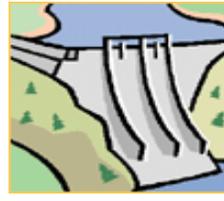


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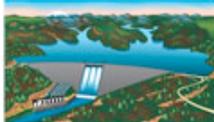
Some Dam – Hydro News™ And Other Stuff



Quote of Note: "Engineering is the professional and systematic application of science to the efficient utilization of natural resources to produce wealth." -- T. J. Hoover and J. C. L. Fish

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(Hold down Ctrl key when clicking on this link) <http://npdp.stanford.edu/> ' After clicking on link, scroll down under Partners/Newsletters on left click one of the links (Current issue or View Back Issues)

"Good wine is a necessity of life." - -Thomas Jefferson
Ron's wine pick of the week: 2014 Yangarra Estate Syrah & Shiraz (Other than French)
"McLaren Vale"
"No nation was ever drunk when wine was cheap." - - Thomas Jefferson



Dams:

(Here we go down the final stretch. The cost is actually over \$800 million.)

Phase 2 of \$500M Oroville Dam repair kicks off

By Kim Slowey, May 4, 2018, constructiondive.com

- California Department of Water (DWR) officials announced Wednesday that the second phase of construction work on the Oroville Dam will begin May 8, The Mercury News reported. The second phase will constitute the bulk of work at the dam.
- As part of the second phase of construction, general contractor Kiewit will demolish more than 700 feet of the main spillway's upper chute and rebuild it with steel-reinforced structural concrete; place three feet of steel-reinforced structural concrete over roller-compacted concrete (RCC) at the middle chute; remove RCC walls in the middle chute and replace them with structural concrete; hydro-blast and resurface energy



dissipaters and provide new drainage systems. At the emergency spillway, crews will remove the emergency embankment of stone, or rip rap, that was put in place February 2017 – pending approval from the Federal Energy Regulatory Commission (FERC) and California Division of Safety of Dams. They will also finish work on a concrete cap at the underground secant pile wall; continue work on the RCC splashpad and build a reinforcing RCC buttress at the base of the emergency spillway.

- In a DWR update on April 18, the agency said it updated its 2018 Lake Oroville Operations Plan to reflect a spring start for Phase II so that there is time for crews to complete construction before winter arrives.

(Who's going to pay the bill?)

SPILLWAY REPAIR FUNDING IN QUESTION

The final phase of the Oroville Spillway reconstruction is days away from getting underway.

By: Heidi Rene, May. 4, 2018, actionnewsnow.com

Oroville, Calif.—The final phase of the Oroville Spillway reconstruction is days away from getting underway. There are doubts growing around getting federal funding for those repairs. North state Congressman John Garamendi says FEMA may not reimburse the costs. Federal officials believe it does not have the legal precedent to do so. Federal officials believe the disaster was caused by lack of maintenance. Garamendi says that ultimately the Department of Water Resources is to blame. Congressman John

Garamendi said, "My take on this is the Department of Water Resources and their major contractors spent their money on the twin tunnel nearly 400 million dollars and didn't spend a nickel on maintaining the spillway." If FEMA doesn't end up paying that means the nearly billion dollar price tag would fall to state and local governments.



(Still thinking on whether to pay.)

Oroville Dam: FEMA still deciding whether to reimburse DWR for major repairs

By Risa Johnson, Chico Enterprise-Record, 05/07/18, chicoer.com

Oakland, CA >> The Federal Emergency Management Agency recently told north state congressmen Doug LaMalfa and John Garamendi that the agency is still reviewing whether the state Department of Water Resources is eligible for further reimbursement to fix the Oroville Dam spillway. The letter from FEMA came in response to one from LaMalfa, R-Richvale, and Garamendi, D-Walnut Grove, who sent a series of questions in February about DWR's eligibility for further reimbursement for the bulk of repairs to Oroville Dam. The agency has provided the department with about \$139 million for emergency restoration work, including debris removal.

FEMA is currently considering DWR's request of \$500 million to repair the main spillway and \$75 million to repair the emergency spillway. The department is also seeking reimbursement for damages to Hyatt Powerplant, transmission lines and the Feather River Fish Hatchery.

One of the questions the congressmen posed in their letter was whether the agency would be relying on the independent forensic report released in January to make its decision or conducting its own review.



The agency said that under review were inspection, maintenance and repairs records the agency requested in September, the independent forensic report released in January and information obtained through California Governor's Office of Emergency Services meetings. Another question the congressmen asked was whether DWR would receive less than the maximum reimbursement of 75 percent or possibly none at all, if FEMA determined there was a problematic lack of maintenance. "Work that addresses damage primarily resulting from a cause other than the designated incident, such as pre-disaster deterioration or deferred maintenance resulting from known design deficiencies, is not eligible for PA (public assistance) funding," reads the letter from Robert Fenton, FEMA regional administrator. The agency clarified that funds could, in fact, be used to improve facilities — not just bring them back to pre-disaster design — if the upgrades were required by "applicable codes or standards or constitute cost-effective hazard mitigation measures." FEMA has the ability to issue funds under Section 406 of the Stafford Act. The congressmen had also asked if the agency would provide reimbursement if a facility's original design had been part of the cause of the disaster. The forensic report pointed out flaws in the original design of the Oroville Dam.

The agency said that its ability to restore or upgrade facilities may be affected by pre-disaster deficiencies in design. LaMalfa said on Friday that he, along with Garamendi, would be seeking more information from the agency, including a timeline for FEMA to make its decision. DWR has stated since the spillway crisis in February 2017 that the State Water Contractors would be on the hook for any repairs cost not covered by FEMA. The department announced on Monday afternoon that the Federal Energy Regulatory Commission gave permission for DWR and contractors to resume work on the main spillway on Tuesday. The first project will be to remove the walls in the middle chute made of roller-compacted concrete. Those will be replaced with permanent structural concrete walls this year. Over the past week, crews have been grinding down the top layer of the middle spillway chute to create a uniform surface before steel-reinforced structural concrete slabs are placed on top. Work is expected to complete in January 2019, when Kiewit Infrastructure West's contract expires.

(Trying to overrule the judge.)

Progress in Congress on protecting Northwest hydropower

May 2, 2018 | grandcoulee.com

For months, my Pacific Northwest congressional colleagues and I have been raising our voices and working on legislation to prevent increasing forced spill at the lower Snake and Columbia River dams from raising electricity rates in our region by \$40 million. That forced spill order, the result of a ruling of a single federal judge in Portland, took effect at the beginning of April. Last week, our work resulted in passing bipartisan legislation, H.R. 3144, introduced by Rep. Cathy McMorris Rodgers, myself, and members of Congress from the Pacific Northwest, which would protect our dams and preserve lower electricity rates for families in the Mid-Columbia. Our bill requires that the dams in the Federal Columbia River Power System (FCRPS) continue to operate under a comprehensive framework called the FCRPS Biological Opinion, which was put in place during the Obama Administration, until 2022. That framework was the product of painstaking negotiations that included local stakeholders, scientists and engineers at federal agencies, states, and sovereign Northwest tribes (Confederated Tribes of the Umatilla Reservation, the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Warm Springs, the Confederated Tribes of the Colville Reservation, the Salish-Kootenai Tribe, the Kootenai Tribe of Idaho, and the Columbia River Intertribal Fish Commission). Yet a single judge threw out that Biological Opinion, saying it did not do enough to help salmon recovery.

In fact, according to the Public Power Council, salmon and steelhead populations in the Columbia River Basin have been improving due to a combination of ocean conditions, better fish passage survival at the dams, improvements in freshwater habitat, harvest reforms, and predator control. More than \$15 billion spent by ratepayers to support salmon recovery since the 1970s has had

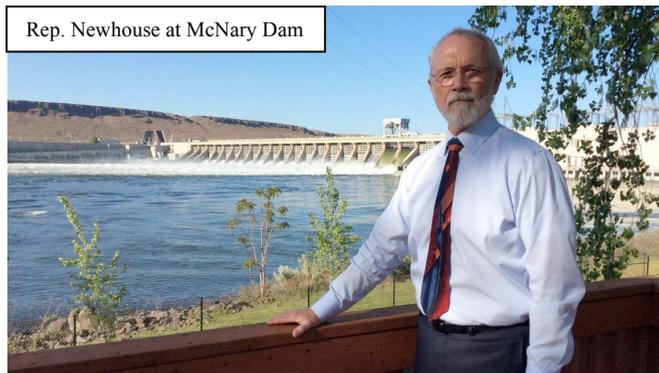
meaningful results. The Bonneville Power Administration (BPA) reports that yearling Chinook salmon and steelhead smolts have a 96- to 99-percent survival rate through each of the four lower Snake River dams. **What is actually in question is whether the judge's forced spill order will aid or hurt juvenile salmon because it would increase the levels of gases that can be dangerous enough to give young fish the "bends."** Our legislation is Congress' effort to exercise our constitutional legislative authority to override a faulty decision by a single judge that has enormous consequences for a federal water system and the communities that depend on it. H.R. 3144 was approved in a vote in the U.S. House of Representatives of 225 to 189, with eight Democrats joining in support. Now that legislation would require action in the U.S. Senate to move forward, and I have been urging senators to listen to the people who live, work, and pay for electricity in the Mid-Columbia. House approval for bipartisan H.R. 3144 shows that we have harnessed strong support for dams on the Snake and Columbia Rivers, I will continue to make the case that the Mid-Columbia deserves to be heard to preserve our fish species and our dams.

(It's your money being spilled.)

Your money's being wasted, congressman says as he visits Mid-Columbia dams

BY ANNETTE CARY, tricityherald.com, May 06, 2018

UMATILLA, OR - **As the court-ordered increased spill of water started over McNary Dam, electricity production dropped from two-thirds down to a quarter of capacity.** The 1,000 megawatt plant was producing just 275 megawatts of electricity, according to Army Corps of Engineer officials who met with Rep. Dan Newhouse, R-Wash., in late April. **"There was enough water to produce the full 1,000 megawatts,"** said Lt. Col. Damon Delarosa, commander of the Corps Walla Walla District. But because of a U.S. District Court order, more water is required to be spilled over the dam, preventing it from being used for generating electricity each spring starting this year



Rep. Newhouse at McNary Dam

(While on the subject, we need these dams, i.e. Lower Snake River dams.)

Floyd letter: Dams are needed

May 02, 2018, idahostatesman.com



I lived in Kennewick, Wash. through the '90s, one could still see the high water marks from a flood early in the century. They were halfway up the third story on the downtown buildings. That is when they put in the dams. **Besides flood control, the water and power they provided changed an arid landscape into farm, ranches and vineyards.** Also in the '90s the enviros began agitation to take out the dams, another flood had Portland erecting 20-foot plywood walls along the waterfront. Dam talk went quiet. About the salmon; to get from the ocean they must evade the three-mile long drift nets set by Koreans and Japanese; next obstacle is the tribes' gill nets. After that jumping up the fish ladders is easy. *JAMES FLOYD, BOISE, ID*

(Not enough money!)

California Water Commission will not significantly fund Temperance Flat Dam project

May 03, 2018, abc30.com

The proposed dam would create a new reservoir that holds up to 1.3 million acre-feet of water above Millerton Lake.

FRESNO, Calif. (KFSN) -- The California Water Commission has voted to fund approximately a quarter of the cost of the Temperance Flat Dam project, but backers of the project think it's unlikely the money will ever come. The proposed \$2.7 billion dam would create a new reservoir that would hold more than million acre-feet of water above Millerton Lake. At Thursday's meeting, commissioners said the project would be eligible for \$500 million. That's more than the Commission staff had recommended. The last-minute boost came as commissioners disagreed with the staff conclusion Temperance Flat Dam project would create no new recreational opportunities.



But the commissioners agreed with the staff on one crucial point: they believe the project will create no ecosystem benefit that would improve the fishery for Spring-run Chinook Salmon. Supporters had attempted to argue that sending more cold water down the San Joaquin River would help revive the salmon run. Because of that, San Joaquin Valley Water Infrastructure Authority Executive Director Mario Santoyo says the project ultimately won't qualify for state water bond money. During the meeting, several commissioners expressed that while they were sympathetic to the need to bring more water to the Valley, the rules of the Water Storage Investment Program prevented additional investment in the project. Many of the commissioners expressed frustration with the process established by the program. The funding and commission were authorized by the Water Storage Investment Program established by Proposition 1, approved by state voters in 2014. Thursday's vote came down after three days of hearings in Sacramento.

[\(The battle goes on. What about flood control?\)](#)

Nancy Hirsh: Dam study reveals raft of benefits

By Nancy Hirsh, May 5, 2018, spokesman.com

Opinion:

A new study commissioned by the NW Coalition shows that the ongoing decline in wind and solar energy prices can not only contribute to a cleaner environment, it may help save Northwest salmon and orca whales that are

threatened with extinction. The Lower Snake River Dams Power Replacement Study – the most extensive yet undertaken on the subject – shows that power from the Ice Harbor, Lower Monumental, Little Goose and Lower Granite dams can be affordably replaced by a mix of energy efficiency measures and renewable energy resources without compromising electric-system reliability and with little or no increase in greenhouse gas emissions. In fact, electric system adequacy, reliability and flexibility would actually improve.

These findings put to rest the decades-old myth that we have to choose between clean, affordable, reliable energy on the one hand and the recovery of salmon populations on the other.

That's quite a deal when you also consider the business opportunities arising from the build-out of new renewable resources, the shot in the arm that dam removal would give to our fishing and tourism industries, and the new tax revenues that would flow to local governments from private-sector solar and wind facilities.



In short, power replacement would primarily be a market-based solution that would benefit businesses, workers and communities as well as salmon and the environment. A win all around. That's why it's disappointing that the ostensibly business and market-oriented Washington Policy Center has come out as the study's severest critic. In an April 8 Spokesman-Review article ("Life without Snake River dams"), Todd Myers of the Washington Policy Center claimed that the transition to private-sector wind, solar and energy efficiency would be too large and too costly. Yet those familiar with power resources know that the Northwest has the largest potential for wind development in the nation and far more solar potential than the amount called for by the study. Meanwhile, in recent years, many states – Texas, Oklahoma, Iowa and California among them – have replaced old energy sources with new renewables on a larger scale than is required to replace power from the Snake River dams.

Also, while the study estimates the average cost to Northwest households to be a little more than a dollar a month, the figure could turn out to be even lower if the future price for wind and solar turns out to be less than the conservative assumptions of the study. Additional savings may also be realized because a 2015 study showed that the cost of removing the dams would be more than offset by the savings of capital expenditures for ongoing dam maintenance and fish recovery programs. And a recent poll showed a majority of Washington voters would be willing to pay far more than a dollar a month to restore wild salmon and improve water quality. Most also said they support removing the four lower Snake River dams in order to save salmon and orcas. Finally, Myers argues that the transition to new renewable resources would greatly increase greenhouse gas emissions. While it's possible that electric system emissions could go up by less than 1 percent due to supplemental market-based purchases by utilities, it's equally true that emissions could decrease by as much as 2 percent depending on state environmental policies.

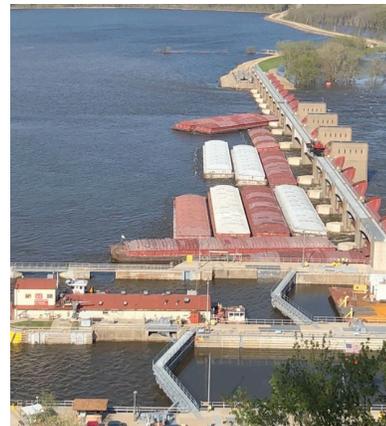
We should also remember that Myers raised the same kinds of objections a decade ago, when Washington voters approved ballot Initiative 937 requiring utilities to increase energy efficiency and the use of new renewables. At that time, Myers wrote that passage would cause our utility bills to double and cost Washington thousands of jobs. Instead, in the years after we passed I-937, utility rates grew at less than the rate of inflation and clean energy businesses became one of the fastest-growing and biggest job-creating sectors of the state's economy. You can see the Lower Snake River Dams Power Replacement Study and summaries of its findings at www.nwenergy.org/lsrcdstudy. Please take a look and then reach out to state and federal policymakers and ask them to explore the study and embrace this new opportunity to solve a decades-old problem. Nancy Hirsh is executive director of the NW Energy Coalition.

(Gotta tie a better knot.)

Barges break loose; slam into Lock and Dam 11 at Dubuque

May 05, 2018, wxow.com

DUBUQUE (KWWL), Iowa - - As many as 11 barges broke loose from their tow Friday afternoon and slammed into upstream side of Lock & Dam 11 on the Mississippi River at Dubuque. The barges hit the dam at mid-afternoon. Several people said they heard what sounded like a 'boom' as the loaded barges ended up against the dam. It's unclear exactly what happened to cause the barges to break free from their tow. Upper Mississippi River towboats, like those that navigate through Lock and Dam 11 at Dubuque, can handle up to 15 or 16 barges. It's unclear if the towboat involved in Friday's accident was pushing just the 11. It could take several days to remove the 11 barges from their resting points against the dam.



(Getting serious about new reservoirs.)

These Sacramento area water storage projects just got a boost in state bond money

BY RYAN SABALOW, sacbee.com, May 04, 2018

Two water-storage projects in the Sacramento region are closer to becoming a reality after getting another bump in state bond funding. The California Water Commission announced Friday that the Sites Reservoir project was eligible for \$1 billion in Proposition 1 funds, up from \$933 million the commission had said it might receive last month. It's the most money tentatively awarded to any of the 11 projects that have applied for Prop. 1 funds. If completed, the project near Williams along the Glenn-Colusa county line would store water piped in from the Sacramento River. Sites would have nearly twice the storage capacity of Folsom Lake, making it the state's seventh largest reservoir.



Sites is supported by a wide array of water districts across the state. They will pay the rest of the reservoir's \$5.2 billion costs. The commission also signaled more support for a small groundwater storage proposed by the Sacramento Regional County Sanitation District. On Friday, the commission said the water "bank" is tentatively eligible for \$280.5 million, up slightly from the \$244 million allocation awarded last month. In 2014, during the worst of California's historic five-year drought, voters authorized \$2.7 billion in spending on water storage projects, but the pot shrinks to just under \$2.6 billion because of bond-finance costs and other expenses. The Water Commission will make a final decision this summer on how the funds are spent.

(Great photos.)

PHOTOS: Hoover Dam May Be Best Seen From Below Hydro:

Go here for photos: <http://thisisreno.com/2018/05/photos-hoover-dam-may-be-best-seen-from-below/>

(Some more dam history.)

Three Forks History: Grand Dam was a long dream

By Jonita Mullins | CNHI News Oklahoma, May 6, 2018, duncanbanner.com

Well before Oklahoma's statehood a young Cherokee named Henry Holderman had a dream to build a dam somewhere along the flood-prone Grand River. Though Holderman had only a fifth-grade education, he understood the value a dam and reservoir could offer both the Cherokee and Wyandotte nations. Holderman gained valuable experience during a period of his life when he moved from job to job at locations around the world. Some of those jobs included construction of earthen dams in India. When he returned to Oklahoma, Holderman spent much of his time and personal funds studying and talking about his dream of a dam on the Grand. In 1896, with a couple of engineering students and his brother Bert, he explored the river and identified three likely sites for a dam. Then, he purchased the land at these sites from the Cherokee Nation. The most promising location was near the old plantation of a Cherokee family named Martin. Joseph Martin operated a trading post called Pensacola on the Texas Road. In 1896, the Martin



store gained a post office named Pensacola. The post office was moved later, but the little community that developed around it retained that name.

Several efforts to privately fund and build a dam near Pensacola failed. In 1928, the Oklahoma Legislature paid for an Army Corps of Engineers study to determine the location for a dam on the Grand. The Corps' report closely matched what Holderman had determined. In 1935, The Grand River Dam Authority was formed and serious efforts began to secure the funding for the Pensacola Dam.

For several years a ferry had operated just about a mile north of the site chosen for this dam. A man named P.D. DeFord operated the little ferry that could carry three cars at a time. He charge 25 cents per car and barely eked out a living from the operation. But when construction began on one of the first major dams in the region, traffic began to pick up. People drove from Tulsa, Muskogee and even Joplin and beyond to see this marvel of architecture and construction. The art deco design of the dam would make it the longest arched bridge in the country. Soon the little ferry was seeing so much traffic, DeFord doubled his price per car. Every Sunday sightseers came to cross the river between the new boom towns of Ketchum and Disney. His traffic went from 60 cars per month to an average of 300 cars per day, and license tags showed these cars came from all over the county. DeFord was able to build a larger ferry boat that could accommodate 12 cars at a time. For the duration of construction, the ferry was in almost constant operation. When the area was flooded to fill the reservoir, DeFord could retire with a tidy sum of money. The Pensacola Dam was completed in 1941 and offered flood control, hydroelectric power and water recreation. The creation of the Grand Lake O' the Cherokees was an economic boon to the two nations as Holderman had dreamed. A monument at Twin Bridges State Park honors Holderman for his efforts in bringing the Grand River dam to reality.



(You don't get this with wind or any other power source.)

50 years later, man-made Lake Keowee 'did change lives around here'

By Abe Hardesty, Anderson Independent Mail, April 27, 2018 | independentmail.com

From a peninsula near Oconee County's South Cove Park and the Lake Keowee Marina, the lakefront allure of the Normandy Shores subdivision is easily apparent today. Perry Rogers remembers when the view required a healthy imagination. Rogers, 14 years old when water began to fill the valley 50 years ago, vividly recalls when Realtor Bruce Rochester pointed to a stake in a dry field and called it a future shoreline. "He put his foot on the stake and said, 'The water is going to stop here,'" Rogers recalled last week. "It was hard to imagine then, because he was in the middle of a big field, at least 250 yards from the nearest creek." Max Wigington was among the first to catch the vision that would become Lake Keowee and the prominent homes that now surround it. The properties in that subdivision were offered at \$6,000 a lot in 1968 (Wigington got a discount by purchasing three at \$4,500 each). A home with distinctive architecture, often called "the castle," sits on those three lots today.



Waterfront lots

A half-century after the start of an award-winning, energy-producing endeavor known as the Keowee-Toxaway Project, waterfront lots in the same area typically sell for more than \$300,000, and lots on the lake's northern end often sell for closer to \$400,000. Wigington, who died in 2013, was among the first to see the massive project as one that would transform the Keowee Valley from forest and farmland into a source of hydroelectric power, cooling waters for the first nuclear station in the region, and an 18,000-acre clearwater playground. Duke Power began buying Keowee land in the 1940s, and Rochester began planning his subdivision in 1963. Land values jumped on Jan. 2, 1965, when Duke President W.B. McGuire announced plans to create a massive power-generating complex and lake.

From talk to reality

Oconee County resident Ed Few, 24 when the lake began to fill, had long heard talk about a man-made lake. "All my life, there had been rumors; we heard something was coming ... but I don't think most people had any idea of the scope of the project," said Few, who was born in a house located at what is now the bottom of Lake Keowee. Few's great-grandfather, Robert Steele, once owned 600 acres in the valley, including a spot approximately three miles north of the present Keowee River dam that was once the site of Fort Prince George. The fort, built in 1753, was part of Keowee Town, the center of an 18th-century Cherokee Nation business hub. Its location played a role in a 1777 treaty in which the Cherokee, who had taken the land from the Creek tribe, ceded almost all the land in what is now Anderson, Greenville, Oconee and Pickens counties. Few, 74 now, was 21 when McGuire made the historic announcement from the Clemson House. "When they made the announcement that they were going to build a nuclear station, we all knew it was much bigger than most people realized," Few said. The project moved quickly. South Carolina Gov. Robert McNair set off a red-white-and-blue dynamite charge to signal the big change in an April 1967 groundbreaking. Later that year, during construction of two dams and five dikes that now impound the lake, Few worked as an engineering aide for Duke Contractors.

The lake was in its infancy in June 1968, when Few was drafted into the Army and deployed to Vietnam. By the time he returned in 1970, the playing fields and fishing holes of his youth were submerged. "Things changed a lot. Before it filled, an archeological team from the University of South Carolina came up and did a lot of digging to find remnants of the fort. I hate that I missed out on all of that," Few said. Even more, Few misses fishing in the Keowee River. Formed about three miles north of the present Keowee Dam, at the convergence of four small mountain streams, the river was known for its pristine water. "The Keowee was a beautiful river, unusually clean," Few said. "It had so much vegetation that it had to rain a lot for it to get muddy. I don't think there's a river around here today that compares with it."

Massive deforestation

Unlike Jocassee, the companion lake to the north that submerged trees when it was filled about three years later, Keowee's bed was the subject of a massive deforestation between 1965 and 1967. "They had to remove all the trees and trash, to protect the nuclear plant," said Few, referring to one of the largest land-clearing projects in the history of South Carolina or North Carolina. The Cherokee language remains prominent in the project. Keowee was the Cherokee term for "place of the mulberry," Toxaway is "place of thunder," and Jocassee is named for a legendary Cherokee woman. The approximately 26-month period as the valley filled with 5.3 million gallons of water was a prime conversation topic in Oconee and Pickens counties, especially among fishermen. "I fished the lake when it was filling up," Jim Walton recalled on the Independent Mail's Our Hometown Facebook page. "As with all new lakes, as it flooded the underbrush, the fish population exploded." The third year (1970), I caught a 9-pound bass one day," said Walton, a former Clemson student. "At the time, it was the largest caught in Lake Keowee. The same day, I lost an even larger one."

Keowee's infancy

Midlands native Hugh Oldham, a young pilot whose brother was a Clemson student at the time, flew over Lake Keowee often in its infancy. "It was interesting ... I remember seeing a huge cliff

in an open quarry (created during the tree harvest) fall into the water," said Oldham, who relocated to Anderson five years after the lake filled. Fed by smaller streams, Keowee filled much more slowly than Lake Hartwell did just a few years earlier. The seven earth embankment dams/dikes were yet under construction when the lake began to fill in April or May 1968. Higher volume enabled Hartwell, though about three times larger than Keowee, to fill in a 13-month period from February 1961 to March 1962. After the completion of Lake Keowee, Duke Energy built Lake Jocassee to the north, a companion reservoir that enables the production of electricity by pumping water from Keowee to Jocassee each night through large tunnels bored under the lakes. The process is reversed each day, creating a tide-like effect on both lakes.

Different lakes, different uses

A half-century after its start, Keowee ranks as an engineering marvel, one that helps the Army Corps of Engineers control the water level at Lake Hartwell. As Hartwell's level declines during drought conditions, the total storage of Duke's reservoir system is lowered by the same percentage, as long as its level is sufficient for keeping the nuclear reactors cool. "This lake is (primarily) for power; Lake Hartwell is for flood control," Nuclear Generation Communications Manager Chris Rimel said, summing up those priorities. "The lake is strategically built in a way that cold water from those mountain rivers comes to the reactors." According to a November 1969 Anderson Independent report, the project had cleared its most difficult hurdle — two 33-foot-wide, 800-foot long tunnels required for the placement of turbines that would generate electricity from beneath the lake. Duke Power engineer Julian Davis said 160 workmen and engineers were at the site as the lake filled. Placement of the turbines required carving those holes 290 feet below what would become the lake bed, into some of most durable rock in the U.S. In addition, the force of falling water helps generate power. The lay of the mountain land — another factor in the selection of the location for a nuclear plant — creates a fall of 310 feet from Jocassee to Keowee and another 200-foot drop from Keowee to Hartwell. The Keowee-Toxaway project was entered in an American Society of Civil Engineers national competition in 1975, when it was selected "The Outstanding Civil Engineering Achievement" of that year.

Price tag

In 2003, the Oconee plant was the first in the U.S. to surpass the 500 million megawatt-hour mark. Rimel marvels even more at Keowee's price tag. All seven dams, the electricity-generating operation that required two 800-foot tunnels beneath the lake, and the nuclear station were all built for \$700 million. "That's incredible, even in 1968 dollars," Rimel said. He's also awed by the planning of the project, whose location was researched for more than 50 years. As early as 1911, a geologic study reported that "this rock is too good not to use for hydroelectric." The report prompted a group led by James Buchanan Duke to craft a plan to build a system of lakes and dams along the seam of rock, which runs parallel and east of the Appalachian Mountains, from Virginia into middle Georgia .

The nuclear reactors sit on what geologists call Precambrian era rock, a combination of granite, biotite hornblende gneiss, white quartz pegmatite and muscovite mica — which Rimel calls "the most stable seam of rock in the country" and one that is the base for nuclear facilities in Georgia, North Carolina, and Virginia. Duke decided on the Keowee-Toxaway Valley location in 1948, after 15 years of research, and began buying land.

A model of the lake and surrounding region can be seen at the World of Energy Visitor Center near Salem. A model of an excavation site that can be viewed at the Keowee-Toxaway State Park, and a model of Fort Prince George can be seen at the Pickens County Museum. The completion of Lake Keowee in the summer of 1970 came just six years after the completion of the Anderson County stretch of I-85, the last segment completed in South Carolina. The World of Energy Visitors Center, which overlooks the three nuclear reactors, opened in 1969. The Keowee hydro station began operation in April 1971, and the nuclear plant began operation in 1973.

"Back then, you didn't think of the events being close together, but when you look back, it's amazing all that was going on around here," Oldham said. "Interstate 85, Lake Hartwell, Lake

Keowee, Lake Jocassee, and the Oconee Nuclear Station projects all happened at about the same time, and they sure did change lives around here."

(A fixer upper.)

PUD begins Phase 1 of re-electrifying Enloe Dam against opposition from the public

By Katie Teachout, May 3, 2018, gazette-tribune.com

About 50 community members attended an Okanogan County PUD, WA meeting held in Tonasket April 23. Enloe Dam, along with a 3.6 MW hydroelectric power plant, was constructed on the Similkameen River west of Oroville in the early 1920s and shut down in 1958 due to more affordable electric power being available from the Bonneville Power Administration. PUD commissioners have been seeking re-electrification of the dam for the past several years. "Phase 1 is part of the design build process that has been going on for a number of years, the permits and lawsuits we have struggled with through the years," said Commissioner Asmussen. The Gazette-Tribune's requests for comment from Commissioners Vejraska and Colyer went unanswered.

"The purpose of the meeting was an effort by us to hold our meetings in the outlying areas of our district so people can attend. Its focus wasn't on just the Enloe project," said Asmussen. "The effort made with the ad was from the dam opponents, so that's who was mostly there." Around 50 people were in attendance at the April 23 meeting to question the choice to re-electrify the dam. Attendees included Salley Bull of Oroville, a District 3 candidate for county commissioner, and Chewela's Karen Hardy, a candidate for State Senate. "It was not an official meeting, so no minutes were kept," said Bull. "The commissioners opened the "listening" meeting to a roomful of attendees. Most were against re-electrifying the nearly 100-year-old dam. A few were middle-of-the-roaders, and at least one person was for approval." Bull said she attended the meeting to hear what the commissioners had to say, as well as remind those in attendance of the county's poverty level. "It would be irresponsible to burden all these people to pay for a project that will be run in the red for at least 20 years, causing rates to permanently raise," said Bull. According to Bull, numbers supplied by the PUD estimate ratepayers' bills can be expected to increase by an average of about \$10-\$15 per month and \$30 in the winter months. "That may not sound like much, but government projects tend to run over budget, so actual costs could be two, three or four times as much—and that is a substantial increase," said Bull.

PUD Commissioners authorized Interim General Manager Don Coppock to sign the contract for Phase 1 Monday, April 9, with Design-Build contractor Max J. Kuney Co. of Spokane in partnership with Tetra Tech, Inc. of Bellevue. The 180-day contract with Kuney is not to exceed \$1,794,346 (\$1.8 million). "At the end of Phase 1, we will have a price tag for the whole project," said Asmussen. "There will be, I'm sure, a few unknowns left, but it will get us pretty close to a price tag. Anticipated costs so far, are still what were in our FERC (Federal Energy Regulation Committee) license, but these numbers will be closer, as the FERC license is almost eight years old, and things go up." The PUD applied for a license with FERC in 2008, finally receiving the license in 2013 to construct a new power plant at the dam (three previous licenses had stipulated reconstruction of the original power plant). When the two-year deadline to begin construction arrived, the PUD received a stay from FERC to extend the timeline. In late 2016, the PUD received unanimous approval from the Washington State Capital Projects Review Committee (PRC) to use the Design-Build contracting procedure on the Project. The PRC's decision was appealed and rescinded before being reheard, resulting in a second approval by the PRC several months later.

Oroville resident and long-time outspoken opponent of re-electrification of the dam, Joseph Enzensperger, said by the time the PUD received the license in 2013, the utility had spent \$12 million in lawyer, engineer and consultants' fees. "Spending has continued, and by October of this year the PUD's spending on the Enloe Project will approach \$17 million," said Enzensperger,

adding that ratepayers attended the meeting to question the “rationale behind this growing capital outlay.” The PUD stated one reason a Design-Build method was selected was hydropower project development is a highly specialized field requiring early contractor involvement to address construct-ability issues, develop practical construction plans and to address environmental plans and protection measures; calling it a “collaborative process.” During Phase 1, a 30 percent design will be finalized, with not-to-exceed project costs developed and a construction schedule set. The PUD’s stated goal is to move forward with a Phase 2 not-to-exceed contract for construction. New facilities to be constructed include a river intake upstream of the existing dam, intake channel, penstock structure and steel penstocks that will divert water available for power generation to the new power plant; a new 9 MW hydroelectric power plant, a tailrace channel that will return flow to the river downstream of the dam; a new substation and a short transmission interconnection to the District’s existing 13.2 kV electric power distribution system. **Improvements to the public recreation facilities and development of new fish rearing facilities are also part of project plans.**

The PUD estimates average annual generation of the licensed project at 45 Gwh/year, equivalent to the typical annual electric energy consumption of about 3,600 homes. “It’s not much, but we knew we had to spend money to have those studies done, so we did want to have some output from the dam to offset those studies,” said former PUD Commissioner David Womack, a proponent of the project since it’s conception. **“Power production at Enloe Dam is 4.5MW average output. It is doubtful that Enloe Dam will ever generate enough electricity to pay for itself,”** said **Enzensperger**. “We will have a small amount of locally generated power, but there will be no economic return for the ratepayers’ loss of income.” Asked what he saw as the main benefit of the Project, Asmussen responded, “It’s either an asset or a liability and I prefer to see it as a performing asset. This is the way, the paths the previous boards have gone down. A project of this scale, you don’t just jump in and out of it on a whim.” “I get it, you have a dam, and you don’t know the future availability of electric,” said Hardy. I am a protect-and-preserve, use-what-you’ve-got person. But there comes a point when things have outlived their purpose.” Enzensperger pointed out the new powerhouse on the east side of the river is expected to cost \$30-\$0 million to construct, with ratepayers forking over an additional \$20-\$30 million in interest over 20 years. “It will add an additional \$2-\$3 million to the annual PUD debt service now at \$3.7 million,” said Enzensperger. “According to PUD estimates, the energy produced at Enloe Dam will be two to three times more expensive than open market power. ‘Why are we not buying cheaper power elsewhere as we need it?’ was a question frequently asked.”

Hardy said when she first started to run for State Senate, she had a lot of potential constituents asking her about the Project, so she made it a priority to find out about it. “I talked to commissioners at the Okanogan County Fair, and said ‘talk to me about this. Sell me on this project,’” said Hardy. “They are caught between a rock and a hard place with this FERC license. If they don’t meet the requirements by 2019 to begin construction, then it is done and over. They have gone this far and have spent a lot of money, and I think they feel like they have to try to do it. That is a lot of the county’s money you have committed, and it’s tough to walk away from the millions of dollars of work, and come out with nothing. That’s a tough one. But that doesn’t make it a good project. If you have to force something, you probably want to step back and take another look at it.” **Several community members said they left the meeting feeling certain the PUD was not willing to step back, after listening to ratepayers.**

“The public became noticeably frustrated by the PUD’s continued pursuance to re-electrify Enloe Dam. What seemed to concern the ratepayers the most was that the power projected to be produced at Enloe Dam will be higher than other sources in the region,” reported Jere Gillespie. **“With a continued effort by the PUD to energize Enloe Dam in a relative disregard by public opposition, a couple attendees of the meeting suggested taking legal action;** to which Commissioner Asmussen responded, “We have been sued before and have won.” But what is troubling by Commissioner Asmussen’s comment is the commissioners are elected officials to represent the public. **Instead of understanding and responding to the public, they act in a defiant manner.”** **When asked if there was anyone at the meeting who spoke up in favor of re-electrification, Asmussen responded, “Yes, there was support. I would say 10 percent of the**

comments were in support.” Hardy said when she spoke with Commissioner Asmussen at the Okanogan County Fair last fall, he told her he had 50 percent support on the project. “I told him, ‘Jerry, I am all over this district, and I’m telling you, you don’t have 50 percent of the district’s support. I don’t have a dog in this fight, but I have been running for office in this district for a year and talking to people, and it’s not at 50 percent,’ said Hardy. “And the more people learn about it, the more concern there is. I do applaud them for having the meeting, it was a good meeting and people were polite. But it definitely sounded like the commissioners had made up their minds.” Hardy said what made it apparent to her the commissioners were on a predetermined path was their refusal to test the soil behind the dam. “The SEPA and NEPA, state and national environmental protection agencies, did a study on the sediment behind the dam, but only did it down so far, and didn’t find anything in the first top eight feet. If they’re re-electrifying it, there is nothing toxic in the top layer that would cause any environmental concerns. But they only did the study to check for re-electrification of the dam, not for dam removal,” Hardy pointed out. “They didn’t actually look to see what was there deeper, so it seems like a decision they’ve already made.”

“Most of the comments given during the meeting concerned the PUD’s lack of getting an appropriate soil sample, one that tests to the actual original bottom of the river bed. The dam is 54’ tall, with about eight feet of water behind it. So about 40’ of silt is settled behind the dam. The PUD chose to test only a few inches—what they considered would be disturbed by the construction activities. They stated it was clean,” said Bull. “They did not agree to do a more extensive soil sample, stating that at an estimated cost of \$100,000, it was too expensive. This is in light of spending \$14 million to get the license and they will \$1.8 million to have plans drawn up this year. Their estimate of \$35 million is for construction. Their argument to proceed is it would cost too much to dismantle it, even though an agency has offered to be the Lead Agency; and organizations have offered to raise money to pay for it.”

The FERC license requires the PUD to either electrify or dismantle the dam. “If you want to electrify it, let’s talk. But it seems to me where we want to start is by addressing what is in the sediment behind the dam,” said Hardy. “Because of the salmon habitat downstream, they can’t allow any sediment to travel down the river. They are using scare tactics to tell people about a bunch of toxic stuff behind the dam that they don’t actually know is there. If they only looked at the top layer, they have no intentions of taking it down.” “The toxicity of those sediments cannot be determined without an accurate sediment study,” said Enzensperger. “We cannot determine dam removal costs or the liability of dam removal without that information. Not knowing the real facts has allowed the PUD to wildly speculate about the cost of dam removal, suggesting costs could run as high as \$350 million up to \$1 billion. A fully-funded scientific study and analysis of the sediments would cost approximately \$100,000. In the opinion of most ratepayers in attendance, that would be money well spent.”

Hardy and Enzensperger both pointed out that plans for the Project call for blasting of large amounts of rock from the bedrock and canyon walls of the Similkameen River, above and below the dam’s attachment to the rock canyon walls. “If they set off dynamite to both sides of the river above and below the dam, that could cause the dam to fail,” said Hardy. “Blasting will be done above the dam for the new holding pond, and below the dam to site the new powerhouse,” said Enzensperger. “This fourth license calls for a new powerhouse on the east side, and demolition of the old historic landmark now perched on the west bank of the river. There are real risks associated with this project.” “What happens if we electrify it, then find out there is toxic stuff behind it, then have to shut it down?” asked Hardy. “They say they don’t want to take it down because they don’t know what is behind it, but they know when they are done with the power plant, they will have to take the dam down, whether that is in 10 years or 100 years.” “In 100 years, technology of removal could change, and could affect the mitigation costs of downstream effects,” said Womack.

Hardy said she was shocked by how many people showed up at the meeting. “I go to a lot of meetings across the district, and often no one shows up; or very few. To have 50 people show up

on a Monday night, willing to talk and willing to listen, and be a part of their community, that's a real positive thing. The citizens there were incredibly well-informed about the dam. They understood the entire scope of the issue. There was a lot the PUD Commissioners couldn't tell me about the dam, for instance they didn't know it was 54' tall. It was impressive to see how well-educated and informed the citizens were. They've got a handle on this, and while you might not agree with them, these were fact-based arguments they were presenting." "This is clearly a significant issue of our times," said Enzensperger. "Those in attendance clearly opposed the electrification by about 25:1. The commissioners did not seem to be moved. We will wait until the next regular meeting on Monday, May 7 at 3 p.m. to see if they heard anything to inform their thinking. If they did, we will wait to see what they are going to do about it." "Are they not servants of the Public Utility District? Are the commissioners not supposed to act upon the majority opinion of the ratepayers?" asked Gillespie. "How are their actions, at least in regards to re-energizing Enloe Dam, in the best interest of the ratepayers of Okanogan County?" "The people of the area deserve a more responsive leadership," said Hardy. "That's why they elected new PUD Commissioners. The new ones don't seem to understand that's why the old ones are gone."

(A century and counting. How can anybody equal that?)

On hydropower program's 100th anniversary, San Francisco looks ahead to next century

The system launched after an earthquake and fire devastated the city in 1906, and now provides greenhouse gas-free power to municipal services.

By Chris Teale, smartcitiesdive.com, May 7, 2018

A 1906 earthquake and fire devastated San Francisco but helped lead to an innovation that has celebrated its 100th anniversary: the city's hydroelectricity power program.

Damage from the fire was exacerbated by the city's insufficient water supply. To solve that problem, San Francisco prevailed on the federal government to build and operate a water conveyance and hydroelectric system in Yosemite National Park. That



became the Hetch Hetchy Water and Power system, owned and operated by the San Francisco Public Utilities Commission (SFPUC).

The system celebrated its 100th anniversary on May 6, having initially used hydroelectricity to help construct the O'Shaughnessy Dam and then expanded into wider city use as San Francisco grew. "It was really driven by a need for San Francisco to have a reliable water supply as it was a growing economic force in the West," Barbara Hale, assistant general manager for power at SFPUC, told Smart Cities Dive in an interview.



Through hydroelectricity, San Francisco serves its city and county facilities, including two hospitals, its water and wastewater plants, public transit agencies, office buildings, jails and libraries.

Currently, Hale said, it serves about 150 megawatts of customer load. "As San Francisco has grown, our government services have grown and our thirst for power for those facilities has grown," she said.

It means power used at city facilities are 100% greenhouse gas (GHG)-free, and in the past year has saved the equivalent in emissions of nearly 38,000 car trips driven annually. And without the hydroelectricity program, Hale said departments would collectively be paying around \$40 million more each year for electricity — and it would not be as environmentally friendly. The gravity-fed system takes drinking water throughout the Bay

Area through several power houses, and generates electricity as it travels through the region to various reservoirs. "We put our water to work here in San Francisco," Hale said.

In the coming years, Hale said SFPUC wants to make greater use of hydroelectricity to power more homes and businesses, starting with new developments on redeveloped brownfield sites, which will be GHG-free like government buildings. That will help interim Mayor Mark Farrell's goal of reaching zero GHG emissions citywide, announced last month, which includes planting 1,000 new trees each year. The city is one of 25 from across the world to pledge to accelerate their emission reduction plans, just under a year after President Trump announced the United States would pull out of the Paris climate accord. "With the Trump Administration displaying a stunning lack of guidance on climate change, it is up to cities such as San Francisco to take the leadership mantle of this critical issue," Farrell said in a statement.

Hale said SFPUC has "a lot of pride" in its system, and other innovations at the time, which included using floodlights so crews could work on building the system around the clock. "[We] continue to see ourselves as innovators in how we provide service to our rate-payers in a cost-effective financially responsible way," she said.



Other Stuff:

(Green with envy.)

These Are the Least Green US States

WalletHub ranking based on environmental quality, more

By Arden Dier, Newser Staff, Apr 17, 2018, newser.com

(NEWSER) – WalletHub says it's time to "call out those doing a poor job of caring for the environment"—and its own report points the finger at West Virginia. Less than a week from Earth Day, the state falls dead last on WalletHub's list of the greenest US states, based on environmental quality (including air, water, and soil quality), eco-friendly behaviors (like energy consumption per capita), and climate-change contributions. And its score out of 100, compared to those of the most environmentally-friendly states, shows just how much ground it has to cover:



Least Green States:

1. West Virginia: 25
2. Louisiana: 26
3. Kentucky: 32
4. North Dakota: 40
5. Alabama: 40

Greenest States:

1. Vermont: 75.5
2. Oregon: 74
3. Massachusetts: 73
4. New York: 72
5. South Dakota: 70.5

Click for the full list: <https://wallethub.com/edu/greenest-states/11987/>

or see how states rank on quality of life: <http://www.newser.com/story/255940/states-with-best-worst-quality-of-life>.



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