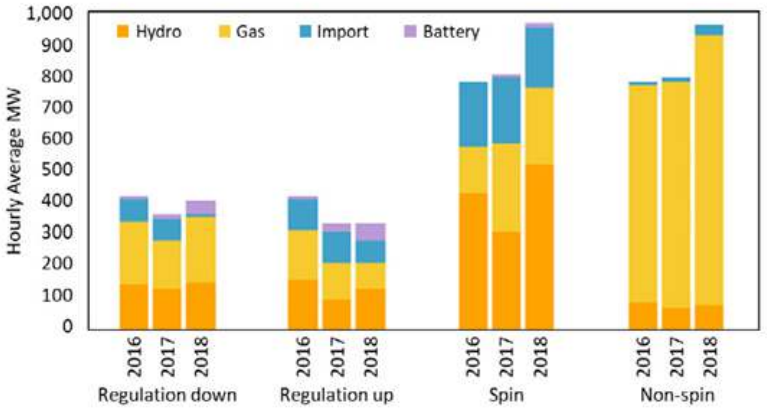
The Value of Hydropower to an Evolving Grid

Hydropower has been an essential source of American power since the 1880s. Together, conventional hydropower and pumped storage represent **over 100 GWs** of baseload, dispatchable capacity.

GRID RELIABILITY & RESILIENCE

- Hydropower is a **baseload resource** that generates reliable, 24/7 electricity from the continuous flow of water across the country.
- Hydropower is **easily dispatchable**, quickly releasing water behind dams to ramp up output in as little as 10 minutes. In fact, hydropower provides better hourly flexibility than natural gas.
- These two features allow hydro to support both reliable power, **so the lights turn on**, and resilient power, **so the lights stay on**. No matter what.

PNNL, Hydropower Value Study:
Current Status and Future Opportunities (2021)

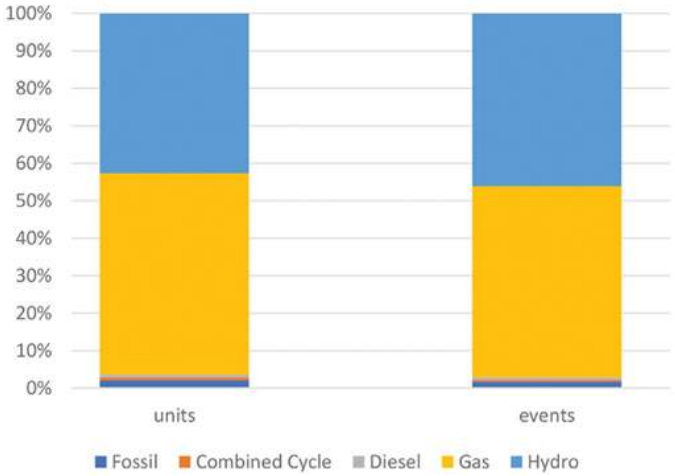


> Pumped storage hydropower represents **96%** of utility-scale energy storage capability in the United States. That's because pumped storage can be dispatched to fill gaps in supply for **8-20 hours**, with no recharge needed.

ESSENTIAL GRID SERVICES

- Hydropower plants maintain **large, spinning mass turbines** that are ready to supply power instantly if there's a sudden drop in generation elsewhere. This quick response helps **prevent outages** and contributes to the stability of our 60hz system.
- Hydropower is also key supplier of **voltage control**, which helps push electricity along transmission lines during regional outages and helps **maintain the quality of electricity** as it moves through the grid.
- Hydropower can restart the grid after a total blackout without auxiliary power, a process known as **black start.** Hydro provides an impressive **40%** of our nation's black start capability.

ORNL: Hydropower Plants as
Black Start Resources



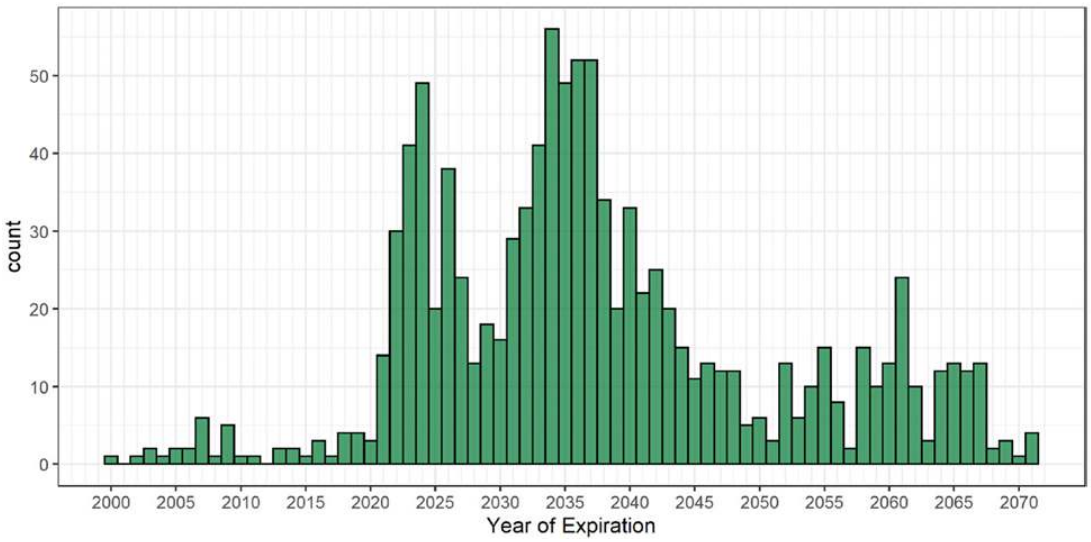
TAX PARITY WITH OTHER ENERGY RESOURCES

To preserve these critical contributions, Congress should pass the ***Maintaining and Enhancing Hydroelectricity and River Restoration Act***, to provide incentives for dam safety upgrades and ecosystem improvements to the existing hydropower fleet.

Hydropower at Risk: License Expirations

Many hydropower facilities are at risk of retirement. Between 2020-2035, **451 licenses** representing **15,700 MW will expire**, with one-third of owners actively **considering decommissioning** rather than renewal.

LICENSING AND RELICENSING



Histogram showing the year in which a license will expire from a sample of 1038 FERC licensed hydropower projects across the United States

- Relicensing a project takes, on average, **7-10** years.
- Relicensing a project costs, on average, **$3.5 million**, with large deviations depending on project size, environmental complexity, and stakeholder negotiations.
- Protracted licensing proceedings **discourage investment** in new hydropower and pumped storage.
- **91%** of private equity investors, banks, and venture capitalists cite extended licensing timelines as a reason to avoid investment in early-stage projects

This trend has already resulted in **68 facilities (322 MW)** shutting down between 2010-2022, due to economic concerns and relicensing uncertainty.

CONGRESS SHOULD STREAMLINE THE PROCESS OF LICENSING AND RELICENSING BY:

a) Clarifying that **mandatory conditions relate only to project effects**, rather than unrelated requirements, and that licensees are authorized to conduct routine, non-substantial maintenance and repairs without a license amendment;

b) improving interagency coordination and process discipline at the federal and state levels, including the development of a consolidated schedule, joint study plans, and a process to resolve inconsistent licensing conditions; and

c) remedying the America's Water Infrastructure Act of 2018, by **expediting the timeline for licensing new generation at existing non-powered dams** and qualifying pumped storage facilities.

Hydropower Potential: Expanding Grid Stability

PUMPED STORAGE HYDROPOWER (PSH)

- **86 GW** of hydropower capacity is currently in the development pipeline, most of which is pumped storage hydropower (PSH).
- PSH acts like a **giant battery**, storing excess energy by pumping water uphill during low demand and releasing it to generate power during high demand.

Scan to explore our interactive Hydro Map!

Includes existing plants, the development pipeline, Section 247 awardees, and more!

- PSH is the most **cost-effective**, utility-scale energy storage for **1000 MW, systems**.

> **56** pumped storage projects across **20 states** are currently in development

NON-POWERED DAMS (NPDs)

- Over **90,000 dams** exist in the United States, but **less than 3%** generate electricity.
- There is an **untapped potential** of nearly **12 GW**, with 8 GW concentrated in just 100 dams.
- Since the dam already exists, **adding power** avoids new ecosystem and river flow disruptions.

> Retrofitting NPDs can boost local economies by creating new jobs and attracting investment.

MARINE ENERGY (ME)

- Has a technical resource potential of **2,300 TWh/year**.
- ME helps diversify the energy mix, reducing dependence on imported fuels and **enhancing energy security**.
- ME drives **technological innovation** and research, pushing advancements in energy capture, storage, and grid integration.

> ME harnesses power from waves, tides, and currents to generate carbon-free electricity.

CHALLENGES & OPPORTUNITIES

- Complex regulatory frameworks and burdensome licensing processes slow hydropower development. **Streamlining these processes can accelerate project timelines and encourage investment.**
- Current market structures often undervalue hydropower's reliability and flexibility. **Reforming market mechanisms can ensure hydropower is adequately compensated for providing essential grid services.**
- Uncertain policy environments threaten the maintenance of existing capacity. **Policy reforms and incentives are needed to sustain operations and unlock growth potential.**

NHA National Hydropower Association