Resource Adequacy Studies

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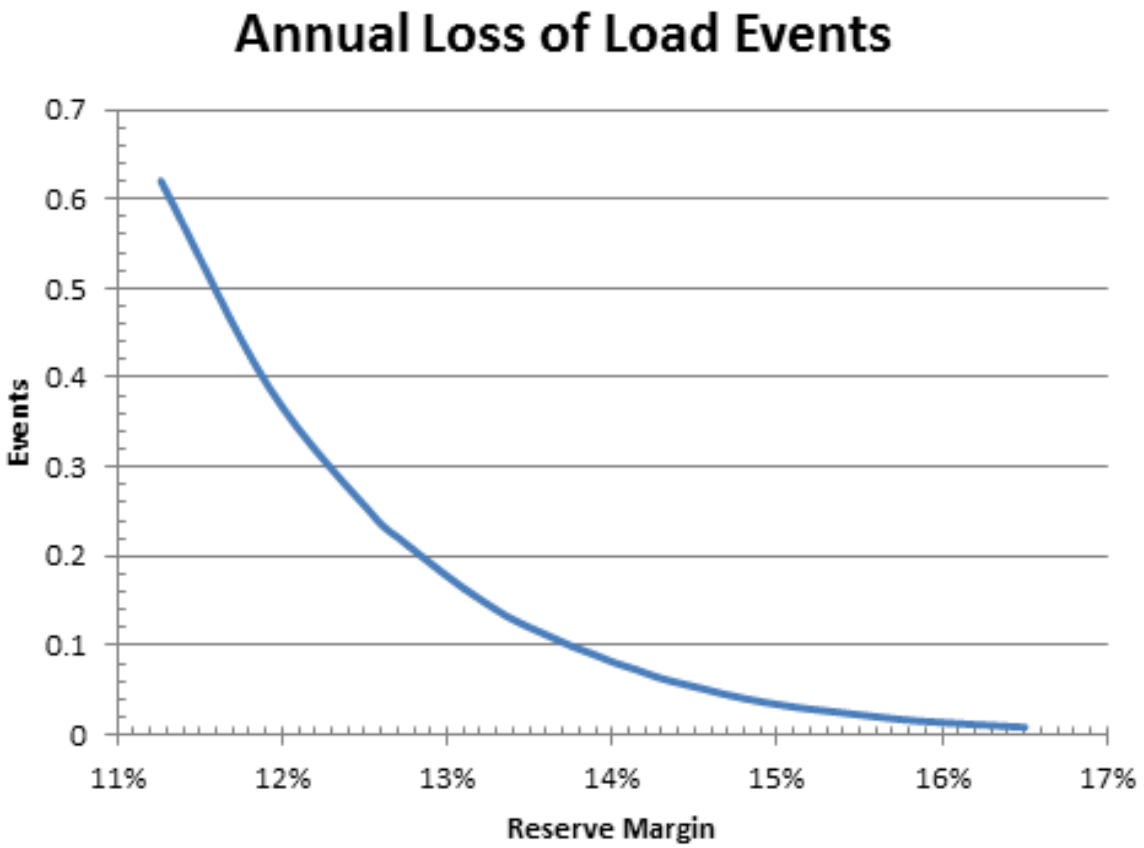
Resource Adequacy Analysis in ERCOT

The analysis of long-term resource adequacy in ERCOT is conducted in two separate steps.

1. Comparison of forecasted loads to expected resources
   - Published every six months in the Capacity, Demand and Reserves (CDR) Report
   - Protocols stipulate criteria for inclusion of resources; the intent is to include resources that are expected to be available during scarcity conditions.
   - The expected reserve margin percentage is calculated from the amount of resources above forecasted load.
2. LOLP Study: a mathematical analysis of the relationship between reserve margin levels and the risk of rotating outages
   - Reserves are needed due to unit outages, in case loads are higher than expected, and to account for variable generation.
   - These “loss-of-load” analyses inform the development of a target reserve margin (based on a predetermined index of the desired level of reliability).
   - ERCOT traditionally has used a 1-event-in-10 years standard to determine a recommended target reserve margin.
   - The primary drivers of the likelihood of loss-of-load conditions in these studies are the reliability of the resource fleet and weather-driven variability of peak loads.

Background: Developing a Target Reserve Margin

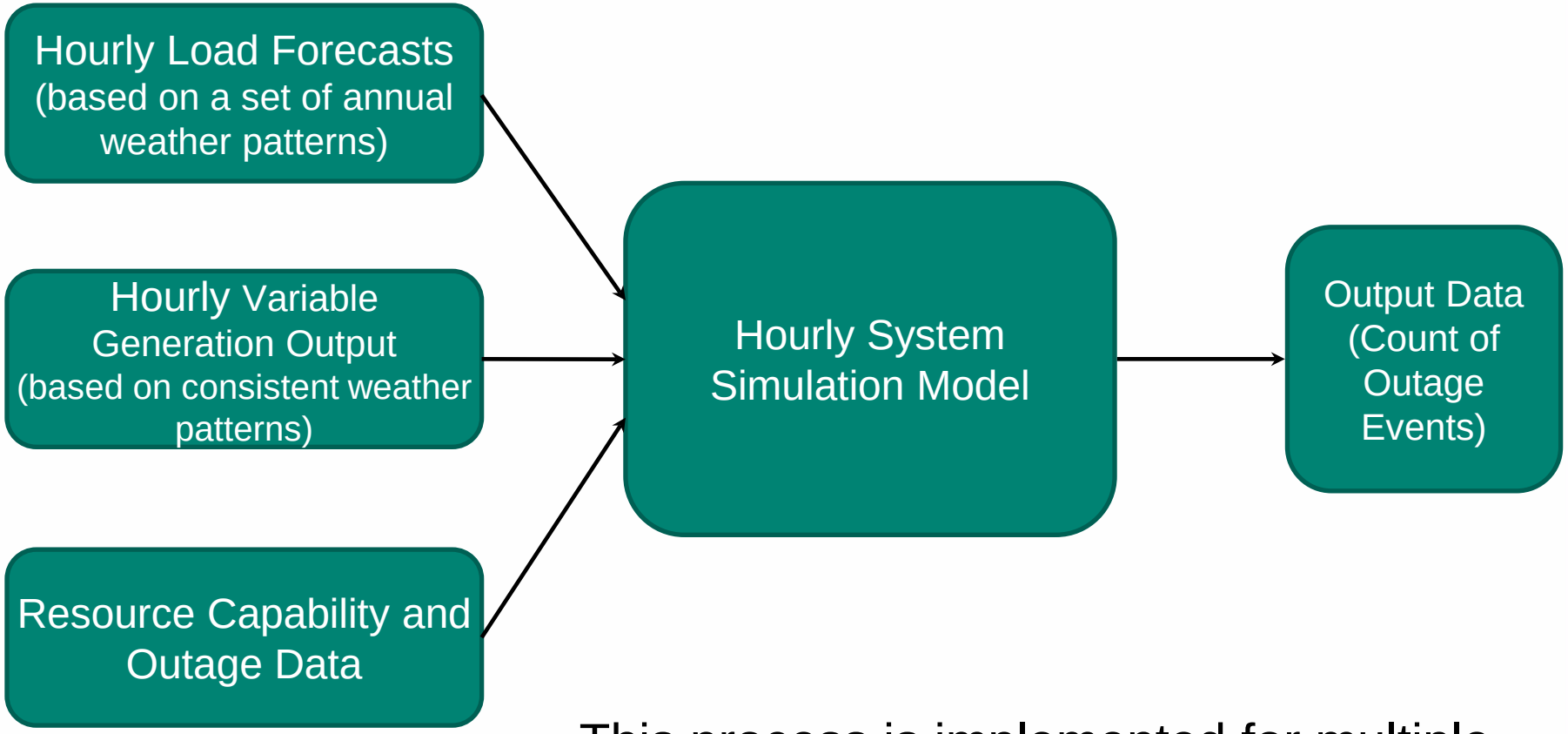
A loss-of-load study establishes the relationship between reserve margin and a reliability standard, such as expected number of loss-of-load events. The following chart shows this relationship from a previous ERCOT study:



In order to establish a Target Reserve Margin, a reliability criterion has to be established. ERCOT traditionally has used a standard of 1 event in 10 years (consistent with several other regions).

The models used in these studies can assess other reliability indices, such as expected unserved energy and expected loss-of-load hours.

Typical Loss-of-Load Study Process



This process is implemented for multiple weather years, for a range of reserve margins, to develop a curve like the one shown on the previous slide.

NERC Reliability Assessments

- NERC recently added a loss-of-load study component to its established Long-Term Reliability Assessment process.
- NERC has asked that all regions conduct a probability-based assessment of the adequacy of resources every other year.
- The intent is to provide a common framework for comparing the adequacy of resources across the various regions.
- ERCOT is working with Astrape Consulting to complete the analysis requested by NERC.

Summary and Other Considerations

- The CDR report shows us what reserve margins we expect to have. Loss-of-load studies have been used to indicate what reserve margins we would like to have.
- Reliability targets (such as those based on LOLE or EUE) do not account for costs or benefits of various levels of resource adequacy.
- Resource adequacy is just one component of a customer's perceived level of reliable service.
- The changing resource mix, with increasing levels of variable generation, demand-response resources, and price-responsive demand, is making it harder to assess the adequacy of resources. Unforeseen events (i.e., black swans) could become more common. The probability of these types of unlikely events is hard to quantify, making it difficult to incorporate them into traditional loss-of-load studies.
- Given the changing nature of the ERCOT resource mix, there may be a need to supplement the summer peak assessment (as shown in the CDR) to provide a robust characterization of the adequacy of resources.