Helping our members work together to keep the lights on... today and in the future
SPP LOLE Efforts

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Southwest Power Pool

- Southwest Power Pool (SPP) Planning Coordinator footprint covers 575,000 square miles
- Includes all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas and Wyoming.
- The SPP footprint has approximately 61,000 miles of transmission lines and serves a population of 18 million people
SPP Planning Reserve Margin

- Planning Reserve Margin Requirement is based on Entity’s forecasted peak, not SPP peak

- Current PRM Requirement
  - Each Load Serving Member’s Minimum Required Reserve Margin is 13.6%. If a Load Serving Member’s System Capacity is comprised of at least 75% hydro-based generation, then such Load Serving Member’s Minimum Required Reserve Margin is 9.89%
    - Requirement set in 1998

- Future PRM Requirement
  - Each Load Responsible Entities (LRE) Minimum Required Planning Reserve Margin is 12.0%. If a LRE’s System Capacity is comprised of at least 75% hydro-based generation, then such LRE’s Minimum Required Planning Reserve Margin is 9.89%
    - June 2017 effective date
    - Summer Peak Season reserve margin requirement
SPP Application of the “1 in 10” Criteria

• LOLE is measured in days/year (1 day/10 year criteria)

• SPP equates any event, regardless of duration, in a day, to a daily event (i.e., any one or more hours in a day equates to a day-long event)
LOLE Study Characteristics

• Software used: GridView
• Calculates LOLE for SPP Entities
• Uses nodal model with NERC LTRA Demand and Capacity forecast incorporated to create a GridView model
• Monte Carlo analysis (probabilistic analysis)
• Load multipliers chosen randomly
• Generator outages based on maintenance schedule and random through Equivalent Forced Outage Rates (EFOR)
• Minimum of 3000 simulations/year performed (26,280,000 hours)
• LOLE analysis performed on years 2 and 5
• Typical runtime is approximately 75 hours for each study
LOLE Data Inputs

- Area load shapes
- Thermal / Variable Generation data
- Historical wind shapes
- Flowgate and Contingency data
- Transactions (Imports / Exports)
- Load uncertainty data
- Nodal transmission topology
- Generation outage data
- Operational guidelines
Wind Resources

• The location of wind resources within the SPP region are geographically diversified
Wind Resources

- The example shows four historical hourly wind output values for five years and the normalized, averaged hourly wind shape value compared historical values.

![Wind Shape Value Comparison](chart.png)

- Chart showing wind output values for different years and times.

- Each circle represents a specific year and hour, with values indicating wind output in MW.
Additional Assumptions

• Nodal modeling of topology, bus, load, and generator data

• Incorporation of flowgate and contingent elements information

• Monitor branches 230 kV and above

• Monitor all branch interfaces with external regions

• Adjustment of reserve margin by increase of load
Combined Sensitivity Analysis

• All assumptions were modeled the same as the original study scope except the following:
  • Historical one year load and wind shapes (2011)
  • Increased maximum LFU (9%)
  • Monitored transmission (100kV and above)
  • Shortened summer season (6/22 – 9/8)
  • Additional capacity retirements

• Sensitivity performed at 12.0% Reserve Margin
Combined Sensitivity Analysis

Combined Sensitivities at 12.0% Reserve Margin

LOLE (Days per ten years)

- Original Study Results at 12.0%
- Combined Sensitivities at 12.0%

SPP Criteria

Study Year

- 2017: 0.85
- 2020: 0.22
- 0.07
- 0.04

1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Impacts of adjusting SPP Reserve Margin

• Goal is to maintain reliability as economically as possible

• Benefits of a lower Planning Reserve Margin
  • Financial savings due to reduction in generation investment
  • Could align with generation retirements due to EPA regulation
  • Demonstrates the value of Transmission upgrades
LOLE Hurdles and Issues in SPP

• How to incorporate wind uncertainty variability
• Forced outage modeling for partial outages
• How to incorporate transmission availability
• Forced outage rates for interregional transactions
• Modeling energy availability of demand response programs and behind-the-meter resources
• Hydro availability limitations
• Seasonal limitations
Are there any questions?