

LESSONS AND CHALLENGES INTEGRATING RENEWABLE GENERATION

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

SouthwestPowerPool



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SOUTHWEST POWER POOL



SPP HAS BEST LAND BASED WIND SPEEDS



United States - Land-Based and Offshore Annual Average Wind Speed at 80 m

SPP NAMEPLATE GENERATING CAPACITY BY FUEL MIX OVER TIME





NAMEPLATE GENERATING CAPACITY BY FUEL TYPE: 105,464 MW TOTAL

AS OF 1/27/22

- Natural Gas (35.7%)
- Wind (29.6%)
- Coal (24.3%)
- Hydro (6.3%)
- Nuclear (2%)
- Fuel Oil (1.6%)
- Solar (0.3%)
- Other (0.2%)

WIND CAPACITY AND GENERATION CONTINUE TO INCREASE



WIND DISPLACING COAL AND GAS GENERATION



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AVERAGE HOURLY WIND CURTAILMENTS HAVE GROWN



NEGATIVE PRICES OCCUR FREQUENTLY



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MAKE-WHOLE PAYMENTS INCREASING



DAY-AHEAD AND REAL-TIME PRICE DIVERGENCE INCREASING



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WIND NOT CLEARED IN DAY-AHEAD MARKET DRIVING PRICE DIVERGENCE



RAMPING

Problem: Almost 80 percent of all scarcity events are transient lasting for 10 minutes or less

- Software lacks look ahead capability
- Virtual bids and offers only present hourly solution

Solution: Ramping product

- Procures 10 minute ramp to address projected ramping needs
- Ramp product prices based on lost opportunity cost
- Demand curve used when short ramp

Issue: Stranded generation

- Majority of resources procured for ramp are behind constraints
- Trapped wind resources have provided 40 percent of upward ramping capacity in 2022

UNCERTAINTY

Problem: Wind forecast variability can result in losing more generation than available reserves

- SPP has experienced unexpected loss of over 20 percent of generation at times
- Created "Uncertainty Response Team" to estimate wind variability and recommend outof-merit commitments to ensure enough reserves
- Out-of-merit commitment distorts prices and does not compensate for reserve, results in additional make-whole payments

Solution: Uncertainty product

- Procures 60-minute ramp to address uncertainty needs in both day-ahead and realtime
- Online resources prices based on lost opportunity cost, offline resources are offer based only

SPP MMI

- Demand curve used when short uncertainty
- Targeting deployment in second quarter 2023
- Likely to have same stranded issue as ramp product

OTHER CHALLENGES

- Ensure resources are available when needed
 - Increased maintenance outages and outage timing a growing concern
- Enhance long-term planning to account for increased renewable generation
 - Transmission planning
 - Resource accreditation