BIG PIVOTS

ENERGY and WATER transitions in Colorado and beyond

June 27, 2022 BigPivots.com Issue No. 58

New study finds flows of Colorado River far worse 2,000 years ago

by Allen Best

The Colorado River Basin has suffered a handful of extended, deep droughts. We're in one of them. But as bad as the current drought is, leaving reservoirs far more empty than full, new evidence has emerged of an even worse drought. It occurred 2,000 years ago.

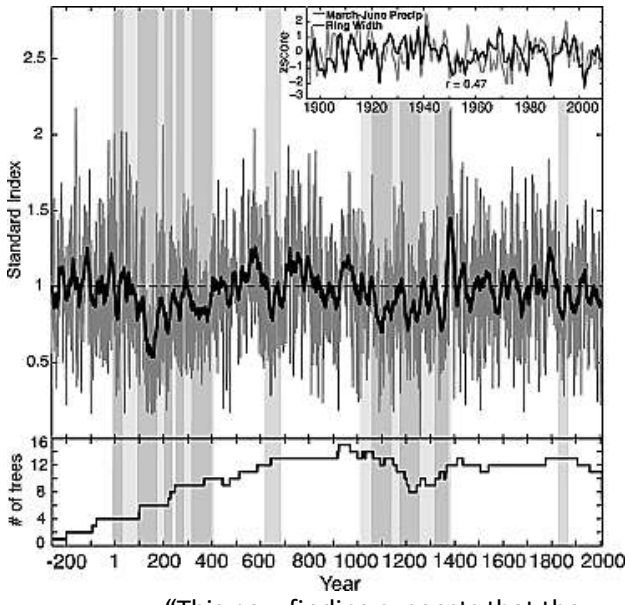
"The new findings should "help water managers plan for even more persistent and severe droughts than previously considered," said Subhrendu Gangopadhyay, the lead author of the study that was published in Geophysical Research Letters. Gangopadhyay is principal engineer for the Water Resources Engineer and Management Group at the Bureau of Reclamation.

The definition of average used by the team of researchers was the average of flows recorded at Lees Ferry since 1906. This location below Glen Canyon Dam is the official dividing line between the lower Colorado River Basin and the upper basin. The latter is where nearly all of the river flows originate, more than half in Colorado.

The new research finds that compared to the current 22-year drought in the Colorado River, with only 84% of average water flow, it was surpassed by a 22-year period in the second century, when the average water flow was 68% of average.

Paleoclimatologists have long known of severe droughts in the Colorado River. One occurred in the late 16th century, about the time Spanish colonists were staking claims in the Southwest, and others occurred midway through the 12th century, and again in the late 13th century, about the time the ancestral Pueblo were vacating cliff dwellings in Mesa Verde.

This new study stretches the record deeper into the past.



"This new finding suggests that the range of natural hydroclimatic variability in the Colorado River is broader than previously recognized, setting a new bar for worst-case scenario from natural variability alone," the study concludes.

Grand Canyon boaters gather in late May at Lees Ferry, the hydrologic divide between the upper and lower Colorado River Basins. *Photo/Allen Best*

In other words, Mother Nature could deliver even worse.

That's not even including the effect of artificial heating of the atmosphere caused by accumulating greenhouse gases. Previous studies have calculated that a third to a half of the reduced precipitation is due to global warming.

Paleoclimatologists have a variety of tools for establishing precipitation of past centuries. Tree rings reflect growing conditions, especially precipitation. Wider bands correspond with more moisture, narrower rings less.

These tree ring studies have been catalogued at many areas. For example, one of the researchers in the current study, Connie Woodhouse, then affiliated with the University of Colorado at Boulder but now with the University of Arizona, has studied Douglas fir trees near Eagle among many other places.

Prominent in this study was research conducted in the San Juan Mountains southwest of Alamosa, near the former mining site of Summitville. It is not in the Colorado River Basin but it does reflect the climate in the San Juan Mountains, which provides a tributary for the Colorado River. That particular site showed a severe drought in the second century, the driest in the last 2,250 years.

For this study, tree rings were not enough. There were just a few fragments. "Tree-ring records are sparse back in the second century," said Woodhouse. "However, this extreme drought event is also documented in paleoclimatic data from lakes, bogs, and caves."

Researchers also used statistical method called grid-point reconstructions.

The take-away, once again, is that the natural drought could lift from the Colorado River Basin next year. Or it could deepen.

As for the aridification caused by greenhouse gases in the atmosphere, we're likely stuck with that even if a miracle occurs and the world figures out how to stop the production of carbon dioxide and other gases.

On the cusp of a huge shift in how we create energy

by Allen Best

A cliché seems like a terrible way to begin a story that strives for deeper analysis of this milestone in Colorado history, but I'm not clever enough to come up with my own simile or metaphor, so here goes:

Colorado's reinvention of its energy system is like trying to rebuild an airplane in mid-air. Plans by Xcel Energy, by far the state's largest utility, to revamp its electrical generation constitute the most compelling exhibit.

It's a time of triumph but also of great uncertainty as Colorado hurries to make investments in electrical generation and transmission that could cost $10 billion.

Colorado has been flying a plane using technology and infrastructure from the 1970-1990s. The rebuilding has been underway for awhile now, particularly since 2016, after prices of wind, in particular, had plummeted, and utilities satisfied themselves that they could integrate renewables without endangering reliability.

Now comes the giant stride. This coupled with new transmission could yield investment of up to $10 billion.

I'd suggest that Colorado has had few singular rivals in the last 100 years in terms of investment in public and quasi-public infrastructure. The splurge of roadbuilding unleashed by the National Interstate and Defense Highways Act of 1956 certainly surpasses this. I'd single out the Colorado-Big Thompson water diversion project of the '40s and '50s. Arguably construction of DIA, too. Buy me a beer, and we can chew through this at length.

But by whatever yardstick you choose, this is – and you knew I had to say this – a Big Pivot. This represents Colorado's most muscular turn yet from centralized power generation from fossil fuel sources to more dispersed renewables.

The landscape of eastern Colorado can be expected to look substantially different by the end of 2025. The plans — approved conceptually in a series of meetings during recent weeks by the Colorado Public Utilities Commission —will yield thousands and thousands of new wind turbines during the next few years scattered across eastern Colorado, likely massive amounts of solar, and game-changing amounts of storage. I can't cite precise numbers, because they are yet to be worked out.

More clear is the transmission needed for this farm-to-market delivery of renewable energy: up to 650 miles of high-strung wires looping around eastern Colorado in a project called Power Pathway. Also possible is a 90-mile extension from a substation north of Lamar to the Springfield area.

Driving this hurried, gold rush-type of development in Colorado's wind-rich regions is the state's determination to dramatically reduce carbon dioxide emissions from electrical generation during this decade. It aims to do this even as it displaces use of fossil fuels in transportation and for space and water heating in buildings.

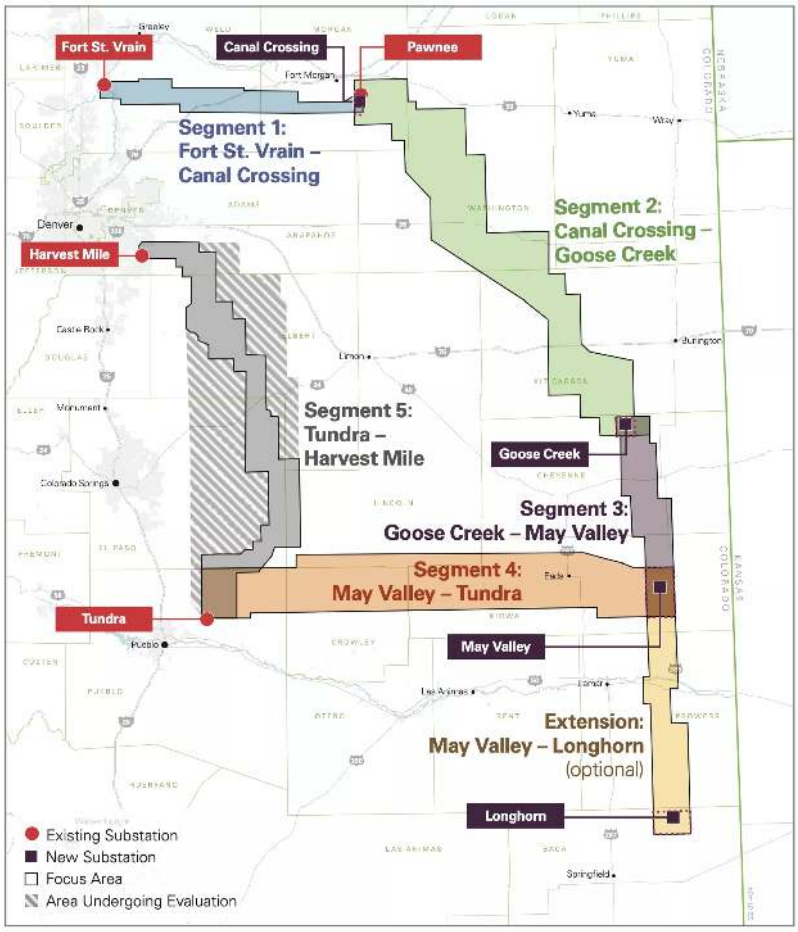
A hard deadline is imposed by the expiration of federal tax credits for wind and solar at the end of 2025.

An Xcel representative, Amanda King, had testified to the importance of completing the first two Power Pathway transmission segments sooner rather than

later. The PUC commissioners cited that testimony in their June 2 decision approving the transmission lines:

"The company asserts that by having these segments in-service by the end of 2025, wind and solar developers will be able to interconnect resources prior to the expiration of the production tax credit and step-down of the investment tax credit, which would represent cost savings of approximately $300 million per (gigawatt) of interconnected wind capacity and $100 million per (gigawatt) of interconnected solar capacity, in net present value, to customers," the decision said.

"It's a pretty amazing amount of infrastructure that needs to go into the ground in a really short time," says one individual, a stakeholder in the PUC process, speaking on condition of confidentiality.



This is Xcel's rough map of its planned transmission in eastern Colorado – and hence an indication of the new wind and solar resources. For a somewhat more precise view of the segments, go to Xcel's Path Pathway website.

Because of that exigency, a written decision is likely in July, no later than August. Appeals by Xcel or other stakeholders could delay the actual green light, but not for long.

For some, this represents a triumph of arguments going back almost two decades.

"It helps unleash the innovation we need to build the 21st century electrical system," said Leslie Glustrom, who wears various hats but was speaking as a representative of the Colorado Renewable Energy Society the day I talked with her.

She uses the metaphor of inheritance vs. income. In this case, fossil fuels are the inheritance. In the future we must live off the income of renewables.

"If you were lucky enough to have a big inheritance you could buy three houses and five condos," she said. Living off income poses a major challenge, she says, especially if you haven't acquired the skills you need.

"We can do it," she adds, "especially if we are better at matching our demands to the times when we have an abundance of wind and solar."

Risk is inherent in this process of transition. But risk cuts both ways, as pointed out by Gwen Farnsworth, senior policy advisor for Western Resource Advocates. The PUC deliberations are

focused on how to evaluate those risks of relying upon fossil fuel generation in terms of system reliability and climate change. The commission, she says, is "pushing Xcel so that its future resources are cleaner, more flexible and more reliable."

With this triumph also comes anxiety. The three commissioners used the word "uncertainty" maybe a dozen times when they deliberated during a long afternoon on June 10.

"We are making decisions about billions of dollars of investments under conditions that may have unprecedented uncertainty," said Eric Blank, the chair, while mentioning climate change, inflationary pressures, rising labor costs, and supply chain disruptions.

Renewables won't be the steal they were in 2018. Demand has grown. This is the gold rush. California alone wants to add 8,000 megawatts of renewable generation.

Closely related is the growing concern about "resource adequacy" mentioned by Commissioner Megan Gilman and also Commissioner John Gavan. Can Xcel keep the air conditioners on during a really, really hot day—or, as in February 2021, on a very cold day?

Later, I talked with Jeffrey Ackermann, the chair of the PUC for four years prior to Blank, to get his big-picture assessment of what this represents.

"I think everyone – regulators and utilities, but stakeholders, too – are eager to move forward while also realizing that you can't get it mostly right. It has to be 100% right."

Ackermann was referring to the greater complexity of the electrical grid being assembled with its more diverse resources and greater interplay between utilities and consumers. The stakes have also elevated.

Overlay that onto the burgeoning Western markets that are still taking shape, which provokes new questions about resource adequacy and reserve margins. What if the interconnected utilities from Montana to New Mexico get struck by a heat wave at the same time?

In the PUC handling of this complex case, Ackermann commends his successor, Blank.

"I like how this chairman has sequenced the conversation," he said. "It affirms the complexity of this and also the uncertainty. At the same time it doesn't shy away from realizing that some tough decisions need to be made now if you want to achieve 2030 goals and beyond. It's a tough balance."

"The more inclusive and integrated our planning and the more far-sighted the planning, the better we can handle the uncertainty."

Ron Lehr
Former PUC chair

Ron Lehr, who chaired the PUC beginning in 1983, concedes the complexity, acknowledges the uncertainty – although pointing out that in 1983, interest rates stood at 18%. (I can confirm; I was suffocating that year, paying 21% interest on my loan for a purchase of a trailer in Granby).

Colorado's planning process, says Lehr, deserves credit. For outsiders, it's maddeningly complex and anything but transparent. Even those deeply engaged in the process sometimes get frustrated with the filing system at the PUC. Joe "Schmo," public citizen? Fuggedaboutit.

Despite these shortcomings, Lehr argues the process itself has been very effective and has improved over time. It creates a forum for diverse voices to exchange ideas.

That process yields some crackpot ideas, he said, "but you weed through them. Then you can diversify your thinking and create a lower-risk template that can attract investment from the private sector."

Colorado's process, he added, has drawn national attention for yielding lots of

Maybe athletes at Lamar, currently known as the "savages," should become the "blades," in recognition of the local wind farms. *Photo/Allen Best*

bids for electrical generation — and lower prices.

"The more inclusive and integrated our planning and the more far-sighted the planning, the better we can handle the uncertainty," he told me.

The story about moving on from coal is the easy story here, but Lehr thinks a side story – about the impacts of Winter Storm Uri on natural gas prices in Colorado — will move the needle past natural gas, too.

"Gas is a bankrupt long-term strategy. You don't have it when you need it."

Back to the metaphor of rebuilding the airplane in mid-flight. It was given to me by Mike Kruger, the chief executive of the Colorado Solar and Storage Association, and in a far more colorful way than I've articulated here.

We wouldn't be remodeling this plane in flight if it wasn't necessary, he says. Yes, uncertainties exist, and likely new uncertainties will become apparent. But the status quo of centralized fossil fuel generation isn't working.

"We have to try something."

Despite its cumbersome aspect, he believes Colorado's legal structure and the stakeholders – Xcel but also the business, consumer, environmental, government, and other groups – have enough flexibility to respond rapidly if necessary.

"If in two and a half years we find we missed the mark on something, I would be surprised if the industry and the environmental and labor groups and Xcel would not be able to figure how to correct it quickly."

That brings up Colorado's newest coal plant, not quite a dozen years old, and also its largest, at 750 megawatts: Comanche 3.

(Some refuse to call it by that name in the belief that it besmirches tribal people. I couldn't help note that almost invariably in the PUC discussions it was referred to as

unit 3 or Pueblo unit 3." Maybe Leslie Glustrom's rants on this are being heard).

When the plant was formally approved in 2005, Colorado's first major wind farm, Colorado Green, located near Lamar, had just begun producing electricity. It was the future, not coal, but most utilities had not yet gotten that memo. Tri-State was about to start spending $100 million on a humongous coal plant downstream along the Arkansas River in Kansas—a decision from which it has not fully recovered. And, of course, Comanche 3 cost upwards of $1 billion in today's dollars. Xcel still had humongous debt, a central issue in how soon it is retired.

Two-thirds of Xcel Energy's electricity in Colorado came from coal in 2005. Now it's a third. It will likely be very close to zero by 2030.

Coal's rapid fall from favor and competitiveness is told in these numbers. The fuel produced 66% of Xcel's electricity for Colorado retail and wholesale customers in 2005. Last year It had fallen by more than half, to 32%. It should be close to zero by 2030. (Xcel may still buy some power from the market that will come from coal plants).

As Noah Long of the Natural Resources Defense Council pointed out in a May 25 posting, this electric resource plan being approved could put Xcel on track to achieve approximately 90% carbon emissions' reductions as compared to 2005 when Comanche closes, no later than New Year's Eve of 2030.

Actually, the plant will likely close before then, perhaps long before.

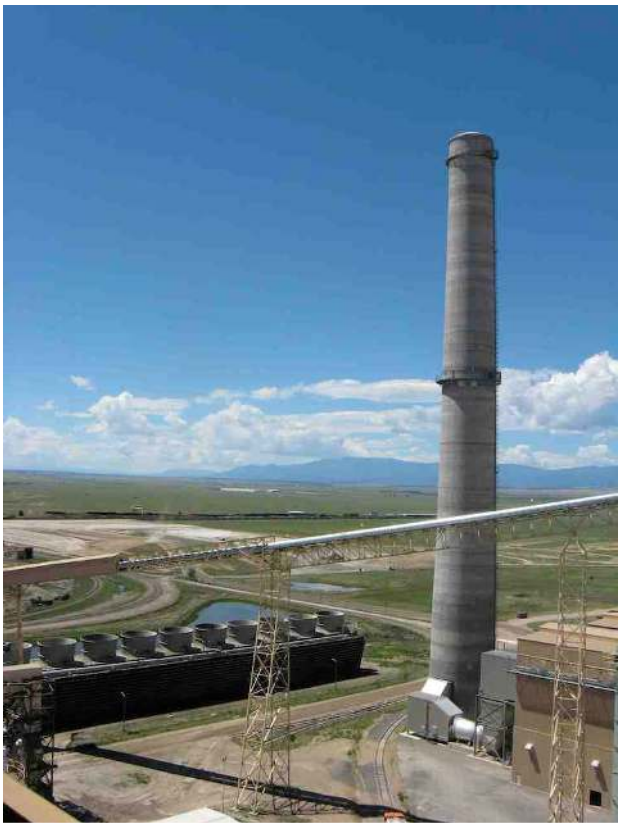
Operations of Comanche will be determined, in part, by a new filter, the social cost of carbon, as specified by new Colorado laws in the last several years.

Another element of the plan being approved by the PUC will create a performance-incentive mechanism (PIM, in the acronym-heavy soup of PUC discussions) to give Xcel financial incentives to steer the plant with decarbonization goals in mind.

The PUC commissioners are going beyond the settlement agreement submitted to them in May by Xcel and the various stakeholder groups. At the suggestion of Blank, the commissioners plan to adopt an additional review governing operations and management that is to be tripped if another major investment is needed to continue operations of the plant.

At issue is how much money will be poured into propping up what one person close to these proceedings described as a "dog." The analogy is to a car. At what point do you just walk away from it?

"Five years down the road we may have another turbine-bearing outage, and it just isn't worth it," said Commissioner Gavan,



Comanche 3 was completed in 2010. ***Photo/Allen Best***

alluding to the cause of the most recent outage that has had "Pueblo unit 3" off-line for most of 2022 (it's back in operation now). It was also off-line for most of 2020.

It seemingly has been cursed with problems since it began operations in the summer of 2010. The latest evidence was the deaths of two men in a slide of coal outside the plant on June 5. Their bodies were found under about 60 feet of coal.

A sharper definition of the closing should come into view during a "Just Transition" proceeding that begins in 2024. That proceeding will consider another round of new generation, presumably renewables, likely with a preference for those that can be added to property tax rolls in Pueblo County, to compensate for the loss of property tax there as the coal plants get retired.

In all this, the PUC has much balancing to do. Xcel is ultimately responsible for reliability of electricity, the PUC in protecting the interests of ratepayers. At least in theory – and I believe in practice – both have an interest in reducing greenhouse gas emissions, while Xcel has the additional motivation of delivering profits to investors.

This gets into a complex area of cost-recovery. As Glustrom points out, "these are not insignificant numbers." The Colorado Renewable Energy Society documented undepreciated assets of the Hayden coal units of somewhere around $70 million, the Pawnee plant at Brush of $170 million, Comanche 3 even more.

Glustrom has long argued that state regulators allow Xcel and its investors unreasonably large returns on their investments. The authorized rate of return is 9.3%. If the utility's decisions are risk free, then the return on equity should be below 5%, she says. Most everybody else is inclined to be more generous to Xcel than Glustrom.

What almost certainly will come into play is a concept called securitization. It's fundamentally a way for an investor-owned utility to shuffle its debt into lower-interest long-term bonds. This will be part of the process going forward and, once again, could alter the retirement date of Comanche 3.

This area of cost recovery, almost certainly will be controversial – and might trigger an appeal by Xcel.

Three of the many additional elements of this deserve mention.

Preconstruction development

One is the idea advanced by Blank to give Xcel some leeway to begin planning and incurring expenses for gas-fired generation, but also wind, solar, and storage – with the expectation that the company will be able to recoup costs short of actual commissioning construction of the assets. It's called "preconstruction development assets."

This provision reflects the concern about the uncertainties and fluidities that Blank talked about in the June 10 meeting. This gives the company some rope to move forward but only so far.

Status of water

Another new element never seen before in Colorado – and perhaps no other state, either – is a provision that Xcel must report the status of its water rights associated with its retiring coal plants. Think particularly of Hayden, although Xcel has an interest in the coal plants at Craig, too. And then there is Comanche 3.

At first glance, this seems like a strange requirement. After all, Colorado state government already has a Division of Water Resources. Why does the PUC need to poke its nose into water?

That was essentially Xcel's argument. The PUC commissioners, though, hesitated not at all in embracing this requirement

Five coal-burning units at Craig and Hayden now require water, but by 2030 those uses of Yampa River water will crease. Future uses remain unclear. ***2020 photo/Allen Best***

The idea had been advanced by Western Resource Advocates. WRA's Ellen Howard Kutzer explains the expansive view here: Water is an essential component of the coal-fired steam plants built by the monopoly to create a public good, the production of electricity. As the coal plants go, the PUC should have some purview over the disposition of those assets. And Xcel has the staff that can provide the essential information in a way that is understandable to PUC staff.

True, the state water agency gets the same information. But the water world gets weirdly wonky at times. So, Xcel's water staff can translate it for non-water-wonks. It won't be a major imposition.

But why does this information matter?

Xcel likely has not decided, and certainly has not disclosed, what it will do at Hayden. It has talked about molten salt but has not dismissed the possibility for green hydrogen or other technologies that may – or may not – be ready for prime time. They can involve water.

The way Western Resource Advocates sees the water, it should be considered as part of the just transition process for Yampa Valley communities. The water that is kept there will most benefit the local communities.

The fear here is of water export, particularly to the Front Range. I dove deeply into this in late 2019 and early 2020 on behalf of Aspen Journalism. Geography matters entirely here. Exporting the water would require pumping it over two mountain ranges. That's a big lift. That said, money has surfaced recently to reanimate the even bigger stretch of exporting water from Flaming Gorge Reservoir to the Front Range, so who knows.

Just how much water is involved in water for the coal plants? I forget the precise volumes, but they are not as much as you might think, but neither were they insignificant. Importantly, they have relatively high seniority.

WRA's position, Howard Kutzer said, is that it's not right to leave the utility to do with the water entirely what it pleases.

"They used these public resources to create a public good, so ultimately — not now, but in the future — the PUC should be able to say whether transferring those water rights is in the public interest."

Level playing field for storage

Finally, the PUC affirmed their support for the treatment of storage proposed by Colorado Solar and Storage.

"Storage will be a critical path to getting the grid of the future that we want," said Gilman at the June 10 meeting of the commissioners in endorsing the recommendation of the trade group.

The critical issues here are of the value assigned to storage and the role of private operators in providing that storage as opposed to company-owned storage. The limitations of storage are well known. Lithium-ion batteries currently can store reserves for about four hours. Because of that, Xcel Energy wanted to assign a lower value, but others wanted a higher value. This outcome favors higher value and hence greater incentive for private developers to propose projects.

Other elements of this plan being approved could deserve mention. An entire story could be written through the lens of Pueblo County (and maybe I will—later).

Or through the lens of Akron, or Cope or Walsh, places on the eastern plains near which these new transmission lines will be draped, along with wind turbines. I hear diverse voices. Some resent the coming wind turbines, an intrusion into rural life to benefit city residents. Others – more commonly those who will directly benefit from lease payments – welcome the development of wind and solar resources.

This won't solve all the problems of eastern Colorado, where mechanization has left farmers arguably more prosperous but it's the main street of towns ever more anemic. Many, like Yuma County, had larger populations 100 years ago than they do today. Several times in recent years, I've had young people from eastern Colorado say to me, "I just wish Kit Carson had two or three restaurants," or "It would be nice if Lamar was just a bit bigger."

This won't make that happen, but it will at least slow some of the erosion.

What's next in this transition? So many things are up in the air. Rules are being drawn up governing the minimized use of natural gas in buildings (and boy, is that stuff tedious).

Then there will be the question of demand-side management and energy efficiency. Xcel is expected to submit its plans for that and for beneficial electrification of buildings on July 1. Expect a lot of push and pull here, as there has been over Comanche 3. The environmental community believes Xcel has vastly under-estimated what it can do in terms of reducing demand and shaping demand to better correspond with this vast fleet of renewables soon to take shape on Colorado's High Plains.

There's good cause for high-five's, but there will be little time to dawdle.

What will be left for the new transmission authority to decide?

Xcel Energy has received the official decision from state regulators that will allow it to start building up to 650 miles of transmission in eastern Colorado that could top out at a cost of $1.7 billion to $2 billion.

Public Utilities Commission members in February had agreed to authorize the transmission additions, called Colorado's Power Pathway project. See: On the brink of yes in Colorado

The five segments approved by PUC commissioners will create a new loop of 650 miles high-voltage transmission lines connecting new renewable energy on the eastern plains to Xcel's customers along the Front Range. See map

PUC commissioners also granted conditional approval of a 90-mile extension in southeastern Colorado from the May Valley substation near Lamar to the Springfield area, which has some of the steadiest and strongest winds in Colorado.

This new transmission will be needed for Xcel to develop renewable resources as it closes coal plants in Hayden and Pueblo and gears up to provide more electricity to displace fossil fuels in transportation and buildings. It has committed to reduce carbon emissions 85% by 2030 as compared to 2005 levels.

Tri-State Generation and Transmission will also need to build new transmission as it closes its coal plants in Craig. It filed an application this year for two 230-kV transmission lines that would cover a combined distance of 130 miles on Colorado's eastern plains.

What role will there be for the Colorado Electric Transmission Authority created by a 2021 law? The new body has been dubbed the "transmission developer of last resort." The law sponsored by a bipartisan slate of both urban and rural legislators allows CETA to select a transmission operator to finance, plan, acquire, maintain, and operate eligible electric transmission and interconnected storage facilities.

As explained in a March story by Big Pivots, this authority may play a role in providing transmission for renewable resources such as the San Luis Valley.

Nine individuals were appointed to the board. The new authority will soon have its own website and members will meet for the first time on Friday, July 8, at 9 a.m. The Colorado Energy Office will have a notice of the meeting, although the new agency is formally independent.

Energy storage idea in Wyoming joined at hip with big wind

by Allen Best

The Seminoe Pumped Storage project would create what would essentially be a giant battery in southern Wyoming joined at the hips—or at least substations—with massive amounts of new wind generation being built for export to Arizona, California, and other southwestern states.

Cost of this Wyoming pumped-storage project would be in the range of $2.3 billion to $2.5 billion, according to rPlus Hydro, the proponent. The project took a small step forward last week with submission of a draft license application to both state and federal agencies.

The same company also contemplates pumped storage hydro in Colorado's Yampa River Valley. Xcel Energy is considering a pumped-storage project southwest of Grand Junction.

Pumped-storage hydro constitutes 90% to 95% of existing energy storage in the United States — and, in Colorado, the single largest storage device. The Cabin Creek project — upper and lower reservoirs in the Georgetown area — has two units with a combined 324 megawatts of potential generation to meet peak demands by Xcel Energy customers, such as hot summer afternoons.

The water released to run through the turbines, generating electricity, can then be pumped back uphill when electricity is more plentiful.

A smaller pumped-storage hydro project exists near Leadville at Twin Lakes.

Denver-based Ron Lehr, a former public utility commissioner in Colorado for 8 years and now a board member of New Energy Economics, points to the advantages of pumped-storage as compared to some other, still unproven or expensive technologies. He points to $500 million in federal loan guarantees recently delivered to a hydrogen storage project in Utah.

Pumped-storage hydro has "many fewer moving parts and tech challenges and a long history of successful operation. Making and storing hydrogen at relevant volumes, not so much," he said in an e-mail reply to questions. "Good to have diversity, helps to manage risks, but need to keep an eye on what's cost effective at the same time."

In Wyoming, the pumped-storage hydro project would be at Seminoe, a reservoir on the North Platte River 35 miles northeast of Rawlins. A new reservoir would be built 1,000 feet higher in elevation on federal land administered by the Bureau of Land Management.

"Being co-located with the wind energy in Wyoming means that the Seminoe project would basically be the battery of Wyoming wind energy and can really help make more efficient use of transmission being built to deliver wind to markets," said Matthew Shapiro, chief executive of rPlus Hydro.

The reservoir would require 12,000 acre-feet of water to begin operations, and then an estimated 300 acre-feet annually after that to cover evaporation. Altogether 10,900 acre-feet would be sent through the turbines to generate electricity.

Wyoming has massive amounts of wind, but nowhere is the bluster greater than along Interstate 80. The Chokecherry and Sierra Madre Wind Energy Project has been taking shape in south-central Wyoming since 2016 in the wind-drenched plains south of I-80.

The giant wind farm would deliver up to 3,000 megawatts of electricity. By comparison, the three units of Comanche Generating Station, Colorado's largest coal complex, can generate up to 1,635 megawatts.

As of April, according to a release by the Power Company of Wyoming, the project had completed more than 135 miles of roads and pads for 178 turbines. It is to ultimately have 900 turbines. Total estimated project costs have been placed at $5 billion.

The company is an affiliate of Denver-based The Anschutz Corporation, which is owned by billionaire Philip Anschutz. Anschutz, who grew up in Kansas, expanded a nest egg into a fortune by exploiting the natural gas deposits in the Overthrust Belt of southwestern Wyoming during the 1970s.

Transmission of this electricity is a story unto itself. Two major power lines, both

Colorado PUC gives Xcel short rope to investigate Unaweep pumped-storage

Xcel Energy asked for permission to spend up to $15 million in investigating whether a pumped-storage hydro project in Unaweep Canyon, south of Grand Junction, is feasible.

No, said Colorado Public Utility Commission members at a meeting on June 10. You can get $1 million that can be recovered from customers but no more.

The company has filed for a preliminary permit application with Federal Energy Regulatory Commission, putting it in more or less the same stage of the planning process as the Craig-Hayden projects. Which is to say early.

"I just see this project has having enormous environmental, financial and technological risks," said Commissioner John Gavan.

Eric Blank, the commission chairman, had said he would be willing to go for $5 million as there seems to be a gap in funding for development of ideas and before they can be solidified. "It's a little bit of a chicken-and-egg problem."

Megan Gilman, the third commissioner, said she was inclined to reject Xcel's proposal.

with a capacity of 500 kilovolts, are planned to export the power from these and other wind projects, one with a terminus at Las Vegas and the second ending in Utah.

The longer line, TransWest Express, which is also owned by Anschutz, is to go 723 miles to Las Vegas. The company projects construction will begin this year and be completed in 2024, spokesman David Eskelsen told S&P Global Market Intelligence.

The second transmission line, the 500-kilovolt Gateway South, is planned by a major utility, PacifiCorp. The line is to extend 400 miles from the Aeolus substation near Medicine Bow, Wyo., southeast of Seminoe Reservoir, to a substation in Utah.

The pumped-storage hydro would connect with this line at the substation near Medicine Bow.

PacifiCorp has projected that it will have the line in service by late 2024. It received approval by Utah state regulators in April and Wyoming regulators in early June. The utility plans to retire 33 coal burning units by 2040 as it adds 3,700 megawatts of new wind power.

Both lines are to traverse Colorado's northwest corner. The TransWest line secured a right-of-way in December from two property owners, Cross Mountain Ranch and the Colorado Cattleman's Agricultural Land Trust.

The Wyoming developer, rPlus Hydro, a subsidiary of Salt Lake City-based land developer Gardner Company, has several projects in the planning pipeline in Western States. The most advanced is in eastern Nevada, at a site called White Pine. The company is working with the Federal Energy Regulatory Commission on a final licensing application. The company hopes to reach that same status for its Wyoming project in December.

The company's idea in Colorado is less developed. "It is still in the very early stage of evaluation," said Shapiro. A preliminary permit has been awarded by the Federal Energy Regulatory Commission, but that, he said, is just a placeholder of an eventual license application.

The next step on Craig-Hayden is geotechnical evaluation of the site south of the Yampa River in the area on the border of Routt and Moffat counties between Hayden and Craig. The site is located on private land and two reservoirs would be necessary, higher and lower.

This contrasts with the Wyoming project, which involves a federal reservoir and adjacent federal land. That federal presence makes the Wyoming project more complicated.

In Wyoming questions about impact of turbines to populations of eagles

As development of wind in Wyoming expands, questions linger about the impact to bird populations, reports WyoFile.

"Most of the (Wyoming wind energy) development is just going off like a rocket right now, and we already have eagles that are getting killed by wind turbines – a hell of a lot more than people are really understanding," said Mike Lockhart, a former U.S. Fish and Wildlife Service biologist.

A representative of the developer of the Sierra Madre and Chokecherry wind Energy Project insists that a dramatically reconfigured project will reduce risk. For examples, turbines will be placed away from ridgelines, and towers and cameras will help inform adaptive-management practices, such as shutting down wind turbines when birds are active in the area.

See, "Wind energy faces bird-kill and other habitat challenges."

Can Colorado benefit from this development of wind and possibly pumped-storage hydro in Wyoming?

Jonathan Naughton, director of the Wind Energy Research Center at the University of Wyoming, told Wyofile that the southeastern part of the state has wind capacity factors of more than 50% compared to 35% in other interior states.

“It means that the turbines that they put up are running at full capacity more often,” he said.

Naughton also said Wyoming wind tends to be more consistent during winter months and evening hours throughout the year, providing a balance to power demands in other western states.

But existing transmission between Wyoming and Colorado, already limited, tends to be entirely full when the wind is blowing hard in Wyoming.

One idea was to link Wheatland, Wyo., and Brush, Colo. This would foster wind generation north of Cheyenne.

“I think it would have a large impact on Colorado and would complement Colorado’s own renewable resources,” he says.

In a paper he and others produced in 2013, Naughton emphasized the value of diversity of resources, in this case those of Wyoming and Colorado. “It is not just being able to produce lots of electricity, but how you produce a more consistent amount of electricity,” he told Big Pivots.

He sees Colorado utilities joining or developing a new regional transportation organization, or RTO, or independent system operator, or ISO, that would further benefit maximized development of renewable resources.

If Wyoming and Colorado were in the same ISO, that would really change things, in my view. States try to develop their own resources for economic development, but renewables work better when sourced from a large area.

Cabin Creek down, one to be retooled for improved efficiencies in 2023

Cabin Creek, Xcel’s pumped-storage hydro project between Georgetown and Guanella Pass, has been down for repairs. One unit was down in May for repairs, and the second unit is now out of service until 2023 as it is being retooled to improve efficiencies and shorten fill times. The revamped unit will have 9 megawatts more production capacity.

Reaction after this story was posed at BigPivots.com…

The folks at NREL just published (May 2022) one of their "resource assessments" for PHES. (https://www.nrel.gov/docs/fy22osti/81277.pdf)

That shows lots of potential in CO, but I'm sure it does not include many of the actual limiting factors. Maybe there could be some cooperation and cost sharing between our PUC, the CO Energy Office, Xcel/PSCo and NREL given their offices are a light rail ride apart. Everybody might learn something. Maybe some folks from the alphabet soup of agencies at the Denver Federal Center could join in.

While PHES is not "innovative" or "distributed" it does check a lot of other boxes for energy development, potentially employing ex-mine workers during construction while using few "critical materials" and these facilities last a long, long time.

Actual construction or detailed planning is going on in many other countries with expanding renewable portfolios and mountainous terrain, e.g. Australia, NZ, Scotland, China...

Fred Porter
Carbondale, Colo.

Natural gas program proposed by Black Hills would rely upon 99% carbon offsets, 1% RNG

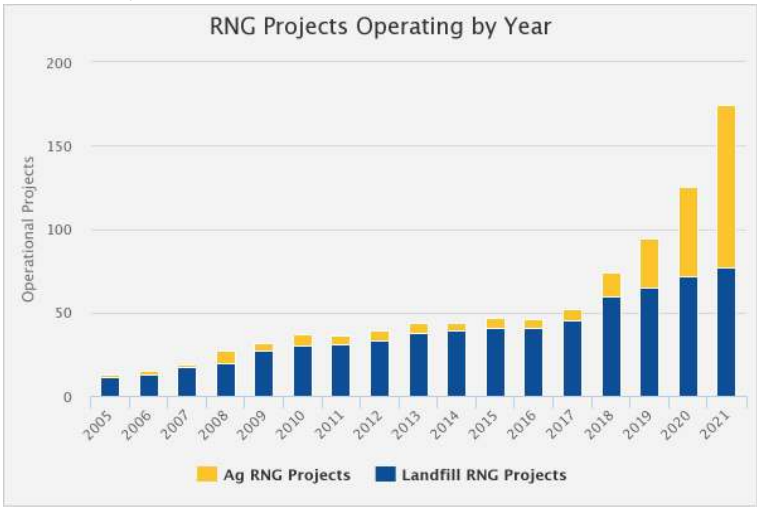
by Allen Best

Renewable natural gas is gas that has been derived from renewable sources. Think of methane from wastewater and sewage plants, or landfills, or even from dairies.

Carbon offsets are intended to compensate for the emission of carbon dioxide into the atmosphere as the result of industrial or other human activity, especially when quantified and traded as part of a commercial program.

Now consider the program being proposed by Blacks Hill Energy. The company wants to conduct a 4-year experiment beginning in 2023 that would allow its 194,000 customers, both residential and commercial, in Colorado to voluntarily reduce or offset the emissions they produce from combustion of natural gas for space and water heating.

The company's Colorado customers are in 100 different communities, from Aspen and Telluride, to Rocky Ford and Yuma, Firestone, and Erie.



Customers would be charged an incremental cost of $5 for the company's procurement of a "block" representing 20.5 therms. That's about a quarter of the average residential customer's monthly use. These purchases could be made on a monthly basis.

For each block the customer purchases, Black Hills will procure the carbon offsets or the environmental attributes of renewable natural gas. The average Black Hills customer would need to purchase four blocks a month, or spend $20 extra, to "absolve" them of their emissions.

Renewable natural gas is in relativeley short supply. Almost everything we burn in our homes and businesses is methane mined from geologic deposits.

But there are a few projects. Grand Junction was first to begin harvesting the methane from its sewage. The most recent of Colorado's four biogas projects was Boulder, in 2020. Methane from landfills at Erie and Fort Collins is also being harvested.

See 2020 story in Big Pivots, "Colorado's fourth biogas project."

Now, about carbon offsets. The Massachusetts Institute of Technology explains that in buying the certificates, a person or group can fund projects that reduce emissions somewhere else.

Common examples include reforestation, building renewable energy, and carbon-storing agricultural practices. A bill sponsored by Colorado State Sen. Chris Hansen, a Democrat from Denver, proposed to help laying the foundation for a market for carbon-storing agricultural practices, but the bill was a suitcase of big ideas and didn't get across the finish line.

Methane harvesting from cattle has not yet been launched in Colorado, but farmers and others in the private sector hope to do so. *Photo/Allen Best*

Biogas projects tapping the agriculture sector — think feedlots and diaries — have yet to emerge, although there seems to be some interest in the diaries of Weld and Morgan county, perhaps elsewhere, too. But nothing seems to be moving forward.

Matthew J. Christofferson, who manages the rate and regulatory filings of Black Hills, in a PUC filing testified that the program relies heavily on carbon offsets because of their lesser cost.

"Due to supply limitations, high production costs, and valuable incentives for RNG in transportation, RNG prices remain relatively high in the current market conditions," he testified.

The program would consist of 99% carbon offsets and 1% renewable natural gas – but only the attributes.

Black Hills says this program was created after 57% of customers who responded to a survey indicated they are "somewhat" or "very" interested in participating in a program of this sort.

"A voluntary program caters to the wants and needs of those interested in participating while not forcing costs on those who are disinterested in the program," said Christofferson.

In coming up with this program, Black Hills has worked with 3Degrees, a consultancy that has also worked with Pacific Power, Puget Sound Energy, and Georgia Power in implementing renewable energy programs.

Blacks Hills wants PUC approved by Nov. 30, citing the "volatility" of the markets for carbon offsets and RNG.

If Black Hills pitches this as a voluntary program, it also has a legal mandate imposed by SB21-264, a law adopted by Colorado in 2021. The law requires each of Colorado's four gas distribution utilities — including Black Hills, the second largest —to file a clean heat plan with the Public Utilities Commission. Those plans must demonstrate how the utility will use clean heat resources to meet targets, 4%

reductions by 2025 and 22% by 2030. These are compared to 2015 benchmarks.

The bill allows utilities a broad range of measures for achieving the goal including beneficial electrification, gas demand-side management programs, hydrogen and recovered methane from coal beds, as well as wastewater, solid waste, and pyrolysis.

Xcel Energy also plans to offer voluntary programs associated with natural gas use. "We are staring to pilot multiple options, including smart electric water heaters, all-electric new building developments and electric air-source heat pumps for cooling and heating combined with natural gas furnaces for backup heating," the annual sustainability report says. The company reports also exploring the testing of both hydrogen production and hydrogen blending in its natural gas distribution system.

Major solar project near Pueblo gets no-go from county commissioners

Pueblo has very rapidly become the solar capital of Colorado. Any why not?

It has transmission because of the trio of coal-fired power plants called Comanche. It also has some of the West's best solar resources, 8 or 9 on scale of 10, according to the solar developer of the first big project, Bighorn, which was completed last November on property owned by Evraz, operator of the steel mill.

But it may not have a project called Pronghorn Solar Park. The Pueblo County commissioners last week rejected the project proposed for 831 acres near the power plant. The reason? Incompatibility with an adjacent residential property called Lakeside Manor Estates.

A resident, Alan Glasscock, told the Pueblo Chieftain that he believed in solar enough to have 24 solar panels on his property but he wasn't ready to have 300,000 panels nearby.

"We are basically going to be in a solar oven and instead of Lakeside Manor Estates we are going to be known as 'solar panel-side' manor estates," he said.

The solar developer, Leeward Renewable Energy, had rejected an alternative site because of lack of electrical infrastructure. It had promised solar panels would be no closer than 800 feet and interrupted by vegetation aided by delivery of water. It indicated plans to rework the proposal it had submitted.

The commissioners in February had approved standards governing solar development. As explained by the Chieftain, the commissioners were hoping to find a balance between rural ranchers hoping to cash in on land leases for solar projects and residents of housing developments who don't want solar panels blocking their views.

Mike Kruger, chief executive of Colorado Solar and Storage Association, a trade organization, expressed disappointment. "After spending seven or eight months rewriting the regulation, a project that conformed with those regulations was still defeated by NIMBYism," he said. "This will be a problem across Colorado as we transition (to non-carbon sources)."

Black Hills Energy plan for 79% renewables by 2030

Black Hills Energy has submitted an electric resource plan to Colorado regulators that it says will achieve 79% renewable energy in its portfolio by 2030.

Somewhat confusingly, this further decarbonization will allow the company to reduce its emissions 90% as compared to a 2005 baseline. Colorado's legal target is 80%.

The plan calls for adding 149 megawatts of wind, 258 megawatts of

solar, and 50 megawatts of battery storage to deliver to its customers in the Pueblo-Canon City area.

A press release from Black Hills says the company also plans to reduce customer bills 1% starting in 2023.

Beneficial electrification program in Eagle County has funds for 125 home upgrades

The program for a beneficial electrification program in Eagle County has been augmented by $100,000, allowing the program to complete 125 home make-overs in the next five years.

The Vail Daily reports that the program, called BEECH, for Beneficial Electrification for Eagle County Homes, was begun in 2020 and has so far completed 14 projects at the Dotsero Mobile Home Park. The trailer park is located near the confluence of the Eagle and Colorado Rivers.

Prior to the improvements, all the homes were heated by propane gas. Poor insulation and appliances with high consumption made this expensive and unhealthy for residents because of gas leaks and carbon-monoxide poisoning, and bad for the global environment, because of the greenhouse emissions.

Propane heaters are removed and replaced with air-source heat pumps for heating and cooling. Also part of the make-over is addition of all-electric induction ranges.

Energy audits reveal how to improve energy efficiency. The ensuing improvements typically result in a $600 annual reduction in heating costs.

In addition to funds and overhead by Eagle County, the program has been enabled by funding from the Northwest Colorado Council of Governments and other sources.

Solar coop seeks to foster sunshine-harvesting in northwest Colorado

The Northwest Solar Co-op made the case for participation this week with events in Meeker, Steamboat Springs, and Craig.

The co-op, organized by nonprofit group Solar United Neighbors (SUN) in partnership with Routt County and the City of Steamboat Springs, has more than 40 members signed up so far.

The solar co-op's mission is to make going solar easier and more accessible to all Northwest Colorado communities.

Snowmass Village adds a touch of microhydro

Twenty years ago the Aspen Skiing Co. installed microhydro to its snowmaking system, allowing the company to generate electricity from the small amounts of water flowing downhill.

Recently, Snowmass Village did the same on the water line between the treatment plant located mid-mountain on the Snowmass Ski Area and the town commercial center more than 1,000 feet below.

The turbine installed by the town and associated water district can produce around 20 kilowatts per hour, or enough for the needs of 16 average-sized houses for 16 to 20 hours per day, reported The Aspen Times. The newspaper did not say whether that is average for Snowmass or some other places.

Also partners in the project were the Community Office for Resource Efficiency, Holy Cross Energy, and the Colorado Department of Local Affairs. Cost was $230,000.

It works in California. Can community choice energy do good things for Colorado, too?

A concept called community choice energy, or CCE, has worked reasonably well for California as it has pivoted its energy system from fossil fuels during the last 20 years. Might it also still be of value in Colorado?

A 2021 state law, HB 21-1269, requires the Public Utilities Commission to investigate the answers. A report is due state legislators by mid-December.

CCE's – also called community choice aggregation – would give communities currently served by Colorado's two monopoly electrical utilities, Xcel Energy and Black Hills Energy, the authority to secure energy from independent suppliers. That means competition. Can that sharpen everyone's game?

On June 13, PUC commissioners heard from four speakers, three from California. California authorized the concept in 2002. Renewable energy prices then were high and selection was limited. It took until 2009 before the first systems were launched.

"It takes a long time, if done well," said Dawn Weisz, chief executive of Marin Clean Energy, or MCE, a not-for-profit energy provider serving 500,000 customers in the Bay Area.

Community choice energy systems can expedite transition to non-carbon sources. But Colorado is briskly moving down that path for electrical generation.

Weisz also emphasized potential cost savings.

"When you are looking at cost savings all the time, you become good at finding those transactions that maximize customer savings while delivering the end result that you want," said Weisz.

Lower costs are not a given, though.

Lately, community choice has come out more expensive than Southern California Edison, reported Tony Foster, business operations manager for Long Beach Energy, a municipal utility. He said Long Beach has chosen to stay with the monopoly.

Questions posed by PUC commissioners were perhaps revealing.

John Gavan pointed out that Colorado is hurrying to join a wholesale market, with utilities mandated to do this by 2030. At least some utility executives think it will happen sooner. Would taking on this new concept on top of the other shifts "be madness or something you would recommend entertaining?"

Suzanne Casazza, from the California utilities commission, advised that it's an "all-hands-on-deck exercise" but did not openly say it was too much.

Erik O'Shaughnessy, a consultant with expertise in markets has worked for the National Renewable Energy Laboratory and various other national laboratories, agreed that it's a lot to take on at once. "I don't know which comes first, the chicken or the egg," he said.

Eric Blank, the commission chairman, asked the same question from a different vantage. He pointed to the nearly $10 billion that Xcel Energy – the utility that would be most affected by the introduction of community choice energy – expects to spend in the next eight years as it closes coal plants and adds renewables and new transmission.

"How do we do this without undercutting our investments in this transition?" Blank wanted to know.

O'Shaughnessy agreed that benefits of community choice energy/aggregation laws will be less in states with already high renewable portfolio targets, although he again stressed that it "seems that utilities will move faster."

Larry Miloshevich, a Lafayette resident who provided input on the bill that requires this study, said the speakers offered evidence on the value of competition in the energy transition.

"While the utilities can surely decarbonize quickly if we pay them enough, what's needed is to decarbonize quickly and at the lowest cost, which is just naturally driven by competition," he wrote in an e-mail. "

"Competition benefits not just community choice customers but investor-owned customers, too, as the IOUs must then try harder to stay relevant and prove to communities than they can meet their needs better than a community choice energy could.

"This consideration of CCE begs the question of why we even still allow monopolies when electricity generation has been a thriving competitive business for several decades now."

What about the regional energy markets, either an RTO or an ISO, as mentioned by Gavan?

Miloshevich said he believes it would be advantageous to develop them simultaneously, "so that each can be designed with the other in mind from the beginning."

The concept "could be implemented in Colorado right now, even without a wholesale market, based upon existing Federal Energy Regulatory Commission rules that require non-discriminatory access to the transmission system (FERC Order 888) and bilateral contracts between buyers and sellers, which is how our electricity system works right now."

Colorado's 29 municipal utilities, he adds, "manage to procure their wholesale power today, so there's no reason why a CCE could not do the same."

The PUC will continue to take testimony in this docket before issuing a report to be submitted to legislative committees in both the Colorado House and Colorado Senate by mid-December.

That report probably should be read most keenly in Boulder, where a significant number of community members for a long time have believed that they can more deftly lead the energy transition if independent of the monopoly of Xcel Energy.

It may also have an audience in Pueblo, despite a 2020 vote that soundly defeated a proposal to break away from Black Hills.

Tri-State shakeup as electric provider starts addressing difficult realities

by Allen Best

A significant staff shuffle and downsizing has occurred at Tri-State Generation and Transmission, likely a recognition of the enormous challenges facing the wholesale provider to 42 electrical cooperatives in Colorado and three other states.

Duane Highley, the chief executive officer, announced that 30 positions – including several senior vice presidents – are being shed as part of a "strategic reorganization."

Altogether, 18 corporate employees were pink-slipped in addition to 12 employees at generating plants in Escalante, N.M., and Rifle, Colo. The Escalante coal plant was closed in 2019 and the natural gas plant at Rifle will close later this year.

The layoffs represent 3% of Tri-State's total personnel but are the first significant changes to Highley's senior management team since he arrived at Tri-State in April 2019.

Joe Smyth, a member of a Tri-State cooperative who has followed Tri-State closely during the last decade at his website, Clean Coop, said Tri-State's efforts to reduce costs show the benefits to ratepayers of increased competition to provide wholesale power to electric cooperatives.

"Instead of co-ops just being trapped in long-term contracts with a single power supplier, oversight by FERC to help ensure fair exit fees means that Tri-State now must cut costs to try to compete, to try and avoid losing more member co-ops," he said in an e-mail. That dynamic, he added, will also benefit the co-ops that remain with Tri-State.

"Beyond the cost savings, one key question is if Tri-State's executive team

The battery storage United Power put into service in late 2018 has been a point of friction between the cooperative and its wholesale supplier, Tri-State Generation and Transmission. ***Photo/Allen Best***

reorganization will allow Duane Highley to more quickly transform Tri-State so it is positioned to succeed in the transition from coal to clean energy," said Smyth, who attended the monthly meeting of the board in late May.

Even before Highley arrived at Tri-State, it was clear that the staid wholesale provider would have to significantly change its business model. That model was built around centralized power generation, particularly coal-fired power plants, and one-way distribution of power. Just about everything in that model is turning sideways or more.

Why the personnel cuts now? The timing likely is not coincidental in that Tri-State has received a setback in its bid to slow the exit of its single largest member, United Power. United alone represents more than 20% of Tri-State's demand. United insists it will be gone by May 1, 2024. The final outcome of what it must pay Tri-State and remaining members is being worked out in hearings at the Federal Energy Regulatory Commission.

Also before FERC are other issues. An administrative law judge for FERC in late May handed down decisions in United's favor on three of four issues, according to a press release from United, and ordered Tri-State to give United Power significant refunds for energy storage resources.

Mark Gabriel, the chief executive of United Power, says the FERC rulings have far-reaching impacts to all Tri-State members.

The issues are complex, involving "unbundling of costs" in cost accounting and other issues. In the matter of Tri-State's policy for certain community solar programs, the law judge ruled it unduly discriminatory as the cost-benefit ratio used by Tri-State varies widely depending on a member's size.

Most illustrative of the dispute between United and Tri-State was the element of energy storage.

In this case, United Power had gone out on a limb in 2018 to erect four megabytes of Tesla batteries behind its office along Interstate 25 near Firestone, north of Denver. Tri-State had tried to prevent United from going forward with the battery storage. It remains the single largest battery storage in Colorado. (Xcel Energy will be putting in a 125-megawatt battery near Pueblo in 2023). The batteries allow United to better juggle its demand from Tri-State, potentially avoiding the most expensive power.

In this case, FERC found that Tri-State improperly charged United Power and must provide refunds from September 2019 going forward. But the FERC judge's ruling fell short of addressing all issues, as it was outside the scope of the proceeding.

Other members have also been moving to partial-requirements contracts. Tri-State allocated 300 megawatts available to members to carve out for self-supply. In 2003, La Plata Electric, Poudre Valley Rural Electric, and San Miguel Power, all in Colorado, were allocated an aggregate of 203 megawatts.

In May, Tri-State allocated the remaining 97 megawatts to Mountain Parks Electric, based in Granby, Colo., and also High Plains Power in Riverton, Wyo., and Jemez Mountain Electric in Espanola, N.M.

But those changes will keep the cooperatives as members of Tri-State, reliant on transmission and some other services.

Highley's reorganized senior team will consist of:

• Barry Ingold will fill the new role of chief operating officer with consolidation of responsibilities for transmission, generation, and energy management. He previously had responsibilities limited to generation.

(The additional responsibilities were previously assigned to Joel Bladow and Brad Nebergall, who have been let go, according to a Securities and Exchange Commission filing. Also let go in the staff shuffle was Jennifer Goss, who had been the chief of technology and had also been responsible for member relations.)

• Bob Frankmore, chief of staff, who will work with Highley to coordinate activities and oversee government relations and external affairs, communications and strategy.

• Barbara Walz, who will be responsible for enterprise risk management and physical security in addition to her other responsibilities, which include environmental compliance and policy, reclamation and remediation, and corporate safety.

• Reg Rudolph, the chief energy officer, who will take on member relations for the organization in addition to existing duties for beneficial electrification programs and development and implementation of competitive energy services.

• Elda de La Peña will fill the new position of chief administrative officer. Peña will be responsible for human resources, people and culture, information technology, cybersecurity, and support service.

• Two senior vice presidents — Ken Reif, the general counsel, and Patrick Bridges, the chief financial officer – will continue in their existing capacities.

Kit Carson Electric wraps up solar for daily needs; will make final payment

New Mexico Gov. Michelle Lujan Grisham was among those who helped snip the ribbon at the Taos Mesa Solar Array on June 3.

Altogether the cooperative now has 41 megawatts of solar capacity within its

service territory in addition to 15 megawatts of battery storage.

This is sufficient to meet the daytime needs of the 7,500 homes within the service territory of Kit Carson in northern New Mexico.

Kit Carson set out to develop its solar capacity in 2002, long before solar was competitive. In 2016, though, directors as well as Luis Reyes Jr., the long-time chief executive, were clear about the future. They negotiated an exit fee of $37 million from wholesale provider Tri-State Generation and Transmission and realigned with a new wholesale provider, Guzman Energy.

Kit Carson is scheduled to make its final payment to Tri-State on June 30.

What is Kit Carson's carbon mix? Reyes says he doesn't know, and Guzman does not disclose that information.

"We don't give breakdowns of mix for our customers. It's nuanced by each customer's local strategy, and the answer would be ever-changing in a situation like KCEC where they are moving rapidly between phases of transition that are getting cleaner while also building in levels of resiliency," said Robin Lunt, chief strategy officer for Guzman.

Guzman in 2020 entered a similar agreement with Colorado's Delta-Montrose but has had a more difficult time with a proposed solar project in Delta County.