Sensitivity analyses

This section considers two aspects of load sensitivity:

- Increased Load, load exceeding a particular summer peak hour forecast
- Minimum Load, the lowest hourly load level expected to be seen in the Planning Horizon.

Load sensitivity analysis – Increased load (2016)

The analysis that is performed for each 10-Year Assessment is based on power flow analysis using specific load forecast assumptions. The load forecast assumes there is some probability of exceeding the load forecast on the peak day. A traditional practice for generation and transmission planning in Wisconsin has been to use a load forecast probability of 50 percent (also known as a 50/50 forecast). This means that there is a 50 percent chance that the actual system peak load will exceed the forecasted value in any given year or, to state it another way, it is expected that on the average the forecast will be exceeded once every two years. The problem with analysis based on the traditional method is that it does not indicate the reliability risk of the actual system peak exceeding the forecasted value. The question then is, what is the risk to reliable system operation in the ATC footprint if the forecast is exceeded and what, if anything, should be done to mitigate some or all of the risk?

One way to assess this risk is to increase the load forecast and determine whether or not ATC's projects in the project list can reliably serve this increased electricity usage. To accomplish this purpose, some utilities use a 90/10 forecast[1], as opposed to the 50/50 forecast. ATC has relied on its customers to provide the load projections for the load forecasts we use in our analysis. As these are usually a 50/50 forecast, we do not have a 90/10 forecast available for the risk assessment in the 2011 Assessment. However, research on weather-normalization and benchmarking analysis by Clearspring Energy Advisors has found that a 5.1 percent increase in certain peak loads may be a reasonable assumption for a 90/10 versus a 50/50 forecast. Therefore, for the 2011 Assessment, ATC has used a 5.1 percent increase in certain peak loads as a proxy for the higher 90/10 forecast.

ATC applied a 5.1 percent increase to scalable[2] summer peak loads in the power flow models representing the year 2016 summer peak while holding non-scalable loads

[1] A 90/10 forecast generally means that there is a 90 percent chance that the load will be less than the forecasted value. Thus, a load based on a 90/10 forecast load would be higher than a load based on a 50/50 forecast where there is only a 50 percent chance that the load will be less than the forecasted value

[2] Scalable means that these loads follow some predictable load cycle pattern throughout the year that may or may not be sensitive to extreme weather conditions.

constant. Table ZS-2 compares the results of the summer peak and the increased load analyses for 2016 for Zones 1-5.

In Zones 1 and 5, ATC found that the increased load did not have a significant impact on the need date for projects.

In Zone 2, the in-service date of the M38-Atlantic 69 kV line rebuild becomes more critical if loads are higher than expected.

In Zone 3, the in-service date of the Royster-Sycamore 69 kV line uprate becomes more critical if loads are higher than expected

In Zone 4, the Manrap-Custer 69 kV line can become overloaded under certain contingency conditions if loads are higher than expected. This can potentially be mitigated by generation adjustments.

At this time, ATC is not proposing to advance project timings to anticipate higher loads or load growth. However, we will continue to evaluate these conditions in future Assessments and in continued development of each project.

Load sensitivity analysis – Minimum load[3] (2012 model and 2021 model)
ATC created a 2012 minimum load case and 2021 minimum load case in an attempt to simulate real world minimum load conditions in each year. To model this scenario, ATC applied a 60 percent decrease to scalable loads in the power flow models representing the year 2012 and 2021 summer peaks while holding the non-scalable loads smaller than or equal to 5 MW constant and applying light load ratios[4] to the non-scalable loads greater than 5 MW.

Line overloads and low voltages improved in all five zones. High bus voltages appeared in all zones, but it should be noted that these issues can be mitigated by generation adjustments, turning off area capacitor banks and/or adjusting transformer tap changers. Table ZS-1 and ZS-3 compares the results of the summer peak and minimum load analyses for 2012 and 2021 for Zones 1-5.

In Zones 1-5, ATC found that the decreased load did not have a significant impact on the need date for projects.

[3] For assumptions for the Minimum load models, please refer to the model building section under Methodology.
[4] To enhance the modeling of shoulder and light load conditions for the ATC Planning analysis, during the load forecast process, ATC requested local distribution companies to provide shoulder-to-peak ratios and light- to-peak ratios for the non-scalable loads greater than 5 MW.

For Zone 2, in the 2012 minimum load case, the Mead and Bay View 69-kV bus voltages are marginal under certain contingency conditions. This might be mitigated by generation adjustments.

At this time, ATC is not proposing to delay or advance project timing because of the minimum load scenario. However, we will continue to evaluate these conditions in future Assessments and in continued development of each project.