

# BIG PIVOTS

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## Salt on the table as Xcel explores menu for life after coal plants

by Allen Best

Molten salt, green hydrogen, biomass gasification—these ideas and more are in play as potential storage media for energy at the coal-fired power plants that Xcel Energy plans to close in the coming decade.

Xcel wants a little help from state legislators in the form of a bill, HB21-1324, which the company says will deliver needed clarification as it examines possible storage technologies that it may submit to the Public Utilities Commission, the state regulatory body overseeing investor-owned utilities.

In theory, the law could play into whether Xcel puts storage at Hayden, Pueblo, and Brush. It will be closing coal plants at all three locations in the coming decade. But Xcel plans to replace the coal plant at Brush, called Pawnee, with a natural-gas plant. New storage technologies might be possible at Pueblo, although Xcel is already planning substantial placement of battery storage and renewables in that area

even as it prepares to close Comanche 1 and 2 in 2022 and 2024.

Hayden stands out because of its vulnerability. It stands not only to lose relatively high-paying jobs but also property tax base when the coal-burning units close in 2027 and 2028.

“We just built a \$61 million school project that is going to put a burden on the community if this power plant is unable to transition,” Tim Redmond, a Routt County commissioner and a former mayor of Hayden, told the Colorado House Energy and Environment Committee meeting on May 27.

The power plant provides over one-third of the assessed valuation of the Hayden School District. The same applies to library, cemetery, and other special districts.

### Company explores partnerships and wants legislation for cost recovery

Some technologies Xcel has been talking about might actually add jobs—and not just any jobs. Hayden, located 25 miles west of Steamboat Springs, already has some workers

in the tourism economy. But the \$95,000-a-year jobs that the power plant has will be preserved or perhaps improved. “We are not going to replace these jobs with service jobs,” Redmond said.

Mathew Mendisco, the town manager in Hayden, told state legislators the community is “very excited about the energy transition” and eager to support “innovative climate-favorable technology.”



**Hayden has a brand-new school but now hopes for the property taxes to pay for it.**

*Photo August 2020/Allen Best*

(See story, page 5, about the legislative bill).

Alice Jackson, the president of Xcel Energy Colorado, said in February that while closing the coal plants, Xcel intended to stay in Hayden, perhaps using lithium-ion batteries or some other technologies.

Xcel representatives were more precise in a recent meeting with Redmond and other Routt County commissioners. [The Steamboat Pilot reported](#) that Jack Ihle, the director of environmental policy for Xcel, identified molten salt storage as the most promising technology. It would allow Xcel to use a turbine and other existing infrastructure. But all options are on the table.

Ihle said Xcel intends to invite proposals from energy technology companies next year. This solicitation for proposals will be issued as part of the company's energy resource plan for the second half of this decade.

That plan submitted to the Colorado PUC will add a "ton of wind, a ton of solar and a ton of batteries," Matthew Larson, also an Xcel representative, told state legislators at a committee hearing.

Energy storage will be a key challenge for utilities large and small during the coming decade. Most have said they know how to get to 80% emissions-free electricity

by 2030 and some say they believe they can get to 90% with existing technology. But everybody agrees some things need to be figured out.

Pumped-storage hydro currently is the single most important storage technology in Colorado, and it's not new. Xcel's two 162-megawatt turbines at its Cabin Creek project near Georgetown date to 1967. Only in the last three years have lithium-ion batteries started being used in Colorado, first at United Power's four-megawatt array along I-25 north of Denver. Other but still small Tesla battery packs have been put into place, with many more to come in the next few years. Xcel has 275 megawatts of battery storage planned in Pueblo and Adams counties. Holy Cross Energy will access batteries near Glenwood Springs, Silt, and Parachute.

### **Limitations of batteries**

Lithium-ion batteries have the advantage of being able to dispatch electricity quickly, to stabilize the grid. They remain relatively expensive, though.

But even as prices of lithium-ion batteries further decline, they will have a major shortcoming. They can store electricity for only a few hours. Extended storage will be needed, as several utilities



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*Photo August 2020/Allen Best*

pointed out in February, when a deep cold was accompanied by windless days.

Tri-State Generation & Transmission, with three coal-burning units located a half-hour drive west of Hayden that will close by 2030, has also been studying its options.

Duane Highley, the chief executive of Tri-State, said at a February forum organized by the Sierra Club that no decisions had been made about its plans for the three coal-burning units at Craig.

“Today, people talk about battery storage a lot. However, the battery that a utility can buy today lasts somewhere from 2 to 4 hours,” he said. “A 6-hour battery is pretty much of a stretch.”

He talked about the Valentine’s Day cold snap that, in Texas, caused widespread power failures. Colorado had its problems. “We had about 3 days of gray skies and no wind. Those would be very difficult days for us if we didn’t have fossil fuels in the mix today.”

What Tri-State hopes to see, he continued, “is a 24- or 48-hour battery. And battery prices are linear. If you double the size of the battery, it costs twice as much. It’s very much a function of the size. We are looking for the storage technology that is better than the lithium-ion battery and has

a scalability that would be suitable for a former coal plant such as at the Craig site. We think it is one of the best in the Western grid for mass storage at utility scale.”

Tri-State has been working with the Electric Power Research Institute, which does what its title indicates and has a \$100 million research effort. Highley said the goal is to find dispatchable energy storage technology. The technology needs to take advantage of surplus renewable energy, both wind and solar. The leading contenders today, he said, are hydrogen and ammonium. For Tri-State, the technology needs to be available by the year 2030.

### **NREL research**

A federal agency created in 2007 is also at work on the challenge. The Advanced Research Projects Agency-Energy, or ARPA-E, was tasked with advancing high-potential, high-impacted energy technologies that are too early for private-sector investment.

One of its current grants, for \$2.8 million, went to the National Renewable Energy Laboratory in Golden. That project, has a goal of creating a modular and

scalable thermal storage system that can operate at the scale of conventional thermal power stations.

In the case of natural gas plants, says a [statement from ARPA-E](#), that's usually about 100 megawatts. In the case of coal generation, it's 300 megawatts.

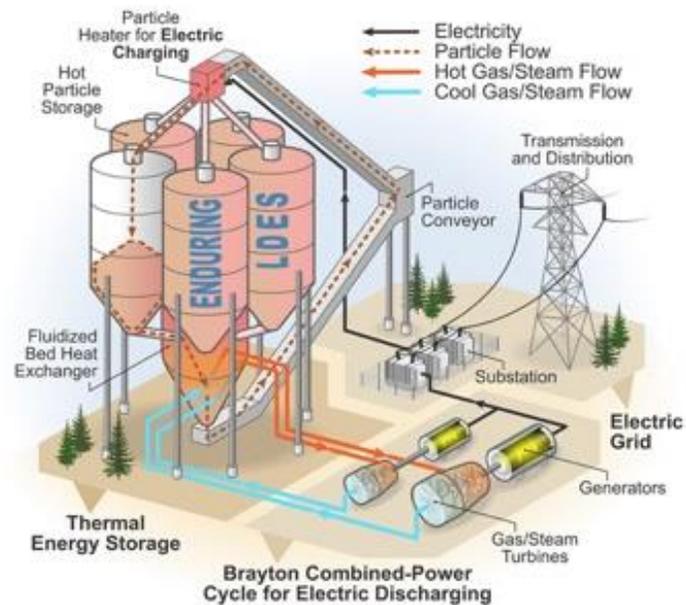
Thermal energy storage, as the name implies, relies upon heat to store energy, and there are a great many media for heat, even rocks or aluminum. A thermal power station is one that creates electricity by producing heat, such as occurs in coal and gas-fired power plants.

The NREL project assumes that the electricity dispatched from a storage unit must cost no more than 5 cents to be useful to utilities. This formula assumes energy arriving into the storage medium can cost no more than 2.5 cents per kilowatt-hour. That's likely, as Xcel has been getting wind for less than 2 cents and storage for not much more than that. That leaves the cost for the storage technology at a maximum of 2.5 cents per kilowatt-hour.

As for nitrate salts, Xcel's front-runner in the report to the Routt County commissioners, it would be heated by the arriving electricity to Hayden to 1,000 degrees. Then the heat would be tapped to power the existing coal-fired turbines when needed to produce electricity. The technology is largely the same, but the coal will be gone from the equation.

Xcel – this is from the Steamboat Pilot report—is also thinking about solar electrolysis, which would convert sunlight into hydrogen that could then be sold to the local natural gas distributor.

Another idea would use biomass, presumably wood, to create a synthetic gas, also to be distributed locally.



Xcel does not sell natural gas in northwestern Colorado, but other gas utilities will be under the gun in the next few decades to eliminate emissions from their product.

Also in the mix is potential for a fish hatchery, to be built in partnership with the Colorado Parks and Wildlife, at site of the power plant in Hayden.

### Salts and solar

Molten salt isn't a new technology. A [2009 story in Scientific American](#) examined the technology and the looming problem of how to buttress renewables, solar in particular. The story used as a case study was a plant in Spain.

At the time, NREL had found batteries wanting, because too much energy that goes in is not returned, along with the expense.

Melting salts do better with what NREL senior engineer, Greg Glatzmaier called "round-trip efficiency." At temperatures above 435 degrees Fahrenheit (224 degrees Celsius), the molten salt can deliver back as much as 93% of the energy. Too, salts are ubiquitous, commonly used in fertilizers.

By 2017, molten salt technology represented three-quarters of the thermal energy storage deployed for electricity applications worldwide, [reported Greentechmedia.com](#), citing a report from the International Renewable Energy Agency. Salt by then had also edged ahead of batteries in the United States.

That same Greentechmedia story noted more and larger molten-salt storage projects associated with concentrated solar projects in the American Southwest.

A [2019 story by InsideClimateNews](#) focused on a molten salt project near Tonopah, Nev.. The concentrated sunlight at the Crescent Dunes Solar Energy Facility—developers later declared bankruptcy—heats molten salt up to 1,050 degrees F in a shimmering tower. At that temperature, the salt looks and flows pretty much like water.

### Many more salt towers

The molten salt runs through a heat exchanger to make steam to run a standard turbine generator, the story explained. The tank holds enough molten salt to run the generator for 10 hours. That represents 1,100 megawatt-hours of storage, or nearly 10 times more than the largest lithium-ion battery systems that had been installed at that time to store renewable power.

Mark Mehos, program manager for concentrated solar power research at NREL, predicted many more CSP molten salt towers. He said that such towers with 8 or 10 hours of molten salt storage were then much cheaper than a solar PV farm with an equivalent amount of lithium-ion batteries. But for that January 2018 story, Mehos also cautioned that molten-salt towers associated with concentrated solar power

still needed to prove their reliability and promised prices.

Figuring out storage is absolutely huge, the holy grail of decarbonization. Renewables have their problems. There are always land-use impacts. At legislative hearings in Denver, Republican detractors sometimes wanted to know the carbon footprint of the infrastructure needed to produce renewable energy.

But renewable generation is now cheap. On its own, though, it can't get any utility to 100% short of building massive amounts of infrastructure.

Colorado utilities are deep in the hunt of finding solutions. Look for another report from Big Pivots soon.

## Xcel-backed bill gives company certainty of cost recovery as it seeks solutions

Colorado State Rep. Mike Weissman, a Democrat from Aurora, ultimately voted for the Xcel Energy-backed bill before the House Energy and Environment Committee on May 27, but repeatedly he asked the same question: Why is this needed? What is missing from the existing process?

HB 21-1324, titled "Promote Innovative and Clean Energy Technologies," would allow an investor-owned utility—Colorado has two, Xcel and Black Hills Energy—to acquire and demonstrate use of zero-emission resources and other innovative energy technologies such as advanced renewable energy and storage.

Xcel wants to ensure it can recover the money it invests in storage technology. Those voting against it were principally worried about giving Xcel an opportunity to make more money than it really deserves, what two called a "blank check."

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Environmental advocates were worried about a provision in the original iteration of the bill—later amended—that would have allowed “low emissions.”

The bill had a bipartisan cast of sponsors, but Dylan Roberts, a Democrat from Edwards who grew up in the Steamboat Springs area, gave the lead pitch. The legislation, he said, would be a “catalyst” for new partnerships, new research and development, attracting new businesses and developing workforces and creating economic growth in these communities that have been producing energy for decades.”

In the Colorado Legislature, at least in my hearing in recent months, every bill seems to be about job creation.

And he also pointed out that the projects that would be enabled by the legislation “must be in the communities impacted by the energy transition that we are going through in our state and in this country.”

A co-sponsor, Rep. Rod Pelton, a Republican from Cheyenne Wells, said the legislation could help Brush, site of one of Xcel’s coal-fired power plants. “Renewables can play a part, but it’s also important to look at new technologies, because that’s the future, too. We need to look at all the options on the table.”

Hearing that, you couldn’t blame Jacob Smith, director of the Colorado

**“This proposal will position Colorado to attract not only private investment, but also expected federal funding opportunities for low- and zero -carbon technologies.”**

**Kathryn Valdez  
Xcel Energy**

Communities for Climate Action, a coalition of 38 counties, towns and cities, for wondering what exactly Xcel had in mind. He—as did several legislators in their questions—kept wanting to know what was behind the curtain of statements about grand ambitions.

Smith warned the committee about giving Xcel a “blank check for Xcel to be able to spend a lot of ratepayer money on highly speculative technology development.” He also shared concerns about the low-emissions allowed.

In a later interview, Smith said he was worried that this could be used to authorize carbon-capture sequestration technology, such as is being pursued in New Mexico (See page 19) His worries – and those of the Sierra Club – were removed by an amendment which specifies zero-

emissions technology.

Defending the amendment, Roberts said meetings with stakeholders had revealed the low-carbon provision was a thorny problem for environmental groups and Xcel was OK with the zero-emissions language.

That, however, leaves the door open for nuclear—although, to be *very* clear, that is not anything Xcel has mentioned. It comes to mind, though, with the news that PacifiCorp, a minority owner in the two coal-burning units at Hayden, has plans to convert one of its Wyoming coal plants to a nuclear plant. (See page 8.)

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Rep. Pico Ayer, who was on the board of directors for Colorado Springs Utilities, wanted to know exactly what the Sierra Club had in mind with its wish for zero-emissions dispatchable power. “What kind of technology are you thinking? The only one available now is nuclear, which is not an option.”

The Sierra Club’s Matt Gerhart said that he was thinking green hydrogen. Hydrogen can be created from any source, both fossil fuels and renewables, as it requires only water. Hydrogen made from renewables is called green hydrogen.

Xcel has said that it is confident it can supply 80% of electricity to its Colorado customers by 2030 with existing technology. To hit its target of 100% carbon-free generation by 2050, though, Xcel has said it needs new technology.



**Kathryn Valdez**

“This proposal will help further that effort,” Kathryn Valdez, Xcel’s energy and environmental policy manager in Colorado, told the House committee. “We will need more than the current wind and solar technology.”

One important guardrail is SB 19-236, the Colorado law that described the targeted greenhouse gas reductions from Xcel. That same law specified that costs could not increase by more than 1.5%.

“Xcel will need a framework to bring partners and funding to Colorado to support innovative generation technology,” said Valdez. “This proposal will position Colorado to attract not only private investment, but also expected federal funding opportunities for low- and zero - carbon technologies.”

And, she added, this would “keep Colorado on the leading edge of the energy transition while protecting customers and reducing project risks through careful project evaluation and also approval by the Public Utilities Commission.”

Weissman, an attorney by profession, wanted more. He waded deep into the weeds of the proposed law. It seemed redundant, he said. Wasn’t Xcel already given the authority proposed in this new bill by a prior law adopted in 2016?

In fact, said Larson, that prior had been of no utility for Xcel, he said, and had limited application elsewhere.

“Part of the purpose of this bill is to create a pathway and framework to ensure that we are creating a plan not only for 2030 but also evaluating different kinds of technologies that can take the Public Service Co. of Colorado (the Xcel subsidiary) to a carbon-free 2050 future.”

The bill passed the House committee in a 11-2 vote. The politics were kind of interesting. Boulder has two representatives on the committee, both Democrats, and they voted on opposite sides: Edie Hooton no and Tracey Bernett yes.

Also voting no was the committee chairman, Alex Valdez, a Democrat whose professional background is in the renewables sector, who remained unpersuaded that the legislation was needed. “I’m very uncomfortable with the kind of blank check nature of this policy,” he said.

The bill easily passed (55-10) the House on June 2 and was before the Senate for a second reading on Monday.

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# Will Wyoming lead nuclear resurgence with new plant?

by Allen Best

Hopes abound in Wyoming that the state can survive the collapse of coal by being at the front edge of a renaissance of new nuclear technology that deploys small modular reactors.

A diverse public-private partnership that includes Bill Gates announced that one of four existing coal-fired power plants in Wyoming will by 2028 become the site of a 345-megawatt sodium-cooled nuclear power plant.

The nuclear plant will be combined with a molten-salt energy storage system, which will potentially boost the output to 500 megawatts for more than 5.5 hours when needed.

As explained by [WyoFile](#) and by the Casper Star-Tribune, the project is to be a

demonstration project, with developers hoping to see the technology used nationwide.

Partners in the multi-billion-dollar projects are the U.S. Department of Energy, PacifiCorp, and TerraPower. Gates is the founder and chairman.

WyoFile explains that the project will be a 50-50 cost share between the private sector, TerraPower in this case, and the public, said Chris Levesque, chief executive of TerraPower.

The U.S. Department of Energy awarded TerraPower \$80 million in 2020 to demonstrate its Natrium technology.

PacifiCorp already operates several coal-fired power plants in Wyoming, although it plans to close them down.

The plan seems to have the support of the Biden administration. WyoFile reported that among the speakers at the Cheyenne press conference was Jennifer Granholm, secretary of energy, who said the Biden administration sees the Natrium project as a starting point for replacing fossil-fuel-generated power in the U.S. in a way that



WyoDak, a coal plant near Gillette, is among four candidate sites, all existing coal plants, for the small modular reactor planned by a consortium using public and private funds, including those of Bill Gates.

*Photo March 2022/Allen Best*

doesn't leave mining communities in the cold.

There's another reason for using existing coal-burning sites, as explained by the Casper Star-Tribune. The smaller modular reactors will be designed to replace coal-fired plants, because it's a huge cost savings. Using existing connections to the electrical grid and the existing cooling systems of coal-fired power plants will save money.

"Using the already existent cooling systems could save hundreds of millions of dollars," Jacopo Buongiorno, a professor of nuclear science and engineering at the Massachusetts Institute of Technology, said.

Gary Hoogeveen, president and chief executive of Rocky Mountain Power, the subsidiary of PacifiCorp in Utah, Wyoming, and Idaho, said at a press conference in Cheyenne that nuclear will help utilities to achieve their emission-free goals.

"We know as a utility ... that you can't do 100% renewable and battery power and serve 24/7—not with the current technology that we have," he said. "That's what's so exciting about today, because this technology can allow us to provide carbon-free electricity 24/7, 365. And that is amazing. There's no other word for it."

**T**he cost of the project was not disclosed, and the Powder River Basin Resource Council posed questions about employing "an experimental and unproven" technology. Too, the Nuclear Regulatory Commission has yet to license a design.

What may be in play is a bill sponsored by Sen. John Barrasso, a Republican from Wyoming, that was signed into law in 2019 by President Donald Trump. The Nuclear Energy Innovation and Modernization Act changed licensing procedures.

Many have long contended that a fleet of small modular reactors will be necessary to eliminate emissions from electrical production even as electricity dislodges

## Where will it go?

Four existing coal generating stations in Wyoming operated by PacifiCorp have been identified as potential sites for the pioneer nuclear modular reactor that developers project will open in mid-2028.

The site will be announced by the end of this year. The four possible locations are:

**Naughton Power Plant** near Kemmerer. One unit was converted to natural gas in 2020. The remaining two units have estimated 2025 retirement dates.

**Dave Johnston Power Plant** near Glenrock. All four units are scheduled for retirement in 2027.

**Jim Bridger Power Plant** near Rock Springs. One unit is set to retire in 2023, a second in 2028 and the last two in 2037.

**WyoDak Power Plant** near Gillette has an end of life projected at 2039.

fossil fuels in other sectors, including transportation and buildings.

Nuclear got a black eye in the United States, as around the world, because of Three Mile Island and other incidents in Japan and in Russia. Nuclear reactors have also become extraordinarily expensive. Even so, the nuclear reactors mostly put in place in the 1970s last year produce nearly 20% of total U.S. electricity generation, a consistent figure for the last 30 years.

The [Energy Information Administration](#) reports that the United States has 94 operating commercial nuclear reactors at 56 nuclear power plants in 28 states. The average age of the plants was 39 years. The combined generating capacity was 96,555 megawatts.



The Colorado River is joined by the Fraser River near Granby on April 2, 2021. *Photo /Allen Best*

## Don't assume today's Colorado River flows will continue in future

Flows in the Colorado River have declined 20% in this century. Is that the new normal?

Don't count on it, say John Fleck and Brad Udall as the seven basin states gather their thoughts about how to craft agreements going forward that reflect the shifting hydrology in the river basin.

Writing in the [May 28 issue of Science](#), Fleck and Udall point out that it is “tempting to use today’s 20% flow decline as the new baseline—that is, modeling future reductions on the basis of what has already been observed. But only by planning for even greater declines can we manage the real economic, social, and environmental risks of running low on a critical resource upon which 40 million North Americans depend.”

Fleck, a former newspaper reporter for the Albuquerque Journal, is a professor in the Water Resources Program at the University of New Mexico. He has written several books, most recently co-authoring “Science Be Dammed” with Eric Kuhn, the former general manager of the Colorado River Water Conservation District.

In that 2019 book, they documented the flawed assumptions and what might be called an irrational exuberance in the making of the Colorado River Compact. Delegates to the meeting in Santa Fe in 1922 had disturbing evidence of lesser flows than were assumed by the agreement they crafted and Congress had even more evidence when it ratified the compact in 1929.

Udall, of the Colorado Water Center at Colorado State University, has been among several researchers in recent years to offer compelling evidence that what is still being called drought in the Colorado River Basin is only partly that. At least half of the reduced flows can be attributed to rising temperatures that result in less of what is called “runoff efficiency.” In other words,

how much snow and rain actually ends up as water in the river—and water in the two big reservoirs, Mead and Powell.

“For every 1°C of warming, researchers expect another 9% decline in the Colorado's flow,” Fleck and Udall wrote. “This year's snowpack was 80% of average but is delivering less than 30% of average river flows. Hot, dry summers bake soils, reducing flows the following year.”

(Actually, it may be worse than that. The National Western Service at its Colorado River Basin site reported on June that the April-July inflow into Lake Powell was to be 23% of average, the third lowest in the 58 years of records).

The 21st century shift in water flows have forced a new reckoning, which the states have begun to address. California has cut back diversions to accord with its entitlement, but perhaps the most flagrant recognition is the cut in deliveries to Arizona's Pinal County, an agriculture district between Phoenix and Tucson that has enjoyed flows from the Central Arizona Project. No more. Arizona had to make cuts, and these farms were lowest in priority for complicated reasons.

The 2019 drought contingency plan—it had a much longer, fancier name—just kicked the can down the road. The big decisions are coming up in the next 2 or 3 years. That is what Fleck and Udall address in the editorial in *Science*.

“Computer simulations showing emptying reservoirs were enough to convince decision-makers of the need to cut back. But have the modelers gone far enough?” they ask.

But the science now—as in 1922—may be the less difficult challenge, they suggest.

“Climate science indicates that there will likely be less water in the Colorado River than many had hoped. This is inconvenient for 21st-century decision-makers, and overcoming their resistance may be the hardest challenge of all.”

## Ground ‘very thirsty’ in the Yampa River Basin

Credit Doug Monger for having the most engaging quote in describing the water situation in the headwaters of the Colorado River.

“We kind of knew this thing was coming mid-winter,” Monger told the *Steamboat Pilot* “It doesn't take a rocket scientist to figure out you cannot dump enough water on this ground right now – it is just thirsty.”

Monger ranches near Hayden and sits on the board of directors for the Colorado River Water Conservation District.

This year may be second worst in this 21st century, behind only 2002 in terms of runoff. The snow-water equivalent in the mountains of the Yampa River Basin was 4.7 inches, compared to 2.3 inches of water on the same date in 2002, the *Pilot* report.

## Two new policy advisors in Colorado agency in realm of water, climate, and energy

Dan Gibbs, the director of the Colorado Department of Natural Resources, has two new high-level policy advisors.

Kelly Romero-Heaney, the director of water resources at the City of Steamboat Springs, will join the state agency as assistant director of water policy. Her diverse experience—including a stint as a wildland firefighter—will inform her work in updating the Colorado Water Plan, overseeing interstate negotiations around the Colorado River, and implementing new water measurement rules.

Angela Boat, already a staff member, has been promoted to the position of assistant director for climate, forest health and energy. She has served in the role of a policy advisor for those topics for the last 18 months.



## Bill on desk of Polis harder to understand than Colorado's first renewable standard

by Allen Best

A legislative bill that landed on the desk of Gov. Jared Polis last week may be just as important in Colorado's energy journey as the first renewable energy standard approved by state voters in 2004.

That standard required Xcel Energy to generate 10% of electrical generation from renewable sources by 2015. That bar now looks quaint: Xcel and virtually every other utility in Colorado expect to achieve 80% renewables or higher by 2030. At least two utilities aim for 100%.

Now comes a focus on fossil fuels used in buildings to warm them as well as heat water and food. HB 21-1238, the bill approved last week, and three others still in the Legislature seek to reduce emissions caused by the combustion of methane, a powerful greenhouse gas and the primary constituent in natural gas.

Just as the renewable standard did in 2004, these bills in 2021 collectively define

But here's why it and three other bills about natural gas demand may be just as important

the beginning of a new path for Colorado. This challenge is different, though. Instead of displacing a handful of \$1 billion coal-fired power plants with renewable energy delivered by maybe \$2 billion in new transmission lines, the legislation takes aim at consumption of natural gas in millions of existing homes and businesses in Colorado.

This is unlike Berkeley and other local governments in California and other states: Berkeley in 2019 banned natural gas hookups in new multi-family buildings. Other cities soon followed with various bans on natural gas. Colorado's measures can better be described as firm nudges. As Eric Blank, chairman of the Colorado Public Utilities Commission, observed at a recent meeting, Colorado just doesn't operate in the same way as California.

It will likely take 30 years for Colorado to complete its shift in electrical generation from non-polluting sources.

This shift now beginning in the building sector will likely take just as long, perhaps longer. It will be essential if Colorado is to meet its 2050 target for a 90% reduction in emissions. Combustion of natural gas and propane inside buildings produces a tenth of Colorado's emissions.

[HB21-1238](#), which was sponsored by Rep. Tracey Bennett, a Democrat from Boulder, and Sen. Chris Hansen, a Democrat from Denver, has a wonky title, "[Concerning the Modernization of Gas Energy Efficiency Programs.](#)"

This bill requires the utilities commission to set targets for gas utility demand-side management programs. The goal is to tamp down the demand for natural gas by improved efficiency or replacing it with electricity that in coming years will come from renewable sources.

What is being contemplated? Think programmable thermostats, more insulation, or even electric hot-water heaters and cooking stoves instead of gas. With electricity coming from renewable sources, the carbon—and methane—footprint will be much lower. One other benefit: As many testified in legislative hearings, having fewer fumes from natural gas in homes will improve public health.

**G**uiding the commission in evaluating the demand-side programs will be three new metrics.

One is the social cost of carbon. The social cost of carbon attempts to account for the damages caused by pollution, carbon dioxide specifically. It was \$46 per short ton when Colorado first adopted this as a decision-making metric in 2019 for evaluation of resource plans submitted by electric utilities. The Biden administration elevated it to \$68.

Closely related is the social cost of methane, the primary constituent of natural gas. The federal government has assigned a cost of \$1,756 per short ton, which reflects the much greater warming potential of methane as compared to carbon dioxide.

The third metric also takes a long-term view. The commission must discount future customer costs and utility bill savings at the long-term rate of inflation rather than the

utility's cost of capital. Laurent Meillon, the chief executive of [Capitol Solar Energy](#), explains that switching to the 30-year average rate of inflation of around 3% will give gas customers higher rebates for installing energy-efficient and renewable energy technologies that cut demand for gas.

The bill “takes into account the interests of our children better by not heavily discounting their future,” said Meillon while leaving on a Memorial Day weekend rock-climbing in Wyoming.

Meillon has been lobbying for this for a decade, including several legislative sessions. The effort was a slog, more like backpacking into an isolated 13,000-foot peak in the San Juans than the sprint of climbing a canyon wall.

The bill also requires the utilities commission to collaborate with the state's Air Quality Control Commission, the body with the primary authority for reducing greenhouse gas emissions, to account for reductions in emissions achieved.

If there are costs associated with reducing demand, they will be much less over time, whether through better insulation or more expensive technology. [The Southwest Energy Efficiency Project](#) estimates that the bill will allow customers of Colorado's natural gas utilities—Xcel, Black Hills Energy, Atmos, and Colorado Natural Gas—to realize net economic benefits of \$600 million to \$700 million from 2022 through 2030. That same work will also cut the equivalent of 800,000 tons of carbon dioxide emissions.

Across Colorado, natural gas hookups are already being eschewed in favor of new

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technologies. In most cases these occur at higher-end homes, such as in Boulder County, or affordable housing units such as [Basalt Vista](#), a 27-unit project in Basalt. At the latter, air-source heat pumps eliminate the need for natural gas for heating and also provide cooling. If front-end costs are somewhat higher, utility bills are much lower, an average of \$15 a month.

But those and other projects remain the exception. Colorado is still adding 30,000 to 40,000 homes and 5,000 to 10,000 commercial units a year, nearly all of which rely upon natural gas. This bill won't eliminate natural gas. The bill specifically precludes the commission from doing that or requiring replacement of gas appliances.

**T**hree other bills still being considered would also push back against combustion of fossil fuels in buildings for heating and other purposes. Senate Majority Leader Stephen Fenberg is a prime sponsor of [SB21-246](#), which would address the same task from a different angle. It would task the commission with establishing energy savings targets and approve plans for Xcel Energy and Black Hills Energy to promote replacement of fossil fuels with electricity in buildings. This bill assumes that electricity during this decade will increasingly come from renewable sources.

Another bill, [SB 21-264](#), would require the gas utilities provide "clean heat" plans with the commission to demonstrate how they will reduce greenhouse gas emissions 5% by 2025 and 20% by 2030, both compared to 2015 levels. Municipal gas utilities must file plans for hitting the 2030 target.

What constitutes a clean-heat resource? Ironically, it's methane. Think dairies, landfills, and sewage treatment plants – or methane from coal mines. The idea is to displace natural gas from the built

environment that has to be extracted from the ground by using the methane from existing sources. On coal mines, the thinking is that they exist anyway and it's best to provide financial incentives to harvest the methane being emitted.

Yet a third bill, [HB21-1286](#), would require owners of large buildings to collect data on energy use and meet performance standards. It doesn't require that natural gas be abandoned, but that requirement would nudge building owners to use it more efficiently.

Observing this year from Basalt, former State Sen. Gail Schwartz recalls her own efforts to introduce similar legislation a decade ago.

During that same time, for several summers she drew together some of the best minds in energy to pick their brains about what steps Colorado needed to take next. Among them, she says, was Meillon. He and others argued for the need to encourage use of non-carbon sources in buildings. In the Legislature, the focus

was on cleaning up electricity. Buildings, she says, were a bridge too far. It was more than what was possible then.

Now as president of [Roaring Fork Habitat for Humanity](#), Schwartz is overseeing planning for a net-zero affordable-housing project at Rifle, one with no natural gas hookups. In Longmont, that same sort of project was completed several months ago. Called [GreenSpire](#), the 44 housing units similarly are carbon neutral. Meillon hopes that the building's symbolism will result in Polis using the building's parking lot as the venue for signing HB21-1238 into law.

*This report was originally published by [Empowering Colorado](#) and benefited from some editing by the staff.*

A decade ago,  
buildings were a  
bridge too far  
**Gail Schwartz**  
*Former state senator*



## A tragedy in 1921 caused a pivot in how Colorado moved forward

by Allen Best

One-hundred years and one month ago the fastest, easiest way to get from Denver to Glenwood Springs was through Buena Vista. This was before Interstate 70, of course, and before there was more than a horse trail over Vail Pass—which had a different name then, if it was called anything at all. That road came in the late 1930s.

Automobiles were still relatively few a century ago, roads primitive, and most comings and goings were by train. For traveling the length of Colorado, that mostly meant going through Pueblo.

A railroad, the Moffat Road, went to Corona Station atop the snowy, wind-lashed Continental Divide at Rollins Pass and down into the Fraser Valley. The trains reached Steamboat Springs and then Craig, but the crossing was difficult and sometimes

impossible, always expensive. The rails remained far short of Salt Lake City, the original goal of the Denver boosters.

To remedy this, they wanted to create a taxing district, to pay for a bore through the Continental Divide. Pueblo's legislators would have none of it. Then the flood of June 3-4, 1921, occurred.

Much was made in Pueblo last week of the flood's anniversary, and rightfully so. Gov. Jared Polis delivered remarks, as did the mayor, Nick Gradisar. Two museums have exhibits now. (But don't try to go on a Sunday.) The Pueblo Chieftain had a couple of interesting stories, from which I will borrow in coming paragraphs. The Arkansas River flood of 1921 was a game-changer for Pueblo—and for Colorado.

Denver then was bigger, but nothing like today. Nor was Colorado Springs. Pueblo was the second largest city in the state, in some ways a rival to Denver. It had the steel mill and all manner of manufacturing concerns.

Too, it was a rail center. This was the launching point for most travel across the Rocky Mountains. The rails of the Denver & Rio Grande hugged the Arkansas River to Leadville and then coasted across Tennessee Pass and down to the diminutive town of Red Cliff and to Glenwood Canyon.

There was also the Midland Railroad, but it was, as a Wikipedia entry notes, "an

extraordinarily difficult railroad to operate” on its route to Aspen.

Pueblo didn’t want to give up its positional advantage—but the flood forced it to accept a new reality.

A levee 18 feet high had been erected along the river to protect the city’s downtown area. It wasn’t enough for an Arkansas River swollen by snowmelt and augmented by rains. The water flowed over the levee and then punctured it. The river’s flows reached a maximum 24 feet, 6 inches.

If 78 bodies were found, the death toll was never ascertained. Most estimates put the figure well above 100. Dozens of businesses were destroyed, and a lumber yard caught on fire. The hard-working industrial city, the place that was the launching point for travel across the Rocky Mountains, was brought to its knees.

The fulcrum for this shift was the Colorado Legislature. Denver got its taxing district for counties along the line from Union Station to Craig to pay for the Moffat Tunnel. The Moffat Tunnel was completed in 1928. In 1934, the railroad to Craig was linked to the Denver & Rio Grande tracks over Tennessee Pass with a 34-mile segment along the Colorado River between the hamlets of McCoy and Dotsero. This allowed trains that more-or-less direct all-weather route to Glenwood Springs—and to Salt Lake City.

Tellingly, when the consolidation of railroads occurred in the 1990s, the rails through the Eagle Valley and over Tennessee Pass were idled while trains continue to groan their way to the Moffat Tunnel (and glide past my house in suburban Denver).

Pueblo got the ability to create a district to deal with flood prevention. One element of that flood-proofing was a rerouting of the river and creation of a beefier levee.

But Pueblo lost momentum. The Chieftain’s reporter, Zach Hillstrom, did a good job of dissecting that in interviews with several people who have put some

thought into how the flood changed Pueblo’s course.

One takeaway of Jonathan Rees, a history professor at Colorado State University Pueblo, is that there was an opportunity cost. As Pueblo struggled, Colorado Springs was put into a position to prosper. Any program that arrived in Colorado Springs between 1921 and 1965 could have come to Pueblo under different circumstances, he said.

Rees told the Chieftain that if not for the flood, Pueblo might look more like Colorado Springs. It has a lower elevation, better access to water, and flatter terrain, all the ingredients for a large city.

Peggy Willcox, a researcher with the Pueblo County Historical Society, who helped write a book about the flood entitled “Mad River,” concurred about the halted momentum.

“Had Pueblo continued its momentum of growth and stayed the hub for the railroads that it was, I think it would have grown to twice this size,” she said.

“Colorado Springs was really not a factor for a long time. So really, the competition was between Pueblo and Denver. So I think the difference is that Pueblo still would have been competing with Denver and would have been able to continue a greater growth. At some point, would Denver have still won that competition? Of course.”

In his interview the Chieftain, Rees talked about opportunity costs.

“Different things could have happened to Pueblo but didn’t because we were too busy trying to prevent future disasters,” he said.

That’s the question to ponder as we try to balance the risk posed by greenhouse gases, with carbon dioxide, as of June 6 at 420 parts per million, an increase of 3.18 ppm during the covid-slowed past year.

# Companies want to make New Mexico a hub of hydrogen

In New Mexico, there's lots of talk about hydrogen. The [Albuquerque Journal reports](#) at least three hydrogen projects that energy companies are pursuing, mostly in the Four Corners area.

Near Grants, two companies want to convert the former coal-fired Escalante Generating Station into a hydrogen production and generating station. It was closed in 2020 by Tri-State Generation and Transmission Association.

To the north, in San Juan County surrounding Farmington, there are other plans, including a proposal by the Utah-based Big Navajo Energy to capture methane emissions from a refinery run by the Navajo National Oil and Gas Co. and convert it into hydrogen to be used for electrical generation.

The Journal, though, devoted most of its attention to plans by Libertad Power, which believes it can make the county into a "hydrogen hub" to supply clean electricity to Western utilities plus non-carbon fuel for vehicle and industrial processes. Instead of using an existing industrial site, it plans to build an entirely new hydrogen-run generating plant near Farmington.

But here's the rub. What constitutes "clean." There are various shades used to describe the source. Green is hydrogen made from renewables. Blue is made from natural gas.

Joseph Merlino, one of three managing partners for Libertad, said his company plans to start with blue hydrogen production and then later transition to

green as more renewable generation becomes available for electrolysis, and as hydrogen electrolyzer technology becomes more efficient and less expensive.

"The technology needs to improve more in the electrolyzer process to increase efficiency and reduce costs, so it's not just a matter of enough renewable power being available," Merlino said. "In the meantime, we need to develop more options and alternatives now like blue hydrogen, because as decarbonization moves forward, utilities are concerned about just relying on wind, solar and batteries."

The Journal heard yeas and nays.

"We're not fans of blue hydrogen. It's a costly endeavor that can be energy intensive, and you're still left with carbon dioxide that must be stored underground," said Dennis Wamsted, energy analyst with

the Institute for Energy Economics and Financial Analyst.

Doug Howe, a former commissioner at the New Mexico Public Regulation Commission, was more welcoming.

"Blue hydrogen seems to be kind of a bridge, a way in which the hydrogen

economy can get started without the enormous expense of electrolysis to produce it," said Doug Howe, a 35-year industry veteran.

It's counterproductive, Howe added, to discard emerging technologies like blue or green hydrogen as decarbonization gains momentum.

"I think hydrogen has a place in the energy future," Howe said. "Wind and solar can't do it by itself, so we will need other energy technologies, whether that be nuclear energy, battery storage, hydrogen, or some mixture of all of that."

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— Doug Howe

## **New Mexico should seize energy transition to help fortify state economy**

Dan Arvizu, the former director of the National Renewable Energy Laboratory, has advice for New Mexico regarding the energy transition.

“It’s a watershed moment in history, and we can’t afford to miss the opportunity,” Arvizu told the Albuquerque Journal.

“It’s too important not to pay attention and do something,” added Arvizu, now the chancellor at New Mexico State University in Las Cruces. “We need to put things in place with the objectives, strategies, and means to embrace it.”

The Journal reported that the state’s universities and laboratories, public agencies, private think tanks and business groups have together been identifying the challenges and opportunities.

The Journal says executives from New Mexico’s three research universities, two national laboratories and the University of Texas at El Paso have been analyzing the economic changes underway and trying to figure out ways to benefit from them along the Rio Grande corridor. The state university – where Arvizu is – has also been leading a federally funded initiative to develop new academic and career-training programs at state university and colleges to prepare the workforce for the clean-energy economy, assist existing businesses and startups to develop new programs, and create a clean energy road map for economic development.



**Don Arvizu**

Arvizu said the Biden administration’s proposed \$2.3 trillion infrastructure investment may benefit New Mexico.

Jim Peach, economics professor emeritus at New Mexico State University, said that New Mexico may be competitive in gaining funding from the \$100 billion Biden has proposed for renewable generation and grid modernization.

## **New Mexico utility wants more generation to avoid Texas & California messes**

The power disasters in Texas and California during the last year have the Public Service Co. of New Mexico hedging its bets.

The Albuquerque Journal reports the company has released requests for proposals for up to 700 megawatts of new generating capacity.

This is to replace the power lost when the company abandons the coal-fired San Juan Generating Station near Farmington in June 2022.

There are problems ahead. A 130-megawatt solar project near Farmington has missed critical deadlines. It is also to have storage.

Then there are the issues outside New Mexico. Tom Fallgren, vice president of generation for PNM, told the Journal that in making plans for closing the coal plant, the company assumed that 200 megawatts or more of out-of-state generation would always be available for purchase on the Western wholesale market. The California and Texas events have cast doubt on that assumption.

“California and Texas have demonstrated that during extreme events there may be no market resources available,” Fallgren said. “There may well be regional electricity available during calmer months, say in the fall or spring, but not

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necessarily during critical summer months when extreme heat taxes regional generating systems, or during a deep winter freeze.”

The Journal points out that PNM did not restrict its RFP to renewables. That could result in proposals for natural gas—or even hydrogen, a still challenging technology being chased in the Farmington area.

Doug Howe, a former state regulator and past chair of the Western Energy Imbalance Market, said utilities throughout the West are now concerned about procuring enough electricity to avoid rolling blackouts such as California experienced in last year’s heat wave.

Howe said how much additional state regulators will evaluate how much additional capacity the utility will need based on evidence it submits.

## **Newspaper pooh-poohs idea of university divesting from fossil fuel sector**

The University of New Mexico Faculty Senate wants the university to divest itself of investments in companies involved in fossil fuel extraction and production.

The Albuquerque Journal, in an editorial, questions whether the university really has the stomach for doing what it proposes for the University Foundation’s Consolidated Fund portfolio.

The university gets \$68.7 million or 33.5% of its annual \$205 million budget for the main campus from the state’s oil and gas sector, the newspaper points out. And does the Faculty Senate have the stomach for commensurate pay and budget cuts? And what about China. Should the

investments in index funds be cut to the world’s largest carbon polluter?

## **San Juan Citizens Alliance and others want EIS for carbon capture project**

The San Juan Citizens Alliance and 8 other environmental groups in New Mexico want to see an environmental impact statement prepared before a carbon-capture project is launched at the San Juan Generating Station near Farmington.

The coal plant is to be closed in June 2022, but Enchant Energy proposes to retrofit the power plant with carbon-capture technology. If successful, it would be the largest in the world that captures carbon from a coal plant, reports the Farmington Times.

Two such projects have been in operation, one at the Boundary Dam Power Plant in Canada and, until recently, the Petra Nova project in Texas.

Timing matters for the company that hopes for continued operation of the San Juan coal plant and an associated mine continuing to operate. Construction must begin by the end of 2025 for the project to be eligible for the 45Q tax credits. The federal tax credits provide \$35 per ton of carbon captured and used in oil and gas production and \$450 per ton of carbon for underground permanent storage. Those tax credits, the Farmington Times notes, have been a key part of Enchant Energy’s strategy.

One option for the carbon is to transport the carbon dioxide from the coal plant to the nearby Kinder Morgan pipeline that transports carbon dioxide from the McElmo Field near Cortez to the Permian Basin of Eastern Texas. The CO<sub>2</sub> is injected into oil wells in an effort to dislodge oil from the rock.