Powering the Energy Frontier

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- Markets 10,515 MW of power from 57 federal dams
- 700 customers
- 15-state footprint
- Operates 3 balancing authorities
- Top-10 largest transmission utility in US (17,000 miles)
Role in national security and grid resilience

• Serve military bases and national laboratories
• Significant black start capabilities to restore power in the event of a large scale outage
• Participate in industry grid security and grid resilience planning
Energy system transition

• Physics barriers are real!

• Institutional barriers can be even more challenging

• Significant generation changes require that the system be operated differently
  – Appropriate emphasis on energy capacity
  – Larger operating footprints with centralized sub-hourly electricity markets

• Analytics, machine interfaces, and artificial intelligence will be required to handle data avalanche
Capacity: Houston, we have a problem

• On August 15, 2019, real time energy prices in Houston hit the market cap of $9,000 per megawatt – for the second time that week

• Reports cited that a 450 MW generator was out of service – on a 78,000 MW system

• ERCOT issued an emergency alert
  – Was this an “emergency”? Or a systemic issue?
CAISO’s expected capacity shortage

![Bar chart showing projected capacity shortages for 2020, 2021, and 2022.]

Projected shortfalls at 7 p.m.:
- 2020 = 2,300 MW
- 2021 = 4,400 MW
- 2022 = 4,700 MW

Graphic Sources:
Northwest Power Pool, CAISO
Northwest capacity risk

• The Northwest Power Pool partnered with regional entities to evaluate expected changes to loads and resources

• Conclusion: By the mid-2020s, the region may face a capacity deficit of thousands of megawatts

• “These developments threaten to upset the balance of loads and resources within the region and, if not properly addressed, could bring an end to a period of stability dating back to the end of the Western energy crisis of 2000-2001.”

Source: NWPP “Exploring a Resource Adequacy Program for the Pacific Northwest”.
Capacity: It’s about reliability

• Sufficient electricity capacity is essential for system operating reliability
  – Balancing reserves to respond to changes in supply and demand
  – Contingency reserves to respond to forced outages
Electricity Markets
North American electricity markets
CAISO Energy Imbalance Market
Southwest Power Pool
Western Energy Imbalance Service
WAPA regions and markets

- Desert Southwest
  - Evaluating SPP Energy Imbalance Service (EIS) and CAISO Energy Imbalance Market (EIM)

- Rocky Mountain
  - Joining SPP EIS with a February 2021 target implementation date

- Sierra Nevada
  - Joining CAISO EIM with an April 2021 target implementation date

- Upper Great Plains
  - Eastern Interconnection facilities
    - Joined full SPP RTO in October 2014
  - Western Interconnection facilities
    - Joining SPP EIS with a February 2021 target implementation date
WAPA energy imbalance objectives

- Ensure reliable delivery of our hydropower while adjusting to a changing energy mix
- Respond to customer feedback requesting WAPA lead organized market discussions
- Address WAPA balancing authority area constraints
- Facilitate integration of renewable resources
- Enable customers who want to optimize their resources to participate in markets
Key takeaways

• Capacity is essential for reliability
• Well-designed electricity markets are critical
• Failure is an option
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