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# REACHING NET ZERO TOGETHER

Hydropower Solutions

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# Presenters



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# Agenda

- Federal Energy Regulatory Commission's (FERC's) final dam safety regulations
- FERC's Notice of Proposed Rulemaking on financial assurance measures
- Opportunities for new pumped storage projects
- Hydropower and grid reliability



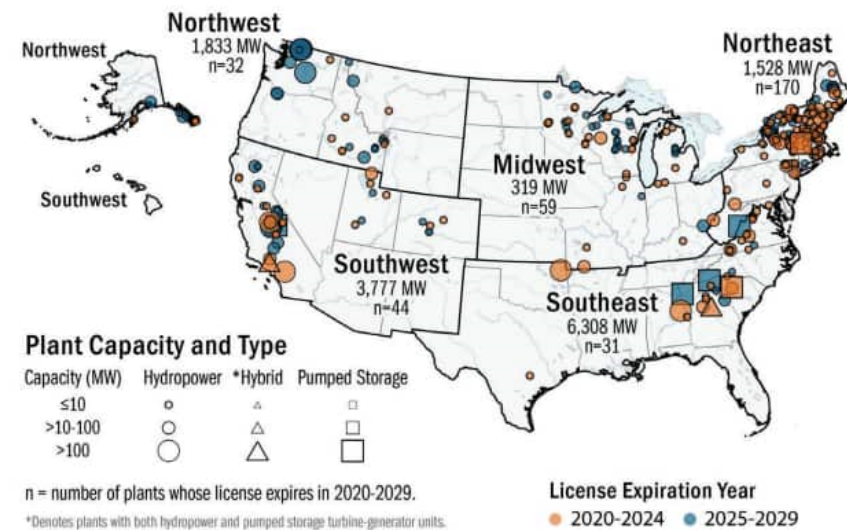
# FERC's final dam safety regulations

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# FERC Dam Safety - Overview

- FERC licenses non-federal hydropower projects (pursuant to Fed. Power Act).
  - FPA § 10(c) gives FERC authority over dam safety.
- FERC's Dam Safety Regs in 18 C.F.R. Pt 12 require licensees to:
  - use "prudent engineering practices."
  - report safety-related incidents.
  - report modifications to the project.
  - prepare an Emergency Action Plan.
  - obtain independent inspections for certain projects.\*
  - submit Dam Safety Program (for high / significant hazard potential dams).

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# 2021 Final Dam Safety Regulations

- Final Dam Safety Regs in FERC Order No. 880 (Dec. 2021)
  - Two safety events (Taum Sauk in 2005 and Oroville Dam in 2017) led to rulemaking.
  - Revisions to 18 C.F.R. Pt. 12
  - 4 categories of revisions.
- (1) Independent consultant safety inspections, in addition to FERC's regular inspections (Pt 12, Subpt D).
  - *Comprehensive Assessment* every 10 years.
  - *Periodic Inspection* every 10 years, at midpoint of Comprehensive Assessment.



## 2021 Final Dam Safety Regulations (cont.)

- (2) Requires licensee to submit to FERC an indep. consultant team proposal (Pt 12, Subpt D).
  - Indep. consultants & engineering or scientific personnel
  - Show that team possesses an appropriate level of project-specific expertise.
- (3) Codifies existing guidance on Dam Safety Program; high or significant hazard potential dams must prepare & review a program. (Pt 12, Subpt F).
- (4) Modifies licensee reporting and preparedness requirements. (18 CFR §§ 12.10, 12.42)





# **FERC's Notice of Proposed Rulemaking on financial assurance measures**

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# Financial Assurances Notice of Inquiry

- January 19, 2021, FERC issued a NOI in RM21-9 on potential changes to its regulations requiring financial assurance measures in licenses and other authorizations for hydroelectric projects.
- FERC has identified at least 88 projects under FERC license that are non-operational, primarily due to a lack of financial resources.
  - Inadequate financing may threaten public safety and environmental resources.
  - Under FPA Section 4, FERC must consider fish and wildlife conservation; preservation of environmental quality.
- Two dams failed near Midland, Michigan in 2020, demonstrating potential threat.
  - Occurred after just 7 inches of rain.
  - Primarily caused from deficiencies to spillway identified by FERC decades earlier as needing upgrade. Delayed due to lack of funds.
  - 10,000 people were evacuated, approx. \$200 million dollars of property was damaged
- In issuing licenses for hydroelectric projects, FERC currently has some financial safeguards in place. They are insufficient.
  - FERC performs an economic analysis to estimate economic benefits and costs and reasonable alternatives.
    - This provides only an estimate. Does not show whether net positive cash flow over life of the license.
  - FERC requires licensees to file a financinc plan prior to beginning construction.
    - Does not address affording ongoing operation and maintenance, other costs.
- FERC has enforcement mechanisms, but they may not always result in the necessary license compliance.

# Financial Assurances Notice of Inquiry

- FERC proposes three potential “buckets” of options for establishing financial assurance mechanisms in hydroelectric licenses:
  - 1. Require licensees to obtain bonds to ensure they have sufficient funds to pay for operation, maintenance, environmental, and safety measures throughout the duration of the license.
  - 2. Establish an industry-wide trust or remediation fund to pay for necessary repairs and remediation (similar to EPA’s Superfund program) or require licensees to maintain an individual trust or remediation fund that is similar to what is done in the nuclear industry, or require funds to be placed in escrow.
  - 3. Require licensees to obtain insurance policies to cover costs in the event of a safety hazard or dam failure.
- Approx. 60 comments have been filed so far.

# Financial Assurances Notice of Inquiry

- April 2022, FERC held a Staff-led technical conference to discuss financial assurance mechanisms. Consisted of three panels:
  - Protecting Hydroelectric Facilities and Communities with Financial Assurance Requirements
  - Establishing a Financial Assurance Requirement
  - Evaluating Mechanisms for Financial Assurance
- FERC invited stakeholders to file post-conference comments that were due June 13<sup>th</sup>.
- Further action is anticipated.



# Opportunities for new pumped storage projects

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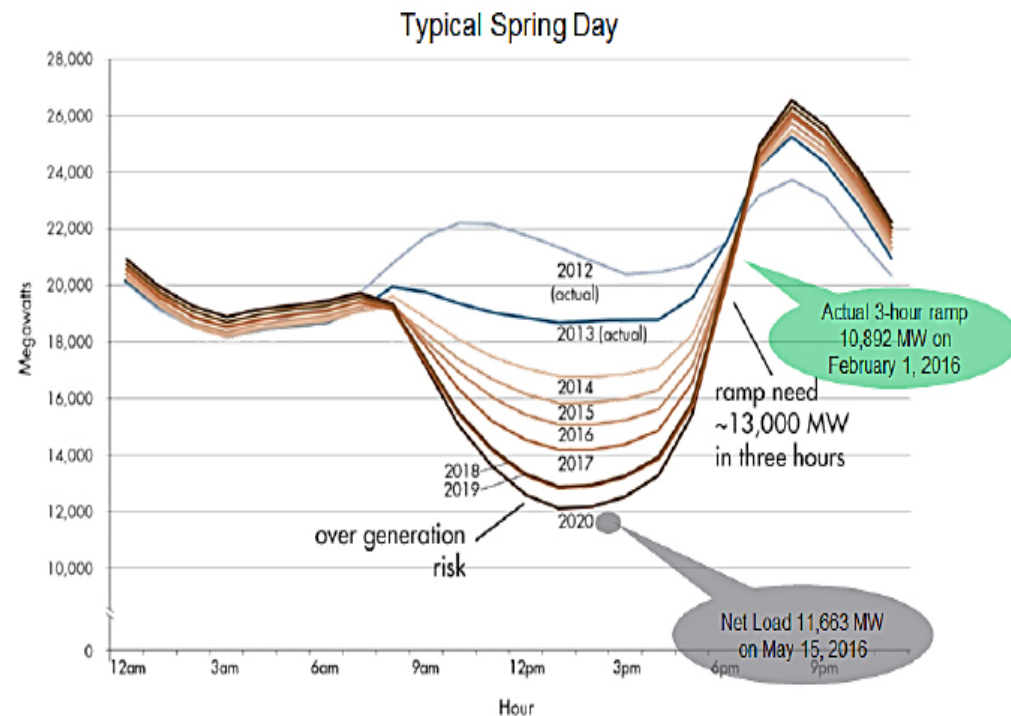
# Dunkelflaute

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# Getting Pumped for Pumped Hydro

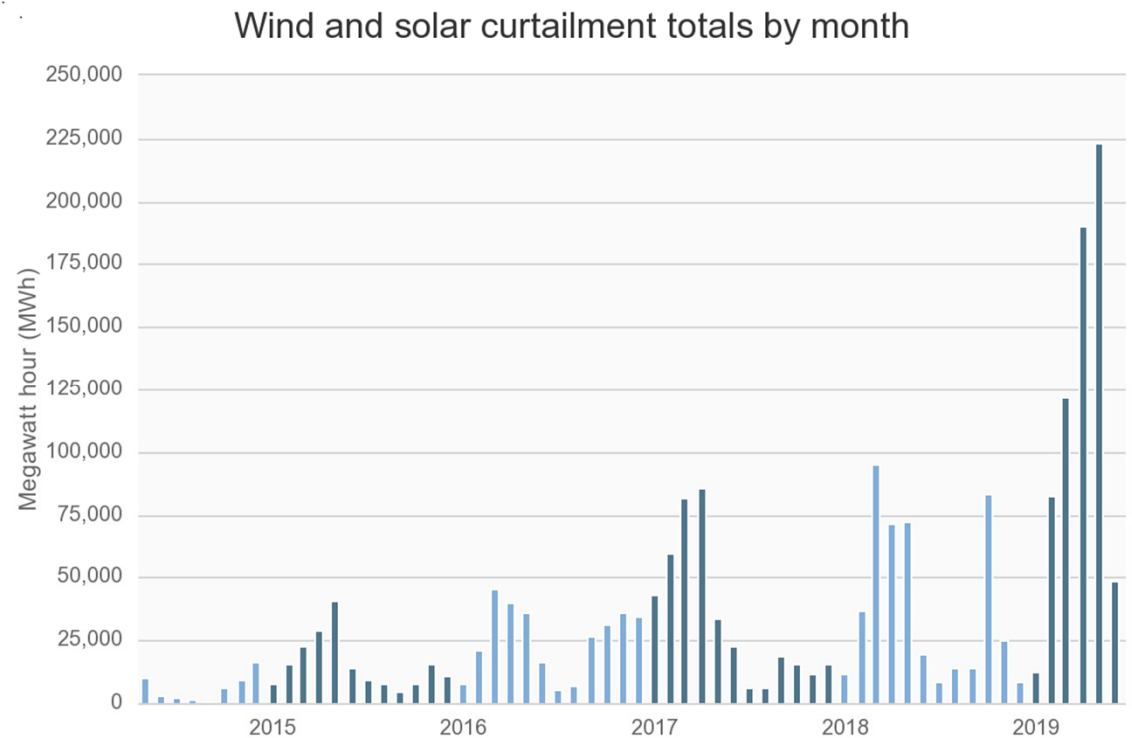
- Many renewable resources (i.e., solar, wind) are intermittent and non-dispatchable.
  - What happens when the sun isn't out or wind isn't blowing?
    - “Dunkelflaute” (i.e., “dark doldrums”).
  - Or, when there's too much solar or wind?
- As solar penetration increase, energy storage effective load carry capability decreases; requires longer-duration storage.

## Problem to address (in CA)



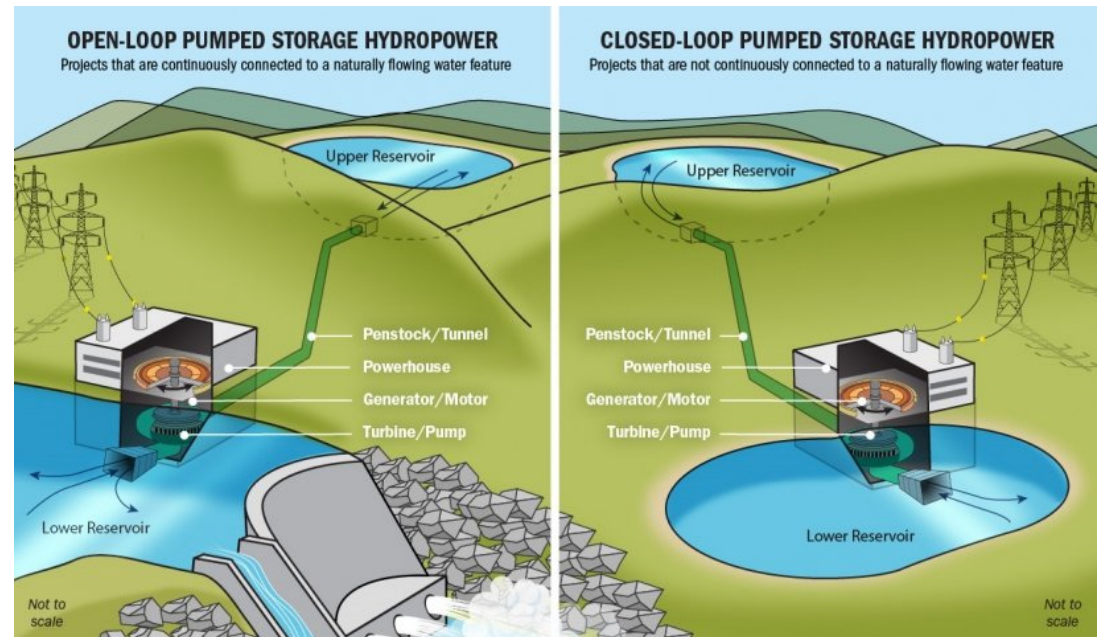
# Getting Pumped for Pumped Hydro (cont.)

- Excess generation or lack of transmission relative to buildout causes curtailment.
- Curtailment = wasted energy.
- Curtailment increasing.



# Pumped Hydro Primer

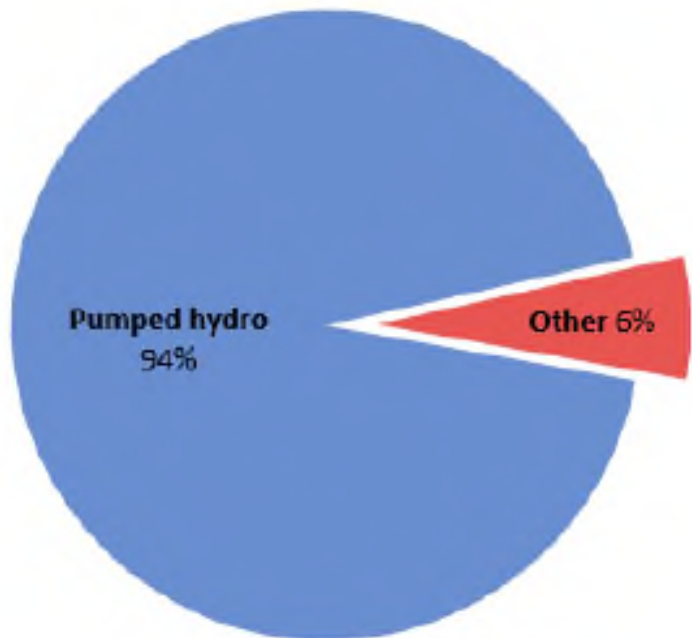
- Pumped hydro = H<sub>2</sub>O battery; storing water as potential energy for later release.
  - Less variable, more flexible, dispatchable.
- Use excess energy to pump water to upper reservoir.
- Fewer environmental concerns.
- Can provide long-duration storage; most electric battery storage 4-6 hrs.
- Long life-span (40-100 yrs).



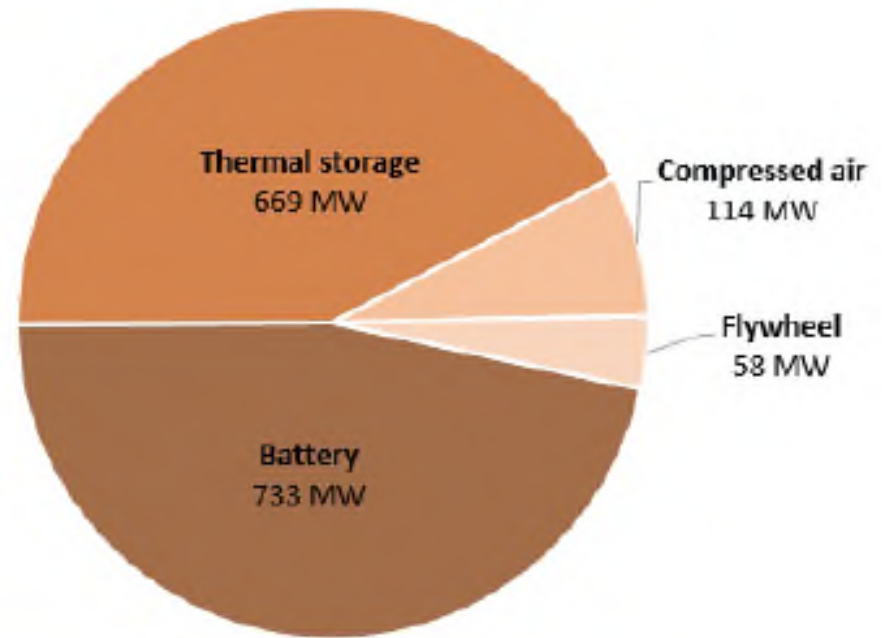


# Pumped Hydro = Proven Storage

25.2 GW U.S. storage capacity



1,574 MW other storage



# Pumped Hydro Considerations

## Challenges

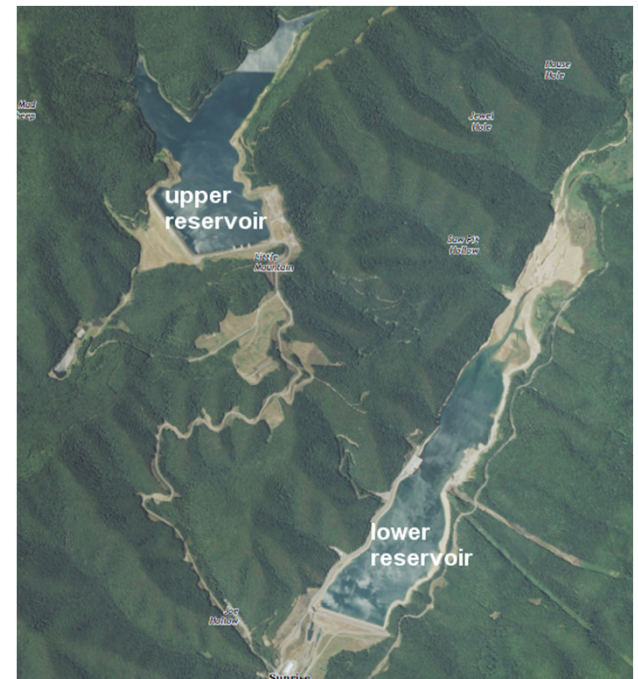
- Limited suitable sites
- Long FERC permitting process
- Large initial capital costs
- Difficulty determining value of storage
- Uncertainty in cost recovery in organized markets

## Opportunities

- Large-scale storage
- Dispatchable, flexible, predictable
- Provides grid voltage support & frequency regulation
- Fewer environmental concerns compared to conventional hydro; no carbon emissions
- Long-duration storage; most electric battery storage 4-6 hrs
- Long life-span (40-100 yrs)
- Cheaper than electrical batteries over long term

# Pumped Hydro Examples

- Helms Pumped Storage Project, CA (PG&E)
  - 1,212 MW
  - In operation since 1984
  - Used in conjunction w/ Diablo Canyon Nuclear Station.
- Bath County Pumped Storage Station, VA (Dominion)
  - 3,003 MW
  - In operation since 1985
  - Two large lakes for recreational use.
- Substantial Amounts of Pumped Storage possible
  - about 22 GW of installed pumped hydro capacity with a potential to add another 36 GW over the next 30 years as we transition to renewables. (Dept of Energy 2018)



# Possible Future Pumped Hydro Projects

- ***Eagle Mountain, CA***
  - 1,300 MW (1 mil homes) closed-loop.
  - Uses former mining pits in desert as reservoirs.
  - 12-18 hours of flexible generation; 10 MW/second ramp.
  - 50 yr license issued in 2014.
- ***Goldendale, WA***
  - 1,200 MW closed-loop
  - Located on former brownfield site
  - 12 hours of flexible generation
  - Awaiting FERC license.
- ***Swan Lake, OR***
  - 394 MW closed-loop.
  - 50 yr license issued in 2019.
  - 9 hours of flexible generation.



# Challenges and Need in California and Beyond

- **Challenges**

- “Too big to succeed”
  - Hard to contract, particularly with multiplicity of LSEs (IOUs and CCAs)
  - Long lead time/capital intensive
  - Difficult environmental hurdles.
- Focus on Batteries and other new technologies.

- **Need**

- California desperately in need of new clean capacity
- Appreciation that NQC of batteries diminishes with increased storage
- Significant delays in projects
- Long duration capacity needed

- **Prospects**

- Prospects bleak, but some procurement possible (San Diego project)
- Will require significant CPUC leadership.





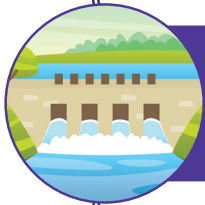
# Hydropower and grid reliability

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# The Role of Hydro Resources in Maintaining System Reliability—Normal Operations



Can be dispatchable



Baseload generation (6.3% of fleet in 2021 according to the EIA; 20-25% in Western Interconnection)



Reactive power (often particularly essential in remote areas)

# The Role of Hydro Resources in Maintaining System Reliability—Emergency Operations



Supplemental and spinning reserves due to high ramping capability



Wide-band of frequency-ride through capability due to slow turbine rotation



Can be blackstart capable



Frequency response



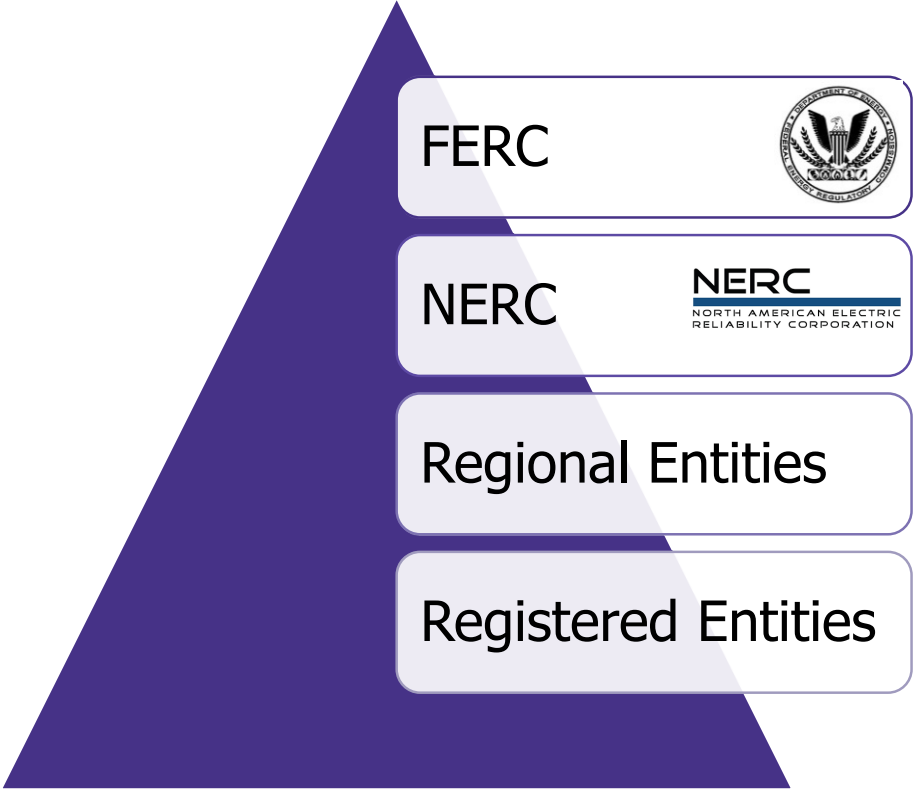
Not subject to sudden, unexpected fuel shortages



# Reliability Regulation for US Hydroelectric Facilities

- Although note unique to hydro facilities, reliability standards apply to all generators to ensure they continue to support the reliability of the broader system
- Section 215 of the Federal Power Act establishes a regulatory structure for developing and enforcing reliability standards for the bulk-power system
- Reliability standards apply to “users, owners, and operators of the bulk-power system”
  - For generation, including hydroelectric, that generally includes the owners and operators of generators meeting the criteria approved by FERC in Orders No. 773 and 773-A.
    - Generating resource(s) *including the generator terminals through the high-side of the stepup transformer(s)* connected at a voltage of 100 kV or above with:
      - a) Gross individual nameplate rating greater than 20 MVA. Or,
      - b) Gross plant/facility aggregate nameplate rating greater than 75 MVA.
    - Note: This excludes much small hydro.
- Separate compliance and enforcement structure (under Section 215/18 CFR Part 39) than for hydro safety and license compliance requirements.

# Section 215 (Reliability Compliance) Structure





# Questions

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# Biography



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Since 2003, William (Bill) D. Kissinger has focused his practice on energy matters in California and nationally along with related environmental issues. He developed this practice after spending two years working as senior deputy legal affairs secretary to Gov. Gray Davis and serving as the primary legal contact for the Office of the Governor with Cal EPA, Cal Health and Human Services Agency, and the Resources Agency. Bill previously spent four years in Washington, DC working in senior positions at the White House and the US State Department.

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J. Daniel Skees represents electric utilities before the Federal Energy Regulatory Commission (FERC) and other agencies on rate, regulatory, and transaction matters. He handles rate and tariff proceedings, electric utility and holding company transactions, utility financing, electric markets and trading issues, reliability standards development and compliance, including cybersecurity requirements, administrative litigation, and transmission development. In handling appeals of FERC decisions, Dan has successfully represented clients before both the US Court of Appeals for the District of Columbia Circuit and the US Court of Appeals for the Fifth Circuit.

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Robert Goldfin represents major energy industry participants in regulatory and transactional matters, including enforcement proceedings and investigations. He handles Federal Power Act matters before the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC). Robert advocates for clients before the Nuclear Regulatory Commission (NRC) and US Court of Federal Claims, and in settlements with the US Department of Energy (DOE) regarding spent nuclear fuel. He also represents clients on national security and international trade matters, including assisting US and foreign entities with notices to the Committee on Foreign Investment in the United States (CFIUS).

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Patrick R. Pennella assists in the representation of major energy industry participants, including electric utilities, nuclear plant operators, and oil and gas pipelines. Patrick assists electric utilities in civil litigation in the Court of Federal Claims in claims against the government for breach of contract relating to disposal of spent nuclear fuel. He advises electric and natural gas clients on regulatory compliance issues, ratemaking proceedings, and enforcement matters before the Federal Energy Regulatory Commission. Additionally, he provides regulatory advice on energy-related commercial transactions.

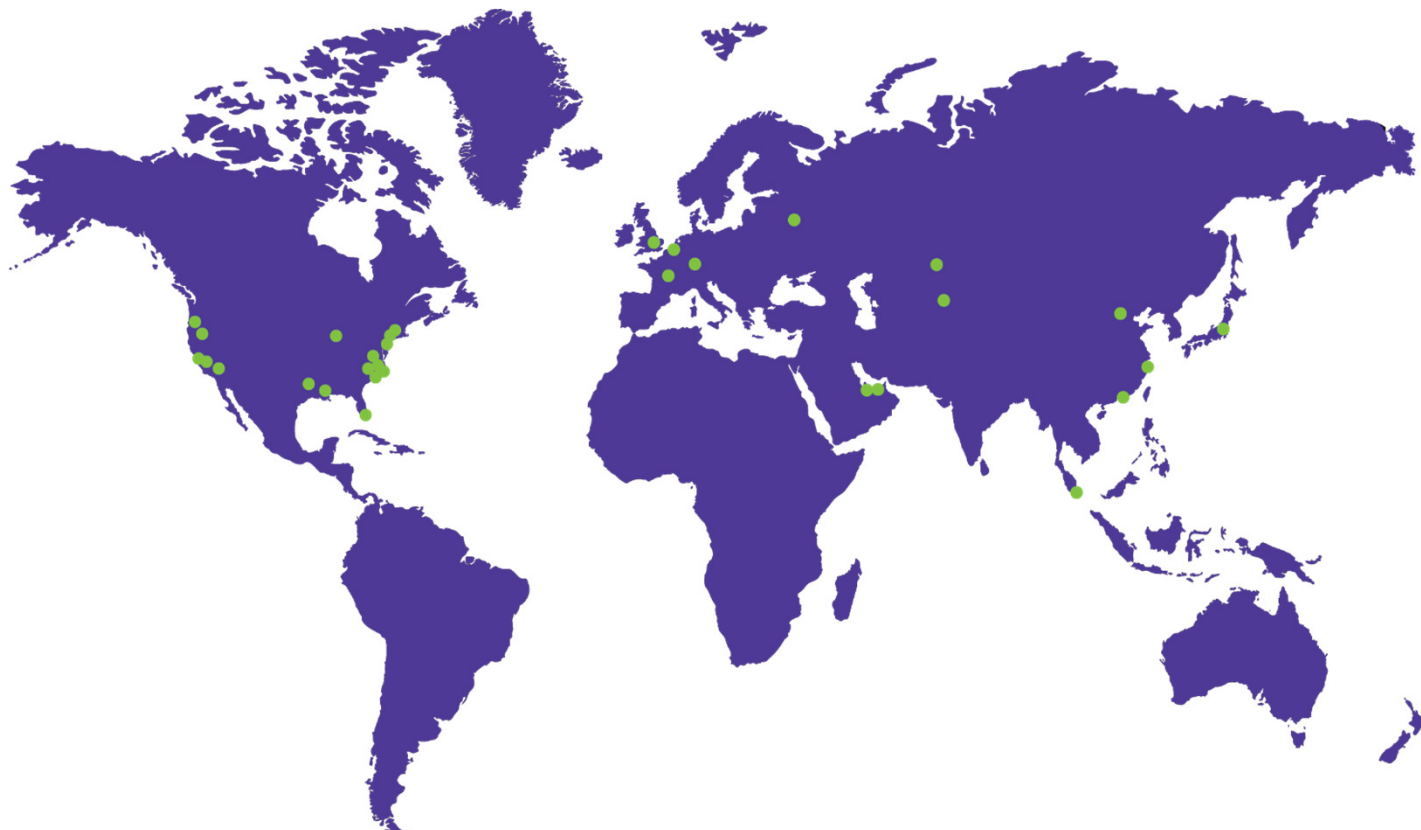
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