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Water & Drought

Oroville Dam repairs aren't enough, feds warn.
Should state be forced to plan for a mega-flood?

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Federal regulators are raising new concerns about the troubled Oroville Dam, telling California officials their recently rebuilt flood-control spillways likely couldn't handle a mega-flood.

Although the chances of such a disastrous storm are considered extremely unlikely — the magnitude of flooding in the federal warning is far greater than anything ever experienced — national dam safety experts say the Federal Energy Regulatory Commission's concerns could have costly repercussions for California. The public agencies that store water in Lake Oroville may be forced to spend millions of dollars upgrading the dam.

State dam operators at the Department of Water Resources also could be forced to store less water in the lake to ensure there's more room to capture flood waters. Lake Oroville, the state's second largest reservoir, is a key source of drinking and irrigation water for millions of Californians.

The wreckage of the main spillway at Oroville Dam in February 2017 left tons of concrete and other debris piled up in the Feather River below. Randy Pench Sacramento Bee file

The warning came late last month in a letter from FERC. It was sent just as $1.1 billion in repairs are wrapping up on the dam's two spillways following the February 2017 crisis at the dam that triggered the evacuation of 188,000 people.

The FERC letter shows that the near catastrophe in 2017 has made the federal government less likely to trust the state's claims that the 50-year-old dam is as safe as it can possibly be, said J. David Rogers, a dam-safety expert at Missouri University of Science and Technology.

"Given that track record, you've got to err on the side of what your safety culture is going to be. Are you going to be at the vanguard of safety?" Rogers said. "That's a big a facility to play with. That's the highest dam in the United States. You have to be a little more conservative."

In the 2017 crisis, a massive crater formed in the dam's main flood-control spillway. To limit it from growing in size, DWR's dam operators let water flow over the adjacent emergency spillway for the first time since the dam was completed in 1968.

Although the flows were relatively modest, the earthen hillside below the spillway started to wash away. Fearing the concrete spillway would crumble and release a "wall of water," officials ordered a frantic evacuation of 188,000 Sacramento Valley residents. In the 21 months since, construction crews have spent $1.1 billion on emergency repairs and rebuilding and upgrading the two battered structures. DWR officials have said they're confident the rebuilt spillways can handle this winter's rains.

DWR officials said the work has left the spillways stronger than ever — and capable of withstanding what the U.S. Army Corps of Engineers considers the worst storm that can be reasonably expected. "The newly rebuilt main spillway can easily do this, without using the emergency spillway," DWR spokeswoman Erin Mellon said in an email.

FERC, though, is warning about damage that could be expected from a "probable maximum flood," a storm that would be magnitudes greater. In its letter to DWR last month, the federal agency said the hillside beneath the emergency spillway could face "substantial" erosion if such a storm ever hit — and told the state that the structure might need to be fortified.

"A more robust and resilient design of the emergency spillway may be required to prevent the possibility of moderate to severe damage to the emergency spillway structure for the expected full peak flow," the Oct. 25 letter reads.

DWR officials agreed that additional work might be needed down the line. The department is preparing a long-term "needs assessment" to study additional fortifications, including the type of work that would safeguard the dam and its spillways from a "probable maximum flood." That assessment will be completed by 2020.

"Regarding the spillways, actions may be needed to expand and bolster the emergency spillway, build an additional spillway, or some combination of other operational factors," Mellon said.

The chances of such a mega-storm are so remote that experts generally don't quote the statistical probability of such an occurrence, said John France, a Denver consultant who led the independent forensic panel that investigated last year's crisis. "It's the theoretically greatest precipitation that could happen on the watershed upstream of the dam," France said.

In such a storm, FERC said outflows would be so strong that significant portions of the natural hillside below the emergency spillway could wash away. However, the damage would be confined to the lower portion of the hill, hundreds of feet removed from the concrete lip of the spillway, France said.

“It could … put a lot of debris into the river,” France said. “It would not be a ‘wall of water.’”

Experts said the mega-storm envisioned by FERC would be so immense, it would almost certainly burst the levees downstream of the dam and cause massive flooding across the Sacramento Valley — even if the dam’s spillways escaped damage.

“Everything downstream would already would be wiped out,” said Joe Countryman, a member of the Central Valley Flood Protection Board and a former engineer with the U.S. Army Corps of Engineers. “These flows that they’re talking about are five to seven times larger than the channel capacity downstream … Every major city is going to be underwater.”

So why bother worrying? Because the federal government wants to be sure that the dam could remain operational in the aftermath of such a flood.

And other experts said it would be unwise not to plan for the worst.

“Our understanding of extreme events has evolved since the time the dam was designed and built,” Robb Moss, an engineer and expert on engineering disasters at Cal Poly, San Luis Obsipo said in an email. “So what was once thought a ‘Godzilla’ event may be more likely than initially anticipated.”

He cited recent disasters, including Hurricane Katrina, as examples of why the federal government is conscious of planning for worst-case scenarios.

Rogers said the watershed above Oroville makes it particularly dangerous. Very little rain that falls actually seeps into the ground. Instead, granite lined quickly canyons quickly channel massive amounts of rainfall into the lake behind Oroville Dam in a process that Rogers describes as “flashy.”

“The water just sheets right off,” Rogers said. “It’s a real flashy reservoir. It’s probably the most flashy reservoir in the country of that size. The more uncertainty, you have to keep (more space in the lake) for flood storage.”

Those concerns are not new. Some downstream communities have spent years unsuccessfully lobbying the state to reduce the amount of water stored during winter at Oroville to prevent flooding.

Critics of the Department of Water Resources also have long complained that state officials have been reluctant to spend the money to upgrade Oroville, and they say those decisions played a key role in the 2017 emergency.

For instance, engineers had known for decades that if water ever spilled over Oroville’s emergency spillway, it would cause serious erosion, possibly compromising the earthen structure that holds back the reservoir and threatening communities downstream.

But California water districts known as the State Water Contractors that helped pay for Oroville resisted calls to armor the structure, which would have required construction outlays in the tens of millions of dollars.

Critics say the FERC letter represents a victory after years of having their concerns brushed aside.

“The handwriting is on the wall that they’re going to have to confront these issues,” said Ron Stork of the Sacramento environmental group Friends of the River, which has criticized safety issues at Oroville. “The contractors are either going to have to pay for a better dam or accept that the dam doesn’t deliver them as much water.”

Jennifer Pierre, general manager of the State Water Contractors, didn’t immediately respond to a request for comment.

Early this year, the independent forensic team led by France heavily criticized California officials, saying the state did a poor job of designing, building and maintaining the structure and neglected safety while focusing on the “water delivery needs” of the water districts who keep water in Oroville.

The forensic team described the festering problems at Oroville as a “long-term systemic failure.”

In response, the state revamped its dam safety programs and ordered 93 dams it oversees to conduct thorough inspections and other ongoing safety upgrades.

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