



Global Technical Training Services, Inc. Newsletter



The State of the Industry

Sid Crouch, GTTSi Chief Technical Consultant

Since **zero carbon emissions by 2050** is the major topic of discussion these days, let's look at how to get there. Based on projected electricity demands provided by the Department of Energy's National Renewable Energy Laboratory, we will need 94% of electricity to be generated by renewable sources, 6% from nuclear, with 932 GW (**Gigawatts**) of battery energy storage capable of providing power for up to 6½ hours or ~6 TWh (**Terrawatt-hours**) of battery energy storage. The research revealed that as renewables grow, battery energy storage needs will diminish. The actual time spent outputting electricity will eventually decline to only 10-20%. Therefore, there is less need for peaking plants and fossil fuel generation, which will reduce overall cost of providing energy, as well as particulates released by burning fossil fuels for coal and peaking plants. However, to attain 94% of our electricity from renewables will cost ~\$4 trillion according to the energy research firm Wood Mackenzie. 6 TWh of battery energy storage will also be costly but will be needed during the transition to back up renewables when they are not available. Today it cost ~\$140/kWh (**kilowatt hour**) or ~\$140 million/GWh (**Gigawatt-hour**) for battery energy storage. 6 TWh will cost 6000 times more or ~\$840 billion. Therefore, the total cost will be 4.840×10^{12} . If we divide it by our population of ~330,000,00 it would cost each of us over \$14,600, but spread out over the next 26 years results in about \$564/year per person. If all of this is true, the transition to 2050 will be costly. Is it worth it?

I welcome your comments or questions - sid.crouch@gttsi.com

Highlights

CHANGES COMING TO DUKE ENERGY'S LEADERSHIP TEAM

ZAPORIZHZHIA NUCLEAR POWER PLANT UPDATE

COAL TO NUCLEAR: A PLAN FOR THE FUTURE

GAIN ANNOUNCES NUCLEAR ENERGY VOUCHER RECIPIENTS

DID YOU KNOW?

GTTSi Job Board Update



GTTSi

807 Bypass 123 – Suite 31

Seneca, SC 29678

864.882.3111

ginfo@gttsi.com

www.gttsi.com

CHANGES COMING TO DUKE ENERGY'S LEADERSHIP TEAM

Duke Energy is one of the largest energy companies in the United States, with a long and storied history dating back to the early 20th century. The company traces its origins to 1900 when Dr. Walker Gill Wylie and James Buchanan Duke founded the Catawba Power Company in North Carolina. The company later evolved into the Southern Power Company, which was instrumental in bringing electricity to the region. Over the years, through mergers and acquisitions, Southern Power Company expanded its operations and changed its name to Duke Power Company in 1924, in honor of James Buchanan Duke.

Now, 100 years later, on April 1, 2024, Mr. Harry Sideris will become president of Duke Energy, reporting to CEO and Chairwoman of Duke's Board of Directors, Ms. Lynn Good.

In addition, Duke Energy has announced that Steve Young is retiring after a 40-year plus career from his current role of executive vice president (EVP) and chief commercial officer and will continue with the company as a senior advisor until June 30, 2024.


As a result of Sideris's expanded scope and Young's planned retirement, Ms. Good's direct reports will now include Sideris; Brian Savoy, EVP and chief financial officer; Louis Renjel, EVP and chief corporate affairs officer; and Kodwo Ghartey-Tagoe, EVP, chief legal officer and corporate secretary.

Sideris's direct reports will include Julie Janson, EVP and CEO of the Carolinas, who adds responsibility for the company's natural gas business unit to her portfolio; Alex Glenn, EVP and CEO of Duke Energy Florida and Midwest;



and Preston Gillespie, EVP and chief generation officer and head of enterprise operational excellence.

Duke Energy has over 27,500 employees and serves 7.9 million customers in North Carolina, South Carolina, Florida, Indiana, Ohio, and Kentucky with over 51,000 **megawatts** of energy capacity. Its natural gas unit serves 1.6 million customers in North Carolina, South Carolina, Tennessee, Ohio, and Kentucky.

Duke Power was an early adopter of nuclear power and built its first nuclear power plant, the Oconee Nuclear Station, in South Carolina, which began operations in the early 1970s. Duke Energy has continued to invest in nuclear power generation over the following decades. In recent years, Duke Energy has increasingly focused on renewable energy and environmental sustainability, investing in wind, solar, and hydroelectric power, as well as initiatives to reduce greenhouse gas emissions and promote energy efficiency. Duke is currently on track to own or buy 16,000 megawatts of renewable energy capacity by 2025 with additional investments in electric grid upgrades and expanded battery energy storage, while exploring zero-emitting power generation technologies such as hydrogen and advanced nuclear. 

ZAPORIZHZHIA NUCLEAR POWER PLANT UPDATE

Note: The last update on ZNPP can be seen in the GTTSi February 2024 newsletter.

In the middle of an active war zone...this is definitely not the place one wishes to find the largest nuclear power plant in Europe. Yet that is the current position of the Zaporizhzhia Nuclear Power Plant (ZNPP). Just like many areas in Ukraine, conditions and daily activities at ZNPP are very different than they were pre-war.

ZNPP faces nuclear safety and security risks but has been able to regain access to their only remaining backup power source, a 330 kV (kilovolt) line that crosses the Dnipro River, following an outage of more than three weeks.

Access to backup power is extremely critical as they have experienced eight complete loss of power events over the past year and half. Without it, they are solely dependent on their 750 kV power source and their emergency diesel generators. Before the Russian invasion, ZNPP had a total of ten power lines available, four 750 kV and six 330 kV lines.

IAEA (International Atomic Energy Agency) officials located at the ZNPP site have continued to report explosions and other military activities not far from the plant. They have reported blasts at various distances from the site almost every day, including explosions and artillery fire nearby in the mornings and evenings.

“What once seemed unimaginable – military activity near a nuclear power plant – has become a daily reality. The situation is not improving and as long as this tragic war continues, the plant remains in danger. For this



*Zaporizhzhia Nuclear Power Plant
Photo Credit: The Insider*

reason, I again call for maximum restraint and full observance of the five principles established at the United Nations Security Council in May last year,” said the IAEA Director General Rafael Grossi.

Listed below are the five principles established by the UN Security Council:

1. There should be no attack of any kind from or against the plant, in particular targeting the reactors, spent fuel storage, other critical infrastructure, or personnel.
2. ZNPP should not be used as storage or a base for heavy weapons (i.e., multiple rocket launchers, artillery systems and munitions, and tanks) or military personnel that could be used for an attack from the plant.
3. Off-site power to the plant should not be put at risk. To that effect, all efforts should be made to ensure that off-site power remains available and secure at all times.

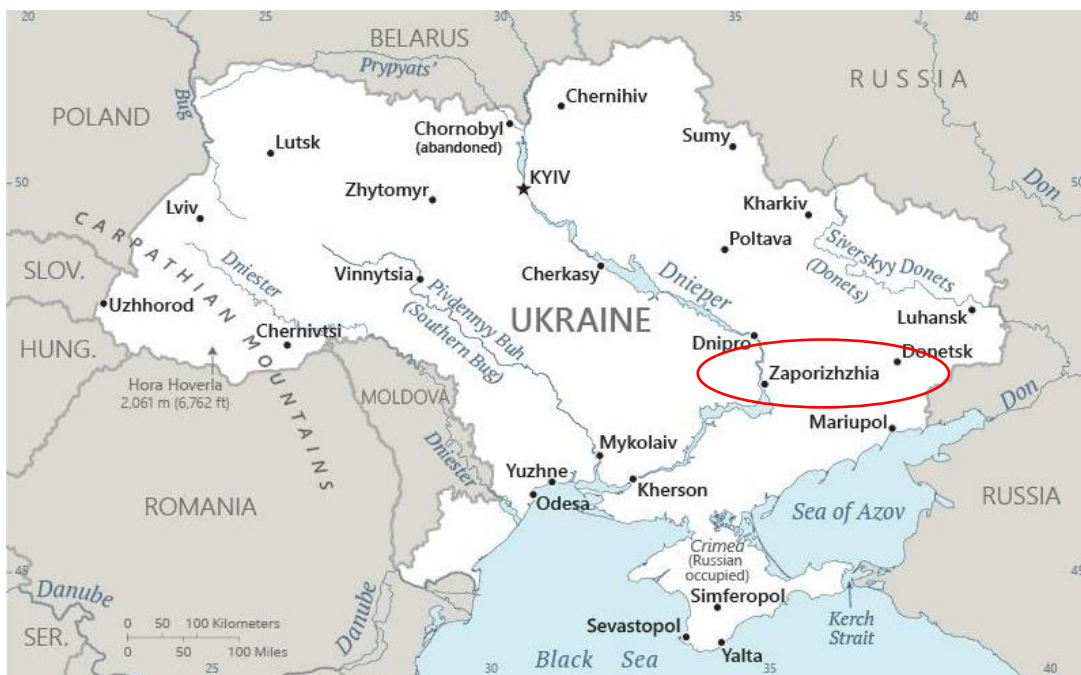
4. All structures, systems, and components essential to the safe and secure operation of ZNPP should be protected from attacks or acts of sabotage.
5. No action should be taken that undermines these principles.

IAEA officials at ZNPP were told by the plant operators that the plant had a drone attack outside the site's perimeter. Investigation revealed there were no casualties and no damage to any of the structures, including a warehouse that sits just 40 meters from the impact site. However, the investigative team observed a shallow cavity in the ground about 70cm (2.3ft) in diameter, located just outside the concrete wall surrounding the off-site diesel fuel storage area, some 100 meters (328 ft) from the diesel fuel storage tanks. They also observed some partially burnt foil or plastic material in the area.

These off-site diesel fuel tanks store fuel for the emergency diesel generators that can be used by the six reactor units at ZNPP. The plant has enough diesel fuel for more than 20 days of operation in the case of a total loss of off-site power.

IAEA officials observed simulator training of the operating staff and held discussions with the ZNPP training center and Rostekhnadzor, the nuclear safety regulatory body of the Russian Federation, about the process that the staff must follow to maintain their operating “authorizations”. The training was based on current conditions, with all reactor units either in cold or hot shutdown, including the external power and cooling water conditions. ZNPP has enough authorized operating staff to maintain the reactor units in their current shutdown states; however, “the staffing situation at the plant remains a vital issue for nuclear safety and security that we will continue to monitor closely,” General Grossi.

The IAEA has continued to deliver equipment to help maintain nuclear safety and security in the Ukraine and all their nuclear facilities. Forty deliveries have taken place since the armed conflict began. Alpha and beta radiation counting systems, personal protective equipment, and portable radio-communication equipment have finally reached the Rivne NPP and the Chornobyl sites. This equipment was procured using funding from the European Union and the United Kingdom. 🇪🇺



Zaporizhzhia is located in south-eastern Ukraine, known for being an important industrial center.

Map Credit: The World Factbook

COAL TO NUCLEAR: A PLAN FOR THE FUTURE

There is no doubt coal has been a major player in the development of the modern world and continues to be a major source of electricity generation globally. At the same time, the elimination of the use of fossil fuels is part of the path for the energy transition to net zero. This has raised the challenge of how to reduce or eliminate the use of coal while providing for an increasing clean energy demand. With nearly one-fourth of coal-fired plants set to retire before 2030, a plan to replace retiring coal plants with nuclear reactors is a major play.


According to the Federal Energy Regulatory Commission, over 21 GW (gigawatts) of coal-fired generation is expected to retire over the next three years. The U.S. Department of Energy (DOE) believes 200 GW of nuclear generation is needed for the U.S. to reach net-zero emissions by 2050.

One solution for providing additional nuclear generation is to build SMRs (small modular reactors) at the retiring coal plant sites, utilizing infrastructure already in place and reducing the overall building cost, while creating new jobs and economic opportunities. A 2022 DOE report found that more than 300 existing and retired coal power plant sites were suitable for hosting an advanced nuclear power plant. Different reactor designs could be utilized to match the generation of the site being converted, thereby increasing nuclear capacity by more than 250 GW, nearly tripling the current 95 GW capacity.

There are several advantages of using these retired coal sites. One is the coal plant workforce already within the community. They possess skills and knowledge transferable to the nuclear facility. In January 2021, the Biden

administration signed an executive order to create an Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. The intent is to help coal, oil and gas, and power plant workers and communities that have been essential to the growth of the United States and ensure that none of these workers or communities will be left behind as the U.S. transitions to clean energy sources. The previously mentioned 2022 DOE report claims that employment at an incoming nuclear plant could increase by more than 650 permanent jobs across the plant, supply chain, and surrounding community. The economic impact of repurposing the coal plant site could include adding to the tax base which also brings about community benefits and improvements.

Eleven states have expressed interest in repurposing their coal sites with nuclear energy: Arizona, Colorado, Kentucky, Maryland, Montana, North Carolina, Pennsylvania, Utah, West Virginia, Wisconsin, and Wyoming.

The DOE's GAIN (Gateway for Accelerated Innovation in Nuclear) program (see **GAIN ANNOUNCES NUCLEAR ENERGY VOUCHER RECIPIENTS**) is conducting three feasibility studies to assess several aspects of repurposing coal power plant sites with nuclear power. These studies are specific to the community and utility being studied but are written such that other potential transition sites will be able to gain insight from them. The GAIN team can also help communities around the country, as they consider advanced nuclear in their energy transitions, and provide information about nuclear energy plants, transition opportunities, and connect these communities to potential funding opportunities. 

GAIN ANNOUNCES NUCLEAR ENERGY VOUCHER RECIPIENTS



In December 2023, GAIN awarded seven companies with vouchers to accelerate the innovation and application of advanced nuclear technologies. The vouchers provide these companies with access to the extensive nuclear research capabilities and expertise available across the U.S. Department of Energy national laboratory complex. Below are the businesses selected to receive GAIN nuclear energy vouchers, their partners, and the awarded proposal work:

- **Westinghouse** to work with the Oak Ridge National Laboratory to perform irradiation testing and post-irradiation examination on ceramic matrix composite for potential use in its eVinci Microreactor.
- **SHINE Technologies** to partner with Argonne National Laboratory and Sandia National Laboratory to model sensor technologies and their placement in a used-nuclear-fuel recycling system to ensure nuclear materials are adequately tracked.
- **Aalo Atomics** to collaborate with the Idaho National Laboratory to evaluate modeling and simulation capabilities for the Aalo-1 reactor fuel and core system.
- **ARC Clean Technology, Inc.** to work with Argonne National Laboratory to enhance its SAS modeling capabilities for passive heat removal capabilities to better model its sodium-cooled reactor design – ARC-100.
- **Global Nuclear Fuels** to partner with Argonne National Laboratory to confirm the viability of their electroreduction technology to convert uranium oxide fuel stock into a metal that can be used for advanced reactor fuel.
- **Boston Atomics** to collaborate with Oak Ridge National Laboratory on a design review of an in-vessel fuel handling machine for a horizontally oriented integrated reactor and steam generator.
- **Energy Northwest** to work with Argonne National Laboratory to use climate forecasting for the next century to inform the design and selection of future nuclear reactor cooling systems and their impacts on electricity cost.

In the first award for FY 2024, on March 19, 2024, the following businesses were selected to receive a GAIN nuclear energy voucher for Round 1 FY 2024:

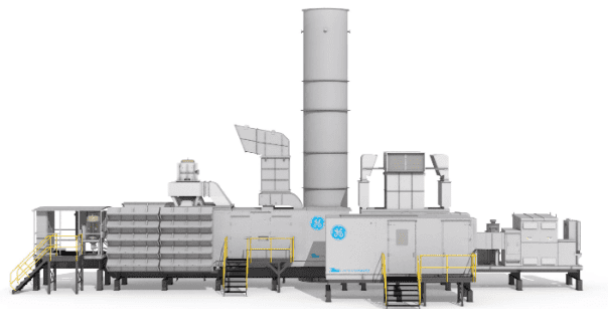
- **Element Factory, LLC** to work with Idaho National Laboratory on the investigation of a spark plasma sintering process for graphite neutron moderator production.
- **Kanata America, Inc** to work with Sandia National Laboratory on the Thermal Energy Storage with Supercritical CO₂ Power Conversion for Low-Cost Micro Modular Reactors
- **Oklo Inc.** to work with Idaho National Laboratory on development of a test vehicle to support Oklo's advanced fuels roadmap.

DID YOU KNOW?



Russia and China are working on a program to build a nuclear power plant on the moon. Yuri Borisov, who leads Russia's Roscosmos space group, says they are "seriously considering" installing a nuclear reactor "jointly with our Chinese partners" sometime between 2033 and 2035 and likely "without the presence of humans." In response, the U.S. has urged a "rigorous" safety evaluation of the project. Nuclear power on the moon has previously been discussed by the Department of Energy and NASA. In 2022, they selected three design concept proposals for a fission surface power system design that could be ready to launch by the end of the decade.

Kindle Energy is building a natural gas peaker plant at Mountain Peak Power plant in Keenesburg, Colorado. The plant is needed to assist with Kindle's energy mix as coal-fired power plants are retired and renewables are added. The 162 megawatt facility will consist of six GE Vernova LM2500XPRESS aeroderivative gas power units. The plant can be built onsite in as little as two weeks because 95% of it can be assembled in the factory. The unit comes in 10 pre-packaged simplified modules and features a mere 27 electrical interconnections, compared to 130-plus for a traditional plant, with minimal mechanical interconnections.



GE Vernova LM2500XPRESS Unit
Photo Credit: GE Vernova



President of Poland Andrzej Duda
Photo Credit: Wikipedia

Polish President, Andrzej Duda, recently visited the Vogtle nuclear power plant in Waynesboro, Georgia. Plant Vogtle Units 3 and 4 made history last year as the first new nuclear units constructed in the U.S. in over 30 years. Unit 3 entered commercial operation in July 2023 and unit 4 successfully connected to the grid in March 2024. The technology used at Plant Vogtle, Westinghouse's AP1000 nuclear units, will be used in Poland, in the country's first nuclear plant, planned in Pomerania. Commercial operation is expected in 2033.

APRIL 2024

GTTSi
807 Bypass 123 – Suite 31
Seneca, SC 29678
Phone: 864.882.3111
Fax: 864.882.1026
ginfo@gttsi.com

Marshalla Schile
President
Phone: 864.882.3111
marshalla.schile@gttsi.com

Clay Schile
Vice-President
Phone: 864.882.3111
clay.schile@gttsi.com

Chrissy Mulay
Technical Staffing Manager
Phone: 864.506.4647
chrissy.mulay@gttsi.com

Lisa Peach
Technical Staffing Specialist
Phone: 864.360.7554
lisa.peach@gttsi.com

Debbie Scott
Administration
Phone: 864.882.3111
debbie.scott@gttsi.com

Sid Crouch
Chief Technical Consultant
Phone: 843.861.0431
sid.crouch@gttsi.com

LD Holland
Senior Human Performance
Consultant
Phone: 864.882.3111
ginfo@gttsi.com

Scott Poteet
NRC Exam Developer
Phone: 864.882.3111
ginfo@gttsi.com

GTTSi Job Board

GTTSi has been providing professional services to the energy and nuclear industry since 1980. We are an MWBE (*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 **864.882.3111**.



- BWR Exam Writer -Cooper Nuclear Plant
- BWR SRO Instructor -Cooper Nuclear Plant
- Simulator Specialist -Southeast
- PWR SRO Instructor -Southeast
- Battery Energy Storage Engineer -Juno Beach, FL
- Transmission Line Principal Engineer -Remote

For updates to your newsletter subscription, please email ginfo@gttsi.com



P.O. Box 307
Hartsville, SC 29550-0307

COMPANY or PERSON'S NAME
STREET ADDRESS
CITY, STATE, ZIP