

What will happen if the Glen Canyon Dam stops generating power?

Impacts will be varied, but the crisis at Lake Powell is bigger than hydropower.



Low tide usually arrives every 12 hours on the Colorado River in Grand Canyon National Park.

River runners who pull their rafts onto gently sloping sand beaches to camp may awake to find their boats stranded far above the waterline by morning. Rocks that disappear in

certain rapids at high tide become major obstacles when the water is low, and most rafters carry a tide chart in their boats' dry boxes alongside their map.

Unlike ocean tides, however, the river's regular fluctuations have nothing to do with the gravitational pull of the moon. They are driven by the power demands of the Southwest.

Managers at the Glen Canyon Dam often release more water from Lake Powell each morning as air conditioners begin to hum and electricity use increases. In the evenings, as people turn in for the night, managers turn down the spigot. Demand for electricity is greater on weekdays, and the Colorado River tides are usually less dramatic on weekends.

Before the construction of the Glen Canyon Dam above the Grand Canyon in the 1960s, the river's flow followed a much longer cycle: raging into flood stage in early summer as snowmelt poured down from the mountains and diminishing to a rock-studded stream in winter.

But as Lake Powell has fallen to record lows in recent years, hydroelectricity generated at the dam has been reduced.

And now the daily tide cycle that has been the norm in the Grand Canyon could end as 22 years of climate change-linked drought threatens to make hydropower production impossible.

'A temporary and helpful action'

The Bureau of Reclamation, which manages the Glen Canyon Dam, and the seven states in the Colorado River basin, including Utah, agreed to [an emergency plan last month](#) that will temporarily boost the level in Lake Powell to keep the hydroelectric turbines spinning.

The plan reduces releases through the Grand Canyon to Lake Mead and sends more water to Lake Powell from Flaming Gorge Reservoir near the Utah-Wyoming border.

"It's a temporary and helpful action," said Clayton Palmer, an environmental specialist at Western Area Power Administration (WAPA), a power marketing administration within the U.S. Department of Energy that is tasked with selling wholesale power from the Glen Canyon Dam and other federally owned reservoirs.

But Palmer said the plan only amounts to a "Band-Aid" if there is a repeat of 2021 when the Colorado River saw near-record low runoff.

"If hydrological conditions continue to be as poor as 2021," Palmer said, "then additional water released from Flaming Gorge is not sustainable and will not help. If, on the other hand, the new normal going forward is dry, but not as dry as 2021, then the added water volume released from flow in the

gorge will assist Lake Powell" in staying high enough to continue generating power.

The impact of an end to power production at the dam is complex and far-reaching, and its greatest effects would be on electricity users in rural areas.

When Congress authorized the Glen Canyon Dam in 1956, the structure's primary purpose was to provide water storage on the Colorado River system by creating the 180-mile-long reservoir known as Lake Powell.

The Upper Basin states of Utah, Colorado, New Mexico and Wyoming are obligated to send a set amount of water downstream each year under the Colorado River Compact of 1922, and the dam's backers saw Lake Powell as a way to provide flexibility during dry years.

But the dam had an added benefit. It was designed to produce up to 1,320 megawatts of hydroelectric power and could generate revenue to pay for its own construction and numerous other costly irrigation projects throughout the region.

In addition, the power sales would support publicly owned utilities formed under New Deal-era programs to bring electricity to primarily rural areas.

Glen Canyon Dam is the biggest hydropower generator in

the Upper Basin states, producing enough electricity to light hundreds of thousands of homes.

Other dams approved in the same 1956 legislation known as the Colorado River Storage Project Act — Flaming Gorge Dam on the Green River in Utah, three dams on the Gunnison River in Colorado, and the Navajo Dam on the San Juan River in New Mexico — are also Bureau of Reclamation projects that market power through WAPA. The projects generate \$150 million in revenue during a typical year, with around 80% of that coming from the Glen Canyon Dam.

“This is not a small thing if Lake Powell gets low enough to lose hydropower,” Palmer said.



(Ecoflight) An aerial view of the Glen Canyon Dam with Page, Ariz. in the background.

Impacts on ratepayers

The effects on utilities that receive a portion of their power from the dam in Utah, New Mexico, Wyoming, Arizona, Colorado and Nevada would be varied.

Utah's largest buyer of WAPA power, the Utah Associated Municipal Power Systems (UAMPS), gets roughly 14% of its power through the agency.

"Generation at Glen Canyon Dam constitutes about 8% of UAMPS resources," said UAMPS spokesperson LaVarr Webb. "Members are already seeing some cost impact as WAPA is not providing the full contract energy from Glen Canyon, but is just providing energy from the actual hydro generation. The replacement cost for that energy is currently about \$11 million per year. The cost of losing all generation at Glen Canyon Dam would be about \$30 million per year."

Webb said the lost hydropower from the dam would likely be replaced with natural gas generation and with purchases on the open market.

"Most UAMPS members have diverse energy portfolios," he said, "so loss of [Colorado River Storage Project] power would not be a crisis, but it could result in some rate

increases."

Donovan Power, who co-authored [a 2015 study](#) on behalf of the advocacy group Glen Canyon Institute, said the impact on most communities would be negligible.

The study found that homeowners in St. George who get their electricity through UAMPS would pay an average of \$1.32 more annually without power from Glen Canyon Dam.

In Blanding or Ephraim, the annual residential rates would go up by less than \$1 per year, the study found, though WAPA questioned the accuracy of the report.

A possible exception may be the Navajo Nation — where over 10% of residents don't have electricity in their homes — and would likely be hit the hardest by rate increases.

The Navajo Nation Tribal Utility Authority, which did not return an invitation to comment, gets the majority of its power from WAPA's Colorado River Storage Project dams. The study found the nation could pay more than \$1 million for electricity each year if Lake Powell gets too low to generate power.

Sales of WAPA power also provides tens of millions of dollars to support endangered fish recovery and other environmental programs in the Colorado River basin, which could see funding cuts as power revenue declines.

But Power said these issues could be solved politically. For example, the federal government could agree to help subsidize the Navajo Nation's power needs regardless of what happens to the Glen Canyon Dam.

"The federal government should look into ways that they can offset the impact on the underserved communities that they're supposedly giving the power to," Power said, adding that environmental programs could likewise be funded through federal appropriations instead of power sales.

The benefit to solving those problems, in Power's mind, would be the potential to restore the ecology of Glen Canyon, which [has started to recover as Lake Powell has dropped](#).

There are also a number of measures that WAPA could take to offset revenue losses due to drought, said Vijay Satyal, regional energy markets manager for Western Resource Advocates.

"WAPA needs replacement energy and owns its transmission [lines]," Satyal said. He challenged the agency to seek out independent project developers "to explore areas around the transmission footprints and where there are rich renewable resources," such as wind and solar.

"WAPA is already aware they will not be able to have the

same generation rate that they had three years ago," he said. "Why wouldn't you want to start a conversation now for replacement power that WAPA can own and sell?" Satyal also pointed to the success of [demand response programs](#) that incentivize electricity users to draw power when demand is low.

Competing demands

With 40 million people dependent on water from the Colorado River, power generation isn't the primary concern for water managers.

"Managing a reservoir is inherently about conflicting demands," said Douglas Kenney, director of the Western Water Policy Program at the University of Colorado. In wet years, managers want to keep reservoirs as full as possible. But if they are too full, they don't provide flood protection.

"And there's this trade-off between always wanting water for storage to protect you in case there's a dry spell," Kenney continued. "But you want to be releasing that water for generating power and other benefits."

Kenney said the severity of the drought, especially in the last few years, accelerated the need to make difficult decisions.

"There's no simple solution," he said. "You've got to get

everyone on board with using less water. I think that's a hard sell, but sometimes the hard choice is your only choice."

The Bureau of Reclamation expressed concerns about what would happen to the Glen Canyon Dam itself if Lake Powell dropped below 3,490 feet above sea level, where power generation would stop. The reservoir is currently at 3,526 feet and is filled to less than a quarter of its capacity.

The lower outlet tunnels on the dam that are located below the hydropower penstocks have never been used to release water for extended periods.

"There's a lot of uncertainty in the physical operation of the dam at that low level," said John Berggren, who works with Satyal at Western Resource Advocates as a water policy analyst. "As far as I can tell, no one knows just how uncertain it is and how potentially dangerous it is. But no one wants to find that out the hard way."

The lower Lake Powell gets, the more difficult it will be to release water into the Grand Canyon and ensure deliveries to Nevada, Arizona, California and Mexico.

"If we start getting to that level of reservoir elevation," Berggren said, "it impacts operations, impacts the hydropower, impacts the releases, impacts the Grand Canyon. That, to me, is a huge wake-up call. The wake-up

call has been there for years, but if that happens, that's catastrophic."

In that kind of crisis scenario, Berggren worries, the environmental concerns could get pushed to the bottom of the priority list. He said the ultimate goal needs to be to reduce water demand in the basin without decimating river ecosystems in the short term.

Kenney, the professor, said he wouldn't be surprised if the Bureau of Reclamation begins studying modifications to the Glen Canyon Dam to allow Lake Powell to be drawn down completely.

"I think that research will be done, and I think those discussions will happen," he said.

Zak Podmore is a [Report for America](#) corps member for The Salt Lake Tribune. Your donation to match our RFA grant helps keep him writing stories like this one; please consider making a tax-deductible gift of any amount today by clicking [here](#).