Update on Winter Season Resource Adequacy Analysis

Tom Falin
Planning Committee
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Winter Risk

Winter Season Resource Adequacy and Capacity Requirements
Issue Charge is posted at:

http://www.pjm.com/~/media/committees-groups/committees/mrc/20161117/20161117-item-09-winter-reliability-requirement-ps-ic-clean.ashx

The Issue Charge has three Key Work Activities
• Winter peak load forecasting
• Winter season resource adequacy
• Winter season reliability requirements
Evaluation of Winter LOLE Risk

Areas of Investigation

• Winter Load Forecast Accuracy
  – Monthly load profile and forecast uncertainty

• Winter Generation Performance
  – Common mode failures
  – Correlation with load level
  – Maintenance scheduling

• Transmission System
  – Planned and forced outages
9-year average historical data (DY 2007- DY 2015)
Table below shows the average percent of generation forced out and the standard deviation forced out during the Summer and Winter peak weeks over the 2007 – 2015 period.

<table>
<thead>
<tr>
<th>Season</th>
<th>Mean</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>Summer</td>
<td>7.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Winter</td>
<td>8.3%</td>
<td>4.0%</td>
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</table>
PRISM uses individual unit EFORd’s to develop a distribution of forced outages which is converted into a cumulative distribution function (CDF) for purposes of comparing it to the load distribution.
Current Forced Outages Distribution in PRISM

Current Mean = 7.4%
Current Standard Deviation = 1.3%

VS

Mean = 8.3%
Standard Deviation = 4.0%

Mean = 7.3%
Standard Deviation = 2.0%
There is no clear linear relationship between planned outages and load during winter.

However, when the load is very high during winter, there seems to be a low amount of planned outages.

Currently, PRISM models a 1.3% Planned outage rate during the peak winter week.

The 1.3% may be understated compared to actual planned outage rates during high winter peaks (see two of the three points in red circle)
Generator Maintenance Outage

- Maintenance Outage Rates are significantly lower than Planned Outage Rates.

- Also, significantly less strong seasonality component in Maintenance Outage Rates.
Generator Maintenance Outage

- Maintenance Outage Rates in all Winter Weeks
Transmission System Planned Outages

Number of Transmission Elements on Planned Maintenance in RTO

Transmission Elements on Planned Maintenance


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The maximum amount of transmission elements on planned maintenance decreases as the summer load increases.
Next Steps

• Compute winter LOLE based on generator forced outage distributions shown on slide 6
• Adjust PRISM generator maintenance schedule to be more consistent with real-time operations schedule and assess impact on LOLE
• How to quantify impact of transmission system planned and forced outages?
• Continue investigation of winter load forecast model
• Next RAAS meeting is scheduled for:
  – May 30 (9:30 AM – 11:30 AM)