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The West's Historic Drought In 3 Maps

By John Keefe and Rachel Ramirez, CNN Updated 10:03 AM ET, Thu July 22, 2021

(CNN)An unprecedented, multi-year drought continues to worsen in the West amid a period of record heat and dryness, which scientists say is a clear sign of how the climate crisis is affecting not only the weather, but water supply, food production and electricity generation.

Despite some good rainfall in Southwest, new drought numbers show worsening and expanding drought across the board in the West, according to the US Drought Monitor. More than 95 percent of the West is in some level of drought, with nearly two-thirds in extreme or exceptional drought — the two worst categories.

Six states are entirely in drought conditions.

Across the US, the drought has nearly doubled in size from this time last year. Around 25% of the country was in drought conditions in July 2020; as of this week, nearly half is in drought.
In addition to mandatory water restrictions already in place, even stricter cuts are looming amid the drought in some states as water levels plummet along the Colorado River.

Current drought

More than 95% of the West is in drought, the largest area on record. More than 65% of the region is in 'extreme' or 'exceptional' drought — the two most severe categories — expanding by 60,000 square miles, or about the size of the state of Georgia, during the month of July.
There are six states completely in drought conditions: California, Oregon, Nevada, Utah, Idaho and North Dakota.

While showers from the Southwest monsoon improved conditions in Arizona, New Mexico, and southwestern Colorado, it brought little relief. Elsewhere, drought intensified across the northern Rockies and especially the Pacific Northwest where the numbers are dire and the rainfall has been basically nonexistent.

As the Bootleg Fire, the country's largest active wildfire, rages in Southern Oregon, about 17% of the state is now in exceptional drought — a number that nearly quadrupled in a month and the highest on record for the state. Washington state, which until last week had never seen any exceptional drought,

has now seen it explode to covering more than a quarter of the state. It's also leading the country with poor ratings for rangeland pastures, spring wheat, and barley.
Many of the West's largest reservoirs and lakes continued to show shocking declines. Lake Mead, a Colorado River reservoir behind the Hoover Dam, fell 135 feet below its 2000 level, when it was last considered full.

Meanwhile, the Flaming Gorge Reservoir in Wyoming and Utah is releasing water to boost Lake Powell's water levels to protect its hydropower generating capacity. Also in Utah, the surface elevation of the Great Salt Lake also declined, tying the previous record low set in 1963.
As the planet warms, drought and extreme heat will also fuel deadly wildfires. Multiple studies have linked rising carbon dioxide emissions and high temperatures to increased acreage of burning across the West, particularly in California.

Rainfall outlook

The West experienced extremely low rain and snowfall over the past year, compounded by drastically high temperatures. Less rain and increasing heat waves have led directly to drought conditions and water shortages.

The Southwest monsoon, which began in mid-July, is expected to lead to some relief in that region. Still, the Drought Monitor reports recent rain "provided limited drought relief." In some cases, the agency reports, "moisture has seeped several feet into the soils."
As climate change accelerates and winter temperatures increase, snowfall will decrease. High-elevation snowpack serves as a natural reservoir that eases drought, storing water through the winter months and slowly releasing it through the spring melting season.

Stream and river flow

Streamflow, a measure of how much water is carried by rivers and streams, is another significant indicator of drought and its impact.

As drought conditions have worsened in 2021, hundreds of stream and river locations are experiencing below-average flow. More than 50 percent of the western monitoring stations reported lighter-than-usual flows. Fishing restrictions have also been put in place on many rivers in Montana due to low flows and warm waters.

Changes in streamflow affect the water supply for our own municipal use, crop irrigation and power generation.

Lake Mead's decline points to scary water future in West

BY ZACK BUDRYK - 06/18/21 12:21 PM EDT

The Hoover Dam is seeing record-low water levels, a significant and scary development with major implications for water and climate in the entire American Southwest.

Amid drought conditions, Lake Mead’s level last week reached an all-time low of 1,071.56 feet above sea level, leaving it just 37 percent full.

The body of water’s level has been declining since 2000, and has fallen about 140 feet over the past two decades. It comes amid a drought in the Southwest that is the worst in two decades, according to a New York Times analysis.

The Colorado River, which feeds the reservoir, is severely over-allocated, with the demand for its water exceeding the actual flow of the river, according to Kathryn Sorensen, a member of the board of advisors at the Kyl Center for Water Policy at Morrison Institute. Scientists have projected the river's flow may diminish by up to 25 percent in the future, she noted.
Seven states are located in the river's basin and affected by the Colorado River Compact: Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. Experts say the overarching problem with water management in the Southwest, and these states in particular, is that existing systems are based on a climate that, because of warming, no longer exists.

The compact was ratified in 1922, and policymakers, including the late Sen. John McCain (R-Ariz.), have repeatedly called for it to be updated to reflect current circumstances.

Moreover, snowpack in the West has begun melting significantly earlier than it did at the time the water agreements were made, according to Noah Diffenbaugh, the Kimmelman Family Senior Fellow at the Stanford Woods Institute for the Environment.

In December, representatives of the seven states wrote to then-Interior Secretary David Bernhardt that they were "initiating preliminary conversations" on another round of talks.

Some stakeholders in the river basin have taken steps to forestall or push back against shortages, she said, such as through a strategy called system conservation, in which one user leaves any water they save in Lake Mead, and those who are next in line for the water under the agreement agree to place their right to the saved water in forbearance.

In the meantime, Diffenbaugh said, stakeholders and policymakers are exploring a number of potential long-term solutions to the drought conditions caused by climate change. These include processes to make water from other sources suitable for use, such as desalination of salt water or treatment of wastewater.

Another potential solution, he said, is artificial groundwater recharge, or directing excess surface water and wastewater back into aquifers. This approach "would require some additional infrastructure but it wouldn't require a new infrastructure system," he said.
However, the situation also illustrates the need for a larger overhaul of water infrastructure in the Southwest, Sorensen said.

These options could range from large transmission mains to local wells but "our first obligation" should be to put such backup plans in place, she said.

At a time when extreme heat threatens to knock out Texas's self-contained power grid, both the heat and the water levels have major implications for energy in the West as well. Last month, the operator of California's own grid issued an assessment warning that the extreme temperatures would likely affect hydroelectric power generation in the state, citing lower snow water content than the previous year.

Hydrogen substitution for natural gas in turbines: Opportunities, issues, and challenges

6.18.2021 ***Bobby Noble and Neva Espinoza, EPRI***

Introduction

This article considers issues associated with hydrogen as an energy carrier. Currently, the energy system is dominated by two largely independent, multi-trillion dollar carrier systems — *electricity* and *hydrocarbon fuels.* In the US today, roughly 40% of energy is carried via electricity and 60% via fuels. Fuels are chemical-based energy carriers with high energy densities that make long-range transportation possible. Today they are almost completely based on fossil fuels, such as natural gas or crude oil. These systems leverage millions of miles of pipelines, a significant petrochemical manufacturing base, and serve a global user network, including vehicles, industrial processes, and building heating.

While many questions remain about the relative roles of electricity and chemical energy carriers in a decarbonized economy, two things seem clear: (1) use of fossil fuels as energy sources and carriers will decrease, although probably not to zero, and (2) use of "manufactured" chemical energy carriers, such as hydrogen that is produced using renewable power, will grow. These will be used to both move energy from sources to user, as well as to store energy.

There are three key issues around hydrogen as an energy carrier: (1) generation of hydrogen, (2) logistics, handling, and movement of hydrogen, such as via pipelines, and (3) utilization of hydrogen by a variety of "energy conversion device" – i.e., devices that generate electricity (e.g., fuel cells or gas turbine power plants), or are used to heat water or building spaces.

The primary focus of this article is to address issue (3) –to identify the opportunities and challenges associated with utilizing hydrogen in energy conversion devices. For example, a key opportunity for hydrogen is to store it and then burn it in gas turbines during times of peak demand. This has the benefits of re-purposing existing technology (gas-fired plants and natural gas infrastructure) for combustion-based energy storage with no carbon emissions. Here we address the following questions:

1. Is hydrogen viable as a fuel? Can hydrogen be used in retrofitted devices or new systems?
2. If so, what are the constraints or issues that must be understood by policymakers, users, and the public?

Can Hydrogen be used in Energy Conversion Devices?

The answer to this question is emphatically yes. There is no fundamental reason why hydrogen cannot be combusted in gas turbines, heaters, boilers, or other energy applications such as generating electricity. It can be used in a blend with natural gas, or as pure hydrogen.

In fact, today hydrogen is used as a dominant fuel source for a number of power generating plants, such as the Fusina hydrogen power station in Italy (100% hydrogen), a petrochemical plant in Daesan, South Korea (95% hydrogen), a steel mill in Wuhan, China (60% hydrogen), and several planned facilities converting to 100% hydrogen such as the Magnum plant in Vattenfall, Netherlands, and the Intermountain Power Agency plant in Utah. It has been flown in specially designed aircraft by Martin, Tupelov, Boeing, and Skyleader, and airframers have pledged future hydrogen aircraft such as the Airbus ZEROe.

What are the Constraints Associated with Utilizing Hydrogen in Existing Systems?

While hydrogen combustion offers a promising energy storage and conversion pathway, it is not a "drop-in" fuel for much of today's natural gas fired energy conversion devices. In other words,

alterations are needed in the fuel handling systems, valves and piping, and combustor hardware. These alterations are needed to address several issues of concern to stakeholders, including pollutant emissions, operability, and cost. These issues are highly interdependent.

We will address pollutant emissions first. In addition to concerns around CO_2 emissions associated with climate change concerns, combustion can generate other pollutants, even zero-CO_2 fuels like hydrogen. Pollutants most commonly associated with fossil fuel combustion are particulates (e.g., soot), carbon monoxide, and NOx.

Hydrogen combustion emits no particulate or carbon monoxide emissions, since it contains no carbon atoms – another major benefit of it as a fuel. However, hydrogen combustion can generate nitrogen oxides (NOx) emissions. In essence, NOx is generated when air is heated to high temperatures and the N_2 and O_2 in air start to react with each other. NO_x is a regulated criteria pollutant because of its potential to cause adverse respiratory health effects and because it contributes to acid rain.

In situations where NOx emissions are not a concern, many options are available to use hydrogen and hydrogen blends, including the ability to use legacy combustor hardware for a range of hydrogen and natural gas blending levels. *In other words, the key challenges associated with using hydrogen are in low NOx combustion systems*. So called "diffusion combustors" are an older technology that leads to high levels of NOx pollutants. These systems require water or steam injection to comply with the NOx regulations in modern air permits, which may be unattractive due to the cost and complexity of the water management systems. These systems need large volumes of clean, de-mineralized water, which introduces additional environmental considerations. In many places, such as the desert, water injection systems are not practical. Nevertheless, diffusion combustors have good fuel flexibility. Many of these systems operate today on fuels with very high hydrogen content, fuels that are naturally produced as biproducts of industrial processes in steel mills and petrochemical plants. Many of these diffusion combustors are 100% hydrogen capable (see specific site examples above) but their deployment is limited to locations and economies where water/steam injection is viable for NOx control.

So called "lean, premixed combustors" are inherently low NOx systems, and can produce compliant emissions without any water or steam injection because they avoid the high temperature regions that produce NOx. This is illustrated in Figure 1, which shows the differences of lean premixed combustors relative to non-premixed combustors. Therefore, lean-premixed systems dominate new electric power plant installations and are the predominant technology in the power generating fleet. However, legacy systems do not have the operational flexibility or fuel flexibility of diffusion combustors.

Given these points, we'll next dig into the details a little further on both operability and emissions in lean, premixed combustors, and what the concerns are and where the issues arise. Operability refers to the ability to operate the plant reliably without having it shut itself down, damage itself, or have unacceptable performance. Hydrogen affects operability in several ways.

- Flashback – this is the most severe concern around high H2 levels in systems designed for natural gas, as the flame can propagate upstream and catastrophically damage hardware. Hydrogen's flame speed is an order of magnitude higher than that of natural gas. Therefore, flashback is the dominant issue for modern lean premixed combustors on hydrogen fuel.
- Blowoff – If you've ever tried to light a match outside when its windy, you'll know what this is. Similarly, combustors have flow velocities that can exceed 100 MPH and so preventing the flame from flying downstream and out of the system is a major challenge. Because hydrogen propagates so fast, blowoff challenges are alleviated with hydrogen.

However, this issue is compounded for fuel flexible combustors, which must avoid blow out with slower burning natural gas fuel and simultaneously avoid flashback with high hydrogen fuel. For these reasons, the highest hydrogen capability marketed for any frame engine with lean premixed combustion is 50% hydrogen by volume, and much lower for most systems.

- Combustion Instabilities- Modern low NOx systems are prone to a variety of damaging oscillations and a great deal of effort is spent on modern systems to develop designs that avoid these issues at the operating conditions of interest. What this design must look like, however, changes with fuel composition or ambient temperature. Thus, in cases where the fuel composition can vary widely, it becomes impossible to develop a static design that is stable over all conditions and for all potential fuels. This has the practical impact of restricting certain operating regimes from operation, depending upon fuel composition. For example, a plant may not be able to operate at peak power for certain fuel composition ranges.

Finally, lets dig a little further into NOx emissions. First, we should correct some common errors that are out there. Since NOx emissions increase exponentially with temperature, and because hydrogen can burn hotter, its sometimes said that hydrogen combustion will produce more NOx. However, ***this point needs to be contextualized as to whether the combustor design is a diffusion flame combustion or lean, premixed combustor.*** It is true for diffusion flame combustors, which are inherently high NOx devices. It is not necessarily true for premixed, low NOx systems. This is because NOx emissions are a function of temperature in these systems and many energy systems run at a fixed temperature or power settings. To restate – premixed hydrogen powered systems can be designed for near-zero NOx emissions.

Next, it's important to understand the connection between efficiency of the engine and its NOx emissions. An approximate rule of thumb is that higher efficiency machines run at higher temperatures and, therefore, emit higher NOx emissions. For reference, current EPA regulations on NOx for gas turbines is 30 ppm, while in certain areas such as in California with air quality problems, they can be as low as 3 ppm. The highest thermal efficiency devices on the planet, combined cycle gas turbines, are now designed to operate with NO emissions between 2-25 ppm. When operating with various H_2 blends, since they are designed to operate at a fixed temperature, hydrogen addition need not adversely impact NOx emissions for premixed, low NOx designs.

However, H_2 also has additional effects on NOx emissions in low NOx, premixed systems associated with subtle differences in the way it burns which causes it to generate trace increases of NO. For big, high efficiency engines, these effects are very small. However, for smaller engines, such as microturbine that might emit 1-3 ppm, the effect could be noticeable – for example, a 1 ppm emission level could become 2 ppm.

To summarize, for lean, premixed combustion systems, increasing hydrogen levels can cause small absolute increases in NO levels, which could be large absolute changes (e.g., in the above example it doubled NOx emissions from 1 to 2 ppm). However, for larger, high efficiency machines hydrogen effects can be minimal.

A final point – heat transfer coefficients of combustion products fueled with hydrogen are higher than natural gas. Because the peak temperature in a gas turbine is controlled by heat transfer to the rotating turbine, this could necessitate a reduction in turbine inlet temperature as hydrogen levels increase. While high hydrogen fuels can actually benefit cycle efficiency, this can be counteracted by the

efficiency reduction from a reduction of the turbine inlet temperature. **Figure 2 illustrates this tradeoff.**

Key Future Needs

To summarize, this paper has shown, first, that hydrogen is certainly an acceptable, very clean fuel. Second, it has shown that it can be used at low levels in existing fielded systems, and some low NOx gas turbines exist in the field today that can operate with H2 levels of up to 50% , cofired with natural gas. Furthermore, systems have been developed to operate with pure hydrogen. The key development challenge for the future is low NOx, fuel flexible systems, that can be readily operated with a range of fuel compositions, ranging from pure H2 to pure natural gas. **Figure 3** below summarizes the hydrogen readiness, R&D needs, and NOx compliance of these various technologies. All of these will enable the combustion technology of the future – low NOx, wide operability range, fuel flexible combustion systems capable of operating up to 100% hydrogen.

Calif. Republicans introduce broad drought bill

Jeremy P. Jacobs, E&E News reporter Published: Tuesday, June 22, 2021

California Republican Rep. David Valadao has introduced legislation aimed at boosting water supplies for agriculture as a worsening drought grips the West.

Valadao's "Necessary to Ensure Expeditious Deliver of Water Act," H.R. 4018, is backed by most Republicans in the California House delegation but will almost certainly be opposed by Democrats and environmental groups.

The lawmaker said the goal is to make sure water currently in the federal Central Valley Project, which transfers water from California's wet north to its drier south, goes to use by reducing regulatory burdens.

Much of the West is experiencing severe to exceptional drought conditions, according to the U.S. Drought Monitor, including Valadao's agricultural-based district in California's San Joaquin Valley.

Abnormally high temperatures, low precipitation and a rapidly melting snowmelt have depleted reservoirs. That's led the Bureau of Reclamation, which manages the Central Valley Project, to significantly cut back deliveries to its project contractors. Most forecasters expect the situation to worsen as the summer rolls on.

Valadao's bill would extend provisions of the 2016 Water Infrastructure Improvements for the Nation Act, a heavily lobbied bill that President Obama signed shortly before leaving office.

Environmentalists, however, sharply criticize those provisions, contending that they make water deliveries available that threaten endangered fish, like salmon runs, which suffered during the last California drought ending in 2016. Valadao's bill would also challenge California's management of its water project.

Both California's State Water Project and federal Central Valley Project divert water out of the Sacramento-San Joaquin River Delta east of San Francisco to be pumped South.

If California reduces deliveries via the State Water Project due to endangered species concerns, Valadao's bill would direct the Interior Department to boost deliveries via the Central Valley Project to "offset losses."

Valadao lost reelection in 2018 but returned to the House this year after campaigning heavily on water issues. Earlier this year he floated a water storage bill (E&E Daily, Feb. 4).

Why some of the world's biggest companies are increasingly worried about water scarcity

PUBLISHED TUE, JUN 29 20211:23 AM EDT, Sam Meredith

LONDON — Major companies from across a range of sectors are increasingly concerned about the cost and availability of the world's ultimate renewable resource: water.

The availability and relatively low cost of water does not tend to capture much attention until it effectively runs out. Yet, with the climate crisis seen as a "risk multiplier" to water scarcity, analysts warn that even companies with relatively limited financial exposure to water risk should brace for disruption.

It comes at a time when water prices are rising around the world. The average price of water increased by 60% in the 30 largest U.S. cities between 2010 and 2019, according to data compiled by Barclays, while California Water Futures have regularly jumped as much as 300% in recent years.

Tribe becomes key water player with drought aid to Arizona

By FELICIA FONSECA July 5, 2021

FLAGSTAFF, Ariz. (AP) — For thousands of years, an Arizona tribe relied on the Colorado River's natural flooding patterns to farm. Later, it hand-dug ditches and canals to route water to fields.

Now, gravity sends the river water from the north end of the Colorado River Indian Tribes reservation through 19th century canals to sustain alfalfa, cotton, wheat, onions and potatoes, mainly by flooding the fields.

Some of those fields haven't been producing lately as the tribe contributes water to prop up Lake Mead to help weather a historic drought in the American West. The reservoir serves as a barometer for how much water Arizona and other states will get under plans to protect the river serving 40 million people.

The Colorado River Indian Tribes and another tribe in Arizona played an outsized role in the drought contingency plans that had the state voluntarily give up water. As Arizona faces mandatory cuts next year in its Colorado River supply, the tribes see themselves as major players in the future of water.

Lake Mead on the Nevada-Arizona border has fallen to its lowest point since it was filled in the 1930s. Water experts say the situation would be worse had the tribe not agreed to store 150,000 acre-feet in the lake over three years. A single acre-foot is enough to serve one to two households per year. The Gila River Indian Community also contributed water.

The Colorado River Indian Tribes received $38 million in return, including $30 million from the state. Environmentalists, foundations and corporations fulfilled a pledge last month to chip in the rest.

Kevin Moran of the Environmental Defense Fund said the agreement signaled a new approach to combating drought, climate change and the demand from the river.

Tribal officials say the $38 million is more than what they would have made leasing the land. The Colorado River Indian Tribes stopped farming more than 15 square miles (39 square kilometers) to make water available, tribal attorney Margaret Vick said.

While some fields are dry on the reservation, the tribe plans to use the money to invest in its water infrastructure. It has the oldest irrigation system built by the U.S. Bureau of Indian Affairs, dating to 1867, serving nearly 125 square miles (323 square kilometers) of tribal land.

The age of the irrigation system means it's in constant need of improvements. Flores, the tribal chairwoman, said some parts of the 232-mile (373-kilometer) concrete and earthen canal are lined and others aren't, so water is lost through seepage or cracks.

A 2016 study conducted by the tribe put the price tag to fix deficiencies at more than $75 million. It's leveraging grants, funding from previous conservation efforts and other money to put a dent in the repairs, Flores said.

The tribe is made up of four distinct groups of Native Americans — Chemehuevi, Mohave, Hopi and Navajo. The reservation includes more than 110 miles (177 kilometers) of Colorado River shoreline with some of the oldest and most secure rights to the river in both Arizona and California.

The tribe can't take full advantage of its right to divert 662,000 acre-feet per year from the Colorado River on the Arizona side because it lacks the infrastructure. It also has water rights in California.

An additional 46 square miles (121 square kilometers) of land could be developed for agriculture if the tribe had the infrastructure, according to a 2018 study on water use and development among tribes in the Colorado River basin.

Glendale Water & Power signs contract tied to C&I energy efficiency program

July 6, 2021 **Peter Maloney**

Glendale Water & Power (GWP) has signed a contract with Lime Energy for energy efficiency that aims to support the California public power utility's clean energy transformation.

Under the $18 million, seven-year contract, Lime Energy will deliver 36,500 megawatt hours (MWh) in energy savings by providing a combination of targeted energy efficiency technologies, upgrades, and services for small and large businesses in Glendale.

GWP projects it will have 964,352 MWh of retail energy sales in its 2021-2022 fiscal year, rising to 940,282 MWh in fiscal year 2030-2031.

The contract institutes a pay-for-performance program that is designed to provide energy efficiency upgrades to commercial and industrial (C&I) businesses in the utility's service territory. The program will use the direct install energy efficiency program model, which is designed as a turn-key process for C&I customers.

Among the services Lime Energy, subsidiary of Willdan Group, will provide GWP are marketing, sales, engineering, project implementation, and customer support for a range of energy efficiency practices and technologies. The technologies covered under the program include lighting, refrigeration, and heating, ventilation and air conditioning (HVAC).

GWP has invested over $50 million in multiple energy efficiency programs, for both residential and business customers, since 2000.

The program with Lime Energy was developed in response to City Council recommendations to develop clean energy programs as part of the utility's plan to **repower its Grayson power plant**.

GWP is repowering the Grayson plant with a combination of renewable energy resources, energy storage and a limited amount of thermal generation. The plan includes a 75 MW, 300 megawatt-hour (MWh) battery energy storage system, as much as 50 MW of distributed energy resources that include solar photovoltaic systems, energy efficiency and demand response programs, and 93 MW of thermal generation from up to five internal combustion engines.

The Lime Energy program is part of GWP's Clean Energy Program suite. Another element of the utility's Clean Energy Program was its **launch in April** of its **Peak Savings demand response program** for residential and commercial customers. The program provides incentives for reducing demand on the electric grid on days when demand is highest and is being run by Franklin Energy.

4 state trends remaking U.S. electricity
Miranda Willson, Kristi E. Swartz & Edward Klump, E&E News reporters Friday, July 9, 2021

With the status of major energy legislation in Congress up in the air, states are under close watch to determine whether President Biden's clean energy agenda is possible.

From Oregon to Massachusetts, lawmakers this year pushed through measures boosting electric vehicles, promoting environmental justice and setting targets to reduce greenhouse gas emissions. But as this year's legislative sessions show, clean energy plans can also face uphill battles — and in some states, fossil fuels are getting a boost.

The split on energy policy is playing out regionally, with some states, mostly in the South and West, enacting laws in 2021 to support coal or gas, for instance. Several plans direct utility regulators to consider the contributions of fossil fuel power plants for a reliable power grid when reviewing utility resource plans.

On the other hand, Oregon this year is expected to become the latest state to move toward 100% carbon-free electricity, echoing Biden. A bill that would require utilities to eliminate power-sector emissions by 2040, five years later than the president's target, passed the Legislature last month and now sits on Democratic Gov. Kate Brown's desk. Some states that have previously established similar goals now are targeting emissions from sectors outside electricity, including transportation and buildings.

In particular, more states this year enacted laws to promote electric vehicle use and to electrify government-owned fleets, observers said. Some also passed provisions that address how much to charge EV drivers in transportation fees, because people with all-electric cars don't contribute to statewide gasoline taxes.

New measures also refine existing clean energy plans by establishing requirements to procure certain types of clean energy resources, such as offshore wind and battery storage. Connecticut, for example, became the latest state to approve an energy storage target, with a new law calling for 1,000 megawatts of the technology by 2030.

Nationwide, Republicans control 61 chambers in state legislatures, while Democrats control 37, according to Ballotpedia. Even in states not considered clean energy trailblazers, however, lawmakers this year passed bills that "recognize that our electricity system is moving in a direction toward decarbonization," Leon said.

While some legislatures are still in session, here's a look at four energy trends that emerged in bills that became law or made progress this year:

Coal and gas

Some states with largely Republican-controlled legislatures — and sometimes with significant coal, oil or gas industries — threw lifelines to fossil fuels in 2021.

In West Virginia, S.B. 542 says the state must "take immediate steps to" make sure no more coal plants close, that no more coal jobs are lost and that "long-term state prosperity is maintained." The law asks the West Virginia Public Service Commission to consider a variety of economic and employment issues when reviewing proposals that could shutter coal-fired power plants.

Similarly, a law in Arkansas declares that the state's General Assembly considers it "to be in the public interest" to promote and encourage the use of electric generating units "to the maximum extent practicable." Many legacy power plants across the United States run on coal or natural gas.

In addition, at least nine states enacted measures to preemptively ban cities and towns from limiting or preventing the use of natural gas in buildings, according to a tally from the National Conference of State Legislatures.

In some states, however, gas-supporting measures extended beyond the use of the fuel in buildings. One new law in Florida restricts local governments from cutting back on the amount of natural gas that was extracted by hydraulic fracturing, while another in the Sunshine State prevents cities and towns from regulating fueling stations.

This week, legal analysts said a court ruling upholding the nation's first gas ban in Berkeley, Calif., could spur other states and localities to enact similar prohibitions on the fossil fuel.

Electric vehicles

With electric vehicles, advocates made some headway and helped to defeat certain measures, even as big packages to set the industry up for growth were unsuccessful.

The Texas Electric Transportation Resources Alliance, for example, celebrated enactment of S.B. 1202, which says an entity selling EV charging services doesn't have to register as a utility to be able to sell electricity.

One notable transportation bill with an EV focus this year came out of Colorado. Signed into law by Gov. Jared Polis (D) last month, S.B. 260 will allocate over $730 million to electric vehicle infrastructure in the state, to be paid for with revenue from new fees on ride-hailing services and

certain deliveries. It also creates a system for phasing in additional fees on EV drivers over the next decade and imposes a charge for gasoline cars.

Lawmakers in a handful of states also sought to address how much to charge EV drivers to support road maintenance and other transportation infrastructure, because those services have traditionally been funded by portions of states' gasoline taxes. Some of the highest fees proposed, however, did not cross the finish line.

EV supporters say they expect more states to impose fees on the cars as electric transportation becomes more widespread.

Clean standards

Once states pass carbon-cutting legislation, they often have to revisit climate plans to fill in details. That was the case in a number of states this year that enacted laws promoting transmission development to support more renewable energy projects and measures affirming commitments to equity and environmental justice in a transition away from fossil fuels.

In a few Western states, several plans could further the development of a Western regional transmission organization. Most of the West is not part of an RTO or independent system operator, which are organizations that some clean energy supporters say have helped advance renewable energy in other parts of the country.

In Oregon, S.B. 589 calls on state officials to prepare a report on the benefits, opportunities and challenges from possible RTO development or expansion in the state. Colorado and Nevada also enacted laws with provisions that seek to encourage utilities to join an RTO or organized market by 2030.

The Nevada bill, S.B. 448, will require the state's main utility, NV Energy, to submit a plan to build new high-voltage transmission lines, as well. In addition, it sets new requirements to allocate 10% of expenditures on energy efficiency to low-income people.

Massachusetts, which has committed to net-zero greenhouse gas emissions by 2050, also sought to fine-tune its clean energy targets. In addition to setting interim emissions reduction goals, S.B. 9 will enable the administration to implement voluntary energy-efficient building codes and calls for the procurement of 2,400 MW of additional offshore wind power. However, some environmentalists wanted the bill to go further (Energywire, March 29).

Overall, provisions supporting environmental justice communities appeared to be a unifying thread among the omnibus clean energy measures approved this year, observers said.

Other states were not successful in passing sweeping clean energy goals. A renewed push in Florida for the state to have 100% renewable energy by 2040 failed, and a similar measure in Georgia calling for 100% clean energy by 2050 also went nowhere. In both cases, Democrats were trying to shepherd the bills through a mostly Republican legislature.

Offshore wind

Although some state proposals on offshore wind did not become law this year, interest in the technology appears to be growing on the West Coast, observers say.

In California, a bill that passed the Legislature 71-1 in May, A.B. 525, would require the California Energy Commission to develop a "strategic plan" for offshore wind and present it to the state's Natural Resources Agency and Legislature by the end of 2022. The measure would also require the state to prioritize "least-conflict" ocean areas to limit potential disruptions to ocean biodiversity.

The bill comes on the heels of an announcement in May from Gov. Gavin Newsom (D) and the federal Bureau of Ocean Energy Management that the first offshore wind leasing sale on the Pacific coast will be held as early as 2022.

Other states enacted laws in 2021 to plan for a potential wave of offshore clean energy. In Oregon, Brown signed a provision setting a goal of 3 gigawatts of floating offshore wind projects by 2030.

In Maine, Gov. Janet Mills (D) signed a plan that seeks to "encourage research to support the Maine offshore wind industry," although she also inked a separate measure this week that prohibits new offshore wind projects in state waters (Greenwire, July 8).

A few governors have opted to explore offshore wind opportunities without legislative support. North Carolina Gov. Roy Cooper (D) issued an executive order last month to build up to 8 GW of offshore wind resources by 2040, while Louisiana Gov. John Bel Edwards (D) initiated a "wind week" in June.

Utilities Pay for Coal-Plant Closures by Issuing Bonds

By Scott Patterson July 9, 2021

A new twist on an old financial tool is helping electric utilities shut down money-losing coal-fired power plants, cutting greenhouse gas emissions and often lowering costs for consumers.

Coal plants aren’t just the heaviest polluters, they also are expensive to run. Coal supplies roughly 20% of U.S. power, down from more than half in 2008, but most of these plants operated at losses last year. Ratepayers often cover the difference so the utilities’ investors can earn a return.

The strategy, which is being pushed by environmental groups, uses securitization to help finance the shutdown of the plants. In the past year, three utility operators have committed to more than $1 billion in securitizations to help retire coal-fired power plants.

Securitization is one of many efforts by Wall Street to reduce greenhouse gas emissions while also making a profit. Green bonds and investment funds that have environmental goals as part of their mandate are raking in cash. Wall Street has helped raise billions of dollars for electric vehicles, battery and alternative-energy companies.

Utilities have used securitization for decades to fund one-time expenses or to help pay off so-called stranded assets, facilities that are shut down before they have paid for themselves. Increasingly, utilities are looking at their unprofitable coal plants as potential stranded assets, and some see securitization as a way to wind them down ahead of schedule.

Securitization is typically used to get money up front from investors and pay them off with cash flow from payments on car loans, credit-card debt or other income streams. Utilities issue these bonds, which are typically rated triple-A, with the cash coming from their customers’ monthly payments.

The utility can then use the proceeds to pay off debt and other liabilities related to money-losing coal plants. It can use any excess proceeds for new investments, including clean power sources, as well as for jobs training in communities affected by the shutdowns.

The upside for customers: The interest rate on the new bonds is usually lower than the rates on the original debt and equity, leading to savings down the road.

Michigan utility CMS Energy Corp. in December received regulatory approval to issue up to $678 million in securitized bonds to help retire a pair of coal-fired power plants. The move, promised amid pressure from environmental groups, should help customers save $126 million, the company said. It plans to issue the bonds in 2023 when it closes the plants.

A Wisconsin utility owned by Milwaukee-based WEC Energy Group did a $100 million securitization for coal-fired power plants, and a PNM Resources Inc. utility in New Mexico did a deal worth $360 million.

Out of 203 coal plants in the U.S. that operate in federally regulated transmission markets, more than 90% provided power at a higher cost per megawatt hour than the average competitive market price in 2020, when considering fixed and variable operating costs, according to data provided by S&P Global Market Intelligence. That was partly due to cheap prices for natural gas, which declined sharply amid the pandemic-induced economic shutdown, according to Steve Piper, research director for energy at the S&P Global group.

S&P Global Platts expects the portion of U.S. electricity supply from coal to fall to 15% by 2026, from nearly one-fourth currently.

Many coal-plant operators running money-losing plants often don't have a financial incentive to shut them down, since they are getting revenue from selling the power and the higher costs are borne by ratepayers, according to Uday Varadarajan, a principal at clean-energy think tank Rocky Mountain Institute.

TVA To Spend $1 Billion Building 1,500 MW Of Gas Turbines

Peter Maloney *July 13, 2021*

The Tennessee Valley Authority (TVA) plans to invest $1 billion to build three new gas-fired combustion turbines totaling 1,500 megawatts (MW)

The planned gas turbines are being built at the site of shuttered coal plants in Tuscumbia, Alabama, and Paradise, Kentucky, and will replace combustion turbines scheduled for retirement.

The plants scheduled for retirement are at TVA's Allen Reservation on the Mississippi River, five miles southwest of Memphis, Tenn., and at the utility's Johnsonville Reservation in Tennessee. The plants have a combined capacity of 1,400 MW and have "received little recent investment, are 40 or more years old and require replacement to ensure reliability," **according to TVA**.

"Current and retired coal plant sites are prime locations for new gas generation because the electrical infrastructure is already in place," Woodward said.

The new gas plants will require upgrades of the existing natural gas supplies, as well as connections to TVA's existing transmission lines, including upgrades to those lines.

While the environmental assessment for the proposed plants was under review and open for comment, TVA noted that the most frequently mentioned comments related to climate impacts, environmental justice, analysis of alternatives, and cumulative impacts.

In its environmental assessment, TVA concluded that the proposed plants would not be "a major federal action significantly affecting the environment and issued a finding of no significant impact."

TVA currently operates 108 natural gas and fuel oil-fired generators totaling more than 12,000 MW at 17 sites, nine in Tennessee, five in Mississippi, one in Alabama, and two in Kentucky.

Emissions From Electricity On Track For A Record High

By Lorraine Woellert 07/15/2021

The power sector's use of coal and other fossil fuels is on track to grow and could push greenhouse gas emissions from electricity to a record in 2022, according to a report from the International Energy Agency.

Solar, wind and other sources of renewable power are increasing, too, but not fast enough to satisfy the global, post-pandemic rebound in electricity use, the IEA said in its semi-annual electricity market report released Thursday.

Electricity generated from fossil fuels will be required to meet about 45 percent of the new demand, leading to an increase in carbon emissions, the agency wrote.

The trend would reverse two years of declines in power sector emissions.

As world leaders prepare for a United Nations climate summit in November, data is showing how difficult it will be to hit that target.

President Joe Biden has said he wants to reach net zero emissions from the power sector by 2035, but his administration and Congress are struggling to reach a deal on budget and infrastructure legislation that would push the country toward that goal.

Weekly Fuel Price Watch

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Weekly Fuel Price Watch

Coal Spot Prices (Powder River Basin 8800 Btu)

July 16: $11.95 per short ton
One month ago: $12.00 per short ton
One year ago: $12.00 per short ton

Natural Gas Spot Market (Henry Hub)

July 13: $3.78 per million Btu
One month ago: $3.28 per million Btu
One year ago: $1.77 per million Btu

U.S. Crude Oil Spot Prices (West Texas Intermediate)

July 12: $74.21 per barrel
One month ago: $71.55 per barrel
One year ago: $40.57 per barrel

On-Highway Diesel Prices

July 19: $3.34 per gallon
One month ago: $3.29 per gallon
One year ago: $2.43 per gallon

Retail Gasoline Prices (Regular)

July 19: $3.15 per gallon
One month ago: $3.06 per gallon
One year ago: $2.19 per gallon