Winter Season Resource Adequacy and Capacity Requirements

PJM’s current load forecasting and planning models and methodologies should be reviewed and updated as necessary to ensure the ability to accurately evaluate the amount of capacity needed in winter periods to achieve an acceptable level of resource adequacy risk.

Background: PJM Analysis of Winter Capacity Needs

The PJM system as a whole is summer-peaking: the highest load levels typically occur during summer. There are also some high load hours during winter months, and spring and summer loads are typically lower. Transmission zones within PJM traditionally have also been summer-peaking, while at this time a few zones are winter-peaking. The forecast RTO summer extreme peak for the 2020/2021 delivery year exceeds the winter extreme peak for that delivery year by over 26,000 MW¹ (the “extreme,” or 90/10, peaks are indicative of the amount of unforced capacity needed for resource adequacy). PJM's annual Reserve Requirement Study reports consistently identify virtually no RTO-level loss of load expectation (“LOLE”) during non-summer weeks under the assumptions used in these studies (such as capacity available year-round).²

As demand-side capacity resources (“DR”) increased on the PJM system during 2008 to 2010, PJM became concerned that, among other limitations, these resources are generally summer-only and result in less capacity available during non-summer months. Due to these concerns, in 2010 PJM staff developed a methodology to determine the maximum quantity of “Extended Summer DR” compatible with an agreed level of resource adequacy during the non-summer period. The methodology involved increasing the summer-only capacity (reducing the capacity available during the winter peak period) until the LOLE occurring during winter peak periods increased the overall LOLE for the RTO by ten percent (that is, from 0.1 to 0.11).³ This methodology, which was accepted by stakeholders and FERC, has been used to determine the Extended Summer DR Reliability Targets for the RTO and zones modeled in RPM.⁴ In essence, the methodology determined the amount of capacity needed during winter peak periods consistent with a winter period RTO-level LOLE of 0.01 (one event in 100 years).

More recently, winter resource adequacy has received renewed attention as a result of multiple developments:

1. The “polar vortex” period in early 2014 revealed that many generating units were unprepared for extreme winter weather due insufficient winterization, lack of firm fuel supply, or other causes, and under those circumstances resource adequacy could be challenged.
2. While years ago PJM had no zones that were winter-peaking (a few had summer and winter peaks that were nearly equal⁵), there are now two zones expected to have significantly higher winter peaks.⁶
3. The increase in gas-fired generation on the PJM system raises concerns about generation reliability during winter periods when pipelines may at times become constrained.
4. Inherently seasonal resources such as wind and solar have been increasing on the PJM system and are expected to further increase over the coming years.

² See, for instance, PJM, 2016 Reserve Requirement Study, October 6, 2016, Table II-4, p. 39.
³ PJM Manual 20: PJM Resource Adequacy Analysis, Revision: 07, August 01, 2016, pp. 43-45. For zones the LOLE criteria is 0.004, or one event in 250 years.
⁵ See, for instance, PJM Load Forecast Report, January 2011, Tables B-1 and B-2 (winter peaks
⁶ PJM Load Forecast Report, January 2016, Tables B-1 and B-2 (showing PL and EKPC zones expected to have higher winter than summer peaks).
Problem Statement

In 2016 the Seasonal Capacity Resources Senior Task Force (“SCRSTF”) was charged with exploring ways to better accommodate seasonal resources such as DR, wind and solar within the RPM capacity construct as modified by the Capacity Performance package of tariff changes. Under the SCRSTF effort, approaches to adding a seasonal element to RPM were explored, which raised the question of seasonal (summer and winter) capacity needs.

At the request of stakeholders, PJM staff evaluated the relationship between different amounts of summer and winter capacity and seasonal LOLE values based on the existing models and methodology. PJM’s analysis indicated that the PJM system could accommodate a substantial quantity of summer-only resource while maintaining resource adequacy at the annual target LOLE level of 0.1 for the RTO region (zones were not addressed in the analysis). However, subsequently, PJM staff raised concerns about this analysis, stating that its “planning model is not designed to reflect all the operational risks that PJM faces in the winter.” In particular, PJM noted that generator forced outage rates correlate with low temperatures and high winter loads, and there can be common mode failures such as disruption of a natural gas pipeline; and “[n]either of these risks is fully captured in PJM’s planning model.”

The question of winter capacity requirements also arises in the context of setting the Winter Weekly Reserve Target, for purposes of evaluating requests for winter season planned and maintenance outages. At present, to set this target PJM simply requires that the winter LOLE, according to its planning model, must be essentially zero (LOLE 0.000001, or one event in one million years), and PJM may reject outage requests that would lower the reserves and raise the LOLE above this level.

Problem / Opportunity Statement

PJM at present lacks a model and methodology capable of evaluating, to PJM’s satisfaction, the resource adequacy risk associated with different levels of winter peak period capacity. The opportunity is to review the current models and methodologies and identify any changes required to be able to reasonably accurately assess the relationship between winter capacity levels and resource adequacy risk (LOLE). The need to update the load forecasting and/or resource adequacy models and/or methodologies arises from the changing PJM resource mix, changing load patterns, and recent operational experience during winter periods.

While the RPM rules with the Capacity Performance changes presently call for PJM to have the same amount of capacity winter and summer following a transition period (beginning 6/1/2020), the SCRSTF stakeholder process recognized that these rules may not adequately accommodate seasonal resources, which can be expected to increase in the coming years, and may need to be changed. In addition, some stakeholders are of the view that the requirement to hold the same amount of capacity in winter as in summer is inefficient and unnecessary, and observe that under such circumstances, the incremental capacity value of winter capacity is close to zero (as indicated in PJM’s Reserve Requirement Study reports, cited above). In any case, PJM needs to be able to accurately evaluate RTO and zonal resource adequacy during winter peak periods, especially for those zones that are winter-peaking.

PJM’s ability to evaluate the amount of capacity needed in winter periods to achieve an acceptable level of risk, which ability it has had since 2010, should be restored by updating the current models and methodologies.

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7 PJM, Informational – PJM Response on LOLE Allocation, Seasonal Capacity Resource Senior Task Force meeting on August 12, 2016, available here. According to this analysis, reducing winter capacity by 17,431 MW, and assuming an additional 5,200 MW unavailable during winter peak due to approved planned outages (for a total of 22,631 MW less capacity in winter than the “one day in ten years” level of summer capacity), would result in a winter period LOLE of 0.01 (or one event in 100 years); and an overall 0.1 LOLE could be maintained under this scenario by increasing the summer capacity by 497 MW (to reduce summer LOLE to 0.09).
9 Id, p. 2.
10 PJM, 2016 Reserve Requirement Study, October 6, 2016, p. 9, pp. 43-44.
11 PJM, Winter Weekly Reserve Target (WWRT), RAAS Meeting May 31, 2016, slide 3.
Winter Season Resource Adequacy and Capacity Requirements

Issue Source
This issue emerged from the 2016 discussions under the Seasonal Capacity Resources Senior Task Force (SCRSTF), as discussed in the associated Problem Statement. This issue is brought forward by the following entities:

- Maryland Office of People’s Counsel
- New Jersey Division of Rate Counsel
- Delaware Division of the Public Advocate

Stakeholder Group Assignment
Suggested assignment: Load Analysis Subcommittee (LAS), for Key Work Activity #1, and Resource Adequacy Analysis Subcommittee (RAAS) for the remaining work activities.

Key Work Activities
The key work activities are the following:

1. **Winter Peak Load Forecasting.**
   
   a. PJM staff to review PJM’s load forecasting methodology to identify any potential issues with regard to the accuracy of PJM’s RTO and zonal peak load forecasting for use in assessing resource adequacy during the winter season (defined as October through April). For example, the increasing penetration of certain end use technologies in recent years may have changed the relationship between extreme cold temperatures and electricity demand in some zones, and this may not be fully captured in the econometric modeling.
   
   b. If any issues are identified, PJM staff to craft potential solutions and to work with the LAS to evaluate and select recommended solutions.

2. **Winter Season Resource Adequacy.**
   
   a. PJM staff to provide education regarding:
      
      i. PJM’s current tools that can be used to evaluate RTO and zonal winter resource adequacy, including but not limited to the existing PRISM and GE-MARS models;
      
      ii. the analyses PJM currently does, or is capable of doing, with these models pertaining to winter season resource adequacy, and the assumptions used;
      
      iii. recent winter operating experience, and what it suggests about winter resource adequacy analysis.
b. PJM staff, working with the RAAS, and with input from the Operating Committee and perhaps other PJM stakeholder groups, to identify any shortcomings in these models for evaluating winter season resource adequacy (that is, the weekly and seasonal Loss of Load Expectations that would result from different levels of winter season capacity.)

c. PJM staff and RAAS to identify solutions to any shortcomings they identify.

3. **Winter Season Reliability Requirements.**

   a. PJM Staff to propose a methodology and assumptions (such as assumed winter peak period planned and maintenance outages) for determining RTO and zonal Winter Reliability Requirements (winter season unforced capacity requirements to meet a winter loss of load criterion).

   b. PJM Staff to demonstrate the methodology by calculating RTO and zonal Winter Reliability Requirements for various winter seasonal loss of load expectation values (such as 0.01, 0.02, 0.05).

4. **FYI, outside of scope:** The specific winter LOLE value to be used for any particular application of this methodology is outside the scope of this Issue Charge. The work under this Issue Charge is to develop the analytical ability to relate an amount of winter capacity to a resulting winter LOLE.

**Expected Deliverables**

1. If any issues with regard to load forecasting are identified, proposed changes to the load forecasting methodology to address the issues.

2. If any issues with regard to winter resource adequacy analysis modeling methodology are identified, proposed changes to the modeling of winter resource adequacy.

3. A proposed methodology for determining winter reliability requirements.

4. Estimated RTO and zonal winter (and summer) reliability requirements based on current forecasts, recommended assumptions, and a few example loss of load expectation values.

**Expected Overall Duration of Work**

The expected duration of work is January to September, 2017.

**Decision-Making Method**

Preferred decision-making method is Tier 1, consensus.