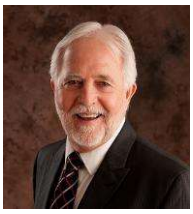
OCTOBER 2025

Global Technical Training Services, Inc. Newsletter



The State of the Industry

Sid Crouch, GTTSi Chief Technical Consultant

Over the past five years, climate or weather events have gone from 9 per year to a staggering 23 per year. Our aging energy grids were not built for these volatile events nor the present-day, two-way flow of energy demand and distribution. Designed, somewhat piece meal, over several decades, the grid was built around centralized generation. But now its contending with a system in reverse - two-way power flows, rooftop generation, and community-scale assets which has changed how power is generated and delivered. It's inevitable that power disruptions will occur. Therefore, we need innovative re-engineering, designing grids to respond, operate, and recover under stress conditions and for endurance, adaptability, and recovery. Achieving endurance requires strengthening the infrastructure to handle physical and electrical stress (***from weather related events to short-circuit faults***). Adaptability requires a modern, data-driven smart grid with flexible protection schemes that automatically adjust, reconfigure the network, and identify and preempt issues before they become bigger. Recovery is all about speed and resilience - modular infrastructure could help. All of this combined is “grid hardening", and it is no longer optional. Some action has been taken and some is in the works - the Bipartisan Infrastructure Law, passed in 2021, provides $73 billion for grid modernization, with grants and funding directed towards states, tribes, and utilities. Our utilities are projected to spend $1.1 trillion between 2025 and 2029 and the DOE is allocating $20 billion, through the GRIP program, in grants and initiatives to support grid upgrades. Grid hardening will be ***COSTLY*** and estimated between $1.1 trillion to $2 trillion by 2029-2050.

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

HIGHLIGHTS

SBA WOSB CERTIFIED

NWBOC WBE Certified MBE Certified

GTTSI
807 Bypass 123 – Suite 31
Seneca, SC 29678
864.882.3111
ginfo@gttsi.com
www.gttsi.com

SMALL MODULAR REACTORS: A STATUS UPDATE

Small Modular Reactors (SMRs) are reinventing the nuclear energy landscape by offering compact, scalable, and safer alternatives to traditional large-scale reactors. These reactors are designed to be factory-built and easily transportable, enabling quicker deployment and integration into diverse energy markets. As of 2025, several companies worldwide are advancing SMR technologies, each with unique designs tailored to specific regional needs and applications.

Holtec International – SMR-300 (USA)
Holtec International's SMR-300 is a 300 MWe pressurized water reactor designed for modular construction and advanced safety features. One of its strengths is a passive safety system that relies on gravity. This design ensures it is "walk-away safe," meaning it can cool itself indefinitely without requiring operator intervention, external power, or external water during an emergency. The reactor is designed to sit deep underground, protecting it from both natural disasters and man-made threats like aircraft impacts. The spent fuel pool is also contained within the robust containment structure, a measure adopted after lessons learned from the Fukushima disaster.

The first deployment is planned at the Palisades site in Michigan, where Holtec intends to establish a 10-gigawatt fleet of SMRs. This initiative aims to revitalize the Palisades plant, which was shut down in 2022, and contribute to meeting the growing energy demands of the region.

Holtec is also planning to deploy a fleet of SMR-300s in Utah and Wyoming in the 2030s, working with regional partners, and is pursuing projects in the UK, Canada, and Ukraine.

GE Hitachi – BWRX-300 (Canada, USA, Europe)
The BWRX-300 is a 300 MWe boiling water reactor developed by GE Hitachi Nuclear Energy. Its design simplifies construction and reduces costs compared to traditional reactors. As a plus, the GE Hitachi BWRX-300 reactor will not require High-Assay Low-Enriched Uranium (***HALEU***) fuel; instead, it will use GNF2 fuel, a proven, standard Low-Enriched Uranium (***LEU***) fuel assembly already used in the global fleet of boiling water reactors. This use of existing fuel technology simplifies the supply chain and leverages proven designs. Ontario Power Generation is constructing the first unit at the Darlington site, Canada, with commercial operation expected by 2029. In the U.S., the Tennessee Valley Authority **(TVA)** plans to deploy the BWRX-300 at the Clinch River site, targeting 2033 for operation. Several European countries, including Poland, Finland, Estonia, and Hungary are also exploring the BWRX-300 for future deployments.

X-energy – Xe-100 (USA, UK)
X-energy's Xe-100 is a high-temperature gas-cooled reactor (HTGR) utilizing TRISO fuel. Each unit produces approximately *(continued)*

80 MWe, and multiple units can be combined to meet larger energy demands, with the standard Xe-100 "four-pack" plant to generate ~320 MWe. In the United States, the first Xe-100 SMR is planned for Dow's facility, located in Seadrift, Texas, where a “four-pack” plant will begin operation by the end of the decade, following an 18-month U.S. Nuclear Regulatory Commission (NRC) review which started in June 2025. X-energy is also collaborating with Energy Northwest and Amazon to develop a multi-reactor facility in Washington State, with the first unit expected by 2030. Internationally, Centrica has partnered with X-energy to develop a fleet of Xe-100 reactors in the UK, with the goal to provide low-carbon energy to approximately 1.5 million homes.

NuScale Power – VOYGR Series (USA, Romania)

NuScale Power's VOYGR series is a pressurized water reactor (PWR) design that has received approval from the U.S. Nuclear Regulatory Commission (NRC). The VOYGR-12 configuration comprises 12 modules, each producing 77 MWe, totaling 924 MWe per plant. This modular approach allows for scalability based on demand. Following cancellation of the Carbon Free Power Project (***CFPP***) project in Idaho, NuScale has been pursuing other opportunities, including in Romania. Recently, the Tennessee Valley Authority and the Houston, Texas–based energy production company Entra1 Energy have signed an agreement to collaborate on the deployment of six new nuclear power plants equipped with NuScale’s SMRs. They are planning for up to 6 GWs of new generation across TVA’s seven-state service region. This collaboration represents the largest SMR deployment program in U.S. history.

TerraPower – Natrium (USA)

TerraPower’s **Natrium reactor** design is currently under construction in Kemmerer, Wyoming, and is expected to be operational by 2030. The design combines a sodium-cooled fast reactor (***345 MWe***) with a molten salt energy storage system. The molten salt energy storage system can be used to quickly release its stored energy, allowing the plant to rapidly increase its power output from 345 MW to 500 MW. This flexibility will help integrate renewable energy sources like solar and wind into the grid by compensating for intermittency and enable significant cost savings for the plant.

The Natrium reactor is designed to use High-Assay Low-Enriched Uranium (***HALEU***) fuel, which has a uranium-235 content between 5% and 20%, a critical component for the Natrium reactor to achieve its advanced performance and reduce waste.

Rolls-Royce SMR – UK SMR (United Kingdom, Czech Republic)

Rolls-Royce’s SMR design is a compact pressurized water reactor producing 470 MWe. The company has secured a partnership with Czech power company ČEZ to develop and deploy SMRs in the Czech Republic, with the first unit planned for the Temelín site by the early 2030s. This collaboration is part of ČEZ's strategy to transition away from coal and enhance energy security through low-carbon nuclear power.

The development of Small Modular Reactors is progressing rapidly, with various designs catering to different energy needs. From large-scale grid applications to specialized uses in remote areas and industrial sectors, SMRs offer a versatile solution to the world's growing energy demands.

GTTSi TEAM MEMBER HIGHLIGHT: COLIN GELLER

This month, we are excited to spotlight team member, Colin Geller, a talented Environmental Scientist and GIS Specialist who brings expertise and enthusiasm to the GTTSi team.

Colin has a strong background in environmental science, ecology, and hydrology, and has proven himself as a skilled contributor in GIS modeling and data analysis. With his extensive experience in creating, interpreting, and applying geospatial data, Colin plays a key role in supporting engineering projects for GTTSi client, NextEra Energy. Colin's ability to transform complex data into clear, actionable insights is helping the team make smarter decisions.

In his role, Colin is responsible for technical and engineering documentation, project support, and CAD-based deliverables, while also contributing his specialized GIS knowledge from geo-referencing historical maps to generating modern land-use visualizations. He also assists with compliance requirements, documentation, and process improvements, making him an integral part of operations and planning.

Colin's expertise comes from both academic and field experience. He earned his BA in Environmental Science and Policy from the University of South Florida, with a minor in Geographic Information Systems and Technology. His hands-on work has ranged from water quality monitoring in the Everglades to GIS-driven land management at the Southwest Florida Water Management District.

When asked what he enjoys most about his work, Colin shared: "I love being able to see the work I do contribute to such an important cause and even more, push the boundaries of mapping technology."

Outside of work, Colin has an adventurous spirit. He is currently the principal percussionist in the Symphonic Band of the Palm Beaches. He is a PADI-certified Rescue Diver and Advanced Open Water Diver and has also earned certifications through FEMA in Incident Command and National Incident Management. His leadership skills extend beyond the office, as he previously achieved the rank of Eagle Scout, leading a 25-person team to design and build a wheelchair-accessible community garden.

Colin is just one of the many industry experts at GTTSi - check us out at www.gttsi.com or on LinkedIn at www.linkedin.com/company/gttsi.

AMMONIA: CHEMICAL BUILDING BLOCK…HYDROGEN CARRIER…AND FUEL?

Ammonia (NH_3) is an inorganic chemical compound of nitrogen and hydrogen with the formula NH_3 and is one of the world's most important industrial chemicals, produced at a scale of more than 200 million tons annually. It has a sharp, distinctive smell often compared to decaying fish, urine, or sweat due to its molecular structure and its solubility in the watery mucus of the nose, which quickly triggers irritant and olfactory receptors.

Traditionally known as **grey ammonia**, it has been manufactured for over a century, primarily as a building block for nitrogen, phosphorous, and potassium (NPK) fertilizers, which are essential to global food production. Ammonia is also used in industrial refrigeration, in the production of explosives such as ammonium nitrate, and more recently, as a transportation fuel, especially in the maritime sector. Companies like Amogy are actively developing ammonia fuel systems for broader applications (see inset next page).

The color labels of ammonia—grey, blue, and green—refer not to its chemical structure, but to its production method:

Grey ammonia: Produced from natural gas through steam methane reforming, releasing CO_2 into the atmosphere.

Blue ammonia: Produced the same way as grey, but with carbon capture and storage (CCS) to prevent emissions.

Green ammonia: Produced entirely with renewable energy, using green hydrogen (via water electrolysis) combined with nitrogen from the air.

Regardless of the production pathway, the ammonia molecule remains the same, and its end uses are unchanged.

Ammonia as a Hydrogen Carrier: Hydrogen is widely considered a clean energy solution, but transporting and storing it is challenging. Hydrogen must be cooled to -253°C to remain liquid, requiring costly infrastructure. Ammonia provides an alternative: it contains 17% hydrogen by weight, can be liquefied at -33°C, and is already moved worldwide in large quantities. Once transported, ammonia can be **cracked** back into nitrogen and hydrogen through an energy-intensive, catalyst-driven reaction. The hydrogen can then be used in fuel cells to generate clean electricity, producing only water as a byproduct.

Ammonia as a Fuel: Ammonia can also be burned directly in turbines, engines, or co-fired with coal and natural gas to reduce CO_2 emissions. While its combustion presents challenges—such as controlling nitrogen oxide (NOx) emissions—research and pilot projects are advancing solutions. Its potential is especially strong in hard-to-decarbonize industries like shipping and large-scale power generation.

Duke Energy is building the nation's first power plant capable of producing, storing, and combusting 100% green hydrogen in DeBary, Florida. The existing DeBary ***continued***

Power Station includes a 74.5 MW solar plant and a 692 MW natural gas facility. By late 2025, it will add two 1-MW electrolyzer units powered by solar to produce hydrogen. The hydrogen will be stored safely in reinforced containers and used in a gas turbine upgraded with GE Vernova technology to run on up to 100% hydrogen. This end-to-end project demonstrates how renewable electricity, electrolysis, and hydrogen storage can integrate into the existing grid.

Ammonia's versatility gives it a unique position in the global energy transition. As production shifts from grey to blue and green pathways, ammonia can play a role in decarbonizing agriculture, industry, and power generation. With ongoing innovations in storage, transport, and combustion, ammonia is emerging not just as a chemical building block, but as a cornerstone of the clean energy economy.

AMOGY REPLACING FOSSIL FUELS WITH AMMONIA

Amogy is a U.S. cleantech company building an "ammonia-to-power" platform that converts ammonia into hydrogen at the point of use and then into electricity, enabling zero-carbon power for hard-to-decarbonize sectors such as maritime shipping, heavy transport, and stationary power. Instead of burning ammonia directly, Amogy cracks ammonia into hydrogen and nitrogen, uses hydrogen in fuel cells or other hydrogen-to-power systems, and focuses on modular, containerized power packs that can be integrated into existing platforms and new builds. The company has demonstrated its technology on both small vehicles and larger demonstrations (including a tugboat),has partnered with major engineering firms and shipbuilders, and has raised venture funding to scale commercialization.

Amogy's system comprises three core stages:
Ammonia cracking (reformer / reactor): A reactor converts ammonia (NH_3) into hydrogen (H_2) and nitrogen (N_2) using catalysts and thermal management. The novelty claimed by Amogy is catalyst and reactor engineering that enables higher conversion efficiency, lower temperatures, and greater power density compared to conventional approaches.

Purification module: After cracking, the hydrogen stream is cleaned and conditioned (removing residual ammonia, controlling moisture and other impurities) to meet the requirements of hydrogen-to-power systems.

Hydrogen-to-power conversion: Hydrogen produced on board is fed into fuel cells (e.g., PEM or other fuel cell stacks) or hydrogen engines/generators, delivering electricity to propulsion motors, electric drivetrains, or stationary loads. Amogy demonstrations have used fuel cells for quiet and efficient power.

Joe Citeno, of Citeno Energy Advisors said, "The Amogy technology has been demonstrated at increasing scales over the past few years and has the promise for providing efficient conversion of ammonia to power for both mobile and stationary power applications requiring zero -carbon emissions."

Amogy plans to use the technology to demonstrate their ability to fuel power plants and/or data centers using ammonia. "This "first of its kind" power plant will begin generating power within the next couple of years," said Seonghoon Woo, Chief Executive Officer and Co-Founder of Amogy.

Woo said that the first systems will be capable of producing 500 kilowatts to 1 MW of electricity, and customers can deploy several in parallel to generate more power if needed.

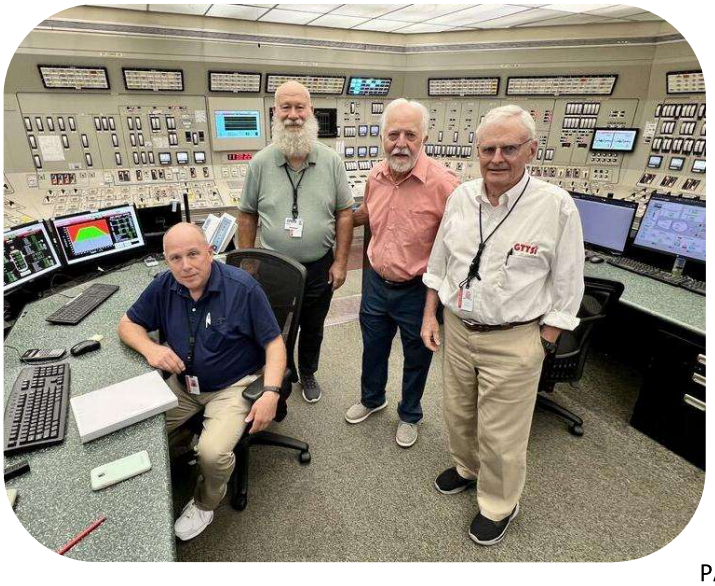
ON THE ROAD: GTTSI AT COMANCHE PEAK & MCGUIRE NUCLEAR STATION

This summer our leadership got to visit our teams at McGuire and Comanche Peak Nuclear Station.

McGuire Nuclear Station, operated by Duke Energy, is located on Lake Norman in Mecklenburg County, North Carolina, about 17 miles northwest of Charlotte. It consists of two Westinghouse PWRs—Unit 1, which began operation in 1981, and Unit 2, which began in 1984—with a combined generating capacity of approximately 2,316 megawatts. The plant produces carbon-free electricity for the region and employs over 1,200 people. Licensed by the U.S. Nuclear Regulatory Commission, McGuire's current operating licenses extend through 2041 for Unit 1 and 2043 for Unit 2.

Comanche Peak Nuclear Station is a two-unit nuclear power plant located in Somervell County, Texas, about 40 miles southwest of Fort Worth. It is owned and operated by Luminant Generation Company LLC (part of Vistra Corp.) and the plant employes about 1,300 people. The two reactors are Westinghouse four-loop PWRs. Each has a net electrical output of about 1,200–1,220 MW, giving a combined capacity near 2,400 MW.

Thank you to the GTTSi team members at site for the important work that you do.



OCTOBER 2025

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 Resource Manager
Phone: 864.506.4647
chrissy.mulay@gttsi.com

Angela Mixson
Technical Resource Manager
Phone: 864.419. 8215
Angela.Mixson@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 Instructor, All Regions**
- **SCADA Applications Engineer, Remote**
- **Digital Marketing Specialist, Houston, TX**
- **Recruiter, Juno Beach, FL**

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

---

GTTSi

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

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