BIG PIVOTS
Energy and water transitions in Colorado and beyond

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Winter has warmed so much in Fraser, but Denver?

By Allen Best

Last week it got to 19 below in Fraser, the Colorado town located northwest of Denver in the valley of the same name. The temperature provoked quite a lot of local talk. How things have changed.

The town, adjacent to Winter Park but the elder in incorporation by 25 years, has a storied tradition of deep cold. In the 1960s, it was often reported by morning radio stations—this was before TV really got into the game of morning broadcasts—as having the deepest overnight cold in the nation. (Other places that stood out in my memory: Truckee, Calif., and International Falls, Minn., and less often, Alamosa, Colo.).

Denver KOA's Weatherman Bowman—there were no women at the microphones in those days—called it the icebox of the nation.

Those temperatures were the result of the steadfast devotion of a couple, Ron and Edna Tucker. They took turns getting up every two hours in order to get an accurate record of the deep freeze. After he died, she kept it up for awhile, then tried to delegate to somebody else. She was also the town's postmaster. But sometime in the 70s this tedious, detailed record of deep cold lapsed. Since then, it's been an anecdotal record.

Kirk Klanke arrived in Fraser in 1971, after playing football for the state college in Pueblo.

The difference between now and then?

"Considerable," he answered. It was 19 below the other night, he reported, which was enough to spark comment. In the 1970s, it would have been typical. "On a clear night it was 25 to 40 below and it sometimes got to 50 below. Even 40 below was memorable. Your car had flat tires from the cold, and they didn't thaw until you had driven for a little bit."

Now distant memories of the 40 and 50 below temperatures in Fraser

"That," he added, "hasn't happened in a long time."

If Fraser were large enough to have had a continuous record, it might have been teased out by Climate Central in that organization's recent report about the change in winter temperatures across the nation. All but 6 of the 242 sites for which it pulled weather records showed warming in the last 50 years.

Colorado Springs has increased 2 degrees on average, and Grand Junction 1.5 degrees.

Albuquerque rose 3.2 degrees, Casper warmed 1.5 degrees, and Salt Lake City 1.9 degrees.

Denver? No, not much.

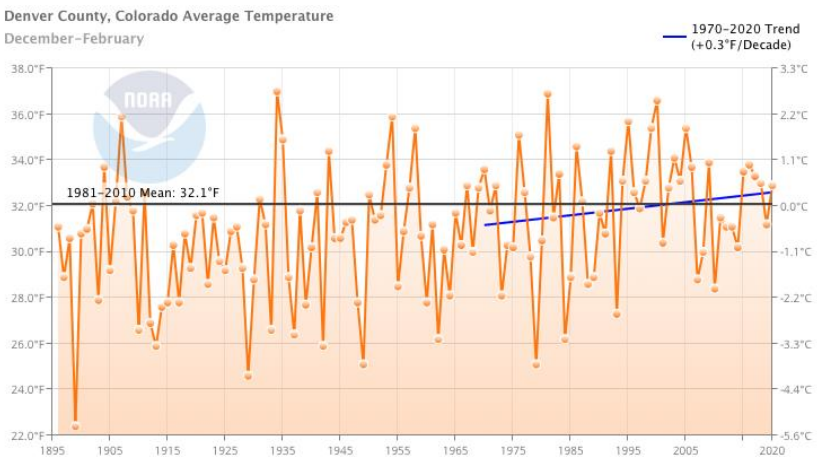
Becky Bolinger, the assistant state climatologist in Colorado, studied the Climate Central work and found that the same recording station at Stapleton (an airport until 1995, then gradually a residential neighborhood now called Central Park Denver) was used for the study. She ran the numbers herself and came to the same conclusion: a very, very small trend downward. Why?

"I would say that major land surface changes have been happening over the past 50 years that could be impacting measurements," she said when posed with this conundrum by Big Pivots.

What caught her eye was the apparent decrease in variability.

"The peaks and minimums are not as extreme in the latter part of the chart as it was earlier," she said.

"My speculation is that the land surface changes (airport until mid-1990s, then suburban in the 21st century) has acted to regulate the winter temperatures a little bit more and reduced the extreme warm and cold winters."



Climate Central meteorologist Sean Sublette says the precise warming levels vary, but the broader picture is clear across the United States. Most prominent was the heating in the Great Lakes states and the Northeast.

But Colorado has clearly warmed altogether, even if the evidence from the state's largest city is wobbly. Running a chart for Colorado altogether using data from the National Oceanic and Atmosphere Administration's Climate at a Glance tool, he produced a chart (previous page) from 1895 forward that shows (see blue line) a clear warming trend across Colorado.

Like Bolinger, he points out the lesser variability of recent decades. "The big variations start to go away in the last 30 to 50 years," he observed.

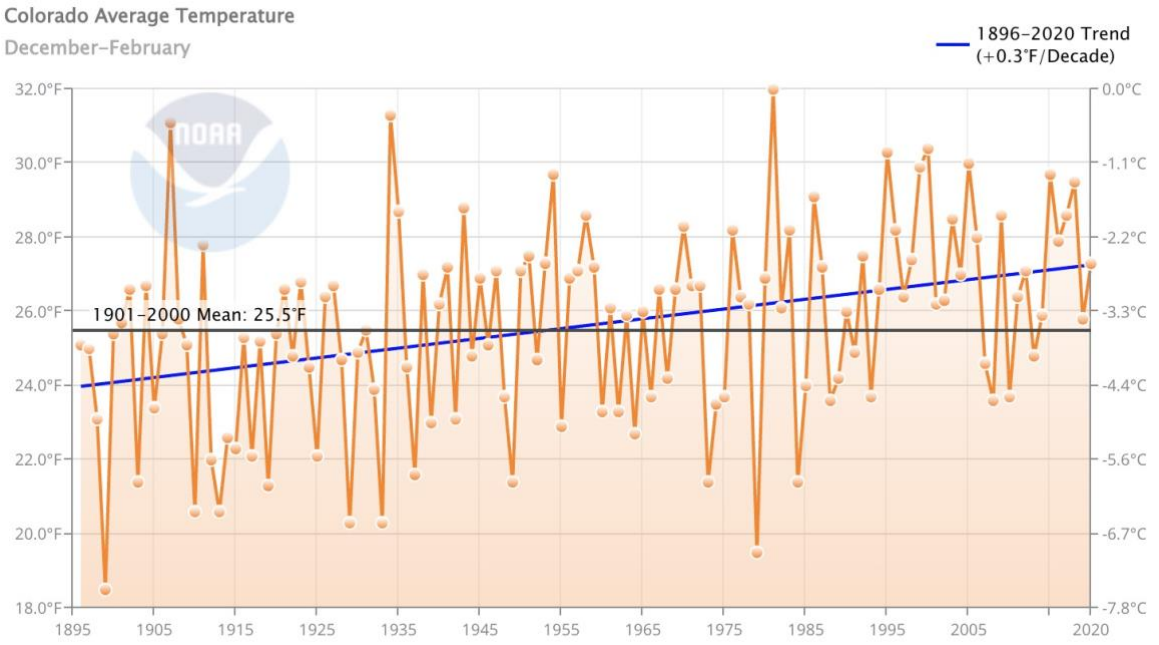
Climate Central illustrates how a small change in average can produce a big change with this bell curve animation.

There's been a national trend for more rain in lieu of snow. This has been true even of Denver, according to a 2016 running of the numbers.

At the State Climatologist's office in Fort Collins, Bolinger says she is not surprised to see some areas of Colorado with little-to-no warming trend during winter.

"Other areas of the country have seen much more pronounced warming in the winter months. For Colorado (and specifically Denver County), more pronounced warming trends are occurring in the summer and fall months."

What can be said about Colorado's higher country? Not all that much, because the long-term temperature records are so scant. But in a general way, climatologists know that those places that are coldest tend to warm at a



more rapid rate than those are already warm, says Sublette.

"Alaska is warming twice as fast as the rest of the world because it's so much colder than the rest of the world."

It stands to reason, he went on to say, that Colorado's ski resorts are warming more rapidly than, say, the Front Range urban corridor.

"As a general rule, the colder places and higher elevations are going to be warming a little faster than the lower elevations," he said, but added: "There are always going to be variations."

In Fraser, you can still see block heaters used to warm engines on cold nights. That wasn't enough for Kirk Klanke when he was in the construction business. Getting started in the morning was an ordeal. It wasn't enough to put a block heater on a pickup or car. The oil would freeze. That means steel-on-steel for the first few minutes of operating a vehicle. "You can wear out a motor pretty quickly that way," he points out.

Instead, he used a 10-inch culvert under the pickup through which he used a weed burner to blow heat and warm the drive train.

Last winter it got to 25 below, he says, but that was the coldest it has been in several years.

If formal records , the evidence of warming became profound in the early part of this century with the bark beetle epidemic. Before, points out , forests lost about 10% of trees during a bark-beetle epidemic. The deep, cold winters kept the beetles in check. But in the early 21st century, with the warm winters, the beetle populations exploded.

Just to the west of Fraser, in the Williams Fork Valley, where the northern Colorado's bark beetle epidemic first flared in 1996, a fire this year burned 15,000 acres.

(This writer can personally testify to some of that cold. In January 1979, he arose one morning when living in Kremmling to a temperature of 62 below zero on the thermometer of Bob Shay's Phillips 66. A Colorado record was set that morning, but elsewhere in Colorado).

On governor's short list for new chair of the Colorado PUC?

COSSA pushes back on Polis plan to replace Jeff Ackermann

by Allen Best

DENVER – Who will replace Jeff Ackermann as chairman of the Colorado Public Utilities Commission—or will there be enough pushback to cause Gov. Jared Polis to reconsider his plan to replace .

Ackermann in late September announced that he had about 100 days left in his term, and he would not be returning. Asked for comment, the Polis office did not deny that was leaving. "As with each administration, appointments to boards and commissions are at the Governor's discretion," deputy press secretary Shelby Wieman said in a statement reported by Big Pivots on Oct. 6.

There has been pushback. Colorado Solar and Storage Association members at a Dec. 3 meeting discussed the matter. "Many in the group were alarmed by this for several reasons, but primarily because (a) Ackermann is a forward-looking and big-picture thinker; (b) the PUC has been tasked by the Legislature with investigating many issues that can significantly address climate change goals; and (c) no one else will be equipped to hit the ground running and grasp all the intricacies of these important issues in the way someone with Ackermann's expertise can," according to meeting minutes.

COSSA members were advised to contract the Polis office or Zach Pierce, the energy and climate advisor to Polis.

The Colorado Renewable Energy Society policy committee expects to discuss the matter at an upcoming meeting. "But we weren't necessarily planning on taking a position," reports the group's Vincent Valvano, "but would likely side with COSSA on this."

Polis early this year got pushback from a key ally, Sen. Majority Leroy Garcia, when he attempted to replace Frances Koncilja on the PUC with Susan Perkins. Perkins had been involved in the effort to municipalize Pueblo's electricity. Voters later defeated the proposal. Garcia is from Pueblo.

At length, Polis relented and instead nominated Gilman, a solar entrepreneur and, at that time, chairwoman of the board of directors for Holy Cross Energy.

But there were no particular defenders of Koncilja. In this case, the vital issue seems to be the learning curve of Ackermann's replacement, if there is one, and what skill set is needed. Gilman and John Gavan are engineers by training but with business experience. But is it good to have a lawyer in the mix, too?

Here is who I am hearing is on the governor's short list.

• Eric Blank, president of CE Ventures, a firm he founded in 2019 that, according to his Linked-In profile, develops and deploys path-breaking new solutions for clean energy at a scale sufficient to meaningfully impact climate change.

Eric Blank

From 2009 to 2018, he was president and co-founder of Community Energy Solar. Before that he was executive vice president of Iberdrola Renewables, where he led U.S. wind development for two years.

He also has a master's degree from the London School of Economics and has a law degree from Yale.

• Leia Guccione directs the Rocky Mountain Institute's Electricity Program.

Since 2002, she has directed RMI's research exploring the potential for distributed generation, distributed energy resources, and distributed battery technologies to disrupt utility business models and other aspects of the U.S. electricity system.

Leia Guccione

Prior to joining RMI, she served in the U.S. Navy as a nuclear-trained surface warfare officer and, according to the RMI website, continues to serve in the U.S. Navy Reserve.

• Mark Valentine is an attorney at the Denver firm of Keyes & Fox. He began his legal career as counsel for the Colorado PUC. Today, according to the profile on his firm's website, his clients range from transportation providers to small and large utility customers to developers of renewable energy projects.

Mark Valentine

He began his career as a legislative analyst for the Legislature's Joint Budget Committee. Early in his career, he also represented regulated utilities.

Private jet use leaps at the Crested Butte airport

GUNNISON, Colo. – This summer the airport serving Crested Butte had Aspen-like traffic, 15 to 20 private jets a day.
The Crested Butte News reports that managers of AvFLight Gunnison and the Gunnison Crested Butte Airport believe the surge was due in part to people avoiding commercial flights but also part of an overall tourism boom to the Gunnison Valley as a result of the pandemic.

The News also reports that September was the busiest month ever for lodging tax collections in Gunnison. July is typically the biggest month, but September this year produced $363,812. That's a 24% increase over the same month last year.

Solar farm success for Park City and others in Utah

Utah regulators have approved a plan by six large organizations to purchase electricity and renewable energy attributes from an 80-megawatt solar project west of Salt Lake City in Tooele County. The electricity will be fed into the system of Rocky Mountain Power, the utility that serves Salt Lake and adjoining areas.

The output will be earmarked for the Salt Lake City, Park City, and Summit County governments, Utah Valley University, and the Deer Valley Resort (operated by Alterra Mountain Co.) and Park City Mountain Resort (operated by Vail Resorts).

"This speaks to the power of collaboration among Park City's largest energy users," said Park City Mayor Andy Beerman. "We are proud to be part of this effort, which will move us closer to our goal of net-zero carbon and 100 percent renewable electricity for city operations by 2022, and community-wide by 2030."

The solar farm will be located on state land, producing income for state schools.

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Holy Cross Energy's deep renewables dive includes six home batteries

by Allen Best

On the cusp of deep penetration of renewable energy that most would have thought impossible just a decade ago, Holy Cross Energy has now started working to contour demands around those intermittent renewables.

Consider the six Tesla Powerwall battery packs installed in recent months in the homes of Holy Cross Energy members. They look vaguely like sleek, slender, and small refrigerators. They serve a similar purpose, storing a perishable, renewable energy, to be tapped when demand peaks.

Electrical cooperative may achieve 80% or even 85% non-carbon portfolio by 2024.

Peak demand in the Holy Cross service area between Vail, Aspen, and Parachute typically occurs during winter evenings. If tests in coming months bear out expectations, Holy Cross hopes to have 100 more batteries installed among its 55,000 metered members by the end of 2021.

Power+, as the pilot project is called, is among several programs launched by Holy Cross Energy to juggle demand to better match supplies of renewables.

This transition to clean energy has been accelerating. In 2019, renewables were responsible for 44% of electrical generation consumed by Holy Cross members. By the end of 2022, renewables may have delivered more than 70% of electricity for the year[1].

The biggest single stride will come from a wind farm near Arriba, located about 120 miles east of Denver along Interstate 70. This wind farm will deliver 100 megawatts for Holy Cross, enough to supply a third of total demand. It's slated for completion by New Year's Eve 2021. Hunter Solar, a solar installation near Bennett, 35 miles southeast of Denver, will deliver another 30 megawatts by July 2022.

Construction of a 5-megawatt solar farm near the Aspen/Pitkin County Airport is expected to begin when the snow melts next spring, with service beginning next summer.

The three projects together will get Holy Cross to 70% renewables of annual energy production in 2022.

Next comes the work to reach 80%. Holy Cross expects to hit that level by the end of 2024—and perhaps even 85%.

In early 2020, Holy Cross invited proposals for new electrical generation. This time, it said, it favored local sources. Too, the projects needed to lower costs, with the savings to be transferred to Holy Cross customers.

That invitation yielded 51 proposals. Among the first chosen was a 4.5-megawatt solar array to be constructed near the Colorado Mountain College Spring Valley Campus, between Glenwood Springs and Carbondale. Several other projects chosen have not been announced pending final scrutiny of contract details.

In deciding which projects to pursue, Beuning, the vice president for power supply and programs at Holy Cross, describes several considerations:

• Does the new generating source create a situation of over-supply? "Over-supply is when the sun is shining and the wind is blowing and our members aren't using much energy," explains Beuning.

An office building sitting empty is costing somebody lots of money. Ditto for a rarely

used wind farm or solar array. Construction is not cheap, even if the wind and sunshine are free. Best is when demand can take full advantage of all renewable resource production.

• Does the proposed solar farm or other resource clash with the utility's existing contract with Public Service Co. of Colorado, a subsidiary of Xcel Energy? Xcel is a major provider of electricity for Holy Cross. The contract, which was initiated in the early 1990s, specifies the circumstances under which Holy Cross can substitute supplies against those contractually committed to Holy Cross by Xcel.

Steve Beuning

"What we don't want to do is buy energy twice," says Beuning.

• What Impacts will occur to the delivery system of Holy Cross? Will the electrical wires already strung accommodate the new energy? A related but more abstract consideration has to do with reliability. How does this new generation affect grid stability? For example, will the loss of generation cause the lights to flicker or, worse yet, cause your computer to crash—causing you to lose that document you had slaved on for an hour but forgot to save!

One solution to this need to maintain steady deliveries may be through development of autonomous, local, so-called micro-grids. The Power+ program from Holy Cross is an example of a micro-grid that helps a single retail customer. In the future the concepts behind this program could be expanded to cover multiple customers with backup supply.

Power+ is one among several programs that seeks to buffer these rough edges between demand by consumers and new renewable energy supplies. Take Power+, the program that will put Tesla batteries into homes. During times of oversupply, they provide storage for consumption later, when renewable production is less but demand may be more.

Holy Cross offers incentives for those participating, but other members benefit, too, as the storage allows members, not just those houses with batteries, to take full advantage of lower-cost renewable energy.

Peak Time Payback, another voluntary program, also works at the fulcrum of supply and demand. Those members participating agree to get messages that request deferring electrical demand. Participants could then choose to delay using their washers and dryers during the evening, Presidents' Weekend or some other time when Vail and Aspen are bustling and everybody is getting ready to watch the latest Netflix offering. The same thing can be achieved during a time of hot weather by moving the thermostat of an air conditioner up a few degrees, to reduce electricity use.

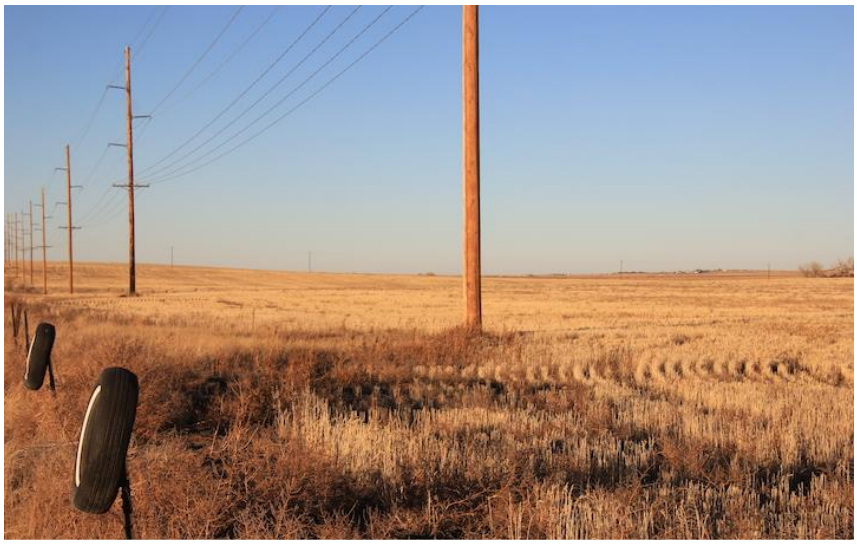
The intent of this program is to shave peak demand, typically during two or three hours blocks. This averts the need for Holy Cross to buy electric capacity on the open market at its most expensive moments.

Colorado Solar & Storage gladly supports Colorado-based energy journalism and is pleased to underwrite this effort.

COSSA

Participating Holy Cross members can, to the extent they alter their demands, benefit from preferred rates.

GreenUp, another pilot program, provides the flip-side to Peak Time Paybacks. It is premised on the fact that there are blocks of time when wind and solar forecasters predict an abundance of renewable energy. Again, there are financial incentives, but this time inverse to those intended to shave peak demand. In this case, consumers are encouraged through lower costs to actually use electricity when its plentiful.



Holy Cross members will begin getting electricity from a solar farm located in the wheat country east of Denver by 2022. Photo/Allen Best.

"We will make the decisions to trigger the program based on our forecast for wind and solar, and the member would make the decisions about any behavior changes to access the reduced rates," says Beuning. "We will communicate the program timing through a text or e-mail."

Other utilities offer similar demand-side management programs in an effort to contour supplies with demands more efficiently. It made sense even when most electricity was generated by burning fossil fuels. Deepening penetration of intermittent renewables will require even greater juggling of demand.

The arrival of electric cars and other vehicles will pose both additional challenges but also offer opportunities for optimizing the balance between supplies and demands.

Holy Cross in recent years has gained a national reputation for innovation and boldness. Platte River Power Authority, which serves four member cities along the northern Front Range, has also started to turn heads.

In 2018, both Colorado utilities adopted ambitious goals for 2030. Holy Cross was first, with its target of 70% renewables and 70% reduction in greenhouse gas emissions in its generating portfolio by 2030. Just a few months later, Platte River Power Authority adopted a resolution calling for 100% carbon-free electricity by 2030.

Now, the two utilities face many of the same challenges, as do other utilities. Platte River's directors noted that 10 conditions would have to be addressed to achieve its 2030 target. Among those conditions is the need for matured battery storage technology along with steep cost declines.

Another is for a regional transmission organization, or RTO. An RTO enables more efficient access to the electric grid and pairs demands with renewables across a broader geographic area. The idea of improved dispatch and transmission is to allow Colorado and California to work more in

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tandem, along with Utah and Arizona and other states. An alternate idea would have Colorado sharing energy and demands with states in the Great Plains and their bounteous supplies of wind.

Integration of geographically diverse markets will give Holy Cross greater flexibility, says Beuning, allowing it to deepen the penetration of renewable energy. Think of using California sun to heat water in the late afternoon, or Colorado wind helping address the evening reduction in solar generation in the desert Southwest.

Twenty-five years ago, changes were few from year to year. Now, they're happening at an almost blinding pace. The race is on toward 100% carbon-free electricity, but there's a lot of hard work ahead.

Colorado air commission says 3 coal plants must retire by end of 2028 to help meet haze and greenhouse goals

It was described as a nudge, not a shove, but several electrical utilities said it is entirely unnecessary.

Colorado's Air Quality Control Commission on Nov. 20 voted to require three coal-burning units to be retired a year earlier than the utilities had planned. The plants are north of Fort Collins, south of Colorado Springs and near Craig.

The plan will be submitted to state legislators in January for ratification. See more at A nudge, not a shove.

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As Vail upgrades meeting center, questions about if it can also be net-zero?

VAIL, Colo. – Vail, the municipality at the eponymously named ski resort, adopted a climate action pledge in 2017 in conjunction with Eagle County. Kim Langmaid, who helped create that county-wide plan, had a question at a recent town council meeting that essentially asked whether the town was walking its talk.

Kim Langmaid

The precise issue was an upgrade to the mechanical system at the Donovan Pavilion, a vaulted venue located along Gore Creek popular for weddings and other events.

"We have greenhouse gas reduction goals, and I am hoping that this mechanical system improvement will improve the energy use," said Langmaid, the mayor pro tem.

In the long term, she added, it would be great to convert the Donovan Pavilion into a net-zero building. Were there such plans?

"We shouldn't just be looking at this as business as usual," she added.

The answer she got from the town staff members shepherding the project along amounted to a no. The problem being solved was driven by moisture reduction, but yes, this new mechanical system would be more efficient than the old one. As for net-zero, it would be hard to install solar on the roof because it isn't oriented well for solar production.

But Langmaid's point had been made. She wanted to communicate the idea about how to start thinking about the day when natural gas is reduced or even eliminated from the dozens of municipal buildings.

Can a car's battery also power the lights at home or work?

by Allen Best

Can electric cars keep the lights on at home or the office — or the recreation center?

Boulder has set out to learn the answer. This may be a first in Colorado. It has installed a new vehicle-to-building charger at the North Boulder Recreation Center. The bidirectional charger from Fermata Energy works both ways. It can deliver electricity from the building to the car, or electricity from the car to the building.

Why would this matter? Because of peak demand charges. The city government's rates are based on peak use. That typically occurs from 2 p.m. to 6 p.m., but especially on hot summer afternoons, electricity use can rise.

Xcel Energy, the utility serving Boulder, charges substantially more when it has high demand on its system. If Boulder can shave the peak off this mountain, it might be able to save money.

For this experiment, Boulder is using a Nissan Leaf from its fleet of 21 electric vehicles. The car's battery has 62 kilowatt-hours of storage. That's enough electricity to meet the average demand by a Boulder home for four days. The average home in Boulder uses 478 kilowatt-hours per month.

A recreation center uses a lot more electricity than that, of course. The idea is to shave off the peak.

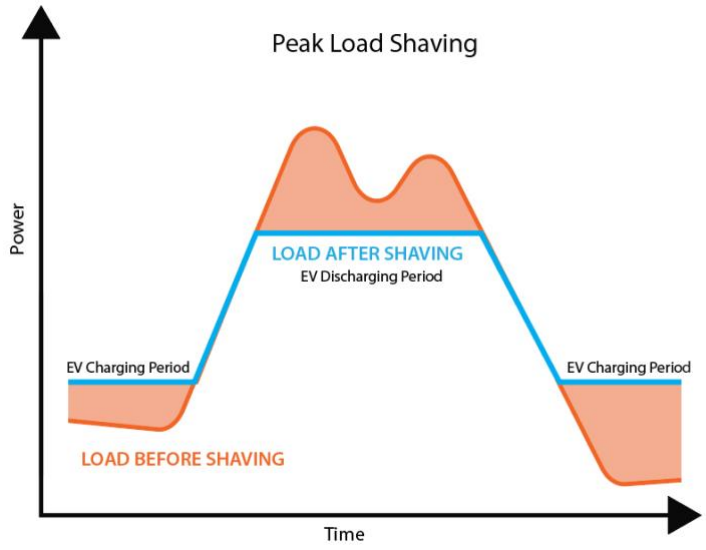
Matthew Lehrman, the city's energy strategy advisor says that the bidirectional charging infrastructure could be expanded to include 2, 5 or even 10 electrical vehicles. He expects results from the study to be ready to share in early 2021. It will be posted at the city's Department of Climate Initiatives website.

The battery of a Nissan Leaf has enough electricity to meet the average demand at a Boulder home for four days

What about when somebody needs the car? "The pilot is designed to allow the fleet driver to use the car any time it is needed. So, a charge or discharge cycle can be stopped at any time," Lehrman explains. "This would, of course, prevent demand management at that time but the hypothesis is that the vehicle is parked enough of the time to reduce peak demand.

It's unlikely this is the first time somebody has done this experiment. Certainly, innovative utilities in Colorado and elsewhere have been thinking about the possibilities. This trial in Boulder is an opportunity for the city to see how the technology works.

"This has been on our radar for a long time," says Lehrman. "The cars are just sitting there. The city is always looking to try new technologies. We were early adopters of the modified EVS in 2008 and 2009."



Lehrman says if this experiment pans out, the use of bidirectional charging could be expanded to more electric cars to create what is called a microgrid at an office park or even in a residential neighborhood. Most microgrids, such as the experiments conducted by Xcel Energy at the Denver neighborhood formerly known as Stapleton (now Central Park), have used batteries in homes.

In trying to create its own municipal utility, Boulder had wanted to push the envelope of new technology in ways to reinvent the grid and wring the carbon out of its electrical supply. In November, city voters chose instead to accept a new franchise with Xcel. That agreement calls for Xcel and Boulder to cooperate on innovations.

"Proving this technology is exactly the sort of thing that could be useful for the broader partnership," says Lehrman.

Fermata Energy, the company that installed the bi-directional charging system, conducted a demonstration project in 2019 that resulted in the new technology being the first in the world to be certified to a new North American Safety Standard.

This year, E Source—a leading research and advisory firm for the energy sector—conducted a case study that concluded that Fermata's V2G technology discharged less than half of the battery capacity of a Nissan Leaf for a peak 15-minute period and saved $191.79 in utility bills during a month in Danville, Va.

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In Aspen's water plan for next 50 years, wildfire and climate change top the list

ASPEN, Colo. – Climate change and wildfire will be top of mind as city officials in Aspen go about creating a 50-year water plan.

Aspen gets its water from two parallel watersheds drained by Castle and Maroon creeks, both fed primarily by spring runoff. The city has limited storage, good for about a half day.

"We are pretty confident that things are getting dryer and warmer," Steve Hunter, the city's utilities resource manager, told the Aspen Daily News. "If that snowpack is getting shorter, we are going to have less water supply with potentially a larger population that is here for a longer period of time."

This year was a warm-up for the future. Aspen had good winter snow but a warm, dry spring that continued into summer, resulting in water shortages.

Then there's the matter of wildfire—which is more likely to occur in a hot, dry year.

"The Maroon Creek and Castle Creek watersheds are directly adjacent to each other. If a wildfire started in one and grew. It would easily fall into the other one," Hunter said.

But the problems persist long after the fire – as Denver can testify, as it had severe wildfires in 1995 and 2002 in the foothills southwest of Denver drained by the South Platte River. The South Platte delivers 52% of the water for Denver Water in any given year. Sediment resulting from the wildfires clogged Denver's reservoirs, forcing expensive remedial measures. Aspen worries about the same, except that unlike Denver, it has little storage capacity.

"The big thing is, you don't want to have a wildfire – as just one of many potential

vulnerabilities – and then try to figure it out on the fly," Hunter said.

The plan Aspen intends to create with the aid of Carollo Engineers, a water consultant, will strive for flexibility.

"Climate science is changing almost daily," Hunter said. "We don't want to be locked into a 50-year water plan that—at the time, in 2020 – we were using this climate science, and then in 2025, we are learning more things. So we want to be able to adapt."

A tough time to be a tree in Colorado, but especially so in droughty San Juan Mountains

DURANGO, Colo. – Nearly all of Colorado's wildfires this year occurred north of Interstate 70. An exception was near Silverton, the town snuggled into the San Juan Mountains.

Near there, a fire that broke out on Oct. 19 went on to burn 600 acres, including along the trail to the above-timberline bowl containing Ice Lake. It was, notes the Durango Herald, the first fire to pose a threat to Silverton in 140 years. It might not be the last.

The San Juans have had several major fires in the last 20 years. There was the Missionary Ridge Fire in 2002, the West Fork Complex near Wolf Creek Pass in 2019, and the 416 Fire caused by the steam locomotive north of Durango in 2018.

Trees in the San Juan have become more vulnerable after four years of marginal precipitation and rising temperatures. Long gone are those winters when deep cold would sometimes knock back the beetles. The Herald reports that the spruce beetle has now damaged trees in nearly 1 million acres of the national forests in the San Juans, or nearly 30% of the forested landscape.

"It's a tough time to be a tree right now," Dan West, an entomologist with the Colorado Forest Service, told the Herald's Jonathan Romeo. "We've never seen anything like this before."

West said studies in the 1980s found about 20% of beetles used to die over the winter. "We don't see that anymore."

In California, two more big cities decide it's time to begin moving beyond natural gas

OAKLAND, Calif. – San Jose and Oakland have joined other cities in curbing opportunities for use of natural gas in buildings.

The East Bay Times noted that San Jose was the largest U.S. city so far to take this leap, although more than three dozen smaller cities across the nation, but mostly in Colorado, had already done so. Berkeley became the first city to prohibit natural gas when it passed an ordinance in 2019; San Francisco recently followed suit.

San Jose's move expanded upon a city ordinance that went into effect in January barring natural gas in new single-family homes, detached accessory dwelling units, and multifamily buildings up to three stories. Excluded from the ban are existing buildings, hospitals, and new dwelling units attached to existing homes.

Oakland's new law requires all developers to design new residential and commercial buildings without natural gas. They can apply for waivers for "technology feasibility reasons." Existing buildings, additions, and accessory dwelling units are unaffected by the legislation.

A key question in San Jose was whether fuel cells powered by natural gas or hydrogen will offer a viable path to the future. That's the business of Bloom Energy, a company based in San Jose. The chief executive, Carl Guardino, argued that intermittent renewable resource must be paired with reliable generation such as the

Bloom boxes to "keep the lights on and businesses running."

Meanwhile, the pushback grows against such bans. Arizona, Tennessee, Louisiana, and Oklahoma have all enacted laws barring local jurisdictions from banning new natural gas in buildings. Similar efforts had been introduced in Missouri, Minnesota, Mississippi, Kentucky, and Georgia.

An industry-initiated ban was pulled from the ballot in Colorado earlier this year after an agreement brokered by Gov. Jared Polis.

The Salt Lake Tribute reports that Utah legislators will consider a similar statewide prohibition on local bans at their coming session.

"We should have customer choice when it comes to energy," bill sponsor Rep. Stephen Handy told the Public Utilities, Energy, and Technology Interim Committee. "As policymakers, we should allow for customer choices, whatever the market dictates, whatever that is. We shouldn't prohibit customer choice.

Democrats dissented, arguing that since there were no such proposals, the bill serves no real purpose.

The Tribune reports that the bill passed on a party-line division.

Dominion Energy owns Utah's largest natural gas utility, Questar, and also "Wexpro, a gas exploration and production firm with operations in Colorado, Utah and Wyoming."

Sammy Roth, of the Los Angeles Times, reports that at a recent webinar, a Dominion Energy executive was asked whether he foresaw local gas bans spreading from California to other parts of the country.

"Unless we do something about it, they will spread," said Donald Raikes, the company's president of gas distribution.

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Must-reads in the Economist: "Making coal history"

This is why the Economist charges $119 per year for a subscription—and I happily pay it. The cover story is about the ending of the age of coal.

These two pieces are at once very local and very global.

It begins locally to the Rocky Mountains, a note about the closing of the Escalante plant in New Mexico in a few months (owned and operated by Tri-State G&T – see story beginning on page 15)—but goes global. Also giving local flavor are mentions of Peabody, the coal-mining company with operations near Steamboat Springs as well as extensive operations in Wyoming's Powder River Basin, which warned in November that it might file for bankruptcy for the second time in five years. There's also mention of the Rocky Mountain Institute.

The global story is bifurcated.

In England, where the industrial revolution began in the 1770s on the foundation of coal, the last coal-fired power plant may close by 2020.

Asia is currently home to nearly 80% of coal consumption. Most of that – 52% of the

global total—takes places in one country: China, followed by India.

The cover art is memorable: a lump of coal under glass, as in a museum exhibit. It's identified as "Coal 18th century-21st century."

See: "Time to make coal history: Coal is at the toxic heart of the fossil-fuel economy."

Also: "Coal's endgame: The dirtiest fossil fuel is on the back foot."

Wyoming tightens belt, but funding to protect coal markets remains intact

CASPER, Wyo. – The Casper Star-Tribune reports that that amid the $500 million in budget reductions in Wyoming, two provisions remained intact:

• a clean coal marketing program; and

• an effort to sue the state of Washington for blocking a coal export terminal

The two efforts represent just $3.45 million in allocations compared to the $500 million in total budget-cutting proposed by Gov. Mark Gordon.

"But the lack of cuts to coal underscores just how committed the state is in its fight to reverse the misfortune of the state's traditional industry, even amid an economic downturn partially driven by coal's decline," the newspaper says. After talking with several energy analysts, the Star-Tribune's Camille Erickson described those investments in coal as a "small bet on a risky hand."

Wyoming's legislature last year authorized $1 million for a coal marketing program, which was interpreted by the governor's office to mean beefing up lobbying to keep coal-fired power plants open and championing the economic benefits of Wyoming coal across the country. But that effort flies in the face of powerful economic forces. The Energy Information Administration predicts coal production could fall by 26% this year. Last year, production was the lowest since 1975.

Wyoming a decade ago mined 400 million tons; last year the output had fallen to 267 million tons.

And that total will fall even more in coming years as coal plants along the Front Range of Colorado cease operation, the first in 2022 and continuing on until late 2028.

Can a federal stimulus package help Wyoming? The newspaper's Erickson talked with a professor at the University of Michigan who studies state and federal energy policy.

"There are going to be energy bills linked to that stimulus bill," Barry Rabe said. "And every state is going to be looking for the most advantageous terms. It's really questionable that coal is going to be center stage in any kind of major stimulus package. I just do not hear the word 'coal' as part of the American or global energy future very widely anymore."

But, of course, Asia continues to build more coal plants. So might that terminal in Washington state be an answer?

Skeptics tell the Star-Tribune that winning the lawsuit is still a long shot. Beyond the lawsuit lie further challenges: permits and the lack of capital.

Steamboat and other Yampa Valley towns/counties seek aid to fund solar project

STEAMBOAT SPRINGS, Colo. – Towns from Yampa to Craig along with Routt and Moffat counties have applied for a $2.1 million state grant to fund solar projects, reports the Steamboat Pilot.

"Everybody is transitioning to the new energy economy," said Gary Suiter, the city manager of Steamboat. "Being a ski resort town, there has to be a sensitivity to climate change and reducing greenhouse gases."

Kit Carson Wind Power has 51 megawatts of capacity available to Tri-State Generation and Transmission. Photo/Tri-State

A blueprint still on drafting table: the Tri-State plan for its big energy pivot

by Allen Best

Tri-State Generation and Transmission submitted plans to Colorado regulators this week that describe how the utility, the state's second largest, plans to shift from a coal-heavy power-generation portfolio to one dominated by renewables during the next 10 years.

It's a house with the blueprints still incomplete but with the potential for some oh-wow features. That could take some time.

The preferred scenario identified by Tri-State in the filing with the Colorado Public Utilities Commission calls for new 1,850 megawatts of additional renewable generation in the next several years to augment the existing 2,000 megawatts of renewable generating capacity. It also envisions 200 megawatts of energy storage.

Tri-State also intends to retire the 1,283-megawatt Craig Generating Station. There, it operates three units, two in conjunction with other utilities. It was ordered by the Air Quality Control Commission in November to close the final unit by the end of 2028. The first unit is to close in 2025. All of this will move Tri-State along toward its commitment to Colorado of 80% carbon reduction from its electricity delivered within Colorado by 2030. Two other utilities, Colorado Springs Utilities and Platte River Power Authority, have also voluntarily agreed to the commitment, and Xcel Energy is bound by law to the 80% reduction.

First utility resource plan in Colorado under new carbon-constrained rules

Tri-State owns 461-megawatts of generating capacity from the Laramie River Station near Wheatland, Wyo. Current retirement is scheduled for 2033. 2008 photo/Allen Best

But there's also much uncertainty about the path forward for Tri-State, which delivers power to 17 member electrical cooperatives in Colorado and well as 25 cooperatives in three adjoining states. Those member cooperatives deliver electricity in 56 of Colorado's 64 counties.

One major question involves what Tri-State will do about its imported power from coal plants in Arizona and Wyoming. It likely cannot hit the 2030 carbon-dioxide reduction targets to which it voluntarily committed in November without minimizing that coal-based production.

In its 2,886-page filing, Tri-State say it plans to engage in discussions with the Salt River Project, a utility in Arizona and other parties involved in the 417-megawatt Springerville 3 unit. Tri-State leases the unit.

Laramie River Station is another question mark. Tri-State's preferred plan does not call for retirement of the coal plant at Wheatland, Wyo. until 2033. However, there has been "no agreement in place" with co-owners of the plant, of which Tri-State owns 461 megawatts of capacity.

Also uncertain is the growth rate. Tri-State assumes a growth rate of 1.5% per year in electrical demand, but that may be less if some members leave Tri-State. Brighton-based United Power and Durango-based La Plata Electric, which together represent more than 20% of electrical demand supplied by Tri-State to its members, have taken legal action to get out. What could also shift demand is how environmental regulations influence the rate of oil-and-gas extraction, a major user of electricity. Long-term impacts of covid-19 also remain uncertain.

As it integrates higher levels of renewables, Tri-State sees natural gas as a backup plan. But that's not a given.

"Tri-State would prefer to delay irreversible resource decisions as long as possible, particularly related to capital intensive options," said the filing. "The next 12 to 24 months will be particularly informative in regards to Tri-State's projected system load. Additionally, Tri-State would prefer to allow additional time for technology to advance non-carbon dioxide emitting dispatchable options that will potentially be more cost-competitive with thermal resources in the future."

Fossil fuel-generated electricity, both from coal and natural gas, requires water to produce steam.

Duane Highley, chief executive, in a statement issued in conjunction with the filing of the electric resource plan, also stressed the preliminary nature of the filing.

Duane Highley

"Our preferred scenario identifies potential resource options, including battery storage and natural gas generation, but we do not have to commit to a path at this time," Highley said. "There will be time for emerging technologies to become competitive before we have to make acquisition decisions."

In October, Highley said existing battery technology is insufficient to meet Tri-State's needs as it closes its coal plants between 2025 and 2030. He cited the example of weather – as had occurred several days before – that caused wind turbines to ice up, stopping production. Lithium-ion batteries store energy for four hours, but Tri-State and other utilities need storage for at least several days.

"We are looking at what is happening with hydrogen. We have 3 to 4 years before we have to make that decision and start committing money," Highley said at a Switch Colorado forum.

Highley has also emphasized need for a regional transmission organization with day-ahead scheduling, to help pool renewable resources across a broad area, much larger than Colorado. He has pushed for expansion of the Arkansas-based Southwest Power Pool's RTO integration into the Rocky Mountain states.

"To achieve the high levels of renewable integration in our electric resource plan filing, it will be necessary for Tri-State to participate in an RTO in the West," he said in the press release.

If only a few steps behind Xcel Energy in its shift from coal, Tri-State stubbornly resisted change for many years. Highley arrived at Tri-State in 2019, charged with the task of turning the big ship. There's still much skepticism among some members about the pace of change. This skepticism was reflected in quotes from a release from the Western Clean Energy Campaign.

"It's encouraging to see Tri-State responding to some of the priorities of its members," said Pinewood Springs, near Lyons, resident Rebecca Henderson, who gets her power from Tri-State member co-op Poudre Valley Rural Electric Association.

"We've been waiting a long time for Tri-State to move more aggressively into clean energy. But it's still troubling to see that it refuses to let go of coal and gas, which will force us to pay far more for our electricity than customers of other utilities that are transitioning to wind, solar and storage more quickly."

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Tom Darin, the western regional representative for the American Wind Energy Association, had a different take during a recent webinar.

"This is not the Tri-State of 5 years ago or 10 years ago," he said in introducing Zach Pierce, the energy and climate advisor to Colorado Gov. Jared Polis. He attributed the shift to the Polis administration.

This is the first time Tri-State, Colorado's second largest utility, has submitted electric generating plans to state regulators. The submission was mandated by a 2019 law. Xcel Energy, the state's largest utility, will similarly file a resource plan in March.

Erin Overturf, deputy director of the Clean Energy Program for Western Resource Advocates, points out that these resource plans will be the first to be filed in Colorado within the carbon-constrained framework adopted by Colorado in 2019.

Those carbon constraints include evaluating projects through the lens of the social cost of carbon. It was $46 per ton of carbon dioxide emissions in 2019 but which has been adjusted upward to reflect inflation. It is estimated to reach almost $68 per short ton by 2030 and $99 by 2040.

Erin Overturf

This new framework combined with the approach of using requests-for-proposal from energy companies for most new resource acquisitions could very well result in some very innovative projects and approaches in Colorado.

"I expect we will see some innovative projects being bid into these upcoming electric resource planning cycles," she says. "And, similar to Xcel's 2016 resource plan, some may be surprised to see new clean technologies emerging as cost-effective. With strong resource planning rules as the foundation, Colorado has set itself up for success."

Xcel's request for proposals yielded jaw-dropping prices for wind, solar and storage projects in 2017. Those projects are now being executed, mostly in the Pueblo area, in anticipation of closing of two coal-burning Comanche units in the next several years.

"Our resource planning process is really notable in the way that it harnesses competition to drive results for customers, and you saw that in the (Xcel Energy) Colorado Energy Plan."

In 2021 and 2022, said Overturf, she expects something similar that "will cause me to go, 'Oh wow!'"

Gunnison County co-op manager says Tri-State story has been oversimplified

GUNNISON, Colo. – Mike McBride, the general manager of Gunnison County Electric Association, tells the Crested Butte News that there's more to the story about Tri-State, his co-op's wholesale supplier.

True, Tri-State's prices are higher than other providers, he said, but co-ops own more miles of energy lines for a smaller return on kilowatt-hour sales. Gunnison, the municipality, has more sales per mile of distribution line, and that's also true for Xcel Energy.

As for solar being less expensive, he said, it's misleading. "It's like comparing the total cost of ownership of a car, insurance and infrastructure versus the cost of gasoline,' he said.

Gunnison County Electric plans to add local renewables, including a 3-megawatt hydroelectric power plant, which he says will have three times the production of a comparable 3 megawatts of solar. His co-op, however, is also planning several solar projects, including one located potentially at Crested Butte.