

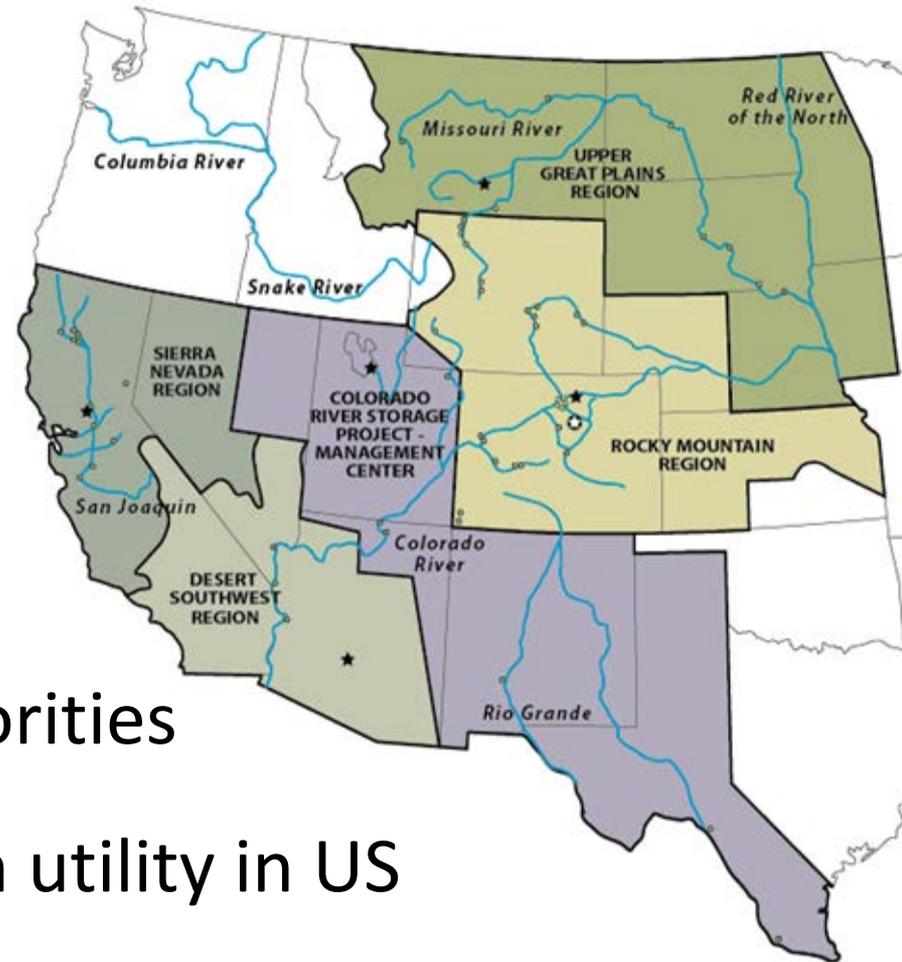
Powering the Energy Frontier

Ascend Analytics Summit
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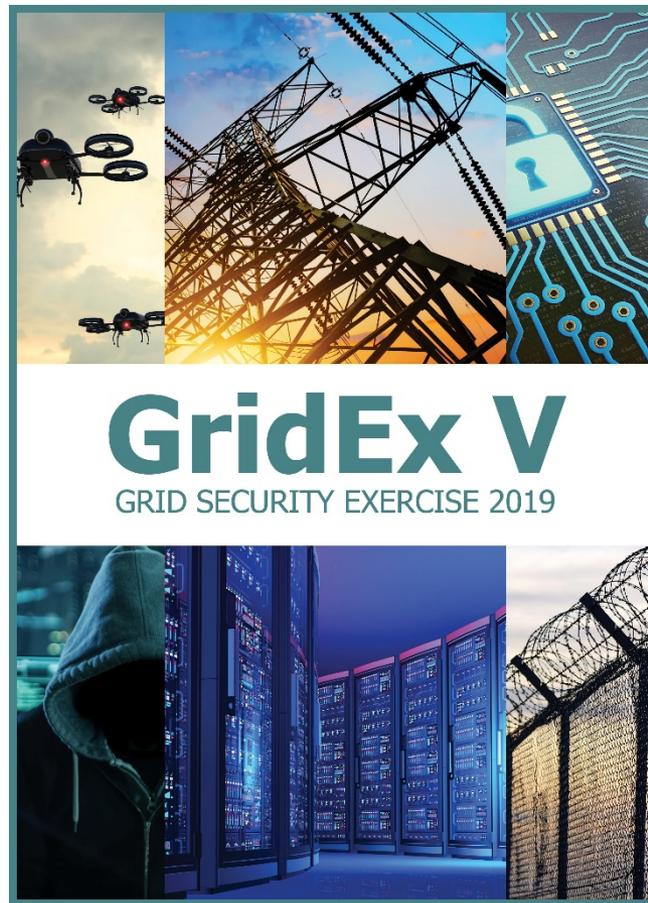
Western Area Power Administration

- 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

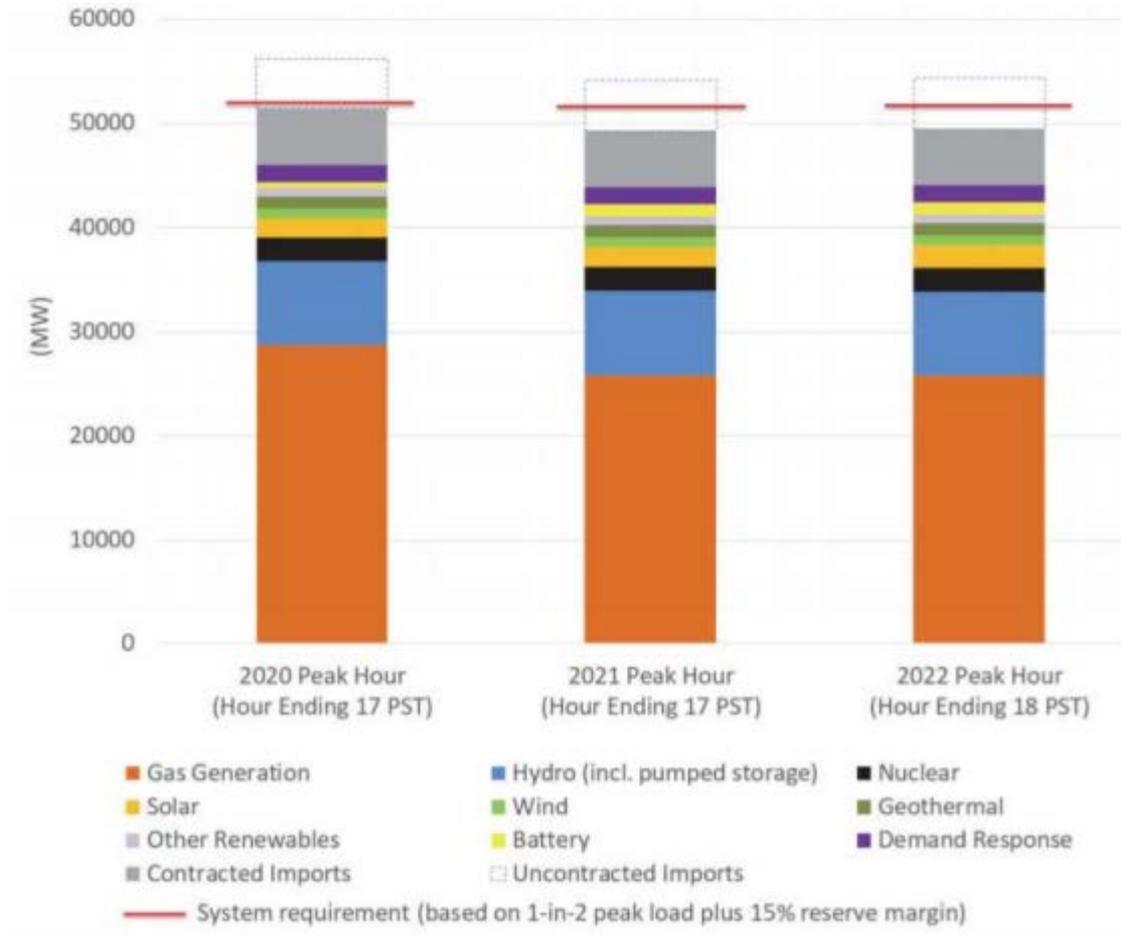
- Physics barriers are real!
- Institutional barriers can be even more challenging
- Significant generation changes require that the system be operated differently
 - Appropriate emphasis on energy capacity
 - Larger operating footprints with centralized sub-hourly electricity markets
- Analytics, machine interfaces, and artificial intelligence will be required to handle data avalanche

Electricity Capacity

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



Projected shortfalls
at 7 p.m.:

2020 = **2,300 MW**

2021 = **4,400 MW**

2022 = **4,700 MW**

Graphic Sources:
Northwest Power
Pool, CAISO

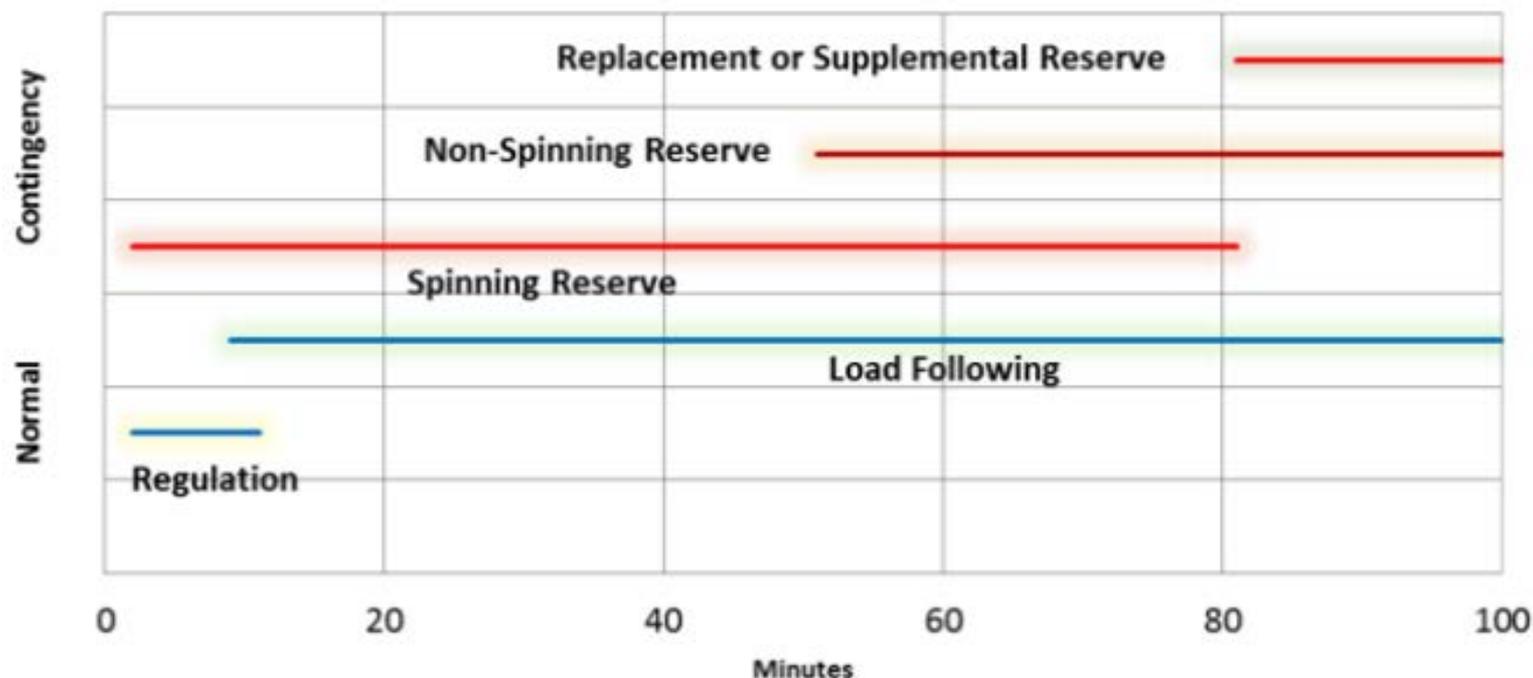
Northwest capacity risk

- 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

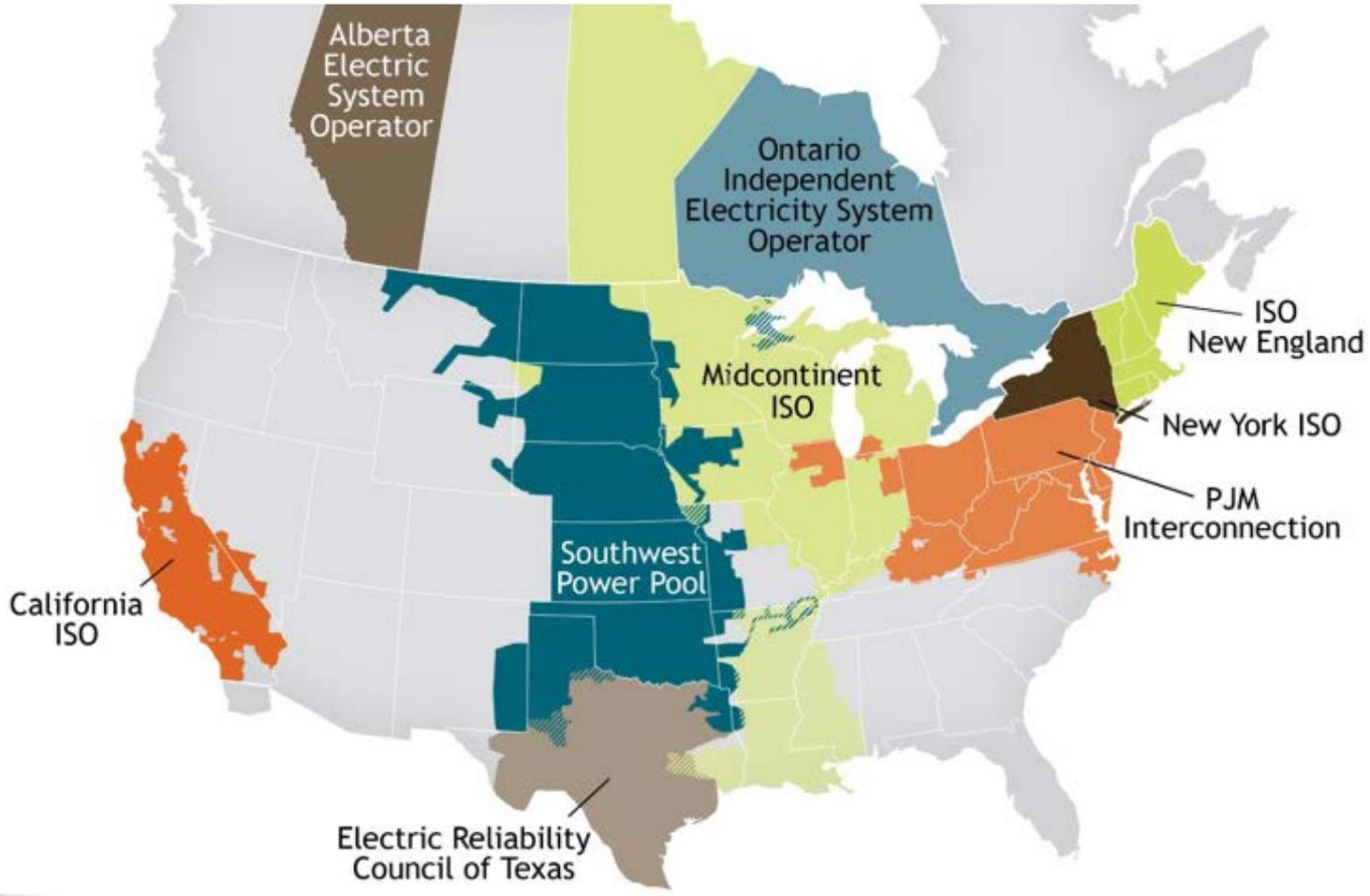
- Sufficient electricity capacity is essential for system operating reliability
 - Balancing reserves to respond to changes in supply and demand
 - Contingency reserves to respond to forced outages



Graphic Source: NERC

Electricity Markets

North American electricity markets



CAISO Energy Imbalance Market

Market Operator

California ISO

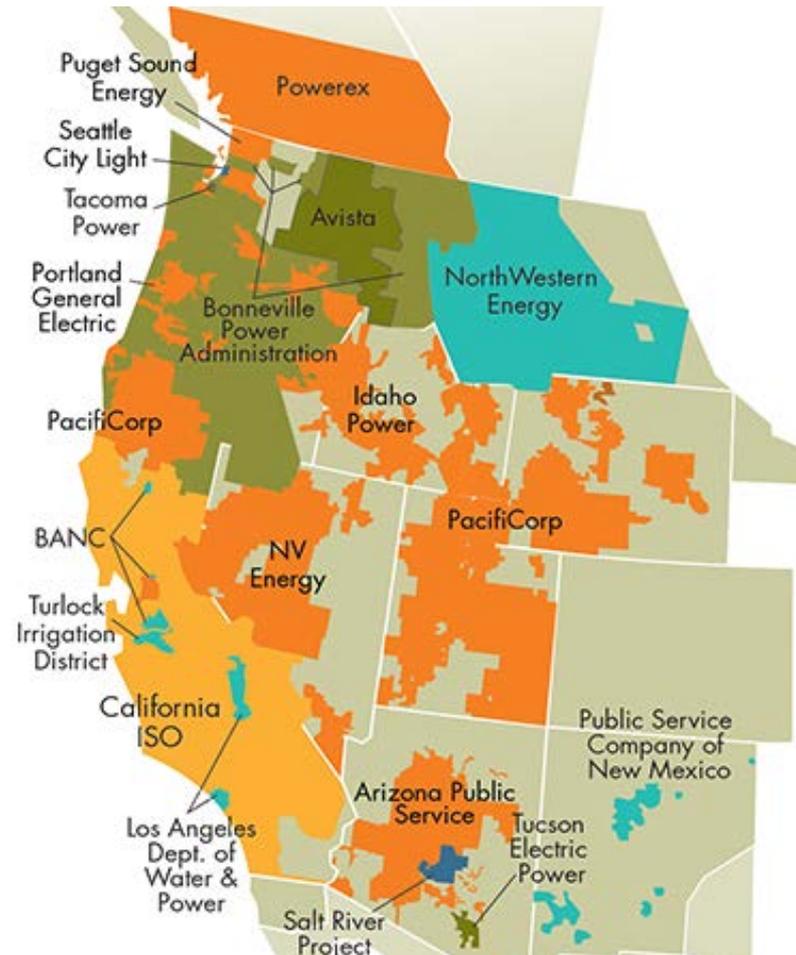
EIM entity

Active participant

Planned EIM entry 2020

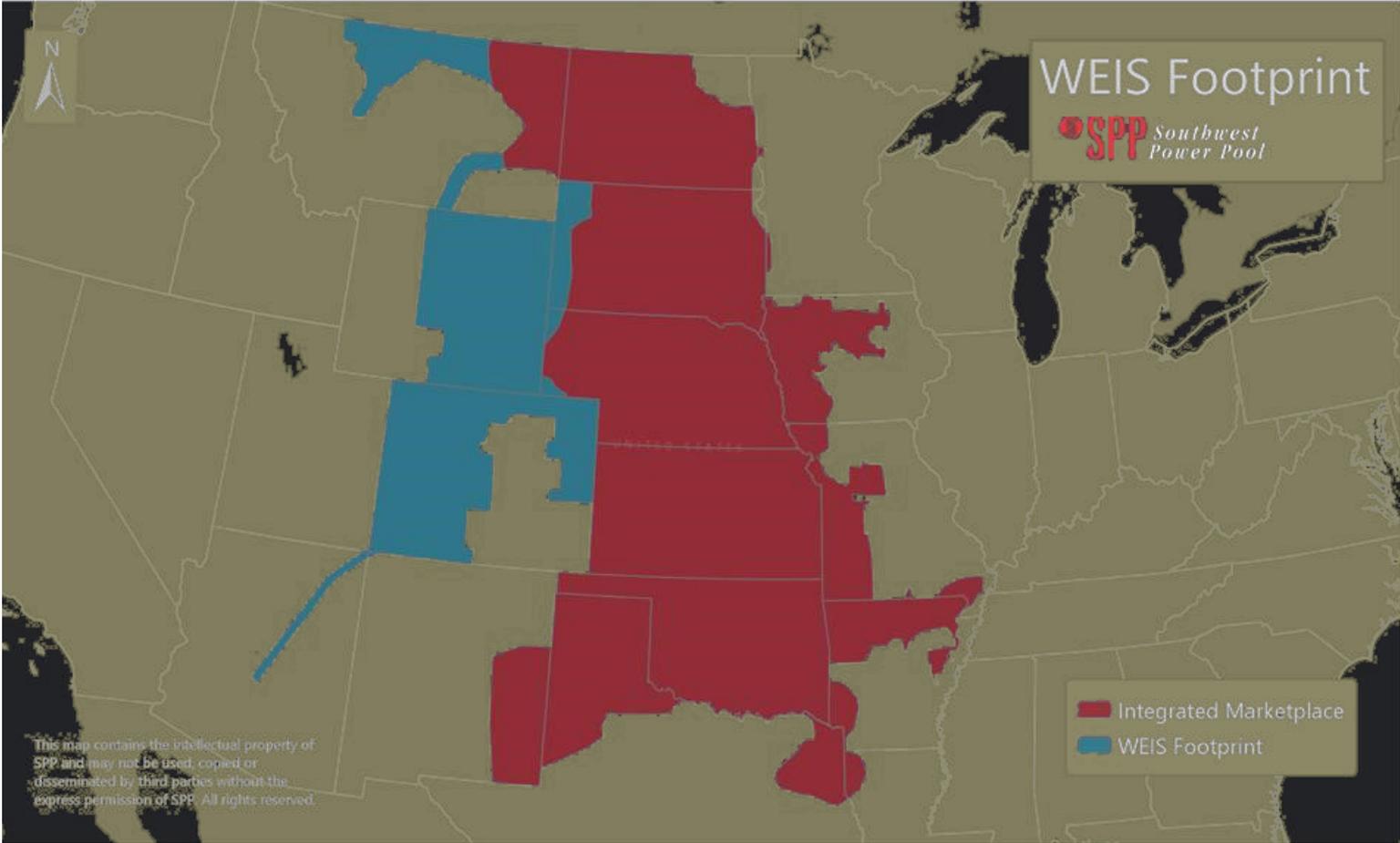
Planned EIM entry 2021

Planned EIM entry 2022



Southwest Power Pool

Western Energy Imbalance Service



WAPA regions and markets

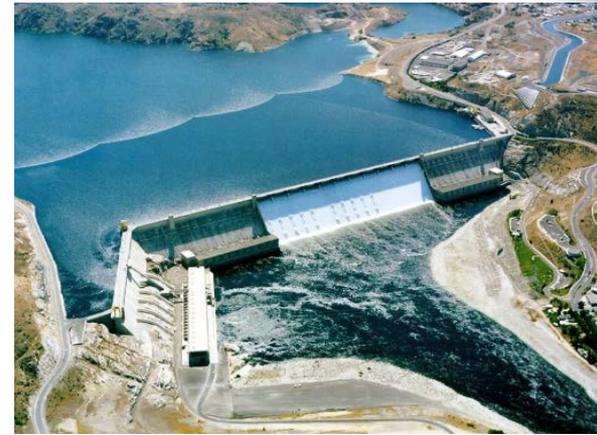
- Desert Southwest
 - Evaluating SPP Energy Imbalance Service (EIS) and CAISO Energy Imbalance Market (EIM)
- Rocky Mountain
 - Joining SPP EIS with a February 2021 target implementation date
- Sierra Nevada
 - Joining CAISO EIM with an April 2021 target implementation date
- Upper Great Plains
 - Eastern 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



Grand Coulee Dam (6,800 MW)



Glen Canyon Dam (1,320 MW)



Hoover Dam (2,080 MW)

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