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Executive Director Industry Update – January/February 2021

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Coronavirus Crushed U.S. Clean Energy Workforce In 2020; 400K-Plus Jobs Still Lost *Clarion Energy Content Directors 1.14.2021*

The COVID-19 pandemic has not only devastated the U.S. health care system, but it's taken a long-lasting direct hit on the nation's once healthy clean energy industry.

A new report by BW Research Partnership indicates that the 2020 clean energy workforce dropped to its lowest numbers in five years. More than 429,000 workers (or 12 percent of the sector's pre-coronavirus workforce) were still unemployed after cutbacks.

Before COVID-19, nearly 3.4 million Americans across all 50 states and the District of Columbia worked in clean energy occupations, including renewable energy, energy efficiency, grid modernization, clean vehicles and fuels. That's more people than work in real estate, banking or agriculture in the U.S., and three times the number of Americans that worked in fossil fuels, according to E2's Clean Jobs America report.

Thirty-eight states and the District of Columbia are still suffering double-digit unemployment in clean energy, with 12 states experiencing unemployment of 15% or more. Georgia continues to have the highest rate, with over 30% of its clean energy workforce still unemployed, followed by Kentucky at 27%.

Since the pandemic-spurred unemployment crisis began in the U.S., 70 percent of the jobs lost in the clean energy sector have yet to be recovered, according to the report. At the rate of recovery since June, it would take about two and a half years for the clean energy sector to reach pre-COVID employment levels.

New EV Battery Could Cut Costs, End 'Range Anxiety' — Study

Miranda Willson, E&E News Reporter January 21, 2021

A battery that regulates its own temperature could hold the key to the development of fast-charging electric vehicles that cost less than most new gas-guzzling cars.

Researchers at Pennsylvania State University say they have developed an EV battery that achieves that cost milestone, potentially opening up the door for more widespread EV use across the country. The battery also solves another issue reported in some EVs: Even in subfreezing temperatures, the researchers' "thermally modulated" lithium-ion battery can charge within 10 minutes without compromising the battery life, according to the study published this week in Nature Energy.

Rapid charging of electric cars has caused some lithium-ion batteries to degrade over time, making the batteries increasingly unstable (Climatewire, Aug. 5, 2020). The phenomenon, known as lithium plating, is more common when the weather is below freezing, some research suggests.

The cold-immune battery system developed by the Penn State team is low-cost, having the potential to bring down the retail price of EVs to $25,000, the study said. New electric cars on the market today typically cost over $30,000.

Lithium-ion batteries often have built-in management systems that slow the charging process when it's cold outside to reduce plating and degradation, according to 2018 research from the Idaho National Laboratory. As a result, charging in northern regions of the U.S. is noticeably less efficient, the lab study said. That could hold back EV adoption in those areas, especially for taxi or rideshare drivers who may need to charge quickly at public stations while on the job.

To achieve fast charging regardless of the climate, the Penn State researchers placed a self-heating structure on a lithium-iron phosphate battery that keeps the system's temperature at 140 degrees Fahrenheit when the car is moving, said Chao-Yang Wang, corresponding author on the paper and co-director of the Battery and Energy Storage Technology Center at Penn State. Made of an ultra-thin nickel foil, the self-heating structure also cools the battery to the temperature outside when the car is turned off, Wang said.

The battery could also last for an estimated 2 million miles of driving, according to the study, which would be a major improvement compared with most electric cars today that can typically be driven for up to 200,000 miles. Most likely, a car powered by the thermally modulated battery would retire before the battery had died — meaning it could potentially enjoy a second life for energy storage or another use, Wang said.

Wind, Solar to Make Up 70% Of New US Generating Capacity In 2021 While Batteries Gain Momentum: EIA

Emma Penrod Jan. 13, 2021

Dive Brief:

- Wind and solar will represent more than two-thirds of new electric generating capacity to come online in 2021, while battery storage capacity is set to quadruple over the next year, according to the U.S. EIA
- Two-thirds of new solar projects are now built in tandem with energy storage, according to Sam Newell, a principal analyst for The Brattle Group.

- At current pace, wind, solar and storage could overtake conventional technologies as the leading source of generation by the early 2030s, according to Wood Mackenzie principal analyst Robert Whaley.

Dive Insight:

Renewable energy is still a ways from becoming the dominant source of energy on the U.S. electric grid, but wind and solar will remain the resources of choice for new development in 2021.

According to EIA, the U.S. is set to bring 39.7 GW of new capacity online by the end of 2021. Natural gas generation will represent just over 16% of this new capacity, according to EIA, with 6.6 GW scheduled to come online this year. Wind generation is expected to grow 12.2 GW — down from 21 GW in 2020.

Solar, meanwhile, will enjoy another record-breaking year, with 15.4 GW in new capacity expected to come online in 2021. The U.S. is also expected to add 4.3 GW of battery storage, more than quadrupling existing capacity, according to EIA.

The growth of solar, Newell said, is in many ways bringing the storage sector along with it. While there are standalone battery projects, he said, the industry has made a rapid pivot to solar-plus-storage as the preferred format, with two-thirds of solar projects already coupled with batteries. Wind is paired with storage much less frequently, he said.

The 2021 trends identified by EIA have been in the works for some time — renewable energy deployment has outnumbered new conventional development since roughly 2015. But Newell the speed with which renewable energy has overtaken conventional generation assets has far exceeded expectations.

The incoming Biden administration, Newell said, could prompt even greater renewable energy deployment if lawmakers implement measures such as a national carbon policy or renewable energy standard.

2021 Outlook: The future of Electric Vehicle Charging is Bidirectional — But the Future Isn't Here Yet

Within a few years, cars may be able to power homes, participate in energy markets and help businesses lower power bills, experts say.

Robert Walton@TeamWetDog Jan. 12, 2021

Electric vehicles are growing in popularity, and utilities are preparing for a future where their value goes far beyond transportation.

As more EVs hit the road, there are growing questions about how utilities will manage their charging needs. Rocky Mountain Institute (RMI) has estimated that electrifying all of the roughly 251 million light duty vehicles on U.S roads today would increase annual electricity demand by about 25% — and that doesn't include medium and heavy-duty applications like freight and public transit along with a host of other applications.

While the transition to a fully electric fleet could take decades to achieve, the near-term implications for grid management as more and more EVs hit the road are significant.

Along with adding demand, EVs are increasingly seen as potential grid assets: aligning their charging needs with times of higher renewables production and lower grid stress can help decarbonize transportation and operate electric systems more efficiently. Managed charging, through time-of-use rates and demand response programs, is known as vehicle-grid integration and is already the subject of utility programs around the country.

This approach to managing EV demand — largely reliant on unidirectional power flows that adjust how and when chargers are pulling energy from the grid — is sometimes referred to as level 1 integration (V1G). But there is also interest in using the energy in EV batteries to serve other loads, with what are known as vehicle-to-grid (V2G) capabilities.

While those capabilities are utilized in parts of Europe and Asia, experts say the United States is still years away from widespread use of V2G. There are a few utilities rolling out pilot programs to test the capabilities, including Duke Energy in North Carolina, but there are still safety and engineering concerns to be addressed, technical problems to solve and business cases to study.

The business cases for bidirectional charging are likely to begin by connecting them with buildings (V2B) rather than the broader grid, said Nelder, due to the complexities involved.

The idea of using an electric vehicle to power a residence is attractive, but experts say this is unlikely to be the first area where V2G capabilities take hold. More likely are school buses, which have much larger batteries and sit idle for long stretches.

NERC's Grid Reliability Outlook Raises Alarms, Shows Growing Need for Flexible Resources Like Hydropower And Pumped Storage

By Cameron Schilling, Nha

A new transmission grid reliability report raises concern about increasing risk of not being able to meet transmission system load with available electric power generation. The answer? Prioritize flexible resources like hydropower and pumped storage.

The entity charged by the Federal Energy Regulatory Commission, FERC, with ensuring electric power reliability at regional levels is raising some alarm bells about the changing resource mix. NERC's (North American Electricity Reliability Corp.) long-term reliability assessment is designed to give the electricity industry a sense of trends that are developing that could impact reliability on the grid.

The latest report finds that nearly all areas of the United States will face an increased risk of loss of load, which occurs when system load exceeds available generation. This includes California, which could see up to 22 hours of load-loss in 2022. After this summer's blackouts, that news is sobering.

Why It Matters

NERC's analysis demonstrates the growing need for flexible resources — like peaking hydro and pumped storage — to balance a decarbonized grid. Hydropower and pumped storage are tailor-made for the clean energy transition. Both resources can provide essential reliability and flexibility on the system.

"It's very important that FERC and the regional transmission organizations (RTOs) listen to NERC's warning and begin discussions on how to better compensate flexible resources that keep the lights on

while enabling the clean energy transition," said Alan Michaels, chair of the National Hydropower Association's Markets committee

Deep Dive

Generally, these assessments are wonky dives into electricity reliability issues … the kind of report that electrical engineers love and other stakeholders ignore. This year's report, however, is worth reading. It's a sobering look at the challenges the grid will face in the coming decade. The report warns that wind and solar resources are "fundamentally changing how our bulk power system is planned and operated."

Part of the challenge, NERC argues, is that the current system is designed around a dispatchable fleet that has a high degree of operational certainty. As wind and solar begin to dominate the grid, our traditional approaches to ensuring reliability, like reserve margins and capacity estimates, "may give a false sense of comfort" to grid planners.

Another increasing challenge is the ability to meet steep ramps caused by large penetration of solar resources. The net peak demand (essentially, the peak demand minus wind and solar resources) has become a difficult period in California, especially as the operator must dispatch other resources like hydro and natural gas quickly to make up the evening peak which occurs as solar tapers off.

Figure 27 from the NERC Report shows the dramatic increase in projected maximum three-hour ramps in California. Hydropower and pumped storage (both in-state and imports from the Northwest) provide a significant share of the net peak ramp in the evening hours.

What Does NERC Recommend?

First, planning needs to be reformed. Utilities ensure reliability by estimating their peak demand (usually, for the hottest day of the year) and adding a reserve margin, or cushion, that accounts for demand forecasting errors, generation outages and operating reserves. As more of our electricity comes from energy-limited resources like wind and solar, operators are forced to manage the grid with greater uncertainties.

For example, solar and wind resources are de-rated when it comes to how much peak capacity they can be expected to contribute. However, these de-ratings may not accurately reflect the conditions in real time. Forecasting errors can mean that wind and solar production can be less than anticipated. This can be compounded by demand forecasts that may underestimate usage from areas that have high penetration of behind-the-meter solar.

Second, NERC urges regulators and policymakers to "develop policies that prioritize reliability, such as promoting flexible resources." Essentially, NERC is saying that operators will need more flexible resources as they match uncertain load with uncertain generation. California's August 2020 blackouts are a great example of the essential role flexible hydro can play. There, the blackouts occurred not during the system peak, but two hours later when solar was dropping faster than demand.

CAISO's analysis of the event found that **hydro peaked at the exact time of greatest system stress and provided essential energy and operating reserves**. In fact, hydropower resources performed better than their resource adequacy obligations. While conventional hydro and pumped storage hydro resources provide roughly 14% of in-state generation, they can supply as much as 25% of the total regulation requirements and 60% of the total spinning reserves.
Without the flexibility of hydro, the California blackouts surely would have been much worse.

What's Next

When it comes to moving the needle on market design changes, NERC outlooks don't really cut it. However, this year's assessment should provide state and regional policymakers some urgency for ensuring reliability while we undergo this unprecedented shift in how we generate and use electricity. In fact, some RTOs have already begun to identify and compensate their flexibility needs, in part due to prodding from NERC and FERC.

New market mechanisms are taking shape. For example, the California Independent System Operator, CAISO, recently reached agreement with NHA members Seattle City Light and Chelan County Public Utility District to compensate their hydro resources for inertial and primary frequency response — services that are not compensated in most organized markets.
It's still early days, but agreements like these are promising and can serve to set examples in other regional markets throughout the U.S.

Siemens Energy Handling EPC Work on Black-Start Battery System At California Gas-Fired Plant

1.28.2021 *By Rod Walton*

Siemens Energy will handle engineering, procurement and construction duties to building a battery-based, black-start generation system at a California power plant.

The 720-MW Marsh Landing Generating Station near Antioch, California was built for NRG Energy nearly eight years ago. Siemens Energy announced Thursday it was selected to provide the black-start capabilities allowing the station to restart electricity to auxiliary systems in the case of an outage or blackout situation.

Siemens Energy will engineer and build a customized battery energy storage system ("BESS") that can support up to three attempts to restart a unit at Marsh Landing within one hour.

Traditional emergency back-up systems run on diesel generators or small, fossil fuel industrial turbines. By contrast, the BESS-based black-start system operates in a carbon-neutral way to start one of the plant's four combustion turbine generator units.

In addition to the BESS, the project will involve transformers to increase voltage, switch gear to integrate the BESS into the broader Marsh Landing system, electrical, civil and structural engineering and control system modifications.

The Marsh Landing Generating Station is a four-unit simple-cycle plant and was one of Siemens Energy's first "Flex-Power" plants, which are capable of fast starts that minimize emissions while ramping up to full power in only 12 minutes. Siemens Energy supplied the four gas turbines, four generators, the SPPA-T3000 distributed control system and auxiliary and secondary systems for the plant.

New Report Charts Path to Net-Zero Carbon Emissions By 2050

February 3, 2021 Paul Ciampoli

Achieving net-zero carbon emissions in the U.S. by 2050 is feasible, according to a new report from the National Academies of Sciences, Engineering, and Medicine. The report, the first of two, presents a technical blueprint and policy road map for the next 10 years of the nation's transition to net-zero carbon emissions.

The committee that wrote the report emphasized that immediate action and proactive innovation are required and recommended a portfolio of near-term policies to ensure equitable access to benefits generated as a result of this transition, mitigate harms to vulnerable populations and engage public participation in decision-making, and revitalize the U.S. manufacturing sector.

The report, **Accelerating Decarbonization of the U.S. Energy System**, says most near-term reductions in emissions would come from the electricity sector, electrification of vehicles, and home heating. Other industries such as aviation, shipping, steel, cement, and chemicals manufacturing will need further innovation to achieve cost-effective decarbonization, the report said.

Among other actions, the report calls on Congress and the executive branch to set an economy-wide emissions budget for the next several decades. Starting with a price of $40 per ton of carbon, increased annually by 5 percent, this budget will create an economic incentive to reduce carbon emissions and unlock innovation in every corner of the energy economy, according to the report.

To guide policymakers through the transition, the report lays out a number technological and socio-economic goals to reach by 2030 including, among others:

Producing carbon-free electricity: The nation needs to double the share of electricity generated by non-carbon-emitting sources to at least 75 percent. This will require deploying record-setting levels of solar and wind technologies, scaling back coal and some gas-fired power plants, and preserving operating nuclear plants and hydroelectric facilities where possible;

Electrifying energy services in transportation, buildings, and industry: Fifty percent of new vehicle sales across all classes should be zero-emission vehicles. The U.S. should replace at least 20 percent of fossil fuel furnaces with electric heat pumps in buildings and initiate policies so that new construction is all electric except in the coldest climate zones. Where industrial processes cannot be fully electrified, they should begin the transition to low-carbon heat sources;

Investing in energy efficiency and productivity: Total energy use by new buildings should be reduced by 50 percent. In existing buildings, energy used for space conditioning and plug-in devices should be lowered every year to achieve a 30 percent reduction by 2030. Goals for industrial energy productivity (dollars of economic output per energy consumed) should increase each year.

Planning, permitting, and building critical infrastructure: The nation should increase overall electrical transmission capacity by approximately 40 percent in order to better distribute high-quality and low-cost wind and solar power from where it is generated to where it can be used across the country. The U.S. should also accelerate the build-out of the electric vehicle recharging network and initiate a national CO2 capture, transport, and disposal network to ensure that CO2 can be removed from point sources across the country;

Expanding the innovation toolkit: The nation should triple the U.S. Department of Energy's investment in clean energy research, development, and demonstration in order to provide new technology options, reduce costs for existing options, and better understand how to manage a socially just energy transition;

Promoting equity and inclusion: Policies should work to eliminate inequities in the current energy system that disadvantage historically marginalized and low-income populations. For example, the U.S. should increase funds for low-income households for home electrification and weatherization and for broadband Internet access for low-income and rural areas and increase electrification of tribal lands.

The report also outlines policies targeting specific energy supply and distribution goals to allow the electric power system to depend upon flexible demand enabled by pricing reforms and infrastructure upgrades.

Colorado River Outlook Darkens Dramatically In New Study

Tony Davis Feb 8, 2021

In the gloomiest long-term forecast yet for the drought-stricken Colorado River, a new study warns that lower river basin states including Arizona may have to slash their take from the river up to 40% by the 2050s to keep reservoirs from falling too low.

Such a cut would amount to about twice as much as the three Lower Basin states — Arizona, California and Nevada — agreed to absorb under the drought contingency plan they approved in early 2019.

Overall, the study warned that managing the river sustainably will require substantially larger cuts in use by Lower Basin states than currently envisioned, along with curbs on future diversions by Upper Basin states.

While climate change's impacts on the river have been repeatedly studied, this is the first study that seeks to pinpoint how warming temperatures would translate into reductions in water that river basin states could take over the long term.

Carrying out the study's recommendations, under the most likely conditions of climate change, almost certainly would mean more supply curbs for the $4 billion Central Arizona Project.

The CAP is already slated to lose nearly half its total allocation under the worst case, shorter-term scenarios envisioned under the 2019 drought plan.

Tucson and Phoenix-area cities and tribes, along with Central Arizona farmers, all depend on the

Federal forecasters predict Lake Mead will drop low enough to require cutbacks in water deliveries to Central Arizona farmers in 2022 due to river flow declines.

But exactly how much will be cut in long-term, future water deliveries is far from settled. The seven states are about to start renegotiating guidelines under which the river has been managed since 2007. Changes to the guidelines won't take effect until 2026.

“SELF-INFLICTED WOUNDS”

In other forecasts, the study took a shot at longstanding plans by the four Upper Basin states — New Mexico, Colorado, Utah and Wyoming — to increase their take from the river under rights held from the 1922 Colorado River Compact.

The Upper Basin states’ forecasts of river diversions are unrealistic and would make it virtually impossible to maintain stable water supplies over an extended period, the study said.

Also, more, major Upper Basin diversions could drain both lakes Mead and Powell, dramatically reducing the amount of water available to serve people for drinking and irrigation and to generate electricity, the study said.

The study also warned that the current, downward trend in river flows will likely continue or worsen as temperatures keep rising.

That will lead to additional evapotranspiration — the absorption of atmospheric water supplies by plants — and aridification of the landscape, in which soils get drier and runoff keeps declining, the study said.

“HUGE, HUGE LITIGATION” COULD BE ON THE HORIZON

That could lead to frequent and possibly large violations of the Colorado River Compact in which Upper Basin states can’t meet their legal obligation to deliver the amount of water they’re required to deliver to Lower Basin states, the study said.

Then, Lower Basin states would put out a legal “compact call” demanding more water, arguing that the Upper Basin is violating terms of the 1922 Colorado River Compact.

“If demands increase or supplies decrease or some combination of the two happens, you could very likely see a compact call.”

Such a call would likely lead to “huge, huge litigation,” Udall said. “There’s a reasonable chance the Upper Basin would say ‘we don’t agree there is an obligation’ and they keep diverting.”

If such a call occurs, the worst case for the Upper Basin would be that all parties who started taking water from the river after the compact was signed would have to stop diverting, Udall said. That would include all major Upper Basin cities, including Denver.

“HUMANS WILL BE FORCED TO BEND TO WILL OF NATURE”

The study also called for major changes in operations of Lake Mead and other reservoirs, and urged the river basin states to consider altering what’s known as the “Law of the River.”

That term describes a series of federal and state laws, regulations, U.S. Supreme Court decrees, compacts, a binational treaty, administrative agreements and various federal decisions that are used to manage the river and have long been seen as politically untouchable.

One key fix the study suggested would be to treat lakes Powell and Mead as a single reservoir when considering how much water is available in the river. That would entail combining the reservoirs’

water storage into a single figure to determine how much water should be released downstream for drinking and farming.

But the researchers warned that such changes, or another suggestion to drain either Lake Powell or Mead to reduce total evaporation, won't save enough water to fix the river's problems.

Based on what it called "reasonable and probable" weather conditions due to climate change, "aggressive commitments to water conservation by both the Upper and Lower Basins will become critical, in the next 25 years," to prop up lakes Mead and Powell at functional levels, it said.

"Dire situations require solutions far from historic norms. An increasingly limited and uncertain water supply should force water managers to confront an uncomfortable reality: the Colorado River system is overallocated and even existing allocations can no longer be guaranteed," the study said.

"American society is on the path of a collision between nature and the structures and institutions of humankind. In the 20th century on the Colorado River, nature was bent to human will. Because we are now fully consuming its waters, and inflows are expected to decline, in the 21st century humans will be forced to bend to the will of nature," the study said.

In a tweet last week, the study's lead author, Oxford University's Kevin Wheeler, said: "Question: What will it take to sustain the Colorado River? Answers: 1) Extraordinary demand management. 2) Extraordinary new thinking."

"NEW ABNORMAL" SEEN IN RIVER'S WEATHER CONDITIONS

The study was conducted by researchers operating under Utah State University's Center for Colorado River Studies. Its mission is to conduct studies that show how the river and its tributaries can be effectively managed, and this is its sixth study.

The new study relied on several known quantities.

First, it employed the same computer modeling system the U.S. Bureau of Reclamation has used to make forecasts for the river since the 1970s, said Wheeler. He's an engineer and project manager who has worked in various roles on Colorado River issues for more than a decade.

Second, it considered the likelihood that the river's weather conditions are entering a "new abnormal." That means predictions of future climate conditions and runoff can't be based on how those forces have behaved in the past.

Under a "new abnormal" scenario, the study said two outcomes could occur. Under one, runoff totals will match very dry conditions of 2000 to 2018, in which the river flows were 18% lower than those of the 20th century. Or, runoff could keep worsening, following the course predicted by Udall in a 2017 study he did with former University of Arizona climate scientist Jonathan Overpeck. They warned warming would lower river flows 20% to 30% by 2050 and 35% to 55% by 2100.

To determine how that scenario could affect the river, the new study used Udall and Overpeck's prediction that continued warming could cause river flows to drop 6.5% for every 1-degree Celsius temperature increase. That's the midpoint in a range of possible outcomes they forecast for lower river flows.

If either scenario happens and hydrologic conditions have truly shifted since 2000, “We need to plan as if this is all we’re going to get, this is what the implications are,” Wheeler said.

“Nobody could be absolutely certain. We could get a wet spell for sure,” Wheeler said. “But we believe that’s much less likely and that the recent conditions are much more representative of what’s likely to happen than flows of 100 years ago which were very wet.”

The study didn’t analyze a specific risk of any particular river flow shortfall or other problems, because it’s really hard to make such projections over an extended period.

But speaking specifically about a compact call, in which competing demands for the limited water would become dire, Udall said, “I can only say the risk is a lot higher than anyone should feel comfortable with.”

BUFFER NEEDED FOR ELECTRICITY GENERATION

When the study assumed conditions that have existed since 2000 would continue past the current time, its forecast was downbeat but not alarming.

If such conditions continue and the Upper Basin states take no more from the river than the 4 million acre-feet they’re now taking in an average year, the two reservoirs will hold 13 million acre-feet of water, the new study said. That compares to about 20 million acre-feet today.

If the Lower Basin states agree to the 40% cutback the study says may be needed, however, then the reservoirs would hold about 17 million acre-feet of water.

But if river flows keep decreasing as Overpeck and Udall have predicted, the reservoirs would keep losing about 250,000 acre-feet a year.

“Aggressive commitments to water conservation” would be needed in both basins just to keep 15 million acre-feet in the reservoirs, the study said.

The 15 million offers “a minimum level of water security,” Wheeler said. It would provide a buffer of 6.5 million acre-feet above what’s needed to keep producing power at Glen Canyon Dam and to let Las Vegas keep taking water out of Lake Mead, Wheeler said.

Said Udall: “Maybe the bottom line on this whole paper is that we need to prepare for the worst and hope for the best.”

Current Colorado River outlook

While a new study warns of a bleak long-term future for Colorado River water users, the river basin's short-term outlook is already tenuous.

Some details:

• Flows into Lake Powell have been about 45% of average since Oct. 1.

• Lake Mead and Lake Powell were both 40% full in January.

• Snowpack in the river's Upper Basin, which supplies Lower Basin states including Arizona, is 75% of the normal median.

• April-July runoff into Lake Powell is forecast at 46% of average.

• Lake Mead, which stores Central Arizona Project water, is forecast to be at almost 1,075 feet in elevation by Dec. 31. That's five feet below the level triggering big cuts in CAP deliveries to Pinal County farmers.

• By the end of 2022, Mead is forecast to be just above the level that would trigger additional CAP cuts affecting tribes and Phoenix-area cities, although not Tucson.

• There's a 13% chance Lake Powell will be too low to generate electricity by 2025, if the hot, dry weather experienced from 1988 to 2018 continues.

• Under similar weather conditions, there's a 20% chance the lake could drop by 2025 below 1,025 feet, which could trigger more severe cuts in CAP deliveries to cities, including to Tucson.

Sources: Arizona Department of Water Resources, U.S. Bureau of Reclamation, Colorado Basin River Forecast Center, and the private Lake Powell water database.

EIA: Higher Electricity Use, Sales Depend On Success Of COVID-19 Vaccine Rollout

January 19, 2021 *Victoria A. Rocha*

Federal energy officials expect higher electricity use across all sectors in 2021 and 2022 after dramatic decreases last year, but demand will depend on the success of vaccination programs in curbing the pandemic.

Still, energy consumption levels in 2022 are likely to remain below 2019 levels, according to the Energy Information Administration in its latest Short-Term Energy Outlook.

EIA forecasts electric consumption across all sectors to rise by 1.5% this year and 1.7% next year, after falling by 4% in 2020. After near-historic decreases last year, electricity use in the commercial and industrial sectors is expected to rise this year by 0.9% and 1.2%, respectively.

EIA also expects a 2.4% increase in electricity use in the nation’s homes in 2021 and a 1.6% increase in 2022 as more residents crank up thermostats because of colder winter weather. Last year, as social distancing guidelines resulted in people spending more time at home, sales grew by 1.3% despite a mild winter.

“During the spring of 2020, retail sales of electricity to the residential sector were about 9% higher than the typical heating and cooling demand given the temperatures at that time,” the report said. “This effect appears to have moderated somewhat in recent months, averaging about 4% above typical consumption since July.”

Over the next two years, renewable energy as a source of electricity will continue its ascent, with a particularly bright outlook for solar, EIA said. Solar capacity is expected to exceed wind growth for the first time in 2021. About 15 gigawatts of large-scale solar (photovoltaic) capacity will come online this

year, and another 12 GW in 2022, the report said. Small-scale solar capacity, driven mostly by residential installations, is forecast to increase by 4 GW in 2021 and another 3 GW in 2022.

Higher wholesale natural gas prices from decreased gas production will result in more coal production in 2021. EIA is projecting a 12% increase in coal production to 603 million short tons in 2021 because a 41% increase in natural gas prices will make the fossil fuel more competitive.

Still, the share of electricity generation from renewable resources will increase from 20% in 2020 to 21% in 2021 and 23% in 2022.

Xcel Energy Looks to Avoid Colorado Wildfires — And Pg&E's Fate — And Wants Customers To Pay For It

The company wants $589.7 million by the end of 2025 to maintain infrastructure and keep trees at bay. Consumer advocates say that's not necessary.

Xcel Energy wants to charge its Colorado customers $589.7 million during the next five years to reduce their risk of causing wildfires, but consumer advocates aren't buying it.

Xcel's subsidiary, Public Service Company of Colorado, has cited the catastrophic wildfires in California started by Pacific Gas and Electric as motivation for the proposal. Xcel, which has 1.5 million electric customers in the state, is asking customers to pay for the work with a monthly fee on their bills.

While the cost is relatively small — less than 1% of a bill's monthly total — groups representing consumers and businesses say Xcel should spread out some of the financial burden for this work to shareholders and not just customers, especially during an unstable economy.

Xcel was allowed to increase customer bills in 2019 to cover approximately $11 million spent on previous wildfire mitigation work, but the PUC required the company to develop a more comprehensive plan for future projects. The new plan would guide projects — including vegetation management and infrastructure updates in a designated Wildfire Risk Zone — that the proposed rider would fund. The rider would also pay for some work the company did in 2019 and 2020.

A PUC administrative law judge is expected to make a recommendation to the commission on both the plan and the rider within a few weeks.

Utility To Pay $2B Settlement In Deadly 2018 California Fire

By The Associated Press January 25, 2021

LOS ANGELES (AP) — Southern California Edison will pay $2.2 billion to settle insurance claims from a deadly, destructive wildfire sparked by its equipment in 2018, the utility announced Monday.

Edison, which acknowledged no wrongdoing, said the agreement covers all claims in pending lawsuits from insurance companies related to the Woolsey fire, which blackened 151 square miles (391 square kilometers) of Los Angeles and Ventura counties. Three people died in the November 2018 fire, and more than 1,600 homes and other buildings were destroyed.

In addition, Edison said it has finalized settlements from the December 2017 Thomas fire and mudslides a month later on land that burned.

Total expected losses for the 2017 and 2018 events are estimated to be $4.6 billion, the utility statement said.

Hydrogen Advocates Look to Capitalize On California's Goal To Replace Diesel For Back-Up Generation

Kavya Balaraman@kavya_balaraman Jan. 25, 2021

California regulators are on the lookout for cleaner alternatives to replace the widespread use of back-up diesel generation — particularly among data centers in Silicon Valley and other areas of the state — and some industry players think hydrogen could be the answer.

Hydrogen's ability to provide long periods of storage capability — critical to a state that has experienced reliability problems and an industry that relies on electricity to keep its servers running — could make it an effective option for displacing the current practice of setting up large diesel generators, stakeholders said last week at a workshop hosted by the California Energy Commission.

Hydrogen fuel cells come with a set of advantages, Segev said: they occupy less space than batteries, are quiet, reliable and 100% zero-emission.

Hydrogen could be a solution for longer outages

The key draw of hydrogen is its cost-effectiveness at longer durations. For a completely resilient, 100% renewable data center with zero emissions, using hydrogen would translate to a levelized cost of electricity amounting to $119 per MWh, said Jack Brouwer, a professor of mechanical and aerospace engineering at the University of California, Irvine. Batteries, on the other hand, would lead to over $4,000 per MWh levelized cost to ensure 48 hours of backup power.

What Would Nuclear Batteries Do For Us?

James Conca

Quite a bit. In power systems of the future, it's not just that smaller is better, smaller is essential. Big centralized systems like power stations with vast physical grids for transmission are inefficient. It was great to get started – we could take advantage of the economies of scale.

Barely a third of the primary energy content in most sources is converted to useable energy. Solar and Wind are limited by physics. But in Fossil Fuels and Nuclear, most of the loss happens because we use the energy for a single purpose, such as producing electricity or thrust, rejecting the remaining two-thirds as waste heat. Only Combined-Cycle (~60%) or Combined Heat & Power (~80%) Natural Gas technologies use more than 40% of their heat. Beyond that in electrical storage, up to 30% of all kilowatt hours stored are lost and another 5% is lost during grid transmission from the plant to the end user.

A centralized power system must account for the highest potential demand anywhere and anytime in the system, so only 40-50% of the grid's capacity is used to power our system. The rest is in reserve for short periods of high summer or winter demand. This results in significant underused capacity and unamortized debt. Intermittency in generation only exacerbates the problem.

In other fields, the concept of centralization is already obsolete. The telephone system of old, with phones wired back over hundreds of miles to a central exchange, manned by thousands of switch operators, has given way to the autonomy of a hand-held device connected via flexible networks to

distributed servers, routers, and autonomous satellites in space - allowing systems to dynamically allocate and handle major fluctuations in data sharing needs.

This in turn has led to new markets, new opportunities and even new industries. There is no reason why the same factors and motivations that drove the digital revolution in communications and media should not drive a similar revolution in which power becomes small, mobile, safe, clean, and affordable. Change in energy and industrial systems and markets could soon mirror the scale of change we have witnessed in wireless and media.

That technology will soon exist as a micro reactor or Nuclear Battery. Researchers at the Massachusetts Institute of Technology have convened a collaborative of industry, national labs and academics called the Advanced Nuclear and Production Expert Group (ANPEG) to develop a Nuclear Battery to mesh with this modern market - factory production, modular package delivery, minimal site preparation, and standardized interoperability with processes that can utilize the heat and/or electricity to produce goods and services on-site directly for local consumption and trade, free from the need for fuel pipelines and large grids.

A Nuclear Battery is a streamlined object, about the size of a large automobile, that would fit into a standard twenty foot (6 meter) ISO shipping container. Like new cars, it would roll off an automated assembly line, one of thousands that have been industrially mass produced.

Like a Lego set, the nuclear power module has smaller modules within itself and only one of these, the control module, is accessible. The others are factory sealed with the fuel core already integrated, which is non-weapon grade, low enriched (5%) uranium (see top figure).

At the end of its 5 to 10 years- life when the fuel is exhausted, the sealed unit is shipped back to a central facility for refueling and refurbishment. Most of the unit can be reused. As such, there is no need for high-level radioactive waste handling and storage at the user site. The timescale for installation or replacement is days, compared with the years required for a mega power station.

Importantly, the waste is ideally-sized for bore-hole disposal.

In addition, Small Modular Nuclear Reactors of various designs, LWR, MSR or others, will begin being built in this decade and thousands should be online by 2040. The flexibility of SMRs and nuclear batteries will play a vital role in deploying power to where it's needed the most.

So we have lots of possibilities to use nuclear power to address the world's major issues. We just have to do it.

Google Wants Americans To Subsidize Their Electric Bill

Ike Brannon

In the Southeast United States, Google GOOG +0.5% is one of the large industrial actors leading an effort to restructure the region's energy markets. Google, and other corporations backing this proposal, claim they are acting virtuously to secure more clean energy. However, the reality is that these efforts are best seen as a strategy for reducing their electricity bills rather than carbon emissions, and should it succeed it would result in most other Americans— including low income families—paying more for electricity

This isn't the first time we have seen this kind of regressive, industrial backed restructuring. Back in the 1980s, merchant power producers began acquiring a new type of natural gas-fired turbine. These turbines were inexpensive and could produce electric power at knockdown prices whenever natural gas was cheap. Soon after their introduction, big industrial power consumers wanted to buy their electricity from generators whenever the price of natural gas was low.

But they didn't want to make a commitment: when gas was expensive—before fracking gas could be pricey—the electricity from gas-fired generators cost a fortune.

The industrial power consumers wanted it both ways: buying from the new merchant generators whenever the price of gas was low, returning to their old suppliers when gas was expensive, and using the same power grid either way, taking advantage of a supposedly common infrastructure largely paid for by retail consumers. Such an arrangement would have left retail consumers holding the bag and regulators prohibited them doing such a pivot.

Firms made similar efforts during the dot-com boom, when a class of middlemen arose that owned gas-turbine generators but also engaged in trading businesses to buy low and sell high on a power grid. The most famous example was Enron, and there was Dynegy too, along with a number of smaller wannabes. Now they are all out of business.

These days, Google and other companies are lobbying state legislatures for the right to buy power on advantageous terms. The transformative innovation spurring this effort is the cost advantage of renewable fuels, which have recently become more cost-effective to use than fossil fuels.

Coincidentally, companies like Google, Microsoft MSFT +0.4%, and Amazon AMZN -0.4% have all announced their desire to operate their data centers solely with renewable energy, a strategy they typically couch as an attempt to stave off climate change. However, it is all a ruse: These companies are really trying to change the rules governing our electricity grid by unbundling their energy production and distribution by eliminating local markets through the creation of Regional Transmission Organizations (RTOs). Some states have already begun this process.

However, Google and others are attempting to reduce their electric bill by passing those costs onto retail ratepayers. In a vertically-integrated market, the public utility commissions ensure that large consumers of power subsidize the smaller consumers. An RTO eliminates the regulator, and allows big consumers of power to use their scale to get electricity for less. If they succeed there it won't result in any more renewable energy produced: all that will happen is that average Americans will pay more for their power and Google, Amazon, Microsoft and Walmart WMT -0.7% will pay less.

We learned from this experiment in RTOs that the vertically-integrated states, which are mostly in the Southeast and Northwest, have had lower, more stable power prices along with more reliable service, and—most importantly—produced bigger percentage of renewable energy than the other states as a group. In other words, the very rationale of supporting the creation of an RTO to spur more clean energy usage appears to be unfounded.