



Zone 3 - 2021 study results

Refer to Table ZS-3 and Figure ZS-11

Summary of key findings

- Additional reactive power is needed throughout the Zone 3,
- The estimated need date for the West Middleton (Cardinal) - Blount 138-kV project is 2020; the primary need driver is certain double circuit tower outages,
- Due to 69-kV system load growth in the Southeast Madison area, the Sycamore-Royster 69-kV line requires higher capacity,
- Several projects were delayed due to lower load forecast in certain local area

In response to low voltages throughout Zone 3, a significant amount of capacitor banks distributed at the Eden, Mazomanie, Concord, Brick Church, Sun Prairie, Dam Heights, and North Monroe substations in the 2017-2023 timeframe were deemed to be the preliminary solutions. The in-service dates for some of these capacitor bank projects are delayed mainly due to load forecast reduction in local areas. The new in-service dates are chosen considering both the latest 2011 10-Year Assessment need date and previous 10-Year Assessments identified need dates.

The Royster-Sycamore 69-kV line is overloaded under single contingency conditions in the 2021 summer peak model analysis. The existing provisional Royster-Sycamore line uprate project is advanced to 2018 based on the new results. A potential project alternative to the line uprate is to add a second Femrite transformer.

Past 10-Year Assessments found thermal overload issues under single contingency conditions for the existing Spring Green 138/69-kV transformer, the existing Hillman 138/69-kV transformer and the North Monroe-South Monroe 69-kV line. Those issues did not appear in the 2011 10-Year Assessment. The past solutions were to install a second transformer at Spring Green, a second transformer at Hillman and uprate the Y87 line in 2018. These provisional projects were retained for now until it can be determined in future 10-Year Assessments that these thermal issues truly no longer exist.

Due to higher validated line ratings and load forecast reduction in Alliant area, the reliability need date for the Y119 Sun Valley tap-Oregon 69-kV line rebuild project is beyond 2026 in the 2011 TYA analysis. A new in-service date of 2020 is chosen mainly based on the preliminary Asset Management need date for rebuilding this line.

Past 10-Year Assessments found voltage and thermal issues in the Reedsburg loop. Those issues did not appear in the 2011 10-Year Assessment. The past solution was to construct a 138kV line between Lake Delton and Birchwood in 2020. This provisional



project was retained for now until it can be determined in future 10-Year Assessments that the line is not needed.

In the 2008 Assessment, the West Middleton 138/69-kV transformers and West Middleton-Blackhawk 69-kV line were observed to be overloaded under single contingency conditions in the 2017 timeframe. To address these thermal overloads, a Cardinal to Blount 138-kV line project was being considered. In conjunction with the Rockdale-West Middleton (Cardinal) 345-kV line project (2013), the Cardinal-Blount 138-kV line could eliminate the thermal overload issues in the long term and provide additional transfer capability into downtown Madison.

In 2013, the existing West Middleton substation will be divided into two separate adjacent substations behind the same fence as follows:

- West Middleton will remain as 69 kV, and
- Cardinal Substation will encompass 138 and 345-kV portions of the substation.

Since the 2008 Assessment, the West Middleton (Cardinal) 138/69-kV transformer ratings have been validated with higher ratings. In addition, with the new load forecasts utilized in the 2009, 2010 and 2011 10-Year Assessments, the original needs for the Cardinal-Blount 138-kV project are sliding out of 10-year planning horizon. However, considering the potential severe low voltage problem under certain double circuit tower outage conditions (especially during a major 345-kV line maintenance outage), as a potential long term solution, it was decided to keep the project in the project table as a provisional 2020 project. It is provisional because the justification of the project needs to be confirmed and a project scope needs to be developed.

Past 10-Year Assessments have identified the emerging McCue-Lamar and Bass Creek-Footville thermal overloads and voltage issues at the Lamar Substation under single-contingency conditions. Those issues did not appear in the 2011 10-Year Assessment. A second 69-kV line from McCue to Lamar in 2017 was being considered as a placeholder to resolve the issues in this area. It was decided to delay this provisional project to 2019 for now until it can be determined in future 10-Year Assessments that the project is not needed.

In the past, Y-32 (Colley Road-Brick Church 69-kV line) saw thermal overloads under contingency conditions as well as age and condition issues. The thermal issues were not seen in the 2011 10-Year Assessment. The age and condition issues remain and will likely result in a line rebuild in the next 10-15 years. The project In-Service date was retained at 2018 until future 10-Year Assessments assure the need to rebuild for thermal reasons no longer exists.



Past 10-Year Assessments determined the Brick Church 138-kV bus could experience low voltages under various contingencies. The provisional project of 2-24.5 MVAR 138-kV capacitor banks and 1-18 MVAR 69-kV capacitor bank at Brick Church would address these issues. While voltage issues were not seen in the Brick Church area, the 2017 In-Service date was retained until we can be assured the voltage issues won't return in the next few 10-Year Assessments.

Past 10-Year Assessments found thermal and voltage issues in the Lake Geneva area. A provisional project to construct a 138kV line between Spring Valley, in eastern Kenosha County to the Lake Geneva area is still being considered. It is expected the new 138kV line would connect to the proposed North Lake Geneva – South Lake Geneva 138kV line. One or two 138/69kV transformers could be installed along the provisional Spring Valley – North Lake Geneva line to strengthen the area. Past 10-Year Assessment had the provisional Spring Valley – Lake Geneva line being placed in service in 2018. The project has been delayed to 2019 due to lower load forecasts.

For detailed discussions on the Badger-Coulee 345-kV line project and the Dubuque-Spring Green-Cardinal 345-kV line project, please refer to Regional Planning section.

No performance limits were exceeded for Category A conditions for all 2021 analysis.

The lead times necessary to implement the corrective plans that are scheduled for 2017 through 2021 were considered and taken into account prior to assigning an in-service date for each associated project. All of the projects scheduled for the longer term planning horizon have an “In-service date” that matches the “Need date”, except the following projects:

Projects whose “Need date” precedes the “In-service date”

- None

Projects whose “In-service date” precedes the “Need date”

- None