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February 2022 Newsletter



Individual Highlights:

- U.S. Becomes the #1 Exporter for Liquefied Natural Gas (LNG) pg#2
- Coal Inventories are Low – 2022 Winter Could be Another Wild One pg#3
- U.S. Crypto Miners Looking to Nuclear Power for their Energy Source pg#4
- Uranium Mining - Ready to Increase Production Once Prices Rise pg#5
- Did You Know? pg#6
- Keep Diablo Canyon and Save California's Reliable Energy Source pg#7
- GTTSi Employee – Mrs. Jackie Pate Retires pg#8

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U.S. Becomes the # 1 Exporter for Liquefied Natural Gas (LNG)



“The U.S. became the world’s number one exporter of liquefied natural gas for the first time in December 2021, as deliveries surged to an energy-starved Europe. However, this could be short-lived, as our exports were just a hair above those from Qatar and Australia. It is expected that we will have the world’s largest export capacity when the Venture Global LNG’s Calcasieu Pass terminal comes online in 2022. The U.S. and Qatar will be vying for the number one position over the next decade.”

The U.S. became the world’s number one exporter of liquefied natural gas for the first time in December 2021, as deliveries surged to an energy-starved Europe. However, this could be short-lived, as our exports were just a hair above those from Qatar and Australia, and any production issues could affect the rankings. Looking to the future, Qatar is planning a gargantuan export project that will come online in the late 2020s, which could cement the middle eastern nation as the top supplier of LNG.

The jump in LNG exports from the U.S. came from the Sabine Pass and Freeport facilities.

Cheniere Energy Inc. said their new production unit at its Sabine Pass plant in Louisiana produced its first cargo in December 2021.

The shale gas revolution,

coupled with the billions of dollars invested in our liquefaction facilities, transformed the U.S. from a net LNG importer to a top exporter in less than a decade.

Gas production surged by roughly 70% from 2010 numbers, and it is expected that we will have the world’s largest export capacity when the Venture Global LNG’s Calcasieu Pass terminal comes

online in 2022.

“Qatar and the U.S. will be vying for being the largest LNG producers in the world over the next decade,” said Muqsit Ashraf, senior managing director of Accenture’s global energy practice.

In the meantime, the jump in U.S. LNG exports will help ease a global supply crunch. Europe is facing a winter energy crisis as utilities grapple with seasonally low natural gas inventories. Overseas buyers purchased 13% of U.S. gas production in December, a seven-fold increase from five years earlier because we did not have the infrastructure needed to ship LNG out of the country.

U.S. LNG export terminals sent out a record 1,043 cargoes in 2021, with Asian nations making up nearly half of the destinations and Europe making up one-third.



Coal Inventories are Low – 2022 Winter Could be Another Wild One



“Coal inventories are at their lowest level in more than 40 years, as coal-fired generation increased in 2021 - due to high natural gas prices. However, physical delivery constraints in the supply chain are limiting how quick coal plants can replenish their stockpiles and could be an issue for electrical supply this winter. But the focus over the next two years will be large-scale solar with some coupled with battery energy storage.”

Although no new coal-fired generation has been added in the U.S., their electrical contribution was 22% greater in 2021 versus 2020 – due to the higher prices for natural gas and somewhat stable lower prices for coal. This marks the first year since 2014 with a year-over-year jump in coal-fired generation. But this has resulted in reduced inventories of coal at the nation’s power plants, and coal stockpiles are at their lowest level in more than 40 years.

Coal-fired plants usually stockpile more coal than they consume in a month, but the physical delivery constraints in the supply chain are limiting how quick coal plants can replenish their stockpiles. This could be an issue for electrical supply this winter.

In response to low coal stockpiles at some plants in the PJM (*the regional transmission organization that serves most of the Northeast and operator for the nation’s largest electricity system – Pennsylvania, New Jersey, Maryland, Delaware, Ohio,*

Virginia, Kentucky, North Carolina, West Virginia, Indiana, Michigan, and Illinois), and continuing supply chain disruptions they have instituted “temporary changes” to rules that govern minimum inventory requirements to provide more flexibility for coal-fired generators.

NERC (*North American Electric Reliability Corporation*) has warned that a major portion of the U.S., from the Great Lakes into Texas, could face power shortages if extreme weather occurs this winter due to disruptions in the supply of coal, natural gas, and continued low rates of hydropower generation.

Over the next two years, however, the EIA expects 78 GW of new electricity generation capacity will be added to the nation’s grids - 62% (~49 GW) from large-scale solar with some of these projects coupled with battery energy storage (~6 GW).

Some of it will be eligible for the Federal Investment Tax Credit, which was extended to 26% for 2021 and 2022. It will fall to 22% for projects in the

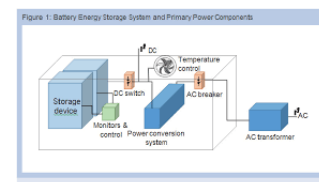
2023 and 10% in 2024.

EIA said 6 GW of battery storage was installed in 2020 - 2021, and they credit lower battery prices, favorable economics of storage when deployed with solar, and the added grid flexibility it provides electricity producers.

Storage technologies are expected to continue to experience significant improvements in both their economics and in their longer-term usability, beyond load shifting. In addition, the improvements in solar equipment are improving efficiency and project economics with faster with faster construction and better maintenance.

Three states – California, Texas, and New York - will account for about half of the expected 49 GW of new solar-plus-storage projects over the next two years; California with 11 GW, Texas with 10 GW, and of New York with 4 GW.

Wind power installations are expected to add ~11 GW of new generation capacity over the next two years, which is a considerable decrease from the prior two years. The agency expects natural gas generation will account for 16 GW of new capacity.



U.S. Crypto Miners Looking to Nuclear Power for their Energy Source



“In the past, Bitcoin mining was centered in China, but China’s State Council recently banned cryptocurrency mining and trading, citing environmental and financial concerns. Now the U.S. is the leading source of Bitcoin production and many of the miners are looking to nuclear power plants for their energy source. Two examples of this are Energy Harbor and Talen Energy. Oklo is also wanting to participate with their new advanced reactor design but recently suffered a major setback on their plans – the NRC denied license for their Aurora advanced reactor design.”

As you know, Bitcoin mining consumes tremendous amounts of electricity and in 2021 it surpassed previous usage of 67 TWh – attaining 89.3 TWh (**Terra Watt Hours**).

Since bitcoin seems to be gaining acceptance, demand is expected to continue to increase.

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Now the U.S. is the leading source of Bitcoin production.

In December 2021, Energy Harbor entered into a five-year partnership with Standard Power to provide electricity from its nuclear fleet to Standard Power’s new Bitcoin mining center in Coshocton, Ohio – repurposing an abandoned Ohio paper mill.

“Bitcoin blockchain mining centers are energy intensive, and we recognize our responsibility to build a more environmentally sustainable future,”

commented Maxim Serezhin, Standard Power’s chief executive officer. “We selected Ohio because of its low electricity costs with availability of carbon-free sources of energy.”

Another U.S. power company, Talen Energy, formed Cumulus Data in 2020 to ‘invest in opportunities created by the convergence of digital infrastructure and power.’ They plan to develop the Susquehanna Hyperscale Campus (**SHC**), a nuclear-powered crypto mining facility and data center on undeveloped land adjacent to its 2494MWe Susquehanna nuclear power plant in Pennsylvania.

This facility, is scheduled to come online in the second quarter of 2022 and it will initially have a capacity of 164MW, rising to 300MW when 100% operational. Delivery of on-site power will be supported by Susquehanna’s two nuclear units and two independent substations. In addition, Talen Energy says they could facilitate up to 1GW capacity in the future, if it is needed.

Talen Energy has also entered into a joint venture with TeraWulf, a US-based bitcoin mining company, to develop the bitcoin mining capacity. The joint venture, Nautilus Cryptomine, will leverage the strengths of both companies as they collectively work to advance the convergence

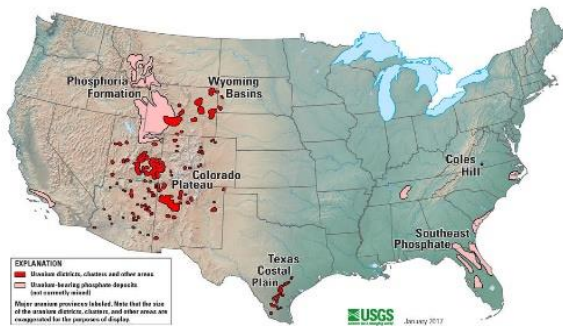
of clean energy sources and digital infrastructure assets. In this joint venture they are planning to invest \$350-400 million in Phase I of the operation. It says the facility, located “behind the meter” directly connected to Susquehanna, will provide Nautilus Cryptomine with one of the lowest electricity costs among publicly traded bitcoin mining peers in the U.S.

In July, US-based Oklo announced a 20-year commercial partnership with Compass Mining, the world’s first online marketplace for Bitcoin mining hardware and hosting. Oklo and Compass Mining aimed to use their advanced fission reactor’s electrical output to promote diversity and sustainability in the energy sources used by the crypto miners. However, Oklo recently suffered a major setback as the NRC (**Nuclear Regulatory Commission**) recently denied license for their Aurora advanced reactor design, planned to be built at the Idaho National Laboratory site.

“Oklo’s application continues to contain significant information gaps in its description of Aurora’s potential accidents as well as its classification of safety systems and components,” said Andrea Veil, NRC Director of the Office of Nuclear Reactor Regulation.

Uranium Mining – Ready to Increase Production Once Prices Rise

Uranium Resources of the United States



“The U.S. was the world’s leading producer of uranium from 1953 to 1980 peaking at 43.7 million pounds, but today producing less than 200,000 pounds. Energy Fuels Inc., the leading U.S. producer of uranium, said they could produce 500,000 pounds annually in six months and 2.5 million within 18 months. There is no reason why mines throughout the western U.S. could not produce 10 to 20 million pounds a year, if prices rise moderately higher from a recent spot price of \$45.50 per pound.”

Uranium is used primarily for nuclear power, but uranium mining had its roots in the production of radium-bearing ore from 1898 from the mining of uranium-vanadium sandstone deposits in western Colorado. The 1950s saw a boom in uranium mining in the western U.S., spurred by the fortunes made by prospectors such as Charlie Steen.

The United States was the world's leading producer of uranium from 1953 until 1980. In 1980, annual U.S. production peaked at 43.7 million pounds of U_3O_8 . Until the early 1980s, there were active uranium mines in Arizona, Colorado, New Mexico, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.

Today, Energy Fuels Inc. is the leading U.S. producer of uranium – the fuel for carbon - and emission-free nuclear energy. They could start producing 500,000 pounds annually of

uranium within six months if prices for nuclear fuel should increase, as they have reserves in Utah, Texas, and Wyoming. This is expected, as nuclear energy is experiencing strong growth around the world, as nations work to provide plentiful and affordable energy, while combating climate change and air pollution. 59 large reactors have come online around the world in the last 8 years and 51 more are under construction, and uranium consumption is now higher than it was prior to the Fukushima accident in Japan.

Energy Fuels says its production could ramp to 2.5 million pounds annually within 18 months if spot prices, which hit \$45.50 per pound recently, rose "moderately higher" and a customer signed a long-term contract. Currently, they are not producing any uranium, due to low prices - fueled by China, Russia, and Kazakhstan's control. Most uranium ore in the United States comes from deposits in sandstone, which tends to be of lower grade than those of Australia and Canada. The lower grade ore required more work to obtain the concentrations needed driving up the cost for U.S. uranium.

In the 80's, the U.S. was the global producer in uranium at over 40 million pounds per year. Today, we are providing less than 200,000 thousand pounds of uranium, but there is no

reason why mines throughout the western U.S. could not produce 10 - 20 million pounds a year, contributing to the global energy industry demands.

With the global increase in nuclear power plants, 8 to 12 new mines will be needed to meet the uranium demand, even with top-producing countries like Canada, China, Kazakhstan, and Russia. However, permitting and licensing here in the states is a lengthy and laborious task, requiring years to obtain and then another year or so to produce. The last mine permitted and licensed in Wyoming took almost seven years and then almost another two years for it to be producing uranium.

Uranium mining has changed over the year and just about all of the U.S. mines are now in-situ operations rather than open-pit mining. In-situ mining resembles oil and gas wells. The uranium is pumped out of the ground with a solution and the solution is taken to a processing facility where the yellow cake uranium is removed from the solution - environmentally friendly.

We have experience with supplying our existing nuclear plants with uranium but the newer SMR's and Advanced Reactors require a higher enrichment fuel and the current facilities do not have the ability to enrich the uranium to the levels they require.

Did You Know?



“That Chelsea Kpodi, a Dallas Texas native, and a Naval Surface Warfare Center, Philadelphia Division (NSWCPD) engineer, was recently honored by the Philadelphia Business Journal as its “Women of Distinction - Rising Star” award for 2021.



This award honors women who have “made a difference in their communities, blazed a trail for the rest of us, and are leaving a mark on Philadelphia business.”



FERC allows termination of Killingly Energy Center planned by Florida-based NTE Energy

The **Killingly Energy Center planned** for Connecticut by **Florida-based NTE Energy** was a 650 MW natural gas-fired combined cycle plant – employing 450 during construction and 20-25 during operation. **However, Federal Energy Regulatory Commission (FERC) has allowed ISO New England (ISO-NE) to terminate the contract.** ISO-NE requested termination last November, saying it had lost confidence in Killingly to deliver capacity by June 2024, more than two years after the project was expected to begin operations. The grid operator said in those filings with FERC that NTE had made “virtually no progress” on Killingly and had moved back project timelines. In fact, to date the ground has never been broken for the project.



NRC rejected Oklo Power’s Aurora-design application to build and operate a compact fast reactor in Idaho

That the **Nuclear Regulatory Commission (NRC) has rejected Oklo Power, LLC’s application to build and operate their Aurora compact fast reactor in Idaho.** This advanced 1.5 MW reactor was to be built and operated at the Idaho National Laboratory. It was the first combined construction and operation license (COL) for an advanced fission technology to be accepted for review by the NRC. The Silicon Valley-based Oklo Power company submitted their application in March 2020 seeking an NRC license, and the application was accepted in June of that year. This design transports heat from the reactor core to a power conversion system and is designed to run on used nuclear fuel known as HALEU, or “high assay, low-enriched uranium.” The NRC said that Oklo submitted supplementary information on several topics in both July and October, but it found the information remained insufficient.



Good news! CO2 emissions in 2020 were the lowest in nearly 40 years - down 11% from 2019

That according to the 2021 year-end report by the U.S. Energy Information Administration (EIA), **carbon dioxide emissions in 2020 were the lowest in nearly 40 years.** U.S. energy-related CO₂ emissions **totaled 4.6 billion metric tons, down 11% from 2019.** That represented the nation’s lowest total since 1983. **EIA cited the reason for the dramatic decrease was due to lower energy demand caused by the COVID-19 pandemic, as well as continuing changes in the electricity generation fuel mix.** The commercial sector emissions totaled 732 million metric tons, a 12% decrease from 2019. Industrial emissions fell 8%. Residential emissions fell 6%. Transportation emission fell 15% - within the transportation sector gasoline emissions fell 15%, jet fuel fell 38%, and diesel emission fell 8%. **Among the hardest-hit sectors during the pandemic, transportation accounted for 58% of all decreases in U.S. energy consumption.**



Hydrostor plans to build a A-CAES project in California

That **Hydrostor, a Canadian-based green energy supplier, is getting a boost for its long-term compressed-air energy storage system with investment from Goldman Sachs.** They plan to build >1 GW/8.7GWh of their Advanced Compressed Air Energy Storage (A-CAES) projects in California and Australia. **This design uses power from the grid to run a compressor, the “heat of compression” is then extracted for re-use in thermal processes, and the compressed air is sent underground and stored in caverns for later use to produce electricity as needed.**

Keep Diablo Canyon and Save California's Reliable Energy Source



“Many experts, such as the current energy secretary Jennifer Grandholm, former energy secretaries Steven Chu and Ernest Moniz, the Washington Post editorial board, ANS President Steve Nesbit, and CEO Craig Piercy, are all in favor of keeping Diablo Canyon open and agreeing that the closing of California’s last nuclear power plant will do more harm than good. We need to keep Diablo Canyon Operating and save this reliable energy source for California.”

In case you haven’t noticed, there is growing support, even in California, to keep Diablo Canyon Nuclear Station open and operating past each reactor’s current licensing end dates of 2024 (*Unit 1*) and 2025 (*Unit 2*).

The settlement reached in 2018, by PGE (*Pacific Gas & Electric*), was that the Diablo Canyon nuclear reactors could continue to operate until they reached the end of their current operating licenses. When that occurs 2.2 GW of around-the-clock emission-free electricity (~9% of California’s power mix) will disappear, and it is to be replaced (*in theory*) by 1 GW of geothermal energy and 1 GW of long-duration storage. ANS President, Steve Nesbit stated in an ANS News column, just last year, “Good luck with that.”

Recently, members from the nuclear community showed up in solidarity, at a rally organized by “Mothers for Nuclear, in support for Diablo Canyon Nuclear Station and the community it serves. It is clear that anti-nuclearism is not representative of the views of the local community.

They only had favorable opinions of Diablo Canyon and shared the reasons for their support.

“The political elites might be divided on whether to use carbon-free nuclear energy to halt climate change and to keep California’s lights on, but working Californians are not,” Smith said. An Uber driver named Kobi, who grew up in the area, listed land conservation, clean air, and a reliable and affordable power grid as her reasons. She said it is out-of-touch decision-makers and outsiders who are threatening the natural beauty of the region by lobbying for the closure of the energy-dense Diablo Canyon. The residents realize that Diablo Canyon can’t be replaced so easily and that the lost power supplies must be replaced somehow, mostly from increased fossil fuels, such as natural gas, and to a lesser extent from land-intensive but intermittent renewables.”

Even the *Los Angeles Times*, acknowledged that many experts believe

keeping Diablo Canyon operating is the best path forward - “would reduce climate pollution, bolster grid reliability, and buy time during a crucial period in the state’s transition toward solar, wind, and other renewable energy sources,” but then they go on to say that keeping Diablo Canyon operating is a misguided idea, divorced from reality, and should instead “serve as an impetus for California to do more to accelerate the shift to renewable energy and set a realistic course to meet the state’s target of getting 100% of its electricity from carbon-free sources by 2045.”

But California should see Diablo Canyon as an opportunity for smart, creative energy development that could address many complicated problems for California in the 21st century California. A recent study from MIT (*Massachusetts Institute of Technology*) and Stanford points out that extending Diablo’s operations until 2035—would reduce carbon emissions from the state’s power sector by more than 10% annually and save ratepayers \$2.6 billion. Keeping the plant open until 2045 (*the end of its planned lifespan*) would save \$21 billion. Using the plant for power would also save about 90,000 acres of California’s land—land that might otherwise be kept as open space—but which would be needed for solar or other renewables to compensate for the loss of Diablo’s electrical production.



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GTTSi Employee Mrs. Jackie Pate – Retires



Mrs. Jackie Pate has retired after 41 years of service to GTTSi.

Jackie has seen the company through a lifetime of service, from the humble beginnings in a basement of a home in Tamasee, SC to a corporate office in Seneca, SC with additional satellite offices in Simpsonville, SC, Hartsville, SC and Rochester, NY.

She was a major contributor to our success, enduring the early days of hope, despair, and small achievements - that one-by-one added up to success. Through all the ups, the downs, and the changes, you were always there with your support – asking only what can I do to help?

We thank you for that “can do spirit”, a smiling face, your Georgia expressions and humor, but most of all we thank you for your LOVE for the job, our employees, and clients.

We will miss you, but what you taught us will long be remembered – take time to listen, enjoy the moment, laughter is the best medicine, don’t take yourself so seriously, just do your best and it will all work out, and showing us that in order to lead ... we must first learn to follow.

We celebrate with you this magnificent achievement – **41 years of service.** Thank YOU, Jackie ---- from the innermost recesses of our HEARTS!

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