Innovation in Action

DUKE ENERGY®

BUILDING A **SMARTER** ENERGY FUTURE®

Figure 1

| Exterior view of an Amazon data center

Innovation in Action

Today, our country, our industry, and our company stand on the precipice of extraordinary change and opportunity. Duke Energy's sense of purpose, spirit of innovation and commitment to our customers position us to lead at this pivotal time. Macrotrends taking shape in the energy sector are driving the need for innovative approaches and new technologies to further enhance power availability and reliability for our customers. We operate in jurisdictions with significant growth potential and are optimistic about building on our achievements to make meaningful progress and capture the opportunities ahead.

Duke Energy has been advancing solutions in partnership with our energy sector peers and federal, state and local governments. Our recent strategic partnership with GE Vernova, for example, leverages our size and scale to manage and secure additional natural gas turbine production capacity. This will help us meet growing energy demand, such as AWS's $10 billion commitment in North Carolina (named by CNBC as America's Top State for Business in 2025[1]) to build data centers, while contributing to the economic development of our jurisdictions.

Regulatory agencies also play a critical role, as they are uniquely positioned to streamline the permitting and approvals required for large-scale technological deployment, and to provide financial and other incentives that support adoption.

Energy sector-wide momentum will accelerate the pace of technological development, refinement and adoption, while increasing availability and driving down costs. These public-private partnerships, coupled with constructive regulatory outcomes, can unlock significant growth across the sector.

At Duke Energy, "Building a Smarter Energy Future®" reflects our broader vision for customers and communities, and best positions the company to meet the growing energy needs across its service territory.

[1] North Carolina is America's Top State for Business in 2025

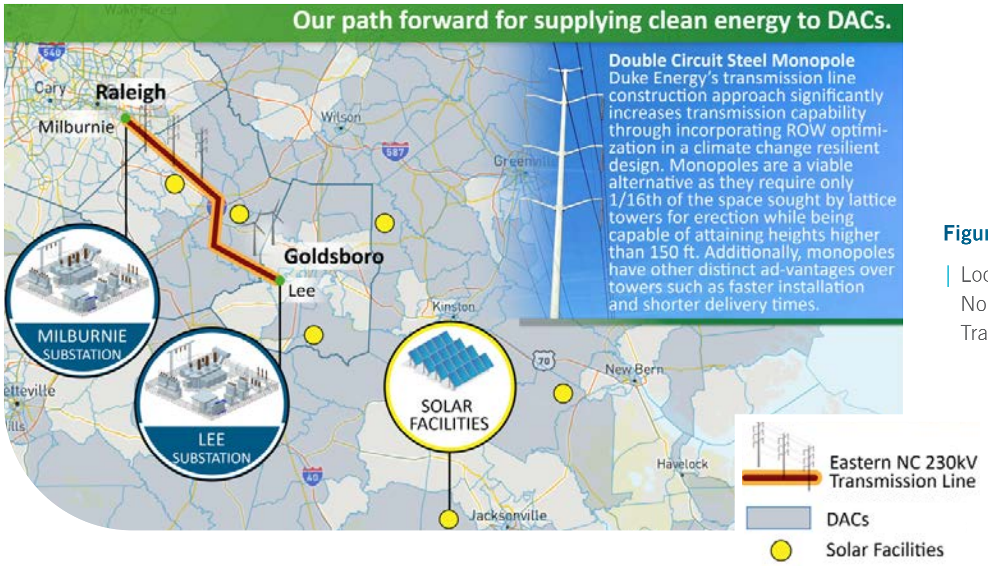

Figure 2

Location of the Innovative North Carolina Transmission Rebuild

Macrotrends

Energy demand in the United States is rising at a breathtaking pace, largely driven by growth in AI and data centers, increased manufacturing demand and higher residential consumption from increased electrification and number of customers. AI and data centers, in particular, are at the forefront of conversations on energy innovation and technology transformation, as they require substantial 24/7 power to support their advanced computational needs – a trend that is only expected to continue. Data centers alone are projected to represent 11.7% of total power demand by 2030, up from 3.7% in 2023.[2] After 15 years of nearly flat electricity demand growth in the United States (averaging 0.1% per year between 2005 and 2020), demand for electricity is now increasing significantly, averaging 1.7% per year from 2020-2026.[3] Looking ahead, Duke Energy anticipates 3% to 4% load growth at the enterprise level and 4% to 5% in the Carolinas beginning in 2027,[4] a projected pace that has not been seen in the region in three decades.[5]

Historic weather events have further strengthened our commitment to making our power generation and transmission infrastructure more resilient to the impacts from storms, flooding and the extraordinary surges in power demand driven by high heat across our service territory. In 2024, we experienced "the most significant storm season in company history," responding "to about 5.5 million outages from three back-to-back hurricanes" as our customers and employees faced the devastating impacts of hurricanes Debby, Helene and Milton.

In 2024, we published the Enterprise Climate Resilience and Adaptation Study, building on the foundational work outlined in the Carolinas Climate Resilience and Adaptation Report released in 2023. The 2024 study provides greater detail on our recommended strategies and investments to further enhance resilience. For example, the findings led to the identification of the Lee-Milburnie 230-kV transmission line rebuild project as a prime candidate for Department of Energy (DOE) funding by demonstrating its potential to enhance grid resiliency and reliability through climate-resilient design and infrastructure upgrades, while leveraging the existing rights of way.

[2] https://www.mckinsey.com/featured-insights/week-in-charts/ais-power-binge
[3] https://www.eia.gov/todayinenergy/detail.php?id=65264
[4] Duke Energy Annual Report, 2024. Page 1.
[5] SUPPLEMENTAL DIRECT TESTIMONY OF GLEN A. SNIDER, DUKE ENERGY CAROLINAS, LLC DOCKET NO. E-100, SUB 190, DUKE ENERGY PROGRESS, LLC. Page 12.

Supply chain disruptions have been driven by increasing demand for components and a shift in the global economic trade environment, including policies aimed at reshoring supply chains. These changes will influence the dynamics of rapid deployment of large-scale solutions to meet growing energy demand and the need for more resilient infrastructure. Each advancing technology presents distinct supply chain opportunities for growth and collaboration:

- Making strong progress in the nuclear sector requires importing adequate amounts of uranium, even as efforts continue to develop domestic resources and enrichment capacity. This development of domestic alternatives presents an opportunity for strategic sourcing and will help build resilience from disruptions in the global uranium supply. Several other dynamics in critical minerals are also being navigated, many of which require dependence on imports. Building nuclear capacity will also require a wide array of skilled workers. The DOE estimates that the nuclear industry will need an additional 375,000 workers by 2050 to support the construction and operation of 200 gigawatts of advanced nuclear reactors.[6]
- Long-duration energy storage (LDES) is emerging as a promising solution, demonstrated by increased market penetration, even while navigating tariffs, geopolitical tensions, and extreme weather events that have dampened sourcing of critical components like vanadium, zinc and rare earth minerals. Greater use of LDES will also require the industry to address U.S. manufacturing capacity limitations and long lead times for specialized equipment. In the long run, sustaining LDES deployment will require adequate supplies of "cost-effective raw materials, subcomponents, manufacturing and assembly – plus a workforce that can put it all together – will be necessary to sustain LDES deployment in the long run. The supply chain will need to handle the anticipated growth of LDES in the 2030s – 10 to 20 times the amount of LDES deployment in the 2020s."[7]
- Carbon capture and storage (CCS) and hydrogen supply chain opportunities include the need for large-scale respective pipeline networks to allow for the transport of hydrogen from production hubs to end-users, and the safe movement of CO_2 from capture sites to regions with large geologic storage facilities, cost-efficiently and effectively.

As cited above, alongside technology-specific opportunities for growth and collaboration, tracking and navigating local, state, and federal **regulatory processes** will require constant diligence and proactive planning for future investments.

Duke Energy continues to monitor these industry trends – from customer energy demands, supply chain and policy shifts, to resilience to extreme weather or technological advancements. The company remains focused on addressing these external dynamics and adapting to the evolving landscape.

Innovation and Technology Development

Nuclear

The U.S. nuclear energy sector is experiencing a resurgence driven by the need for reliable energy sources and the increased electricity demand from various sectors, including data centers for artificial intelligence, and supported by several federal-level incentives.

The H.R. Reconciliation Bill provides tax credits, loan guarantees, and direct funding for both existing and new nuclear projects. Further, four **executive orders** signed in 2025 aim to quadruple U.S. nuclear capacity by 2050 and are designed to incentivize the use of nuclear power. The orders include directing the U.S. Nuclear Regulatory Commission (NRC) to streamline its licensing processes and providing support for domestic uranium enrichment, funding for workforce development and advanced reactor deployment.[8] In addition, the DOE has launched a $900 million

[6] Pathways to Commercial Liftoff - Advanced Nuclear
[7] Ibid.
[8] 9 Key Takeaways from President Trump's Executive Orders on Nuclear Energy | Department of Energy

Figure 3

Oconee Nuclear Station, South Carolina

program to support Gen III+ small modular reactors (SMRs), with funding tiers for both deployment and supply chain development[9] (in which Duke Energy is a participant of the Tennessee Valley Authority (TVA) grant application).

The recently deployed Vogtle Units 3 and 4, operated by Georgia Power, represent the first new large reactors to come on line in the U.S. since 2016. Beyond Vogtle's modernized Westinghouse AP1000® pressurized water reactors, there are a number of different types of demonstration reactors that are under construction across the country. These demonstration reactors focus on different technologies, including the TerraPower Natrium® demonstration project in Wyoming, a liquid sodium-cooled fast reactor with molten salt energy storage (in which Duke Energy is an advisor); the Kairos Power Hermes reactor in Tennessee, to inform commercialization of salt-cooled, high-temperature nuclear technologies; and Project Pele, the U.S. Department of Defense's investment in a mobile high-temperature gas microreactor in Idaho. Other companies are making efforts to restart retired reactors, including Holtec's Palisades Nuclear Plant in Michigan and Constellation Energy's Three Mile Island Unit 1 in Pennsylvania.

Expanding the nuclear fleet involves navigating various dynamics and significant risks of cost overruns. A recent study at Boston University found that out of all energy infrastructure projects, nuclear power plants had the highest cost overruns and delays, with average construction costs exceeding estimates by 102.5% or $1.56 billion.[10] These issues reflect broader industry challenges, including high costs and long construction timelines, regulatory challenges and permanent solutions for waste disposal.

The industry is also pursuing the development of advanced reactors, including small modular reactors (SMRs) and microreactors, which are designed to be smaller and more flexible than traditional large-scale nuclear plants. Although the cost per kWh of electricity may be between 15% and 70% more than the traditional nuclear power plants, due to economies of scale,[11] the technology offers lower upfront capital costs and shorter construction timelines.

With the currently limited demonstration of SMRs coming on line,[12] it will be important for the industry to coalesce around a standardized design for advanced and small modular reactors to deploy more units. Doing so will accelerate the beneficial impact of the federal government's efforts to incentivize investment in nuclear technology and help overcome the challenges to deployment.

Duke Energy's participation in the DOE SMR grant application supports our new nuclear strategy by joining with other utilities and technology providers to more cost effectively advance a standard

[9] https://www.energy.gov/ne/articles/900-million-available-unlock-commercial-deployment-american-made-small-modular-reactors
[10] https://www.sciencedirect.com/science/article/abs/pii/S2214629625001380
[11] Small Modular Reactors - How do They Compare to Traditional Nuclear Reactors – New York Energy Week
[12] https://spectrum.ieee.org/small-modular-reactor-united-states

Figure 4

| Hot Springs microgrid, North Carolina

technology design and license, while learning best practices from others in the industry pursuing new nuclear technologies, with the goal of reducing technology risks and costs for the benefit of our customers, communities and investors. In addition, Duke Energy has entered into an agreement with GE Vernova Hitachi (GVH) to invest in activities to advance the standard design and licensing for GHV's BWRX-300 SMR technology. This agreement, together with participation in the potential U.S. SMR coalition, if the grant is awarded, provides another opportunity for Duke Energy to exchange valuable insight and best practices with TVA and other collaborators as they implement GHV's SMR technology. Furthermore, Duke Energy intends to file an early site permit for an SMR later this year at its Belews Creek, N.C., site, allowing us to make early progress on licensing while reactor designs we are considering for the Carolinas continue to evolve and mature.

These efforts highlight the innovative approaches that will guide Duke Energy's near-term evaluation and early development activities for new nuclear initiatives. By embracing cutting-edge technologies and forward-thinking strategies, these efforts will not only support the company's broader energy modernization but also deliver long-term value to Duke Energy's customers and communities.

Long-Duration Energy Storage

Long-duration energy storage (LDES) is a technology capable of storing and dispatching energy over extended time frames – typically longer than the four- to eight-hour maximums achieved by conventional energy storage – and often spanning days or even weeks. LDES offers utilities with a pathway to enhance grid reliability, support renewable integration, and manage daytime to multiday energy imbalances. Technologies grouped as electrochemical (e.g., batteries), mechanical (e.g., pumped storage), chemical (e.g., hydrogen), and thermal (e.g., pumped heat) are being evaluated and piloted for their potential to provide services such as load shifting, firm capacity, and long-duration backup power, particularly as the system faces the challenges presented by growing demand and increasing severe weather.

In historic weather events like hurricanes Helene and Milton in 2024, LDES technologies significantly improved grid resiliency and reliability. For example, Duke Energy's microgrid in Hot Springs, N.C., kept the town powered for nearly a week after Hurricane Helene, restoring critical facilities within days, while surrounding areas faced multiweek blackouts.[13] Likewise, distributed solar + storage battery systems kept the lights on for thousands of homes. This real-world case underscores how technology can maintain electricity supply and sharply reduce outages during severe storms, highlighting its critical role in bolstering grid reliability amid extreme events.

While the promise is significant, scaling LDES in utility portfolios remains challenging. Supply chain constraints, site-specific design requirements, and uncertainty about technology lifespans further complicate procurement planning for regulated and

[13] Resilient Power in the Wake of Hurricane Helene - Clean Energy Group

competitive utilities alike.[14] LDES technologies are also still in the scaling phase, as many companies work through manufacturing challenges. Testing of these early stage technologies is needed to validate performance prior to large-scale deployment.

To realize the full system value of LDES, utilities and regulators must act decisively within this decade. Standardization of designs and cost declines can accelerate adoption, but industrywide coordination at both the federal and state levels is needed now to bring LDES into the mainstream of utility infrastructure by the early 2030s.[15] Continued funding opportunities to advance these non-lithium storage options will also be important to help ensure a sufficient number of these promising technologies reach market scale.

Duke Energy is actively monitoring the LDES technology landscape through ongoing market research and participation in industry and peer working groups devoted to LDES. The company has completed several techno-economic studies of emerging long-duration energy storage technologies and continues to test and pilot non-lithium battery systems. One example of this is a recently commissioned demonstration in Suwannee, Fla., of a 5-MW, eight-hour sodium sulfur battery. Several additional emerging electrochemical technologies have also been tested through the Emerging Technology Office, allowing Duke Energy to gain experience and validate these companies prior to larger deployments. By the end of 2025, Duke Energy will have installed an EnerVenue (nickel hydrogen), Eos (zinc hybrid), and Emtel super capacitor at its Mt. Holly, N.C., R&D facility. These front-end studies and tests help the company to de-risk select technologies while the market continues to mature.

Demand Response and Energy Orchestration

Another valuable tool for utilities to store and dispatch energy is by leveraging demand response and energy orchestration as a strategic enabler – one that optimizes both local- and system-level performance. Today, traditional demand response programs already provide measurable value at the system level, helping shave peak loads and maintain grid stability. However, the future lies in moving beyond broad, systemwide actions toward locally targeted load management at the distribution level. Duke Energy is actively working toward this future through an energy orchestration platform that integrates real-time data, distributed energy resources (DERs) and intelligent automation to dynamically reduce demand in specific neighborhoods or circuits experiencing stress. This precision approach not only preserves reliability in constrained areas but also extends the life of infrastructure investments and increases resilience by enabling us to do more with the resources we have.

A strong example of this localized approach was demonstrated in Duke Energy's localized demand response pilot in Chapel Hill, N.C., conducted summer of 2024. Over the course of three months, the utility dispatched 10 localized demand response events targeting specific parts of the distribution network. The pilot was designed to evaluate both the technical feasibility of localized dispatch and customer sentiment around participating in such events. Early findings showed that customers were receptive to targeted programs, especially when communications were clear, incentives were meaningful, and the impacts on comfort or convenience were minimal. This effort provided valuable operational data and customer insights that are now helping shape the next generation of location-based demand response and energy orchestration programs.

CO_2 Capture and Storage

Carbon capture and storage is an advanced emissions reduction technology that enables the capture of carbon dioxide from industrial and power generation sources, preventing its release into the atmosphere. Despite policy incentives, CCS deployment in the power sector remains modest due to cost considerations, suitable geology and permitting requirements.

[14] Long Duration Energy Storage Working Group - Center for Climate and Energy Solutions
[15] NASEO_Energy Storage_v2.pdf

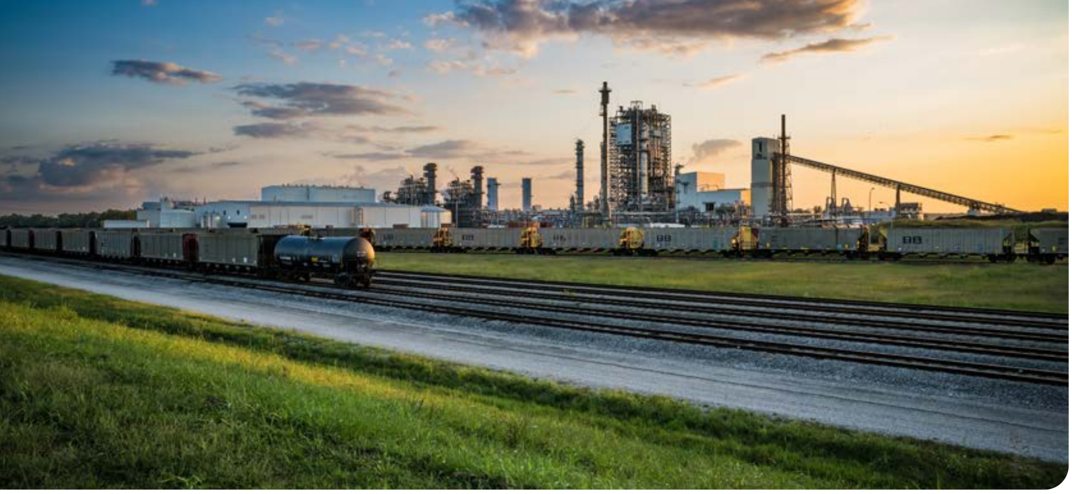

Figure 5

| Edwardsport, Indiana site of the carbon capture and storage FEED study

Duke Energy Indiana, LLC is leading a project team conducting an integrated CCS front-end engineering and design (FEED) study at the company's Edwardsport Indiana 618-MW integrated gasification combined cycle (IGCC) facility. The post combustion capture system will enable maximum fuel flexibility from coal-gasified syngas (primary fuel), natural gas and syngas/natural gas blends. The project will target capture of at least 95% of carbon dioxide from the generating units, while minimizing capital and operating costs. The FEED study will provide the design and engineering basis, along with cost estimates, enabling an informed evaluation of the potential CCS project.

The storage process for CCS in the U.S. relies on CO_2 underground (Class VI) injection wells, which are currently permitted under the U.S. EPA's Underground Injection Control (UIC) program. The EPA can reallocate their permitting authority to a state. EPA has granted North Dakota, Wyoming, Louisiana, and West Virginia primary responsibility for issuing these permits as of August 2025. Only about 25 Class VI sites have permits issued nationwide, while 150-175 applications remain pending with the EPA, often entangled in multiyear reviews.[16]

To accelerate CCS adoption, in addition to improvements in the cost and performance of the technology in power generation applications, it is imperative that policymakers streamline the Class VI permitting process. This, along with supportive regulations regarding long-term stewardship, adequate underground storage and CO_2 transportation will help unlock CCS as a utility-scale carbon management tool in the next decade.

Hydrogen and Alternative Fuels

Hydrogen is emerging as a versatile energy source in the global transition to a low-carbon economy. It can be used in power generation (e.g., co-firing in natural gasturbines), to power energy-intensive industrial processes (e.g., steelmaking, ammonia production), in transportation (especially heavy-duty and long-haul) and in energy storage applications (as a seasonal or long-duration storage medium). Hydrogen production is often characterized by its carbon intensity. For example, hydrogen made through electrolysis utilizing renewable energy is considered very low carbon-intensity (green hydrogen), whereas hydrogen made utilizing fossil fuels with carbon capture is known as blue hydrogen.

Hydrogen's flexibility makes it a key enabler of deep decarbonization across sectors that are hard to electrify. Power generation utilities are also piloting end-to-end green hydrogen systems for power generation, including on-site production, storage and combustion. Duke Energy has initiated its own end-to-end green hydrogen pilot at the DeBary power plant (anticipated operation for fall 2025), [17] which can provide peak power at times of increased electricity demand.

However, wider adoption of hydrogen faces

[16] Carbon Capture in the South: What It Is and What Southern States Are Doing - CSG South

[17] https://www.utilitydive.com/news/duke-energy-green-hydrogen-DeBary-gas-plant/699673/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202023-11-14%20Utility%20Dive%20Newsletter%20%5Bissue:56431%5D&utm_term=Utility%20Dive

Figure 5

DeBary combustion turbine rendering, Florida

challenges, including the lack of infrastructure specifically designed to transport and store hydrogen, high costs and limited regulatory clarity and cohesion. Additionally, definitions of acceptable hydrogen sources and incentives are still evolving. These challenges can be overcome by coordinated investments from the energy sector, public-private partnerships and increased public financing and funding.

Establishing a comprehensive and diversified hydrogen supply chain, where production, storage and distribution are integrated through unified infrastructure, can significantly reduce costs, streamline logistics and accelerate deployment timelines. For example, coupling hydrogen production with optimized storage and transport scheduling enables flexible responses to renewable generation variability, making electrolytic hydrogen more costcompetitive.[18] Integrated planning also allows for centralized decisions on facility siting, pipeline versus truck logistics, and production technology mix to minimize the levelized cost of hydrogen under demand uncertainty.

Navigating the Road Ahead

Duke Energy is committed to an "all of the above" generation strategy to help meet the growing demand for reliable, value-driven and increasingly clean electricity. This approach reflects our belief that no single technology will solve the energy challenges ahead; rather, a diverse portfolio of solutions will be essential. Through strategic investments in nuclear, long-duration energy storage, carbon capture and hydrogen, the company is working to build a cleaner, more resilient and flexible energy system.

At the same time, many of the key enablers, such as reduced permitting timelines, supply chain readiness, and supportive regulatory frameworks, require continued progress across the broader energy ecosystem. Duke Energy is actively working with industry partners, policymakers and communities to enhance our technical capabilities but also keep our solutions grounded in real-world needs and expectations.

Looking ahead, Duke Energy remains focused on ensuring that the technologies needed to meet future energy demands are available, scalable, and cost-effective as we navigate this dynamic landscape. By embracing innovation and fostering collaboration, we are confident in our ability to deliver energy solutions that support economic growth, modernize infrastructure, and align with the evolving needs of our customers and communities.

[18] Design of Hydrogen Supply Chain Networks for Cross-Regional Distribution | Industrial & Engineering Chemistry Research

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