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Individual Highlights:

- Cost of Winter Storm "Uri" Continues to Plaque Texas pg#2
- Japan Asks IAEA to Review Plans for Disposal of Fukushima Water pg#3
- NET Power Plans for Two 280 MW Zero-Net Carbon Emission Plants pg#4
- The \$2.25 Trillion Infrastructure Plan Includes Power Infrastructure pg#5
- Did You Know? pg#6
- Southern Company Recognizes Two Farley Nuclear Plant Women pg#7
- GTTSi Employee – Mrs. Sara Gaines pg#8

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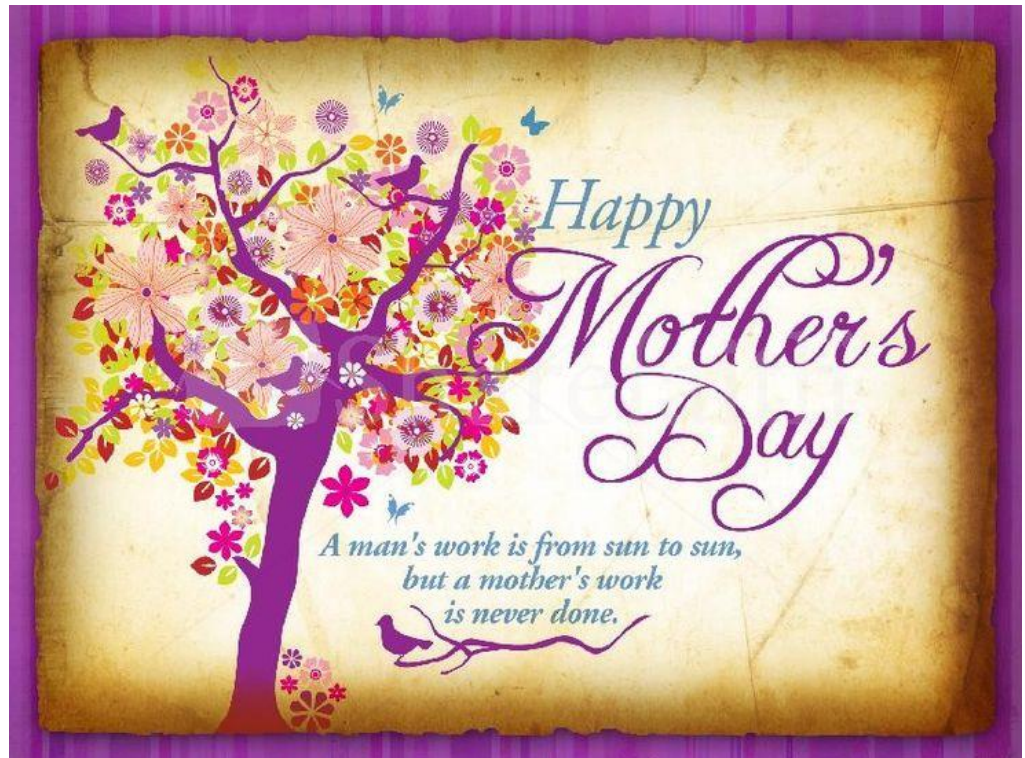
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Cost of Winter Storm “Uri” Continues to Plague Texas



“Just two weeks after Governor Abbot appointed Arthur D’Andrea as chairman of the Texas PUC, he asked for his resignation and received it. D’Andrea was the only remaining PUC commissioner, and his resignation will become effective immediately following the appointment of his successor. The recent Texas blackout continues to plague Texas - three companies have filed for bankruptcy. One of which, is Brazos Electric Cooperative - the state’s largest and oldest membership power cooperative.”

The cost of winter storm “Uri” continues to plague Texas. Just two weeks after Governor Abbot appointed Arthur D’Andrea (pictured above) as chairman of the Texas Public Utility Commission (PUC), following the resignation of the former chair DeAnn Walker, the Governor asked for D’Andrea’s resignation and he received it. Mr. D’Andrea was the only remaining PUC commissioner, and his resignation will be effective immediately following the appointment of his successor.



The Texas PUC regulates the state’s electric, telecommunication, water, and sewer utilities. In this role, they were to provide oversight of ERCOT which operates the Texas Grid and manages the Texas

deregulated electric market.



Due to the demand and very limited supply of electricity during the extended Texas blackout - electric rates and service charges increased by a quantum leap.

Recently, there has been heated debate over repricing of the electricity trades that occurred during this February event.

Wholesale power prices hit the state-imposed maximum of \$9,000 per megawatt-hour and stayed at those levels for days due to a PUC mandate that requires these \$9,000 prices remain in effect for 32 hours after the market had returned to normal.

Several Texas utilities and retail electricity providers suffered severe consequences over these trades, resulting in three companies filing for bankruptcy. One of which, is Brazos Electric Cooperative - the state’s largest and oldest membership power cooperative. In their March 1 bankruptcy filing, Brazos Electric stated that they will not foist this catastrophic ‘black swan’

financial event onto our members and their consumers. We have commenced a “bankruptcy” filing to maintain the stability and integrity of our entire electric cooperative system.

NRG Energy, a Houston-based utility and one of the state’s largest generators, said it anticipates a \$750 million loss attributable to the winter storm, and forced them to withdraw their 2021 financial guidance they had announced on March 1, 2021.

Potomac Economics, an independent market monitor, recently said that ERCOT had overbilled power companies by as much as \$16 billion in charges related to the storm, though it later revised that figure to about \$5.1 billion.

The cost of electricity during the storm has been a contentious issue, and the Texas Senate suspended its own rules, and by a 27–3 vote passed a bill that would force the PUC to reverse those charges. Lt. Gov. Dan Patrick (pictured below), who leads the Senate, supported the measure, and said it would be the “right thing to do.”



Japan Asks IAEA to Review Plans for Disposal of Fukushima Water



out to the IAEA to confirm that their method and facilities meet the required safety standards.



The IAEA Director General, Rafael Grossi, (*pictured above*) said the IAEA is prepared to fully support Japan, being convinced of the country's determination to resolve the issue of the treated water and its technological capacity in carrying that out.

"It has become increasingly important to dispel concerns and reputational worries over the safety of the water which have been raised domestically as well as from our neighboring countries," Minister Kajiyama said and he added ... that under such circumstances, it is "extremely effective" that the IAEA transmits messages in and out of Japan on how the treated water is actually being handled as well as its safety.

“On March 11, 2011, the Great East Japan Earthquake of magnitude 9.0, created a 15-meter tsunami that disabled the power supply and cooling for 3 Fukushima Daiichi reactors, causing a nuclear accident. All 3 cores largely melted in the first 3 days. The accident was rated a level 7 (highest level event) on the International Nuclear and Radiological Event Scale, due to the high radioactive release, totaling 940 PBq (PBq = petabecquerel = 10¹⁵ Bq).”

Japan's Industry Minister, Hiroshi Kajiyama, has asked the IAEA Director General, Rafael Grossi, to conduct a scientific and objective review of their plan for the disposal of ALPS (**Advanced Liquid Processing System**) treated water into the ocean. In addition, he has also requested the IAEA (**International Atomic Energy Agency**) openly convey their findings to the international community.

The 1.2 million tons of treated water has been used to cool the reactors that suffered core meltdowns due to the devastating earthquake and tsunami that hit the Fukushima Daiichi nuclear power plant on March 11, 2011. The contaminated (**radiation-tainted**) water flowing through the reactor for cooling has been treated using an advanced liquid processing system (**ALPS**), which removes most of the contaminants other than, relatively less toxic, tritium. It is stored in tanks on the plant's premises, but space on the plant site is projected to

run out by the fall of 2022. Therefore, a decision on its disposal is somewhat eminent.

Japan has been considering various options for disposal of this treated water – they are in “final-stage coordination” for deciding its policy on the treated water - specifically asking the IAEA to confirm their method and facilities used for the water disposal; match the body's safety standards, verify the radiation data in the environment, and release their findings to the international community.

Disposal into the ocean has faced opposition by the local fishery industry, which is concerned about the possible effects this release could have on marine products, as well as neighboring countries. China and South Korea has expressed concerns over the discharge of this treated water from the Fukushima plant into the environment.

Therefore, Minister Kajiyama (*pictured above on the right*) has reached

NET Power Plans for Two 280 MW Net-Zero Carbon Emission Plants



“The NET Power natural gas-fired Allam Cycle plant design captures and sequesters carbon dioxide at virtually no extra cost and uses it as part of a fuel mixture that is 95% carbon dioxide at the point of combustion. It works by burning the fuel and oxygen in supercritical CO₂ resulting in an exhaust that has the necessary mass to spin a turbine. The Durham, NC based company – NET Power – along with 8 Rivers Capital are planning operation for two 280 MW gas-fired power plants, one in Colorado and one in Illinois.”

You may recall our blog article on the Allam Cycle in 2018, where you learned that although CO₂ is typically used to suppress combustion - it can also be used to sustain combustion.

This counterintuitive fact is at the heart of a novel natural gas-fired power plant design of NET Power – a Durham, NC based company. This plant design captures and sequesters carbon dioxide at virtually no extra cost and uses it as part of a fuel mixture that is 95% carbon dioxide at the point of combustion (***pictured above is Rodney Allam standing beside his power plant design***)

It works by burning the fuel and oxygen in supercritical CO₂ resulting in an exhaust that has the necessary mass to spin a turbine. The heat of combustion expands the supercritical CO₂ to exhaust it through the turbine, from which it exits at around 3 MPa (***1 Megapascal or MPa = 145.037737797 psi***).

The hot exhaust enters a heat exchanger, which

transfers the gas's thermal energy to a supercritical CO₂ stream that is headed back to the combustor. The turbine exhaust, then exits the heat exchanger, having been cooled to air temperature - falling out of its supercritical state - and the water vapor produced in combustion condenses and drains away. The now highly pure CO₂ stream is then compressed, cooled, and pumped up to a supercritical 30 MPa for a return trip to the combustor.

The pumping step is one of the key steps in Allam's design. His team realized that using compression, alone, to pressurize the CO₂ from 3 MPa all the way to about 30 MPa, would require more energy and reduce the overall efficiency. Because compressing CO₂, which boosts pressure by decreasing the gas volume, would take more energy than pumping it, which can also increase pressure by adding mass. Therefore, the Allam cycle, compresses the CO₂ to a superfluid at around 8 MPa, then cools it, and then efficiently pumps it to 30 MPa.

8 Rivers Capital and NET Power are planning for operation of two 280-MW NET Power natural gas-fired plants by 2025 – one in Colorado and one in Illinois.

In Colorado, through a partnership with the Southern Ute Indian Tribe

Growth Fund (***SUGF***), the 280-MW NET Power facility will be located within the Southern Ute Indian Reservation in southwest Colorado. Final decision on the Coyote Clean Power Project is expected in 2022, with production as early as 2025.

“We are delighted to partner with the Southern Ute Indian Tribe on this clean power project, highlighting our collective leadership in the energy transition to a carbon neutral environment”, said Damian Beauchamp, president at 8 Rivers and Board Member of NET Power.

In Illinois, teaming with the agricultural and processing firm, Archer-Daniels-Midlands Co. (***ADM***) the 280-MW NET Power facility will be located at the Broadwing Clean Energy Complex in Decatur, Illinois. Final decision is expected in 2022, as this project includes building on an existing carbon storage facility at Decatur, funded by ADM and the Department of Energy.

“In the coming months, the Broadwing Clean Energy Complex team will work together to advance key elements of the proposed project, from engineering design to permitting activities to the signing of final contracts between the companies.”. If all goes well, this plant could also be operational by 2025.

The \$2.25 Trillion Infrastructure Plan Includes Power Infrastructure



“The \$2.25 Trillion Infrastructure Plan includes our power infrastructure with emphasis on electrification, resilience, decarbonization, infrastructure efficiency, closure of tax loopholes for fossil fuel, buttressing carbon capture, and boosting hydrogen demonstrations - with a new production tax credit (PTC). The plan cites the recent Texas and central U.S. outages as an impetus for the “urgent modernization” of our aging electric grid but uses outdated 2012 figures – claiming power outages ONLY cost \$70 billion annually – not realistic today.”

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The plan cites the recent Texas and central U.S. outages as an impetus for the “urgent modernization” of our aging electric grid but uses outdated 2012 figures – claiming power outages ONLY cost \$70 billion annually – not realistic today. Below are some of the plan’s proposals.

A targeted investment tax credit (ITC) to incentivize construction of 20 GW high-voltage capacity power lines and a Grid Deployment Authority (working under the U.S. Department of Energy) to leverage existing “right-of-way” (along roads and railways) and spur development of these “high priority, high-voltage transmission lines.”

A 10-year extension and phase down of an expanded “direct-pay” ITC and PTC for clean energy generation and storage.

To support state, local, and tribal governments through mechanisms like “clean energy block grants” and 100% clean energy federal purchasing power to drive clean energy deployment.

To meet the proposed 2035- 100% carbon-free power target - the president will establish an Energy Efficiency and Clean Electricity Standard (EECES) to increase competition in the market but incentivize more efficient use of the existing infrastructure, and leverage the carbon pollution-free energy provided by existing sources like nuclear and hydropower.

To eliminate “tax preferences” for fossil fuels and restore payments from polluters into the Superfund Trust Fund so that polluting industries will help cover the cost of cleanups.

To focus new energy development in “overburdened” communities, with 15 hydrogen demonstration projects, with a new PTC, 10 “pioneer” facilities that demonstrate carbon capture retrofits for large steel, cement, and chemical production facilities (not power plants).

Accelerate carbon capture and storage deployment

through a reform and expansion of the Section 45Q tax credit. These reforms would make the credit direct pay and “easier to use for hard-to-decarbonize industrial applications, direct air capture, and retrofits of existing power plants.”

The plan calls for targeted tax credits, federal funding, and grants to improve building energy efficiency, but it focuses more heavily on transportation electrification - proposing a \$174 billion investment to “win the EV market - building a national network of 500,000 EV chargers by 2030 and replacing 50,000 diesel transit vehicles, 20% of school buses, and most of the federal vehicle fleet with EV’s.

The plan calls on Congress to invest 150 billion in the National Science Foundation (NSF), creating a “technology directorate”, \$35 billion in R&D efforts that address the climate crisis to help launch the Advanced Research Projects Agency-Climate (ARPA-C) program, and \$15 billion in demonstration projects for climate R&D, including: “utility-scale energy storage, carbon capture and storage, hydrogen, advanced nuclear, rare earth element separations, floating offshore wind, biofuel/bioproducts, quantum computing, and electric vehicles.”

Did You Know?



“That Heidi Tinnesand a Mechanical Engineering Researcher at the NREL (National Renewable Energy Laboratory) in Golden, Colorado has always been interested in wind – converting a force of nature into a source of power motivated her to pursue a career in wind energy. Women make up 25% of the wind energy workforce and Heidi recommends being around like-minded women – an organization like Women in Renewable Industries and Sustainable Energy ”



Autonomous Robot, dubbed A212, can be used in hazardous environments

That this Autonomous Robot, dubbed A212, can be used in hazardous environments and eliminate the need to send people into view the hazard or situation. It uses a system known as SubSlam in order to live-stream 3D images of the environment, such as that within a spent fuel pool or waste tank. Pilots of the A212 can see what is of concern and decide on what action(s) to take – it becomes especially handy in situations where the nuclear materials are in danger of colliding with one another. **A212 recently showcased its capabilities within a hazardous environment at Forth Engineering’s 1.2-million-liter tank facility located in the U.K. (United Kingdom) at Maryport.**



China is largest contributor of coal-fired power generation – 53%

That although coal-fired power generation is being decreased around the world, China has emerged far and away the largest contributor of coal-fired power generation – 53% of the world’s coal-fired power generation portfolio. This has been driven by their electricity demand – rising by 1,880 TW-hours (Terawatt-hours) over the past five years. Global emissions are still higher than in 2015 – any reduction by developed nations has been offset by China’s increases.



The solar thermal collector heats the “thermal fuel” as it is pumped through transparent tubes, and when the sunlight contacts the “thermal fuel”, the bonds between its atoms are rearranged, transforming it into an energy-rich isomer – capturing the energy between the isomers’ strong chemical bonds.

That scientists in Sweden have developed a “solar thermal fuel” – it is reported to store energy captured from the sun for up to 18 years. According to Jeffrey Grossman, an engineer who works with these materials at MIT explained, **“A solar thermal fuel is like a rechargeable battery, but instead of electricity, you put sunlight in and get heat out, triggered on demand”.** The solar thermal collector named MOST (Molecular Solar Thermal Energy Storage System) heats the “thermal fuel” as it is pumped through transparent tubes and when the sunlight contacts the “thermal fuel”, the bonds between its atoms are rearranged, transforming it into an energy-rich isomer – capturing the energy between the isomers’ strong chemical bonds. Incredibly, the energy stays trapped there even when the “thermal fuel” cools down to room temperature. **To use this trapped energy, the “thermal fuel” flows through a catalyst (also developed by the research team) creating a reaction that warms the liquid by 113 °F (63 °C) – returning the “thermal fuel” to its original form, releasing energy in the form of heat.** It was calculated that the “thermal fuel” can store up to 250 watt-hours of energy per 2.2 lb (1 kg) - pound for pound, that’s roughly twice the energy capacity of the Tesla Powerwall batteries. Enough energy to power a building’s water heater, dishwasher, clothes dryer, with industrial applications as well, including low-temperature heat used for cooking, sterilization, bleaching, and distillation.



30 GW offshore wind by 2030

That the Interior, Energy, and Commerce Departments announced the Biden’s Administration target - 30 GW of offshore wind by 2030 - expected to create 80,000 jobs. Also, they announced the New York Bight, ~800,000 acres of shallow waters between Long Island and the New Jersey coast, could be used to build offshore wind farms.

Southern Company Recognizes Two Farley Nuclear Plant Women



“These two women began their careers at Farley Nuclear Plant (pictured above) in Alabama. While operation of nuclear power plants remains a male-dominated field, women continue making advancements at these facilities, especially in roles of leadership. They bring a different perspective and realize their diversity adds value and do not feel they have been given an advantage over their peers or had a disadvantage because of being a woman.”

While operation of nuclear power plants remains a male-dominated field, women continue making advancements at these facilities, especially in roles of leadership.

During Women’s History Month - Southern Company recognized two Alabama women who work in key positions when it comes to the reliable production of carbon-free energy at Alabama Power’s Farley Nuclear Plant – Samantha Boswell and Jamie Coleman.



Samantha Boswell (pictured above) is a nuclear chemist and the department’s Quality Assurance / Quality Control administrator.



Jamie Coleman (pictured above) is the Fleet Licensing Manager for Southern Company, which operates Farley Nuclear Plant.

Samantha never dreamed of working in nuclear energy. After earning a Bachelor of Science degree in chemistry and a Master of Science degree in Business Administration she began looking for a job and found opportunities posted at Plant Farley. “When I finally had the opportunity to accept an offer from the plant, I knew it was going to be life-changing. I fully recognize the unique opportunity I have being a part of the nuclear energy industry.” She has been employed at Plant Farley for 15 years.

Boswell began her career as a chemistry technician and transitioned to performance improvement and organizational effectiveness. She currently works as a nuclear chemist and the department’s Quality Assurance/Quality Control (QA/QC) administrator.

“In my role, I monitor our nuclear IQ database, which stores our chemistry data and quality control checks and scheduling,” Boswell said. “I write procedures for chemistry and lead initiatives in corrective actions, safety and health, and new lab instrumentation.”

As a woman working in a predominantly male field, Boswell said, “It can be challenging at times, if you let it be. Take advantage of any opportunity to grow. This can be extra training outside of your immediate duties or exposure in a

different area. Be versatile and embrace change. You never know where your next opportunity may lead you, so be prepared for the unknown.”

Jamie, like Samantha, began her career at Plant Farley after graduating with a Bachelor of Science degree in chemical engineering in 2003.

“I didn’t know much about nuclear energy until I interviewed for a job at Plant Farley. Everyone I talked with was so passionate about nuclear. I left Plant Farley that day with the impression that nuclear was the future and answer to our country’s energy needs, and I wanted to be a part of it.”

She is also among an elite group of women, in the nuclear industry, earning an SRO (**senior reactor operator**) license from the NRC.

“Being in operations was one of the best jobs I’ve had with the company. The opportunities and knowledge gained during my time in operations have been invaluable”, Coleman said.

With respect to her experiences in a predominantly male field, Coleman said, “I know that I bring a different perspective and different opinions to every team. Being diverse adds value and I’m happy to be able to do that. I have never felt like I’ve been given an advantage over my peers or had a disadvantage because I am a woman.



GTTSi Employee – Mrs. Sara Gaines



Meet GTTSi employee – Mrs. Sara Gaines, a Senior Projects Controller with 9 years of experience and a BS degree in Business Administration and a Bachelors of Hotel, Restaurant, and Resort Management.

Sara has been working for two years as a Senior Projects Controller for three of NextEra Energy’s major projects – Wheatridge Wind Farm (~300 MW) in Oregon, Hubbard Wind Farm (~300 MW) in Texas, and the Arlington Solar & Energy Storage Project (~360 MW / ~240 MW-988 MW-hr Storage) in California.

In this position, she tracks and manages all changes to the project scope and cost baseline ensuring that the cost and schedule stay in-synch and are reflective of the costs being presented to the Project Manager and NextEra’s Leadership. This requires multi-tasking, flexibility, patience, and acuity with an ability to analyze, validate, and verify the data gathered on each of these projects. In addition, she also reviews and processes all vendor invoices.

Other accomplishments include Davis-Besse Nuclear Power Station - she was the Project Support Lead for the Steam Generator Replacement Project and not only communicated with the engineering staff and vendors, but also served as liaison between the NRC (**Nuclear Regulatory Commission**) and the Site Project Manager.

Sara is a “bona-fide” professional and a very valuable team member. Her willingness to go the extra mile always lead to something good and we pride ourselves in working with employees like YOU – emphasizing teamwork, dedicated to quality, getting the job done right the first time, every time, and helping GTTSi to grow as a valuable supplier to our clients.

We thank you for your service and we are so proud to recognize you as one of our valued employees.

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