularly to identify short lead-time solutions that could expedite improving service to our customers in this area. The refined list of core projects that ATC and its stakeholders have identified in the Escanaba area is shown in Solution Set D of Figure UP-8C-ESC and includes the following:

Projects in service:
1. Uprate the Escanaba area 69-kV loop lines (C2a),
2. Uprate Delta-Escanaba 69-kV lines #1 & #2 to 55 MVA (C25, C26, one line non-ATC), and
3. Asset Renewal Project on the Chandler 69-kV line (C-AR3).

Near-term projects:
1. Install a second 138/69-kV transformer at the Chandler Substation (C3), and
   - Project is in the design phase, includes providing for a 138 kV ring bus, and is scheduled to be in service in 2012.
2. Install 69-kV bus tie breaker and replace five Delta 69-kV breakers
   - Breaker projects will provide greater generator stability during system disturbances, greater operating flexibility and will be in service prior to the year 2012.

Next priorities:
1. Extend the 138-kV system into the major load areas of Escanaba (C5, C6, C8), by constructing an 18th Road – Chandler double-circuit 138/69-kV line, installing two 138/69-kV transformers and installing 1-8.16 MVAR capacitor bank at 18th Road.
   - Proposed projects are moving forward with 2014 in-service dates.
2. Asset Renewal Project on the Powers – Chalk Hills 69-kV line (C-AR4).
   - Provisional project is moving forward with a 2018 in-service date.
3. Add a new 345/138-kV transformation at the Arnold Substation (C21).

- After analyzing generation availability in the area, it was determined that the Arnold 345/138-kV transformer would be the preferred solution in the area in the 2015 timeframe.
- Proposed project is moving forward with a 2015 in-service date.

Remaining priorities:

4. Construct a new Escanaba D-T Substation (C22, non-ATC),
   - Provisional project is moving forward with a 2014 in-service date pending D-T interconnection request analyses.

Please refer to Zone 2 – 2012 study results and our Asset Renewal section for further details related to the above projects.

Munising/Newberry area core solutions

The list of core projects that ATC and its stakeholders identified in the Munising area is shown in Solution Set B of Figure UP-8C-MN and includes the following:

1. Construct a second Gwinn-Forsyth 69-kV line (C10),
   - Upon further analysis, this project was found to be no longer needed.
2. Close the normally open Seney-Blaney Park 69-kV line and uprate the entire Munising-Seney-Blaney Park 69-kV (Inland) line (C17),
   - This project is provisional in nature and moving forward with a 2014 in-service date.
3. Asset Renewal projects on the Munising – Forsyth 138-kV line (C-AR1), and
   - This project is proposed in nature and is scheduled for a 2012 in-service date.
4. Asset Renewal projects on the Munising – Gwinn, Blaney Park – Munising, and Roberts – 9 Mile 69-kV lines (C-AR1, C-AR2 and C-AR3).
   - These 69-kV projects are proposed in nature and have projected in-service dates in the 2011-2014 timeframe.

Please refer to Zone 2 – 2012 study results and our Asset Renewal section for further details related to the above projects.

Western area core solutions

The refined list of core projects that ATC and its stakeholders identified in the Western area is shown in Figure UP-8C-W includes the following:

1. Rebuild the M38-Atlantic 69-kV line (W9), and
   - This project is planned and is scheduled to be in service in the 2013 timeframe.
2. Minimum Asset Renewal of Conover – Mass 69-kV line (W-AR2).
   - This project is provisional in nature and is scheduled to be in-service in the 2018 timeframe.

Please refer to Zone 2 – 2012 study results and our Asset Renewal section for further details related to the above projects.

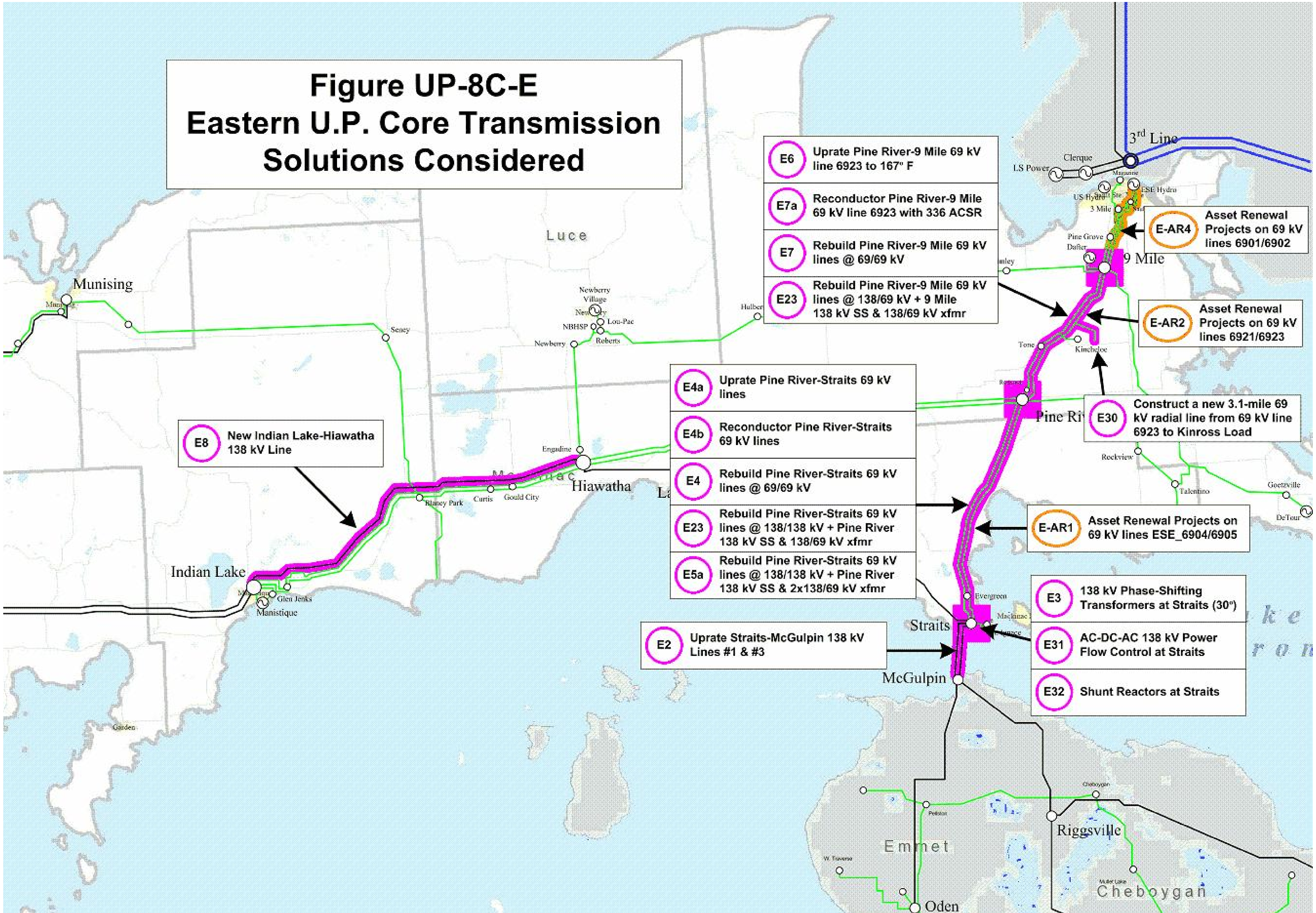


Figure UP-8C-E Eastern U.P. Core Transmission Solutions Considered

Figure UP-8C-ESC: Escanaba Area Core Transmission Solution Sets Considered

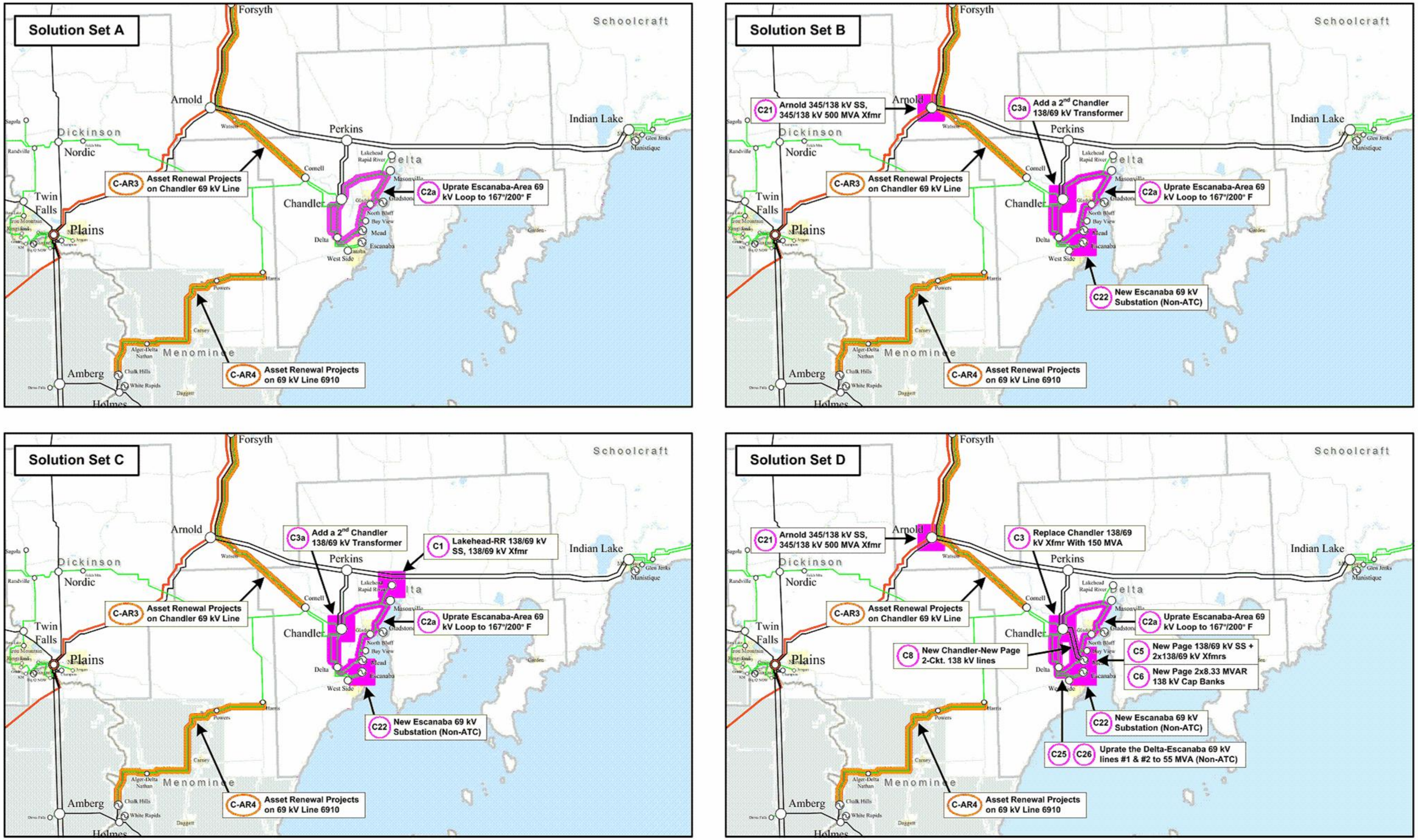
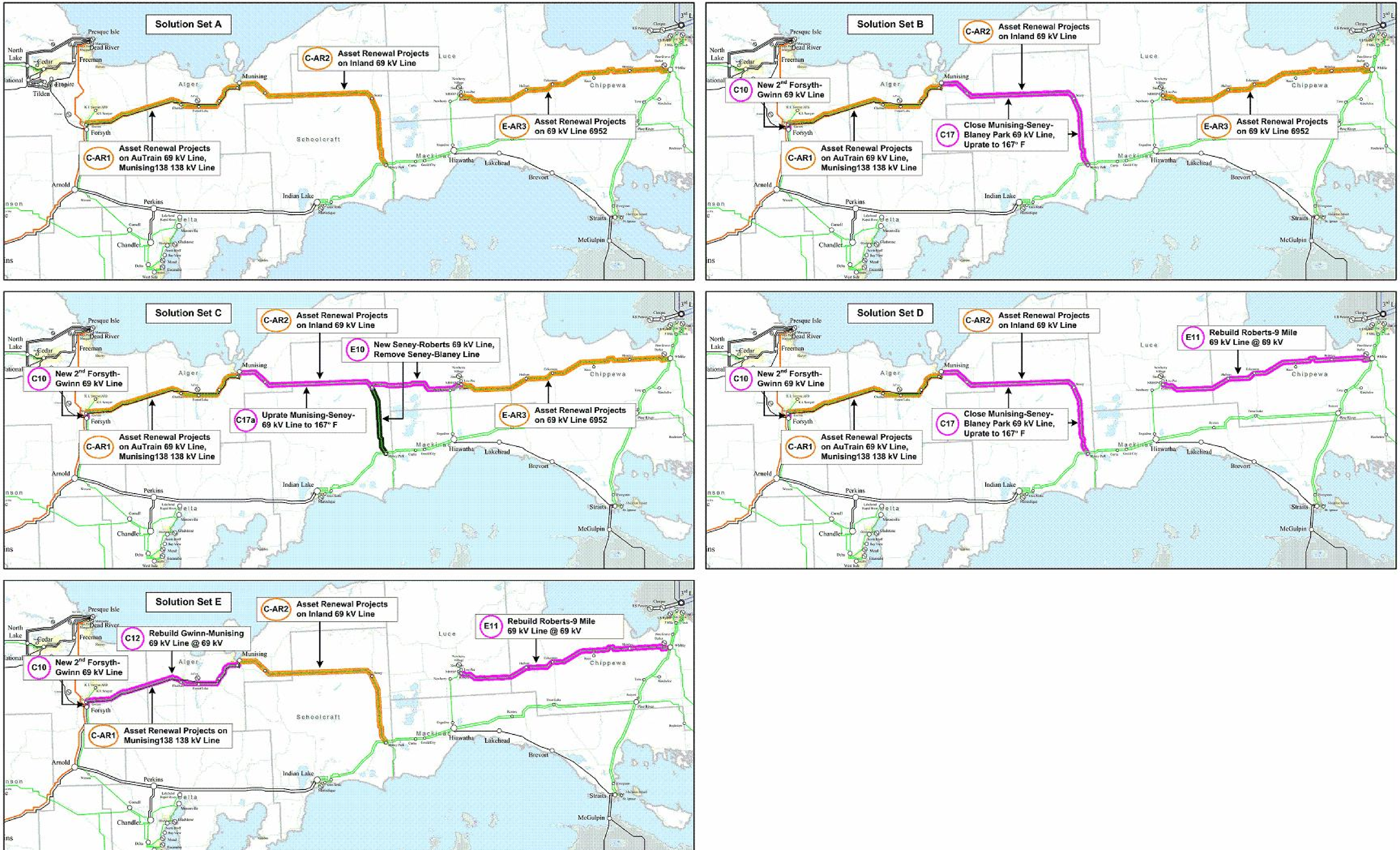


Figure UP-8C-MN: Munising/Newberry Area Core Transmission Solution Sets Considered



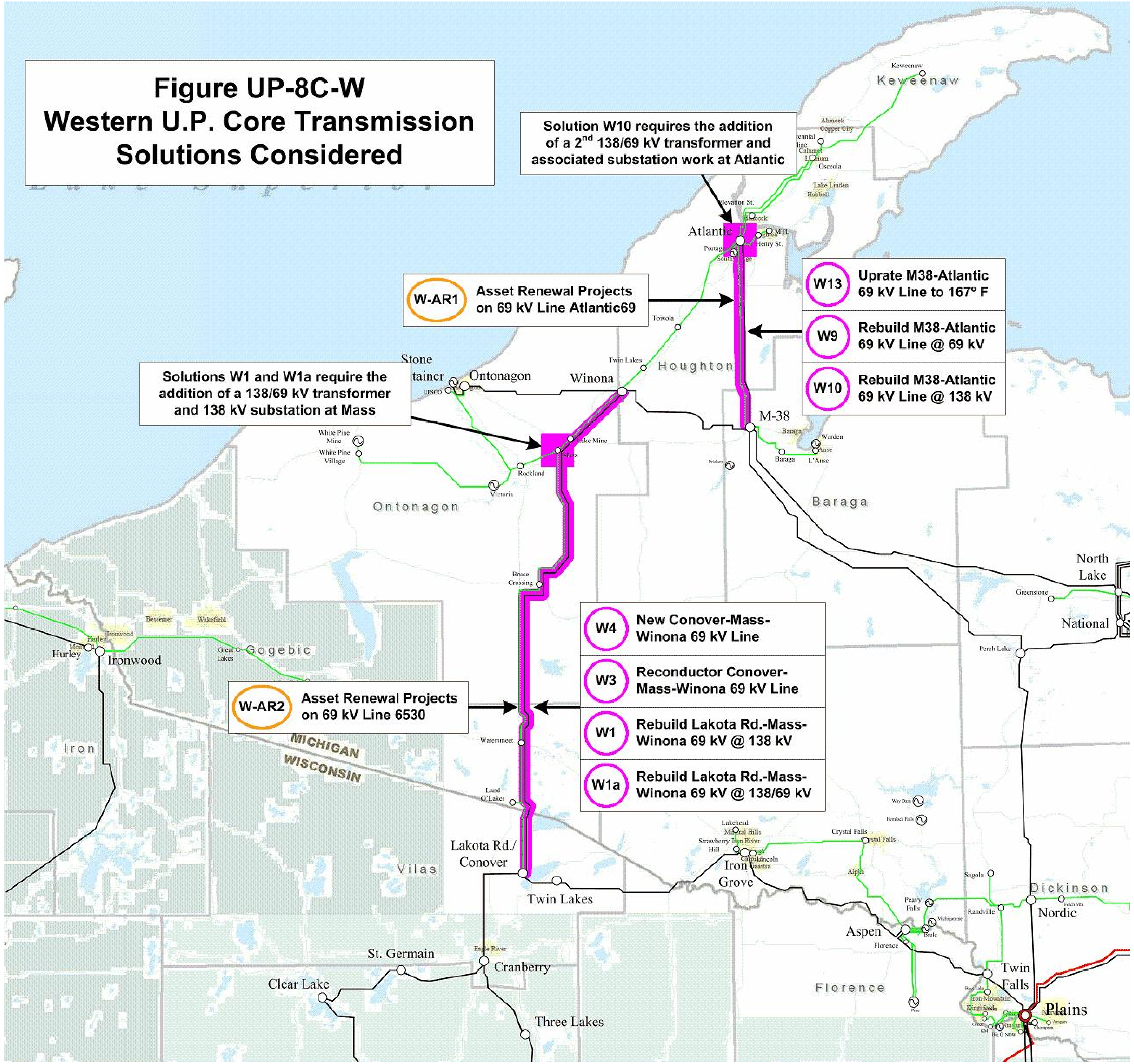


Figure UP-8C-W
Western U.P. Core Transmission
Solutions Considered
Solution W10 requires the addition of a 2nd 138/69 kV transformer and associated substation work at Atlantic
W-AR1 Asset Renewal Projects on 69 kV Line Atlantic69
W13 Uprate M38-Atlantic 69 kV Line to 167º F
W9 Rebuild M38-Atlantic 69 kV Line @ 69 kV
W10 Rebuild M38-Atlantic 69 kV Line @ 138 kV
Solutions W1 and W1a require the addition of a 138/69 kV transformer and 138 kV substation at Mass
W4 New Conover-Mass-Winona 69 kV Line
W3 Reconductor Conover-Mass-Winona 69 kV Line
W1 Rebuild Lakota Rd.-Mass-Winona 69 kV @ 138 kV
W1a Rebuild Lakota Rd.-Mass-Winona 69 kV @ 138/69 kV
W-AR2 Asset Renewal Projects on 69 kV Line 6530
Keweenaw
Atlantic
Houghton
Winona
Ontonagon
M-38
Baraga
North Lake
National
Ironwood
Hurley
Gogebic
Iron
MICHIGAN
WISCONSIN
Vilas
Lakota Rd./ Conover
Twin Lakes
Iron Grove
Aspen
Florence
Dickinson
Nordic
Twin Falls
Plains
St. Germain
Clear Lake
Cranberry
Three Lakes

Figure UP-MCP-1