

BIG PIVOTS

ENERGY and WATER transitions in Colorado and beyond

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Figuring out urban landscapes that can use less water

by Allen Best

Strolling on a recent afternoon through the older residential component of Lafayette, the one-time coal-mining town in Boulder County, I was struck by what I saw in the front yards.

These were not massive yards of mansions, but modest tracts to befit modest homes. But every second or perhaps third house had a xeriscaped yard, meaning that instead of turf, the yard consisted of a more inventive creation—and, importantly, with need for less water. I saw cactus and yuccas, sunflower stalks and rocks, especially sandstone from the nearby Lyons Formation.

Lafayette is a place that abounds with art and with artists. Whimsy and invention can be seen at every turn, from garage doors to front doors. Might Colorado's urban landscapes have more of that mindful playfulness?

Now comes creation of a state-wide Urban Landscape Conservation Task Force charged with ways to rethink the nexus between water and urban landscapes in Colorado. Over the next year, the 21 members appointed by the state government

will be responsible for identifying practical ways to advance outdoor water conservation through state policy and local initiatives.

Gov. Jared Polis in his 2023 State of the State address called out the need to prioritize the intersections of climate change, water, and housing. Creation of the task force was also informed by the recently revised Colorado Water Plan, which calls for “transformative landscape change.”

“The task force will focus on actionable recommendations like setting standards for turf-alternative ‘Colorado Scaping,’ gallons-per-square-foot water budgets, as well as evaluating land-use development, water affordability, and much more,” said Dan Gibbs, executive director of the Colorado

Department of Natural Resources, in an announcement from his agency and the Colorado Water Conservation Board.

“There’s not one single solution to urban water conservation success in Colorado,” said Becky Mitchell, director of the state water board. “It will require a cumulative effort, everyone doing a little bit.”

In Boulder, water demand-side management consultant Peter Mayer described the task force formation as “an acknowledgement that urban landscape irrigation makes up a sizable portion of municipal water demand. Advancing state and local policies that promote native landscapes, water budgets, and efficiency with the goal of reducing supplemental irrigation is a worthwhile effort.”

New task force charged with addressing urban landscaping policies in Colorado



Castle Rock has become a poster child for the need to crimp outdoor irrigation. It depends upon unsustainable drafting of the Denver Basin aquifers, has almost no river drainage above it (Plum Creek), and has no access to imported Colorado River water. Photo/Allen Best

At the same time, he also noted that municipal outdoor use is a comparatively small part of total water demand in Colorado. “Both sectors, ag and urban, should contribute as proportionally as possible to any further required demand reductions.”

“It’s about time,” exclaimed Ken Neubecker, a long-time water activist on the Western Slope, when told of the task force. He suggested that the 2015 Colorado Water Plan missed a beat by not moving more aggressively at outdoor water use in urban areas. It’s a drop in the bucket compared to agriculture use, but shifting local land-use regulations and attitudes will be a hurdle.

“There will always be people here who want to transform Colorado into Ohio,” said Neubecker. That is the hurdle: How do we really encourage people in communities to change their land-use regulations and their habits.”

Colorado legislators in the 2022 session started nudging the work along with an appropriation of \$2 million for turf removal. [HB22-1151](#) further instructed the Colorado

Water Conservation Board to “develop a statewide program to provide financial incentives for the voluntary replacement of irrigated turf with water-wise landscaping.”

As many as 22 municipal water providers in Colorado have existing turf-replacement programs. Twelve of them along the Front Range have documented a cumulative 2.4 million square feet of conversions since 2013. Denver has been at this for a while with its xeriscape program, a word that a staff member coined decades ago. Castle Rock and Aurora stand out for their measures in the last year to more aggressively restrict turf.

A fact-filled report delivered during January to the Colorado Water Conservation Board warns against expecting too much. It used the well-known landscaping restrictions in the Las Vegas area as a benchmark. Savings could be less and the price tag higher than was the case in Nevada, the report warned.

“Should Colorado still pursue removing non-functional turf? Absolutely. But removing

turf responsibly to achieve lasting water savings will require a broader suite of tools. A thoughtful and Colorado-specific approach to turf removal will make all the difference for achieving the Transformative Landscape Change called for in the 2023 Colorado Water Plan,” says the analysis by BBC Research & Consulting.

Findings from the report, titled [“Exploratory Analysis of Potential Water Savings, Costs and Benefits of Turf Replacement in Colorado,”](#) include:

- Municipal water accounts for just 7% of total water use in Colorado. Of that municipal water use, 40% goes to outdoor irrigation.

Stated in another way, outdoor use accounts for approximately 2.8% of all Colorado use.

- The BBC report assumes that a quarter of Colorado’s estimated 100,000 acres of irrigated turf serves no real purpose.

- Assuming this non-functional turf has been removed, it could save 10,000 to 20,000 acre-feet of water a year. That’s roughly 2.5% to 5% of annual outdoor water use.

- It could cost \$5 to \$10 per square feet to remove turf. Replacing 30% of the non-functional turf in Colorado could cost \$1.8 billion to \$3.5 billion.

- Water budgets could save five times more water at a cost 20 times less than turf replacement rebates.

If savings from urban landscape transformation will be marginal, Colorado’s water future will be decided on the margins. What must be remembered is that Colorado’s cities, both those along the Front Range but on the Western Slope, too, are places of financial have’s but water have-not’s.

This matters because so much of the water for Colorado’s towns and cities comes from the Colorado River and its tributaries. That river, of course, is governed by a 1922 compact, and water rights older than that are not subject to the compact. The water rights for roughly half of that supplied to Front Range cities are junior to the compact. That’s

true of many municipalities on the Western Slope, too.

In a time of climate change, will that water be there? Those framing the compact in 1922 assumed at least 16.5 million acre-feet, but as Eric Kuhn and John Fleck laid out in “Science be Dammed,” those carving up the river in Santa Fe assumed more than 20 million acre-feet.

The Colorado River never delivered that reliability in the 20th century. In the 21st century, flows have dropped to 12.3 million acre-feet—and it could get worse, much worse, as the rising temperatures exacerbate the process of aridification already underway. Might water levels drop to 9 or 10 million acre-feet? Not out of the realm of possibility.

In Douglas and El Paso counties, there’s a similar problem. Castle Rock, Monument, and other water-providers still rely upon unsustainable drafts of aquifers.

See also: [“Digging Deeper on turf removal”](#)

Also: [“Does Colorado need water-use standards given the impacts of aridification?”](#)

Russ Sands, the water supply planning section chief at the Colorado Water Conservation Board, said this task force had the endorsement of about 80% of those who attended The Colorado Landscape Summit held in November 2022. He also emphasizes that transformation of urban landscaping as the Colorado Water Plan calls for will take time.

“It’s a bit of a culture shift that requires increasing collaboration between water providers and land-use planners and will take years to achieve,” he said via e-mail. “Rate discussions, code changes, and just understanding best practices are things that are multi-year efforts we need to start now.”

He points to questions about turf replacement even beyond how much water it will save.



An irrigation canal in Grand Junction. *Photo/Allen Best*

“When you rip up turf, what do you replace it with? How do you fix the irrigation after that change? There are rates and codes and other regulations that drive these changes.”

Now dominated by water providers, the task force could add more experts to shift the balance.

Sands cites the Denver One Water Plan as a possible model for integrating land-use and water resource planning. That plan will set out to create a framework for collaboration and implementation of critically needed water conservation and alternative water resource policies that are coordinated with newly developed land-use plans, he says.

Doug Kemper, director of the Colorado Water Congress, also points to a conundrum for places like metro Denver, which are becoming more dense, increasing non-porous surfaces. Porous spaces are also needed for stormwater runoff.

The task force will have a representative from a stormwater district as well as from 8 water utilities, 2 water conservation districts, 2 environmental organizations, a developer, a professional landscaper, and several others.

Those members may also choose to consult with specialists in affordable housing,

water rates, arborists, and others as they see fit. The team will aim to meet 4 times over the next year, wrapping up in January 2024.

The members are:

- 1) **Greg Fisher**, Denver Water;
- 2) **Catherine Moravec**, Colorado Springs Utilities;
- 3) **Tim York**, Aurora Water;
- 4) **Rick Schultz**, Castle Rock;
- 5) **Mariel Miller**, Fort Collins;
- 6) **Drew Beckwith**, City of Westminster;
- 7) **Andrea Lopez**, Ute Water – Grand Junction;
- 8) **Jarod Biggs**, Durango Water;
- 9) **Torie Jarvis**, Northwest Colorado Council of Governments;
- 10) **Lisa Darling**, South Metro Water Supply Authority;
- 11) **Amy Moyer**, Colorado River District;
- 12) **Frank Kinder**, Northern Water;
- 13) **Paige McFarland**, Centennial Water & Sanitation District;
- 14) **Laura Belanger**, Western Resource Advocates;
- 15) **Kate Larson**, Resource Central;
- 16) **Bao Chongtoua**, Mile High Flood District;
- 17) **Waverly Klaw**, (land use planning expert) Sonoran Institute;
- 18) **Austin Troy**, (urban planning expert) University of Colorado-Denver;
- 19) **Patrick McMeekin**, (developer) Hartford Homes;
- 20) **Cinceré Eades** (community expert), Denver Parks & Rec,
- 21) **John McMahon**, (landscape professional), ALCC.

Cultural churn around the energy transition

Good issue - You're coming up with good things on the cultural churn around the energy transition, who's going to be on the train, who doesn't want to ride, and who's gonna be run over....

George Sibley
Gunnison, Colo.

'New' nuclear technology is merely lipstick on a pig

Re: [These 'statement' bills failed in the Colorado Legislature. Why?](#)

Allen, not with you on this statement – “My takeaway: We may need nuclear and the cost and disposal issues may be resolved appropriate to the risk...”

Everybody from Joe Biden through his energy secretary through Bill Gates is banging the drum for “new nuclear.” Which is about as far from “new” as I am from my first birthday.

Where are the voices of sanity here? Nuclear has a *nearly unblemished record of costing too much and creating deadly waste that no one is willing to have stored permanently in their backyard.* Why would any rational person (including Gates) go there for slightly different versions of the same old song? Solar and wind and batteries and pumped hydro and hydrogen (with limits) and burning buffalo chips and damned near everything non-fossilized is better than nuclear. Most of it is way cheaper.

Jesus, man, I can't tell you how much I detest the notion that communities like Pueblo CO could become home to Small Modular Reactors (which aren't small when bundled) and, long term, storage on-site of the nuclear waste that goes along with them. That's after decades of Pueblo living with in-

town coal plants generating power that gets shipped up to Denver while Puebloans get stuck with the resulting local air pollution. Are you willing to have an SMR built within 10 miles of your homes (*AND* live with the waste that gets stored on-site for the foreseeable future)?

The newly approved SMR design by NuScale turns my stomach, what with all the salesman-like BS about cost and design savings, reduced amount of waste created, the wonders of modular design, faster and cheaper construction etc. ad nauseum. They paint a picture that SMRs will be “new,” but in so many ways, they won't be anything but lipstick on a pig. The nuclear industry is a chronic budget-busting “bad learner” business that lives on the backs of ratepayers and taxpayers. So, to quote the quotable malaprop expert Samuel Goldwyn, “include me out.”

Steve Andrews
Florence, Colo.

Lumping nuclear energy with fossil fuels is ludicrous

Worth noting that the nuclear bill was not entirely a “statement” bill. There was some substance.

Current statutory language for Colorado's Renewable Energy Standards, which the state's retail electric providers MUST comply with, stipulates “Fossil and nuclear fuels and their derivatives are not eligible energy resources.” C.R.S. 40-2-124 (1) (a)

So under the status quo, were a utility to consider bringing a nuclear project forward (cost arguments aside) it would not count toward meeting the state's renewable portfolio requirements.

Say what you will about nuclear energy, lumping it in with fossil fuels on an environmental basis is ludicrous.

Jake Fogleman
Via Internet

What you said

Nuclear is not flexible

Nuclear is not flexible, and flexibility is what is needed for the last 10% to 15% of decarbonization.

Sure hoping my friend Allen Best doesn't jump on the nuclear bandwagon just because Hal Harvey says you should ... sure hoping.

Leslie Glustrom
Boulder, Colo.

Cost disqualifies SMRs

An objective study might well conclude that SMRs (small modular reactors) have no future on cost grounds.

By way of example, even with the Inflation Reduction Act subsidy, the latest cost estimates for NuScale's SMR show it is way out of the money at \$89/MWh. [See IEEFA study.](#)

Nextera is the biggest renewables developer in the country and the largest utility by market value on the planet. They know about this energy stuff and predict that, toward the end of this decade, "near firm" onshore wind & solar (meaning wind/solar + 4 hours of battery included) will cost on average \$20/MWh or less. [See page 9 in this Edison Electric Institute document.](#)

That means that even over-building renewable resources (again with short-term storage attached) still comes in much cheaper than nuclear. And their analysis does not take into account the progress being made with long-term storage that can further firm up

increasingly cheap intermittent renewables (e.g. Form Energy's iron-air 100 hour batteries that Xcel recently announced it will deploy in Colorado at the Comanche coal site—planned to come on as early as 2025).

No traditional gigawatt-scale nuclear plants will ever be built in the United States given recent exorbitant cost.

For SMRs the issue is not what they cost in absolute terms, rather it is what the cost relative to the alternatives. With SMRs anticipated to come onstream at the end of the decade the current comparison based on estimated power costs at that point are not looking favorable for them.

Adam Quinton
Edwards, Colo.

Fuzzy math and the way technology comes about

Germany closed its nuclear and off-shored its first in the world, solar manufacturing to China, building copious amounts of wind and solar. Most of which is failing to live up to generation estimates. We are learning of the "great stilling," cloudy, windless weather.

I believe a Colorado scientist was awarded one of Germany's highest non-military awards for the help provided to Angela Merkel. (This is) now recognized as a policy mistake unrivaled in modern European history.

By tripling natural gas purchases from Germany during this "transition," a whole country, Ukraine, was eventually sacrificed to Russian aggression.

Failing to execute the energy transition can have massive social costs and environmental ones as well. Witness Germany burning massive amounts of coal to keep the lights on while fumbling to restart nuclear.

Comparing solar or wind, on a dollar-to-dollar basis, to dispatchable forms of energy is fuzzy math—at best.

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Technology doesn't always follow need or demand, just as water doesn't follow the plow.

David Marston
Durango, Colo.

Why no mention?

Re: [Golden moves on path to all electric](#)

Why was there no mention of electric generation efficiency in this article? CO's electricity comes from renewables (37%), coal (35%), and natural gas (27%). Coal is 37% efficient, gas is 60% efficient, and if you assume renewables are 100% efficient then CO's electricity generation is 66% efficient. This does not include transmission losses and any inefficiencies in electric building heating systems.

Modern gas furnaces are 95% efficient, however.

How is it better to use electricity that is only 66% efficient instead of natural gas that is 95% efficiency?

This looks like nothing more than ideological cheerleading that is willfully blind to reality.

Dean Schulze
Via Internet

Demand-management and storage may trump 'net-zero'

Interesting comment from "groups who worked on recommendations" about the "moral responsibility" to generate energy locally and strive for "net zero."

I disagree. My town also seems overly focused on "net zero."

Energy storage and demand management may be far more effective. Most "cities," even suburban ones, will never be "net zero." With electrified heat and transportation, local solar generation will not meet winter needs, even with multi-day electricity storage.

In Colorado, concerns over land use in "distant" (I'd say not all that distant) solar and wind farms are overblown. Heck, we grow

corn for ethanol at about 0.1% efficiency on tens of thousands of acres. For solar, many rooftop systems cost 3x/kW and generate 50%/kW compared to solar farms. So which has the least resource consumption?

For the example of a hotel, thermal storage of heat, and V2G BEV charging and discharging would seem far more important. These can coordinate demand with variable renewable generation, distant or not, and minimize needs for transmission and distribution upgrades.

Fred Porter
Carbondale, Colo.

Other renewable technologies

Solar panels and wind turbines receive most of the renewable energy "ink," and for good reason. But there are other equally important technologies, including new promising developments in hydrogen creation and storage.

Geothermal heat exchange systems can benefit single family homes, school buildings, apartment buildings, commercial office spaces, and hospitals, by reducing the energy required to heat and/or cool the water used for air conditioning. Once installed, it takes several years for a heat exchange system to pay for itself. But it is worth it for anyone planning to stay put over the long haul.

Many states have money set aside for rebates, to help homeowners and office managers defray the costs of purchasing and installing a heat pump exchange system. Colorado is expected to have such a program available by the end of 2023.

Pete Simon
Arvada, Colo.

Correction: 80MW of solar

Early version of Big Pivots 68 gave an incorrect number for capacity of the solar generating project on Garnet Mesa, near Delta of 800 megawatts. The correct number is 80 megawatts.



Why Colorado wants to develop the legal structure for carbon capture & storage

by Allen Best

Coloradans intent on figuring out how to shrink greenhouse gas emissions associated with the state's economy 90% by 2050 will soon be discussing how carbon capture and sequestration may be part of that future.

Or not. This is already a hot topic, able to cause those who would otherwise disagree about most everything, especially regarding the energy transition, to find common ground in seeing this technology as a foolish waste of money. (See story on page 12, "Scientific consensus.")

The Holcim/LaFarge cement plant at Florence has begun investing the potential for carbon capture to reduce its emissions.

Photo/Allen Best

A report ordered by Gov. Jared Polis was filed on Feb. 20. It outlines in great detail the legal framework that Colorado will need to govern the injection of carbon dioxide emissions into underground geological formations. Called "Creating Colorado's Carbon Sequestration Framework: a Legislative Proposal," [the report can be found here](#).

Almost simultaneously, two Democratic legislators introduced a bill that would fund a "carbon management roadmap" for Colorado—but also make industrial and manufacturing operations eligible for grants under clean air programs. That bill, [HB23-1210](#), Carbon Management, sponsored by Rep. Ruby Dickson and Sen. Chris Hansen, is scheduled to get its first hearing on Thursday, March 9, before the House Energy & Environment Committee.

The idea of injecting carbon dioxide underground is not new. It is done so in northwestern Colorado already to force out oil from the Rangely oil field. Colorado also exports carbon dioxide from the state's southwest corner to the Permian Basin oil wells in Texas and New Mexico.

New are the greater economic motivations. The Inflation Reduction Act of 2022 boosted the tax credits available from \$50 per metric ton to \$85 a metric ton or, if used for enhanced oil recovery, by lesser amounts. The law also lowers the threshold for qualifying for the tax credits and provides a longer timeline.

The report cites three projects in Colorado moving toward feasibility study.

"With several projects already moving forward, additional funding becoming available, and added interest in CCUS throughout the state, Colorado may become a CCUS hub in the not-so-distant future," the report says.

CCUS stands for carbon capture utilization and storage. CCS the same sans utilization.

Kathryn Valdez, director of carbon-free technology for Xcel Energy, told the Colorado House Energy and Environment Committee on Feb. 22 that her company is interested in carbon capture technology in conjunction with its natural gas plants.

Even before that legislation, several companies in Colorado had set out to sequester carbon with the motivation of making money.

Owners of the Holcim/LaFarge cement plant at Florence have investigated the potential. Production of cement produces carbon emissions, and we have a lot of concrete in our lives. The [BBC several years ago reported](#) that cement is the source of about 8% of the world's carbon dioxide emissions. It contributes more CO₂ than aviation fuel (2.5%) and is not far behind global agriculture (12%).

Might there be a way to create cement without the gigantic emissions? Possibly. In

Longmont, an entrepreneur has work underway to produce a low-carbon cement.

The Florence cement plant received a \$1.5 million federal grant to complete feasibility work for a project that would remove two million tons of CO₂ per year from cement manufacturing and natural gas-fired steam generation. The CO₂ would be sequestered.

Other projects are contemplated in conjunction with ethanol plants at Yuma and Sterling in northeastern Colorado. A project is also contemplated on the Ute Mountain Ute reservation in southwestern Colorado.

There is great mistrust, at least in part because some of the money for pushing carbon capture and storage has come from oil companies.

For a small sample, see this op/ed from the New York Times from August 2022: "[Every Dollar Spent on This Climate Technology Is a Waste.](#)"

The writers – a professor at MIT and a chief executive of a mining company said this:

"Fifteen years ago, before the cost of renewable energy plummeted, carbon capture seemed like a good idea. We should know: When we began a start-up 14 years ago — the [first privately funded company](#) to make use of C.C.S. in the United States — the idea was that the technology could compete as a way to produce carbon-free electricity by capturing the carbon dioxide emissions emitted from power plants and burying them. But now it's clear that we were wrong, and that every dollar invested in renewable energy — instead of C.C.S. power — will eliminate far more carbon emissions."

As for Colorado's journey, it was spawned by the Colorado Greenhouse Gas Pollution Reduction Roadmap issued in January 2021, which said much about carbon capture, including in this summary paragraph:

"Unlike the 2030 goal, achieving the 2050 goal likely will require further technical innovation and economies of scale to bring



An ethanol plant at Yuma is among the candidates for deployment of carbon capture and sequestration technology. Photo/Allen Best

costs down and allow deployment at scale in a number of sectors. Important technologies may include green hydrogen, long duration energy storage, carbon capture and storage, advanced biofuels, and synthetic fuels based on air capture of carbon.”

The roadmap called for convening a task force in 2021 to come up with recommendations. That was done through the Colorado School of Mines. That six-page report—relatively brief compared with these new recommendations—was completed in February 2022.

In addition, a law passed in 2021, HB21-264, sponsored by Sen. Chris Hansen and Rep. Alex Valdez and Rep. Tracey Bernett, directed the Oil and Gas Conservation Commission to conduct a study “that would be needed to ensure the safe and effective regulation of injection wells used for sequestration of greenhouse gases.”

In May 2022, Polis ordered this new study done in concert with key stakeholders to prepare a comprehensive legislation proposal to address the many issues of governance.

“While my administration intends to pursue legislative action to develop a safe and effective regulatory regime for CCUS in Colorado in the 2023 legislative session, the development and implementation of these policies is likely to take years, and we do not

want to slow progress. In the meantime, private industry and the federal government are moving ahead developing CCUS projects across the United States, including some here in Colorado. Providing regulatory certainty is critical to the success of these and future projects.”

This new 62-page report is rich with thoughtful explanations and gorgeous (but basically irrelevant) photos of mountain goats and timberline tarns. It explains the choices for Colorado and explains the choices Wyoming, North Dakota, Louisiana, Nebraska, and Montana have made.

What does this new report say? It explains why Colorado thinks that CCUS must be on the table for Colorado to meet its goals for emission reductions:

“CCUS has been identified as an essential tool for hard-to-decarbonize sectors. This includes the industrial sector where there has historically been a lack of alternatives to reduce on-site energy and process emissions, including sectors such as cement, iron and steel, chemical production, and others where carbon emissions are prohibitively expensive or very difficult to abate with current technology. Lack of clarity in the regulatory and permitting process has been identified as a significant barrier for emerging transitional

energy industries, including carbon sequestration.”

Class VI wells primacy

It also tackles item by item the major issues that need to be addressed. Foremost is whether Colorado will have primacy in administering the underground injection control Class VI wells. Only two states have that primacy, but to be sure this can go forward, states must set up regulatory framework that ensures protection of underground sources of drinking water.

“The application must show that the state’s statutes and rules are at least as stringent as all federal requirements and demonstrate the state’s capability to implement a safe and effective UIC Class VI program.”

The Infrastructure Investment and Jobs Act includes federal funding for state Class VI programs. The EPA estimates that the grant details and funding should become available by the middle or end of 2023.

Pore space ownership

Who owns the tiny spaces between the sedimentary rocks in which the CO₂ is to be sequestered? “We recommend that the legislature adopt the majority position and declare that, in Colorado, ownership of pore space is vested in the surface owner unless it has been severed and separately conveyed.”

Aggregating property rights

What if one or two of the property owners say nope, not going to go there? “Provide a mechanism, applicable only to geologic storage, for aggregating property rights, including nonconsenting owners,” the report recommends to legislators. “Legislators should establish a threshold for consenting owners.” “This would allow a declaration that CCUS is in the public interest, which would create a pathway for involuntary aggregation of pore space rights.”

Long-term stewardship

Several recommendations are delivered, including a 20-year post-injection monitoring period during which the operator retains ownership of and liability for the stored CO₂ and storage facility.

And also...

Other recommendations cover pipelines and the question of whether Colorado should accept CO₂ exported from other states. The Colorado Geologic Survey estimates Colorado has 720 billion tons of CO₂ sequestration potential, primarily in the Denver Basin, Cañon City Embayment, Piceance Basin, and Sand Wash Basin. The latter two are in northwestern Colorado.

Hydrogen and geothermal

“Underground hydrogen storage has been identified as an important factor for the success of future, large-scale hydrogen production and use,” the report says. “Potential storage reservoirs for hydrogen include salt covers, deep saline reservoirs, and depleted oil-and-gas reservoirs.”

Several issues need to be sorted out by state legislators, the report says.

The report recommends Colorado pursue a technical study of the state’s geothermal resources, including a “resource evaluation, technology assessment, an evaluation of potential impacts, an economic analysis, and evaluating the potential to repurpose existing infrastructure.”

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Scientific consensus on warming remains as legislator fails in bid to delist CO2 as pollutant

by Allen Best

Despite an exhaustive effort, a Colorado legislator last week failed to upend the global scientific consensus about the risks of elevated concentrations of carbon dioxide.

State Rep. Ken DeGraaf, who is from El Paso County, proposed to delist carbon dioxide as a pollutant and had an extensive explanation why. For this, he had shared with other members of the House Energy and Environment Committee a paper detailing his thinking about why nearly all of the world's climate scientists have it all wrong.

"None of you did your homework," DeGraaf, a former calculus teacher at the U.S. Air Force Academy, of which he is also a graduate, chided fellow committee members as he prepared to launch into his tutorial. "Not a surprise."

After telling the child's story of Chicken Little, he proceeded to offer an explanation about why climate change models falsely lead to the conclusion that elevated levels of carbon dioxide caused by burning fossil fuels have started warming global temperatures.

"Carbon dioxide is a bit player," he said.

"The total energy that we use in a year globally from hydrocarbons is removed from the Earth by evaporation in less than 30 seconds," he said.

In that, he is correct – although that is nothing new. Clouds constitute the most common greenhouse gas.

DeGraaf's main contention was that the Earth has great capacity to shed energy. The Earth's current warming, he said, began about the time the Little Ice Age ended (he put it at 1900, although the more common bookend is the 1850s).

Plants need carbon dioxide, he said, and pointed out that greenhouses, such as are used to grow orchids, have high levels of carbon dioxide. (As do airplanes full of passengers, by the way). Carbon dioxide does not become a direct health threat until much,

much higher levels than the current 420 parts per million.

Other, very smart people have challenged the theory of global warming. But so far, their arguments have always been shown to be missing. If there are great uncertainties

remaining, the theory largely explains what is being observed, the same way as the theory of gravity explains why apples fall from trees and astronauts float in space. This is a theory, not a simple hypothesis.

In his roughly 30-minute explanation to committee members last week, DeGraaf frequently invoked a physicist from Princeton, William Happer. "The frenzy over climate resembles the medieval crusades against foreign infidels and home-grown heretics," said Happer and a co-author in an essay published in 2021 in the National Review. DeGraaf's presentation was in many aspects an echo of that essay, "[Climate Emergency? Not So Fast.](#)" if more detailed in its science.

DeGraaf wrapped up his case by proclaiming that Colorado's greenhouse gas reduction goals are misguided. "We are



spending hundreds of millions of dollars if not billions and trillions of dollars in order to achieve what? We're not achieving anything."

Then came the witnesses, both those for and against.

One bill supporter, with an Ph.D. in agriculture economics, advised one way to reduce carbon. "If you want to reduce your carbon footprint, I urge you to breathe in but not breathe out."

There were a lot of questions and discussion about correlation vs. causation and, related to that, whether climate scientists had falsely blamed increasing concentrations of greenhouse gases with causing what was in fact happening naturally, as has occurred over the many ages. (This has been answered many, many years ago).

The most interesting back-and-forth was with energy transition activist Leslie Glustrom, who has a master's degree in biochemistry. Opening her comments by observing that she "just loves democracy," she reported agreement with DeGraaf on some elements. For example, he had expressed distrust of underground carbon injections. She called it "very risky, very expensive, not the right way to go."

Glustrom also credited DeGraaf with getting parts of his scientific story correct. "It's part of the story, but not the full story,"

she said before launching into an explanation of the role of water vapor in climate. "It is one of those part-trues, but really misses the point."

Without the increases in CO2 and other atmospheric gases, she pointed out, the climate was already predicted to start cooling. Instead, temperatures are rapidly rising.

Glustrom also explained how climate models can parcel out individual "forcing" agents to isolate the role of CO2 and other greenhouse gases.

She suggested that if committee members really wanted to drill down on the science of climate change, that Colorado has hundreds and hundreds of world-class climate scientists, "and they would love to be able to speak to everyone on these points."

DeGraaf made an urgent appeal for votes, resorting to the argument that voting no was in practice truth suppression.

"We are not deciding whether this is true, we are deciding whether to suppress the truth," he said. "I would like to see this energy committee do something constructive instead of throwing it down a literal hole."

The bill was killed on a party-line vote, 8-3, with DeGraaf and his two fellow Republicans on the short end.

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Solar & storage group members have more than tripled. Why so?

Colorado Solar and Storage Association has expanded its membership from 83 business members to 275 during the last several years.

Is COSSA giving out ski passes to new members?

No such thing, says Mike Kruger, the executive director since 2018. He points to both broad economic and industry trends but also strategic moves by the organization.

Employment numbers illustrate the industry’s growth in Colorado. Last year 9,000 people were directly engaged in solar installation or the development process. This compares with 6,000 just a few years ago.

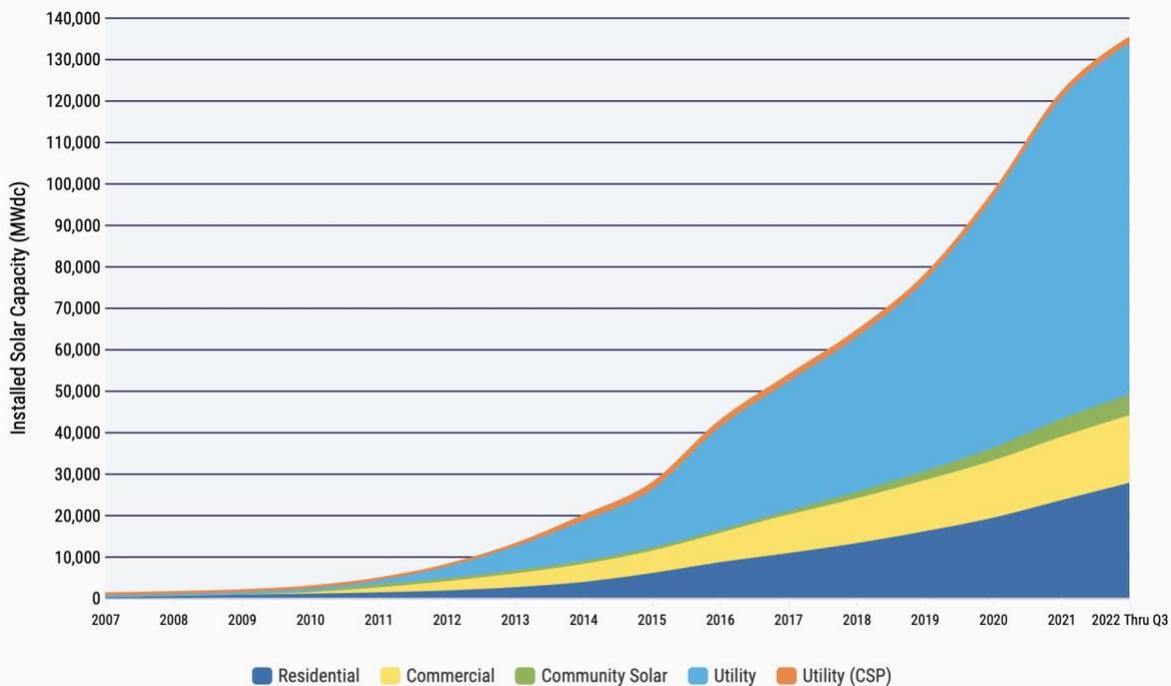
“Solar energy in the United States is booming,” proclaimed the Solar Energy

Industry Association, a national trade group, in a report from late 2022.

The market size of the U.S. solar power industry has grown 20.7% per year on average from 2018 to 2023, reports [IBIS World](#), an industry research firm. It projects the same pace of growth in 2023. Citing the national solar trade group, the New York Times recently reported an even larger figure: an average 33% per year. By the third quarter of 2022, 45% of new generating capacity came from solar.

Residential, commercial, and community solar have expanded, but particularly utility-scale solar projects such as those near Pueblo, including the 300-megawatt Bighorn solar project associated with the steel mill there. It was completed in 2021.

This growth can at least partly be attributed to prices of PV panels that, despite supply-chain disruptions manifested in 2022, have fallen by half since 2010. Technology innovations have also helped make solar more competitive. For example, solar cells



Source: [SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q4 2022](#)



can now convert 31.6% of solar energy to electric currents, up from 24.4%.

Then there are public policies, such as those in Colorado, that seek to foster renewables in myriad ways, plus the improved ability of electrical suppliers to integrate high levels of renewables while maintaining high levels of reliability for electrical deliveries.

COSSA's growth has been the result of strategic moves, both by the 16 board members and some undertaken by Kruger. One of them was the renaming of the organization to pair solar with storage.

"When we did it in 2019, it was pretty danged aspirational," Kruger says of the inclusion of the name storage. "Everybody knew it had to be the answer."

Then, storage was still a minor player in the energy picture. Now it has become a major part of the electric resource plans by Xcel Energy but also other electric utilities.

"Three years ago it was aspirational," says Kruger. "Now it is reality."

COSSA's agenda is set by 16 members, a large and perhaps at times unwieldy number of voices. That size, says Kruger, is reflected by the ambition of the organization to broadly reflect Colorado.

"A lot of our growth has been outside of the Denver metro area," he says, citing businesses from Grand Junction, Steamboat Springs, Durango, and Alamosa.

This also reflects the directions given by Kruger to develop relations across Colorado with electrical cooperatives, municipal utilities, and others. The broad goal is to lower tensions to a level that conversations can occur.

"We won't agree with each other all the time, but at least they know they have a partner that they can go to and ask questions."

This, in turn, helps the members of the association, as the trade group can engage with local officials. "The bulk of installations are still in the Denver area, but we are

starting to see very large installations in Pueblo and Weld County attracting national companies."

This, says Kruger, contrasts with COSSA in its earlier iteration, when the organization more narrowly focused on Xcel Energy and its operations in the Denver-Boulder area. COSSA is still in those discussions, but there's a larger picture.

Kruger credits staff members that include Cathy Boies, who arrived as policy director in 2021 after spending time at the Colorado Public Utilities Commission as a policy analyst, and Jason Henderson, who is the vice president of development and has been in the solar industry for a decade.

As for Kruger, he came to Colorado knowing very little about the state. A one-time middle-school teacher, he learned about public policy development while working for the Obama Administration and about the electric power sector as the Director of Communications for the Smart Electric Power Alliance. As for Colorado, it was a mystery.

"Man, I am embarrassed to say that I came to Colorado for the lifestyle that I saw on TV and social media. And I had only visited a few times," he says. "I couldn't have found Kit Carson County with a map."

Reflective of that broadened, deepened understanding is Kruger's travel schedule. He travels to Lamar and Durango, Alamosa and Craig in the course of his work.

He also knows that Kit Carson, the county, is located along the Kansas border, its largest town, Burlington, spliced by Interstate 70. Likely he knows there's another Kit Carson — the town, this one bisected by an extension of East Colfax Avenue, otherwise known as Highway 40. And he's seen Kit Carson Peak, the 14er in the Sangre de Cristo Range.



Mike Kruger

Staggering sums in United Power split from Tri-State G&T

by Allen Best

I'm not sure which astounds me more, the amount of money United Power has devoted to legal and expert witnesses in making its case against Tri-State Generation and Transmission or the amount of money that it claims it has lost because of Tri-State's stalling.

The latter estimate, by the way, ranges from \$483 million to \$533 million.

The estimate comes from Kurt G. Strunk, from the National Economic Research Associates, in New York, who was asked to assess the economic damages to Brighton-based United because it could not leave Tri-State in 2020 as United says it originally intended.

Strunk's firm is billing United \$200,000 for 400 hours used to come up with this estimate. That's \$500 an hour.

The Feb. 20 filing in Adam's County District Court, site of United's lawsuit against Tri-State, also reports these fees charged to United by witnesses and lawyers:

- Herrick K. Lidstone Jr. of Greenwood Village, billed 40 hours at \$600 an hour for \$24,000;
- Jason Wiesner of Boulder billed 20 hours at \$850 an hour for \$17,000; and
- Karl R. Rabago of Denver billed 33 hours at \$250 an hour for \$8,250.

This sort of filing makes lowly-paid journalists question their career choices. I assume Tri-State has also been throwing heaps of cash into the effort to fight United in court. Several years ago, I was at a Colorado Public Utilities Commission meeting when then-PUC commissioner, Frances Koncilja,

asked the Tri-State lawyer how much he billed per hour. \$500, replied Thomas Dougherty.

Money envy aside, why do any of these numbers matter? Why does Big Pivots yet again write about the legal war between Tri-State, Colorado's second largest utility, and United Power, its single biggest member, alone responsible for more than 20% of Tri-State's sales?

Because I believe this case indirectly poses the question of the future of the energy transition in rural Colorado.

Rural areas were slow to partake of the advantages of electrification early in the 21st century. Investor-owned utilities weren't interested, and so Congress in 1936 passed

the Rural Electrification Act. My grandparents became members of their local electrical cooperatives in eastern Colorado in 1942 and 1948.

The big question here is whether Tri-State can reinvent itself in a way that can help rural

Colorado fully gain the benefits of the energy transition.

Let's be very clear: Tri-State is very different from what it was 10 or 15 years ago when it thought that all questions were answered by another big coal (or possibly nuclear) power plant. It is making the effort to reinvent energy. But this case suggests something less than a full commitment. Why else is United so determined to leave—and now so many others, too?

As readers familiar with the story know, Tri-State first set an exit price for Kit Carson of \$119 million, but they settled at \$37 million when the Taos-based utility left in 2016.

Something similar happened with Delta-Montrose: an initial offer of \$322 million and then, after two years of negotiations, \$62.5 million.

With United, Tri-State in 2018 proposed an exit fee of \$1.2 billion—then the next year reported a higher figure of \$1.3 billion.

Dispute scheduled to go before jury in June — unless this rocky marriage can be saved before



Tri-State added this wholesale greenhouse near Fort Lupton and two other non-electric members in order to lose its exemption from regulation by the Federal Energy Regulatory Commission. Photo/Allen Best

An administrative law judge with the Colorado Public Utilities Commission in August 2020 concluded that an exit fee of \$235 million would be just and reasonable.

By that time, Tri-State had set out with another strategy. Even in May 2018, according to this most recent filing by the United legal team, Tri-State was plotting how to avoid jurisdiction in Colorado. Two strategies were contemplated to bypass Denver in favor of the Federal Energy Regulatory Commission.

(The Colorado PUC makes me dizzy at times; I am told that FERC is byzantine enough to make you forget your name).

To move this already slow-moving case to D.C., where things move far more slowly yet, Tri-State needed to add members who were not electrical utilities. Its first new member was MIECO. A marketing company, it had

provided gas services to Tri-State. That was in September 2019.

Soon came two more non-utility members: Olson's Greenhouse, a wholesale greenhouse, near Fort Lupton, and Ellgen Ranch, near Craig.

The disingenuousness of this strategy is described in the heavily footnoted filing (page 210) in this way:

"Tri-State's purpose to admit Ellgen is to lease its Tri-State owned land for ranching, even though Tri-State already had an existing relationship and lease with Ellgen as of the date of the purported membership agreement. Tri-State's purpose to admit Olson's as a member is to sell it thermal energy for its greenhouse operations, even though Tri-State already had an agreement with Olson's to sell thermal energy and is now giving Olson's a discount for that thermal energy."

To cut to the chase, Tri-State was able to shrug off any decisions by the Colorado PUC about how much United Power should have to pay when it got FERC jurisdiction. FERC still has not decided, although its administrative law judge last summer recommended a formula that looks an awful lot like the one devised by his Colorado PUC counterpart two years before. FERC commissioners themselves will do the deciding. That might happen this year, but whatever they decide might in turn be challenged legally.

All of this is the background for the central argument of this new filing. The United team alleges that this maneuvering to get FERC jurisdiction is not just ethically suspect (my words) but also illegal under Colorado law (their contention). That argument keys on something called “Article 55” under Colorado law.

The details of this, if pivotal, are tedious. The short story is that if United’s interpretation of Colorado law is proven correct, then Tri-State unlawfully sought federal jurisdiction.

That’s for a jury to decide. Nine days have been reserved in Adams County District Court for a jury trial beginning June 26.

Does this change anything? I suspect it sets the stage for a judgment against Tri-State, an organization already beleaguered by debt on a fleet of coal-fired power plants that, whatever their role in providing reliable electricity, have become very costly to operate.

Perhaps I’m missing something, but the big picture that I seem to see is that Tri-State managers should have found a way to make peace with United Power and other dissident members. Now, the dissidents have expanded.

We have two other coops, in addition to United, that have served notice they intend to leave, along with several others said to be considering their options. Taking things to Washington D.C. has prevented United from getting out but it may have precluded a

number of other options that could have been advantageous for all the “family” members.

Is there a parallel to the strategic mistakes made by Colorado-Ute, whose coal plants at Craig Tri-State inherited? Maybe—but I’ll leave that alone for another day.

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