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Minority Woman-Owned Enterprise

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June 2022

June 2022 Newsletter

Individual Highlights:

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2020 BEST of the Upstate Greenville News

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- ***Debbie Scott, Administration***
- ***Sid Crouch, Chief Technical Consultant***

DAD is a son's first hero ….
and a daughter's first love!

Byron Generating Station Receives Grant for DAC Technology

"A $2.5 million grant has been awarded to Constellation and it project partners to research DAC at Byron Generating Station (pictured above). They are expecting to capture 250,000 tons of CO_2 each year. Using Carbon Engineering's DAC technology and their Cooling Towers, they will capture CO_2 from the air to be used in industrial processes that would have net zero emissions, from creating sustainable aviation fuel to beverage industry production."

The US Department of Energy (***DOE)*** has awarded a $2.5M grant to Constellation and its project partners (***1PointFive Inc., Worley Group Inc., Carbon Engineering Ltd., Pacific Northwest National Laboratory, and the University of Illinois Urbana-Champaign***) to research carbon removal technology, called Direct Air Capture (***DAC***) at Byron Generating Station in Northern Illinois.

The DAC project at Byron Station is expecting to capture 250K tons of CO_2 each year, reducing global carbon emissions and helping to decarbonize energy intensive sectors of the economy.

Although Byron, like other nuclear plants, produces no carbon emissions, the study will examine the feasibility of using their Cooling Towers to assist in capturing CO_2 directly from the atmosphere, a possible next-generation technology to help in combating the climate crisis. Using Carbon Engineering's DAC technology, a chemical solution will be added to the water flowing through the facility's main condenser on the non-nuclear side of the plant. After traveling through the condenser, the water travels out to the cooling towers, where the CO_2 within the air attaches itself to the chemical solution – captured and sequestered - later to be used in industrial processes that would have net zero emissions, from creating sustainable aviation fuel to beverage industry production.

The study, expected to finish in 2023, is designed to take advantage of the flow of clean water vapor from the plant's cooling towers. The partners said it could lead to a nuclear plant becoming a DAC hub.

"We need many new solutions to address the climate crisis and exploring this technology at one of our clean energy centers is a positive step driving us toward a carbon-free future," said Joseph Dominguez, CEO of Constellation.

You may recall, back In August 2021, the DOE announced that $24 million in funding would be awarded to nine projects planned for researching new methods for DAC. These nine awards were led by two national laboratories and seven universities and tackle topics including the discovery of novel materials, chemistries, and processes for extraction of carbon dioxide from air, and combined experimental and computational studies on carbon dioxide capture for sequestration or reuse.

Byron Nuclear Generating Station, owned and operated by Constellation Energy, consists of two Westinghouse pressurized water reactors that were commissioned in the 1980's. Unit 1 is licensed through 2044 and Unit 2 is licensed through 2046.

In February 2022, Exelon completed the spinoff of its nuclear power plant division to Constellation Energy. Constellation owns all six Illinois nuclear power plants –Braidwood, Byron, Clinton, Dresden, LaSalle, and Quad Cities.

After 3 Years Offline - Large Hadron Collider Breaks Its Own Record

"After three years offline, CERN's Large Hadron Collider (LHC) just broke its own record. The particle accelerator created the most energetic beams of protons ever made by humans - 6.8 trillion electronvolts (TeV). CERN, the European Organization for Nuclear Research, is made up of 23 countries, all European except Israel, and its main function is to provide particle accelerators and other infrastructure needed for high-energy physics research."

After being offline for three years, for maintenance and upgrades, the Large Hadron Collider (***LHC***) just whizzed past its own record. In preparation for its third major run of experiments, the particle accelerator has created the most energetic beams of protons ever made by humans. The particles went racing around the 17-mile (***27 km***) tunnel near Geneva, Switzerland, with an energy of 6.8 trillion electronvolts (***TeV***).

On April 25, 2022, the LHC began a new start. "This, of course, is an important day for us... but it's only the start of a very long commissioning period which [will] bring us to actually collide the two beams for the experiments and provide the highest-energy collisions," says Jörg Wenninger, head of the LHC beam operation section and the LHC machine coordinator. He went on to say that beams should start colliding within a couple of months.

You may recall, back in 2009, that the LHC broke its first record, just after it began operation. and became the world's most powerful particle accelerator. The beam of protons was accelerated to an energy of just over 1 TeV, beating out Fermilab's Tevatron accelerator near Chicago, Illinois.

"Then one year later, we pushed to 3.5 TeV," Wenninger says. After setting yet another record, LHC was shut down for maintenance and to consolidate some of the magnets that control the proton beams. "This allowed us in 2015 to reach 6.5 TeV, again a new world record," he says. That satisfied the particle physicists who rely on LHC data for three years. During the second long shutdown, which has just ended, researchers and technicians "did further consolidation of the safety system of the magnet." Those tweaks enabled today's new record and brought the team "very close to the designed energy of the LHC, which is 7 TeV," he says.

CERN, the European Organization for Nuclear Research, is a research organization that operates the largest particle physics laboratory in the world. Its main function is to provide the particle accelerators and other infrastructure needed for high-energy physics research.

The collider is contained in a circular tunnel. The collider tunnel contains two adjacent parallel beamlines (***beam pipes***), each containing a beam of particles which traveling in opposite directions around the ring.

The beams intersect at four points around the ring, which is where the particle collisions take place.

Some 1,232 dipole magnets keep the beams on their circular path, while an additional 392 quadrupole magnets are used to keep the beams focused, with stronger quadrupole magnets close to the intersection points in order to maximize the chances for interaction where the two beams cross.

Magnets of higher multipole orders are used to correct smaller imperfections in the field geometry.

In total, about 10,000 superconducting magnets are installed, with the dipole magnets having a mass of over 27 tons.

Approximately 96 tons of superfluid helium-4 is needed to keep the magnets, made of copper-clad niobium-titanium, at their operating temperature of 1.9 °K (***−271.25 °C***), making the LHC the largest cryogenic facility in the world at liquid helium temperature.

During LHC operations, the CERN site draws roughly 200 MW of electrical power from the French electrical grid, of which 20 MW are needed for the LHC and its detectors.

GE Gas Turbine Burns Hydrogen - 1st Time in a Commercial Operation

"The GE gas turbine at the Long Ridge Energy Center in Hannibal, Ohio (like the one pictured above) has demonstrated hydrogen can be used as a fuel source in a commercial gas turbine application. The U.S . Department of Energy (DOE) said that advances in gas turbine design have allowed hydrogen to be fired at concentrations over 90% in simple-cycle turbines or aero-derivative machines, and at concentrations of up to 50% in large-frame combined-cycle turbines."

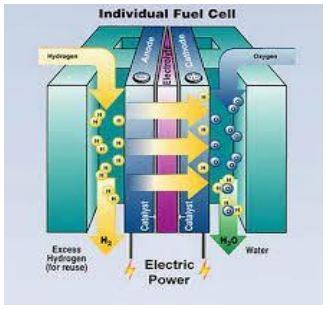
The GE 7HA.02 gas turbine (***pictured above***), at the Long Ridge Energy Terminal (***pictured right***), is utilizing hydrogen for the very first time in a commercial operation.

The GE turbine is currently burning between 15-20% hydrogen by volume but there are plans for the turbine to burn up to 100% hydrogen over time.

While the 485 MW combined-cycle plant in Hannibal, Ohio began operating commercially in October 2021, the plant conducted a successful hydrogen-blending demonstration on March 30, 2022. The demonstration injected a 5% of blend of hydrogen into the combustion system of the gas turbine, but GE said further upgrades will allow the plant to burn much higher percentages of hydrogen, subject to fuel availability and economics.

Initial planning for the Long Ridge Energy Terminal dates back more than five years. The power plant was built on a former aluminum plant site, with rail and LNG (***Liquid Natural Gas***) loading facilities included in the planning. The plant was long planned as a pure CCGT (***Combined Cycle Gas Turbine***) facility.

The plant plans to produce hydrogen onsite via electrolysis (***see below***), as the plant has access to the Ohio River, and it is considering the use of below-ground formations for large-scale hydrogen storage.



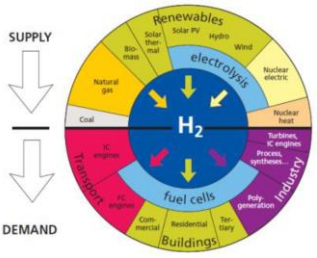
Long Ridge Energy Terminal is owned by a subsidiary of Fortress Transportation and Infrastructure Investors LLC.

Major OEMs (***Original Equipment Manufacturer***) within the power generation industry like GE, Siemens, and Mitsubishi Power have been focusing efforts on hydrogen combustion within their gas turbines - developing materials and systems to increase the concentration of hydrogen that can be combusted.

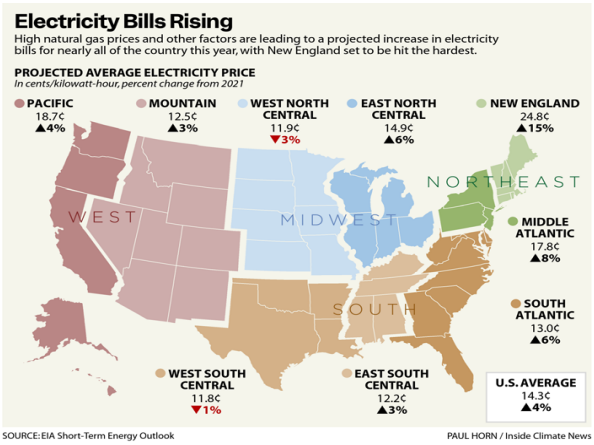
According to the U.S . Department of Energy (***DOE***), these advances have allowed hydrogen to be fired at concentrations over 90% in simple-cycle turbines or aero-derivative machines, and at concentrations of up to 50% in large-frame combined-cycle turbines.

However, experts note 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.

According to the DOE's hydrogen plan, significant progress has been made, but additional research, development, and demonstration is needed to address issues such as auto-ignition, flashback, thermo-acoustics, mixing requirements, aerothermal heat transfer, materials issues, turndown and combustion dynamics, NOx emissions, and other combustion-related issues.



Spiking Electricity Bills Plus Blackouts – Coming this Summer



"Electricity prices are rising in much of the country at the same time grid operators are warning they may not have enough electricity available to meet consumer demand this summer, which raises the risks of blackouts and brownouts. The problems of high prices and potential blackouts are intertwined in that they both have roots in the failure of the government, utilities, and grid operators to manage the risks tied to climate change and the transition to clean energy. Not only is basic affordability threatened, but system planning as a whole is broken."

Electricity prices are rising in much of the country at the same time grid operators are warning they may not have enough electricity available to meet consumer demand this summer, which raises the risks of blackouts and brownouts.

One of the challenges for grid planning is that rising temperatures mean the existing models for electricity demand are no longer accurate, said Alice Reynolds, president of the California Public Utilities Commission. "Climate change impacts are really outpacing all of the predictions that we've made".

Across the country, nuclear power plants and older coal-fired power plants have been closing, and their replacement has been renewable energy, battery storage, and natural gas power plants.

The transition has not been smooth, with delays in building new plants and concerns about how best to operate a system that increasingly relies on intermittent resources like wind and solar.

The move to natural gas as the replacement for baseload, previously provided by nuclear and coal-fired plants, has greatly contributed to the increased costs for electricity, as natural gas prices have increased from $2 to $7 per million BTU's.

The national average cost for household electricity is expected to rise 4% this year (***pictured above***) compared to 2021, which would be the largest percentage increase since 2008, according to the EIA (***Energy Information Administration***).

New England is poised to get the worst of it, with a projected increase of 15%.

Only two regions show a decrease in electricity prices: West North Central and West South Central, 3% and 1% respectively. The 3% decrease is attributed to a large rate increase in 2021 and is falling a bit from that increase. It's not clear what's driving the 1% decrease in the southern region.

"As the heat goes up, it is really hard to anticipate the amount of outages we might find ourselves with," said Siva Gunda, a member of the California Energy Commission, speaking at a briefing about the state's readiness for the summer.

California's grid operator, California ISO, has said there is a high probability that demand for electricity will exceed the supply. Last summer, you may recall, California went through rolling blackouts because of a shortage of available electricity.

One of the challenges for grid planning is that rising temperatures mean that the existing models for electricity demand are no longer accurate, said Alice Reynolds, president of the California Public Utilities Commission. "Climate change impacts are really outpacing all of the predictions that we've made," she went on to say.

Last month, the grid operator for much of the Midwest, Midcontinent Independent System Operator (***MISO***), issued their seasonal outlook that showed peak demand will exceed the supply of electricity from power plants.

Texas also sees the potential for a difficult summer. They have already endured unseasonably high spring temperatures. which is typically not a time of extreme heat in Texas.

According to analysts at the National Consumer Law Center, the problems of high prices and potential blackouts are intertwined in that they both have roots in the failure of the government, utilities, and grid operators to manage the risks tied to climate change and the transition to clean energy.

Did You Know?

"That Celia Kornegay has attended five Georgia Tech Commencement ceremonies, but this time - the sixth was for her – a BS degree in Civil Engineering. She is passionate about encouraging young girls to pursue STEM fields. In June she will begin her career as a staff engineer on site design and land development projects at Eberly and Associates, a civil engineering firm in Atlanta where she interned last summer."

Executive director for operations at the NRC has ordered evaluation of NuScale's "stress averaging approach" and, if necessary, update the application and evaluate whether there are "any impacts" to the 2020 design approval.

That ***John Ma, an engineer at the Nuclear Regulatory Commission (NRC) has raised concern over the NRC's approval of the NuScale SMR design. He alleged that the design of the building, intended to enclose the reactor units and its spent fuel pool, did not provide assurance it could withstand the largest earthquake considered without collapsing and may be vulnerable to smaller earthquakes.*** *"Collapse of the reactor building ... could potentially cause an early and large release of radioactive materials into the atmosphere and ground, which could kill people," Ma wrote. Dan Dorman, the executive director for operations at the NRC reviewed Ma's complaint and has ordered the agency's Office of Nuclear Reactor Regulation to document its evaluation of NuScale's "stress averaging approach" and, if necessary, to update the application and evaluate whether there are "any impacts" to the 2020 design approval.* ***It was uncertain whether the additional actions will affect the Carbon Free Power Project for UAMPS (Utah Associated Municipal Power Systems) with multiple reactors at the Idaho National Laboratory, with the first coming online in 2029 and full plant operation in 2030. This project's timeline has been delayed several times already.***

Willliams to grow its capacity by nearly 2 Bcf/d to accommodate growing demand, particularly for exports

That the oil and gas industry midstream giant, ***Williams, is spending about $1.5 billion with six transmission projects to grow its natural gas transportation capacity by nearly 2 Bcf/d over the next few years (targeted for 2025) to accommodate growing demand, particularly for exports.*** *"As we look overseas to the energy crisis in Europe, we recognize the need for reliable, affordable and clean energy that can keep up with the growth that the world demands on a global scale," CEO Alan Armstrong said during a first quarter conference call. "Williams has critical infrastructure connected to the best natural gas basins in the United States to serve these growing needs."*

California achieved 99.87% of its electric power from renewables. This moment is a shot in the arm for those who want CA powered by 100% clean energy by 2045.

That ***California achieved 99.87% of its electric power from renewables on Saturday, April 30th at 2:45pm PST. 12,391 of the 18,648 MW's came from the solar panels connected to the state's electrical grid while the rest came from wind, geothermal, and other renewable sources.*** *Although this only lasted for a period of 15 minutes the renewable contribution to the grid was significant and continued through the afternoon at a gradual reduction to about 50% until dusk. As this is quite an achievement, note it was achieved during the daytime and on a weekend day, not during the week when load demand is typically higher.* ***California is still far away from being entirely independent of nuclear and natural gas but Saturday's brief moment in the sun is a shot in the arm for the government and the environmentalists who want the state to be powered by 100% clean energy, 100% of the time, by 2045.***

FERC Issues a NOPR to Reform Transmission Planning & Cost

The Federal Energy Regulatory Commission recently issued a Notice of Proposed Rulemaking due their concern that existing rules have led to short-term, piecemeal expansion of the transmission grid. They felt reform was needed, as the current regulatory regime, is unlikely to identify more efficient or cost-effective solutions to transmission needs driven by the changes in the resource mix and demand – including the recent growth in renewable generation, which is often located in geographically remote areas and thus requires more long-range transmission infrastructure to reach consumers. "

The Federal Energy Regulatory Commission (***FERC***) recently issued a Notice of Proposed Rulemaking (***NOPR***) which builds on previous Order Numbers 888, 890, and 1000 – issued in 1996, 2007 and 2011, respectively. These orders established rules governing regional transmission planning and cost allocation processes.

But this NOPR is driven by FERC's concern that the existing rules have led to short-term, piecemeal expansion of the transmission grid and without reform, they fear the current regulatory regime is unlikely to identify more efficient or cost-effective solutions to transmission needs driven by changes in the resource mix and demand – including the recent growth in renewable generation, which is often located in geographically remote areas and thus requires more long-range transmission infrastructure to reach consumers.

This rule requires public utility transmission providers to:

- Identify transmission needs driven by changes in the resource mix and demand through the development of long-term scenarios that satisfy the NOPR's requirements, including accounting for low-frequency, high-impact events such as extreme weather
- Evaluate the benefits of regional transmission facilities to meet these needs over a time horizon that covers, at a minimum, 20 years starting from the estimated in-service date of the transmission facilities
- Establish transparent and not unduly discriminatory criteria to select transmission facilities in the regional transmission plan for purposes of cost allocation that more efficiently or cost-effectively address these transmission needs in collaboration with states and other stakeholders

Additionally, the NOPR proposes that dynamic line ratings and advanced power flow control devices in regional transmission planning processes be fully considered.

Regarding transmission cost allocation, each transmission planning region must seek the agreement of relevant state entities on the cost allocation method or methods that will apply to transmission facilities selected in any given regional transmission plan. Once chosen, providers would be required to include the selected cost allocation method or methods in their tariffs. Additionally, the NOPR would prevent public utility transmission providers from taking advantage of the "construction-work-in-progress" rate-enhancing incentive when engaged in long-term regional transmission planning, as FERC is concerned that the incentive would shift too much financial risk to consumers for facilities that may not ultimately be placed in service, if at all, for many years.

In a somewhat surprising development, FERC further proposes to partially resurrect the federal right of first refusal historically enjoyed by incumbent transmission providers (***and removed by Order No. 1000***) to build transmission facilities selected in regional transmission plans within their service territories or footprints. This right would be conditioned on the incumbent providers establishing joint ownership of such transmission facilities with unaffiliated, non-incumbent entities.

Finally, with respect to interregional transmission coordination and cost allocation, the NOPR would require that public utility transmission providers revise their existing interregional transmission coordination procedures to reflect the long-term regional transmission planning reforms established by the NOPR.

GTTSi Job Board Update

GTTSi

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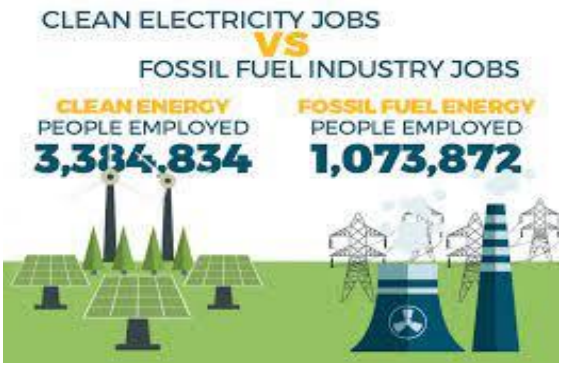

GTTSi provides professional services to the energy and nuclear industry since 1980. We are a MWOBE (***minority woman owned business enterprise***) and have served over 80% of the US commercial nuclear facilities, 8 Federal agencies and prime contractors, and one foreign government. If you are qualified and interested in any of the job opportunities listed below, please contact us at ginfo@gttsi.com or call our Home Office at **864.882.3111.**

- ***Initial Test Program Operational Control Room Support***
- ***Initial Test Program Test Coordinator***
- ***Initial Test Program Operational Field Support***
- ***Licensing Specialist - Nuclear***
- ***Infrastructure Technical – Project Manager***
- ***Infrastructure Technical - IT Monitoring Tools & Process***
- ***Project Manager – IT Service Management CoE Track***
- ***ITAAC Field Engineer (all disciplines)***
- ***Project Planner (Electrical / Mechanical)***
- ***Initial Test Program Tagout Coordinator***

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