Zone 5 – 2021 study results

Refer to Table ZS-3 and Figure ZS-19

Summary of key findings

- Load growth in Waukesha and Washington counties will require voltage and thermal reinforcements. Local generation adjustment is an interim solution, and
- Voltage and thermal issues remain in Zone 5 under contingency conditions.

Following are the results of the 2021 contingency analysis (NERC Category B or TPL-002-0 conditions) performed on Zone 5.

Low probability circuit breaker outages at Oak Creek continue to be a chronic issue. Relief can be provided by reducing the output of area generation.

Certain outages will result in the Albers–Kenosha 138-kV line loading to exceed its summer emergency rating. Re-dispatching local generation will provide relief.

Two 138-kV buses in southeastern Wisconsin indicate low bus voltages under single contingency conditions during off peak periods. The 138-kV buses experiencing marginal bus voltages are Maple and Germantown Substations. Re-dispatching area generation will provide relief.

Loading issues on the Arcadian – Waukesha 138-kV lines and Arcadian transformers under contingency conditions worsen when compared to 2016. Rebuilding the lines with higher capacity conductors and replacing the two smaller transformers at Arcadian are potential solutions. Running local generation provides additional relief.

Loading on the Pleasant Prairie – Zion 345-kV line exceeds its summer emergency rating under contingency conditions. The Kenosha – Lakeview, Lakeview – Zion and Arcadian – Zion 138-kV lines exceed their summer emergency ratings under certain outage conditions. The new Pleasant Prairie – Zion Energy Center (2014) 345-kV line as described in the Zone 5 - 2016 analysis and our Economics section will resolve these issues.

Past studies have shown low bus voltages in eastern Jefferson, western Waukesha, and southern Washington counties, all areas where load growth has been and is expected to remain high. To provide relief, a new 345-kV line connecting the Madison area with the Milwaukee area could be considered. Such a line would improve the voltage profile in Jefferson, Waukesha and Washington counties, reduce loading on parallel 138-kV circuits, reduce system losses, and improve ATC's existing east-west transfer capability in this

region. Such a project is not being proposed in this Assessment, but may be justified in future Assessments for analysis beyond the current 10-year horizon. Potential economic benefits will need to be reviewed as the future develops.

As part of our 2021 analyses, we performed a screen to determine the potential impact upon the transmission system given the long lead-time outage of Oak Creek 345/230-kV transformer T884. The results of this screen indicate a potential overload of the Oak Creek – Bluemound 230-kV line under this scenario plus the next contingency. Further study is needed, but a provisional project to uprate the Oak Creek – Bluemound 230-kV line 873 could address this issue.

A provisional project to uprate the Oak Creek-Pennsylvania 138-kV line is being considered in the 2021 timeframe in order to address remaining voltage and thermal issues.

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”

- Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer.