



## **Zone 5 – 2014 study results**

Refer to Table ZS-2 and Figure ZS-18

### *Summary of key findings*

- Additional reactive support is required in the greater Milwaukee area.
- Potential thermal violations indicate the need for facility upgrades in the Waukesha and Kenosha areas.
- Thermal, voltage, and load serving issues in Kenosha and Walworth might be resolved with a 138-kV line between Spring Valley and North Lake Geneva.

Additional reactive sources are required in the greater Milwaukee area. In addition to the Summit capacitor banks, 225 MVAR of capacitance will be installed at the Bluemound Substation in 2012.

Following are the results of the 2014 contingency analysis (NERC Category B or TPL-002-0 conditions) performed on Zone 5.

An outage of either one of the Arcadian–Waukesha 138-kV lines or Arcadian transformer #1 create overloads in 2014 compared to heavily loaded facilities as seen in the 2010 analysis. Running generation at Concord and Germantown provides relief until line clearances are increased and transformers are replaced. Other alternatives are also being investigated.

The Albers-Bain 138-kV line loads to 113 percent of its summer emergency limit for an outage of the Bain-Kenosha 138-kV line. The limiting element is line conductor clearances. Increasing line clearances is being considered.

Splitting the Pleasant Prairie 345-kV bus between bus sections 3 and 4 will cause Bain transformer #5 to exceed its summer emergency rating by 59 percent. Bus outages are low probability events. Relief can be provided by reducing the output of Pleasant Prairie generator #2 to about 350 megawatts.

An outage of the Hartford – St. Lawrence 138-kV line results in the Hartford 138-kV bus voltage dropping to 90.0 percent of the nominal bus voltage. Running generation at Concord improves bus voltage at Hartford.

The intact system bus voltage at Cooney is at 95.9 percent of nominal voltage. This is approaching the 95.0 percent limit as specified by NERC Category A requirements. An outage of Cooney – Summit results in the Cooney bus voltage dropping to 91.5 percent of the nominal bus voltage. Running generation at Concord will provide relief. In addition, 138-kV capacitors at Concord and Summit will improve the voltage in Waukesha and Jefferson Counties.

Thermal, voltage, and load serving issues in Kenosha and Walworth County might be resolved by constructing a 138-kV line from Spring Valley to Twin Lakes, continuing on to South Lake Geneva. This would entail acquiring new right-of-way between Spring Valley and Twin Lakes. The remaining segment between Twin Lake and North Lake Geneva could make use of an existing right-of-way. Studies are underway to determine the course of action to alleviate the issues in the area. This



# 10-Year Assessment

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2009

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project would also coordinate with a Zone 3 project, the North Lake Geneva-South Lake Geneva 138-kV line with a 2016 in-service date. Please refer to [Zone 3 – 2014 study results](#) for details about this project.

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

- Uprate Arcadian-Waukesha 138-kV lines KK9942/KK9962 (need 2010, in service 2013)
- Replace two existing 345/138-kV transformers at Arcadian Substation with 1-500 MVA transformer (need 2010, in service 2013)

Considering reasonable project lead times, the 2013 in-service date was chosen for these provisional projects. In the interim, dispatching area generation could be one possible mitigation strategy to address the Arcadian area constraints.

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

- None