Education: Current Reliability Metrics in PJM's Resource Adequacy Construct

Patricio Rocha Garrido
Resource Adequacy Planning
RASTF
December 17th, 2021

Reliability Metrics

- For the RTO, the reliability metric currently in use is Loss of Load Expectation (LOLE) and the criterion is 1 day in 10 years
  - Criterion is translated as 0.1 days/year when applied to a single study year
- For the LDAs, the reliability metric currently in use is Loss of Load Expectation (LOLE) and the criterion is 1 day in 25 years
  - Criterion is translated as 0.04 days/year when applied to a single study year

PJM's interpretation of days/year is identical to events/year because most of PJM's Resource Adequacy Studies are focused on the single peak hour of each day (therefore, by definition, there cannot be more than one loss of load event in a day)

Loss of Load Expectation

- To understand the calculation of the LOLE metric, consider the following example including two cases:
  - Assume that there are 100 different annual scenarios for a future delivery year (where each scenario is equally likely to occur i.e., probability of each scenario is 0.01)
  - Case 1: Assume that when simulating those 100 scenarios, there are 10 scenarios where there is a single day with loss of load
    - Then, the LOLE calculation is as follows

      LOLE = (10 x 1 day/year x 0.01) + (90 x 0 day/year x 0.01) = 0.1 days/year
  - Case 2: Assume that when simulating those 100 scenarios, there are 8 scenarios where there is a single day with loss of load and 1 scenario where there are two days with loss of load
    - Then, the LOLE calculation is as follows

      LOLE = (8 x 1 day/year x 0.01) + (1 x 2 day/year x 0.01) + (91 x 0 day/year x 0.01) = 0.1 days/year

Note that both cases above meet the 1 in 10 criterion. Note also that the calculation above does not consider the duration or magnitude of the loss of load events

Standards

- The RTO LOLE criterion is governed by ReliabilityFirst Standard BAL-502-RF-03 and PJM Manual 20 – Section 1
  - **“**Calculate a planning reserve margin that will result in the sum of the probabilities for loss of Load for the integrated peak hour for all days of each planning year analyzed being equal to 0.1. (This is comparable to a “one day in 10 year” criterion).”
  - Note that the standard does not require “one day in 10 year” as the reliability objective (just the **calculation** of a reserve margin based on “one day in 10 year”).
  - However, PJM Manual 20 – Section 1 ties the PJM Reserve Requirement value to the “one day in 10 year” criterion
- The LDA LOLE criterion is governed by PJM Manual 20 – Section 4
  - “The Load Deliverability Method requires the selection of a transmission risk level to define the CETO. This risk must be very small when compared to the one day in ten year LOLE applicable to generation risk. A transmission LOLE of 1 D/ 25 Y was judged to be sufficiently small. This risk refers to the probability of having to shed load due solely to insufficient transmission import capability, not a shortage of generation resources"

Interpretation

- If an LDA within PJM were to procure resources to just meet the LDA's reliability requirement (exhausting the LDA's entire Capacity Emergency Transfer Limit) and if the RTO were to procure resources to just meet the RTO's reliability requirement, then
  - Customers inside the LDA face a 0.04 days/year loss of load risk due to local resource adequacy conditions (i.e. insufficient transmission) plus a 0.1 days/year loss of load risk due to system-wide resource adequacy conditions.
  - Therefore, customers inside the LDA face no more than 0.14 days/year loss of load risk

Contact

SME / Presenter:

Patricio Rocha Garrido,
patricio.rocha-garrido@pjm.com

Education: Current Reliability Metrics in PJM's Resource Adequacy Construct

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com