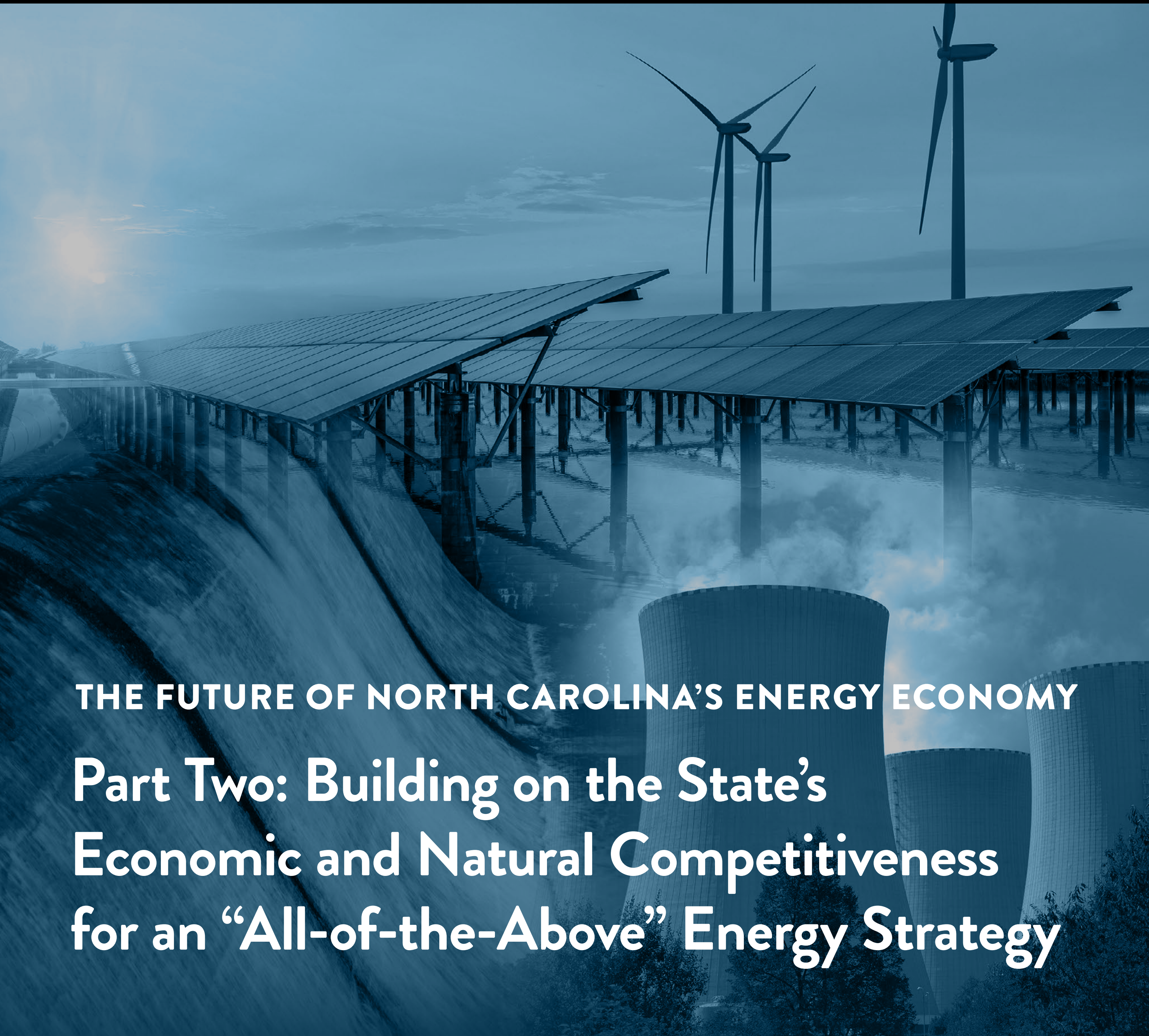
NC DEPARTMENT of COMMERCE
ENERGY & INFRASTRUCTURE



THE FUTURE OF NORTH CAROLINA'S ENERGY ECONOMY

Part Two: Building on the State's Economic and Natural Competitiveness for an "All-of-the-Above" Energy Strategy

NC DEPARTMENT OF COMMERCE | ENERGY & INFRASTRUCTURE OFFICE

A more diverse and resilient energy resource mix strengthens the state's long-term economic security while creating significant job opportunities across a range of sectors and regions.

North Carolina is at the intersection of three major economic trends impacting the electric power sector: Booming demand for computing power from data centers, the reshoring of manufacturing, and population growth, with North Carolina among the top five fastest growing states since 2020.[1] Access to affordable, reliable, and diverse energy sources will determine whether and how North Carolina captures future economic opportunities as the U.S. races to build more resilient domestic supply chains and maintain its competitive edge in AI.

These demand signals are occurring during a seismic shift in electricity generation, with traditional baseload coal facilities retiring at a rapid rate. Supply chain difficulties also impact availability of critical transmission and distribution hardware, limiting utilities' ability to move quickly in delivering projects and responding to major storms. Because of electric power's critical role in economic growth, the NC Department of Commerce's Energy & Infrastructure Office (EIO) is releasing a series of white papers examining North Carolina's energy sector and its relationship to the security and future prosperity of the state's economy. Access to affordable and reliable electricity is not only critical for recruiting new industries, but for overall economic health and community well-being.

This second paper in the series provides an overview of North Carolina's current energy resource mix and highlights the state's natural and economic assets that position it to further diversify its energy resources. Access to diverse energy resources is essential for economic development because different energy resources have vastly different project development and deployment timelines. According to a 2024 study, solar and land-based wind energy projects in the United States averaged between two and three years to commission.[2] By comparison, Duke Energy's planned 1.3 GW natural gas turbine in Person County and 850 MW natural gas turbine in Rowan County are not projected to be completed until 2030.[3,4] And globally, it takes an average of five years to complete offshore wind projects, and seven and a half years to construct a new nuclear reactor.[5,6] The most recent nuclear reactors to come online—Vogtle Units 3 and 4 in Georgia—took approximately 14 years to complete.[7] As companies increasingly make location decisions based on electricity access, North Carolina must strategically leverage every available energy source—balancing cost, reliability, and deployment timing—to maintain its competitive edge in attracting and retaining business.

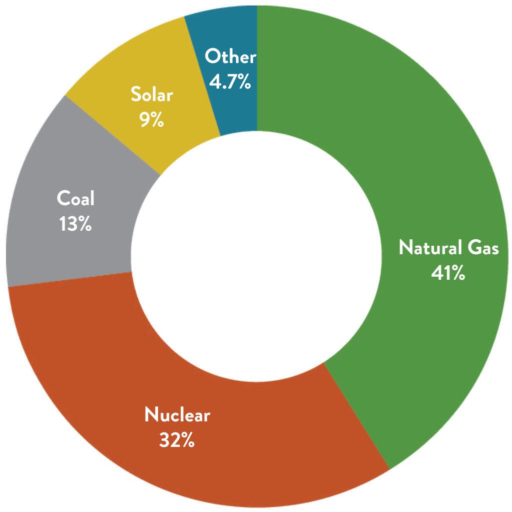
1. census.gov/newsroom/press-releases/2024/population-estimates-international-migration.html
2. sciencedirect.com/science/article/pii/S030626192301927X#s0045
3. starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=77396239-a087-47a1-a259-f3915017866e
4. starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=26da11db-6677-469b-9a50-9e9659e315f1
5. sciencedirect.com/science/article/pii/S030626192301927X#s0045
6. sustainabilitybynumbers.com/p/nuclear-construction-time
7. energypolicy.columbia.edu/vogtle-unit-3-has-started-commercial-operations-whats-next-for-the-ap1000

North Carolina's Electricity Generation Energy Mix

Over the past decade, North Carolina has undergone a significant energy transition.

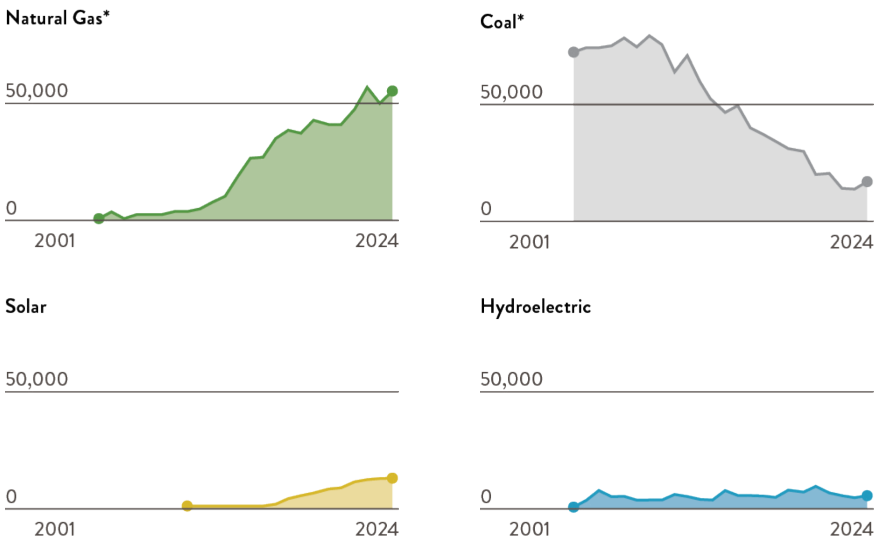
Coal delivered primarily from West Virginia and Pennsylvania was once used for two-thirds of the state's electricity generation but now accounts for just 13 percent.[8] Natural gas, once delivered from the Gulf but now largely transported from the Marcellus Shale Formation in Pennsylvania, has grown to supply over 40 percent of the state's electricity generation.[9] Solar has emerged as the fourth-largest source of the state's electricity, with projects distributed across the state and utility-scale deployments particularly concentrated in the east (Piedmont and Coastal Plain). And finally, North Carolina's three operating nuclear reactors consistently provide about 40 million MWh annually, making North Carolina a national leader in nuclear energy generation.[10]

Energy sources used for utility-scale electricity generation in North Carolina, 2024.



Source: U.S. Energy Information Administration

Net Electricity Generation by Top Energy Sources in North Carolina



Units in thousands of Megawatt-hours.
** North Carolina's Natural Gas and Coal are imported from other states.*
Source: U.S. Energy Information Administration

---

8. eia.gov/coal/distribution/quarterly/pdf/25q1_destination.pdf
9. deq.nc.gov/state-energy-office/2025-draft-nc-energy-security-plan/open
10. eia.gov/electricity/data/browser

North Carolina's diverse geography and industrial strengths support the state's pursuit of an "all-of-the-above" energy strategy.

With the scheduled retirement of all coal plants, North Carolina will need to adopt an expansive all-the-above approach to new generation that maintains reliability and manages cost while moving towards net-zero carbon by 2050. While natural gas will play an important and growing role in providing both baseload and peaking power generation for future decades, it alone cannot fill the need created by growing demand for more power.

Moreover, unlike other states with native coal or natural gas resources, North Carolina imports nearly all of its fossil fuels. However, the state's natural resources, such as abundant sunlight and strong consistent winds, make utility-scale energy generation possible through deployment of solar and wind projects. These renewable resources reduce our reliance on imported fuels while supporting in-state energy generation and economic development.

Beyond its natural assets, North Carolina is also well-positioned to compete for larger, capital-intensive energy projects, such as land-based and offshore wind projects and nuclear power reactors, which require long supply chains and a large, skilled labor force. The state's strengths in workforce development, infrastructure, and advanced manufacturing make North Carolina a competitive destination for these complex energy investments.

SOLAR

North Carolina's geography and economic conditions make it well-positioned to support competitive utility-scale solar development. In the eastern part of the state, large tracts of flat land are well-suited for solar installations, reducing construction complexity and cost compared to more mountainous regions or coastal areas where land is more expensive.

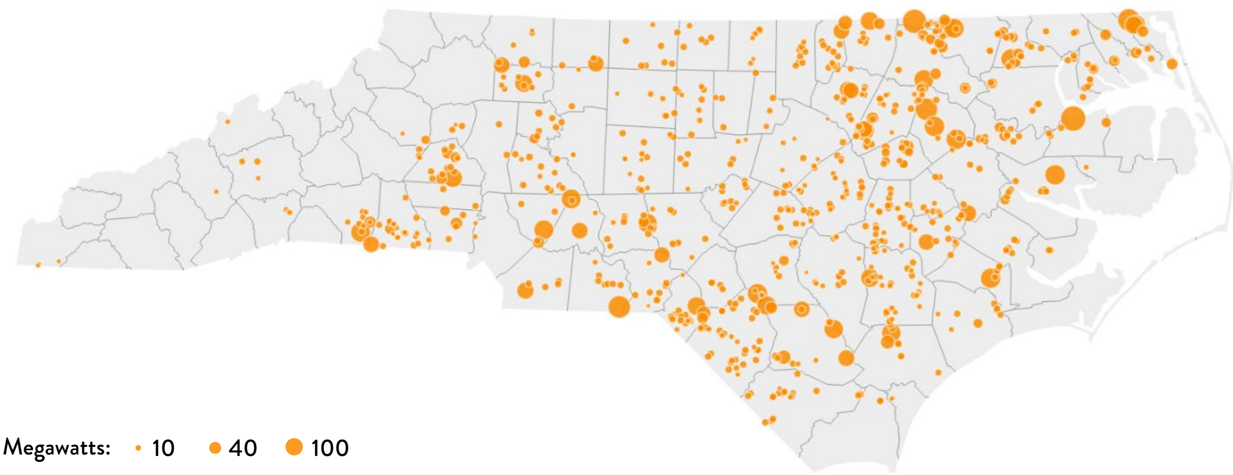
North Carolina is already a national leader in solar energy, ranking 5th in total installed capacity as of 2025.[11] The majority of these investments are in rural and economically distressed communities, with approximately 58 percent of the state's utility-scale solar capacity sited in counties facing persistent economic challenges such as high unemployment and low household incomes.[12]

Solar development has generated significant tax revenue for local governments. According to an evaluation of statewide property taxes paid on parcels with utility-scale solar installations, total local tax revenue increased from $2 million before installation to over $19 million after a solar project was developed.[13] Despite this significant deployment of solar projects, solar panels still occupy only 0.13 percent of North Carolina's total land area as of 2024.[14]

Solar development in North Carolina complements existing industries in rural areas. Many landowners, especially farmers, lease land to solar developers, securing stable, long-term supplemental income while leaving maintenance and operations responsibilities to the solar project developer.[15]

Concerns have been raised about utility-scale solar development reducing farmland, but analysis shows that current installed solar occupies 0.28 percent of farmland, with other forms of commercial development accounting for most cropland losses in North Carolina.[16]

Utility-Scale Solar Projects in NC



Capacity in Megawatts: • 10 • 40 • 100

Source: U.S. Energy Information Administration. Graphic created with Datawrapper.

---

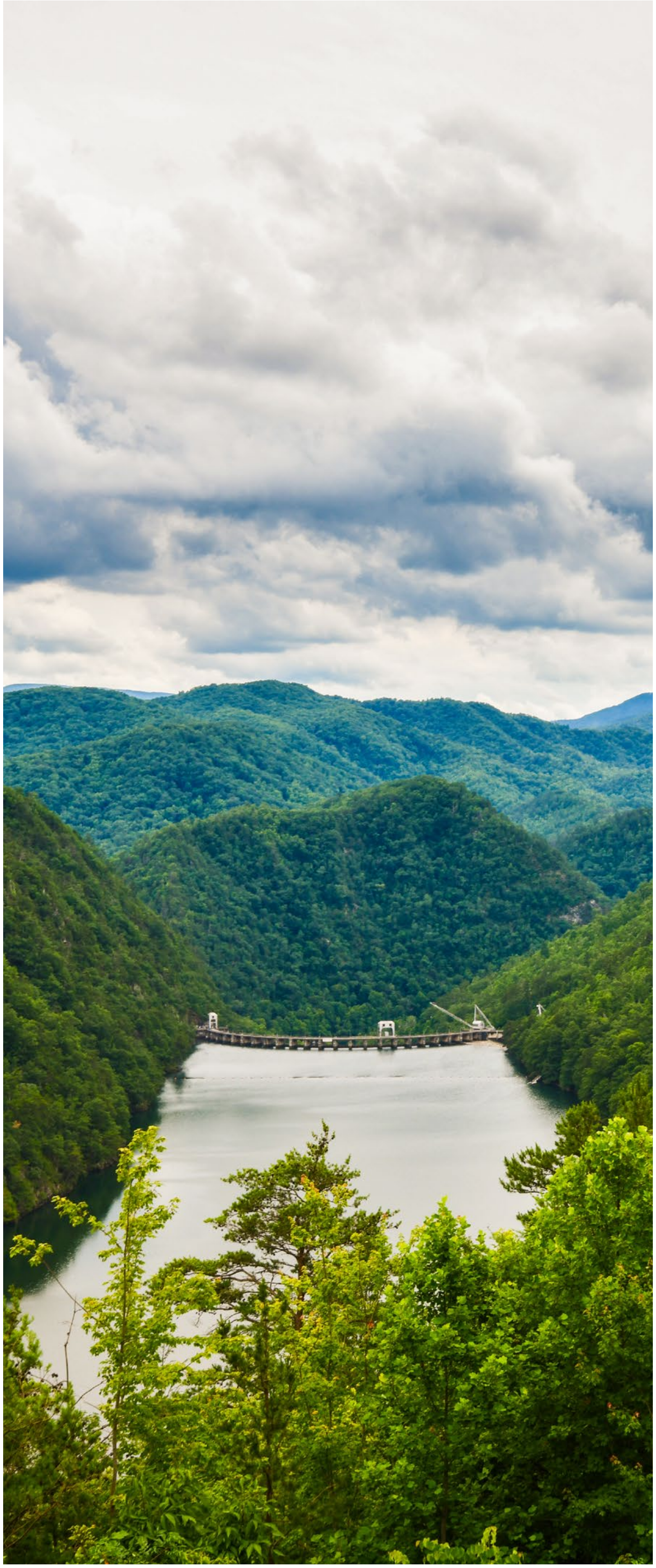
11. seia.org/wp-content/uploads/2025/06/NorthCarolina.pdf
12. NC Commerce analysis of data from the U.S. Energy Information Administration (EIA). Counties facing chronic economic distress identified here: commerce.nc.gov/grants-incentives/county-distress-rankings-tiers
13. energync.org/wp-content/uploads/2025/06/2025_June-Property-Tax-Study_6.12.25.pdf
14. seia.org/state-solar-policy/north-carolina-solar
15. duke-energy.com/Our-Company/About-Us/New-Generation/Sell-or-Lease-Land-for-Solar-Energy
16. energync.org/wp-content/uploads/2022/06/2022_Solar_Agv2.pdf

HYDROELECTRIC

Hydroelectric power is North Carolina's second-largest source of renewable energy. The state has about 40 utility-scale hydroelectric dams, most of which are in the mountainous western region. Several are operated by the Tennessee Valley Authority (TVA).

Hydropower generation comes in two main forms: conventional and pumped storage. Conventional hydroelectric facilities use dams to direct flowing water through turbines, generating electricity. Pumped storage operates similarly but requires a second reservoir. When electricity demand is low, water is pumped uphill to the higher reservoir. When demand is high — such as during late-afternoon peaks in the summer or morning peaks in the winter — water is released downhill to generate electricity. For example, during the summer 2025 heat wave, pumped storage supplied about 10 percent of the Carolinas' energy during peak demand hours.

While hydropower is a renewable energy source, identifying sites for new facilities is challenging. Projects require large areas of land due to changes in water flow both upstream and downstream. These environmental and land use impacts make new development difficult, even in areas with strong hydropower potential.



Fontana Dam on the Little Tennessee River, Swain and Graham Counties, NC.

17. eia.gov/state/analysis.php?sid=NC
18. ncuc.gov/reports/longrange24.pdf
19. eia.gov/electricity/gridmonitor/expanded-view/electric_overview/balancing_authority/DUK/GenerationByEnergySource-14/edit
20. maps.nrel.gov/psh

WIND

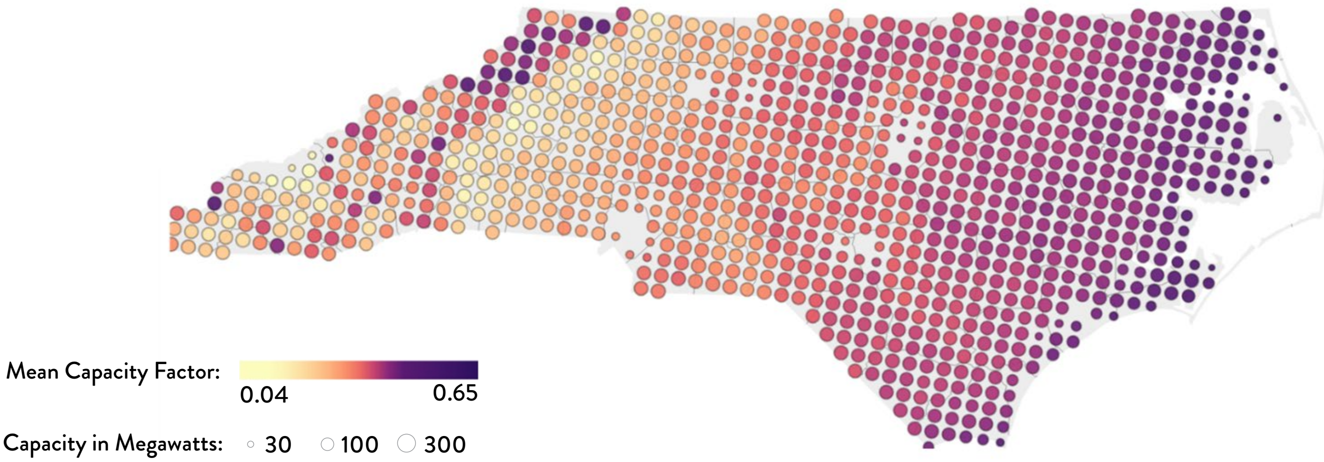
North Carolina has assets to support both land-based and offshore wind development, though the industry in North Carolina remains in its early stages. A key measure of competitiveness for wind energy is access to land that has strong, consistent winds to make the projects financially feasible.[21] In North Carolina, two regions have competitive resources to support utility-scale wind generation: near the eastern coast and parts of the Blue Ridge Mountains.

Two land-based wind projects currently operate in the northeastern region of the state: Amazon Wind, developed by Amazon in Perquimans and Pasquotank counties, and Timbermill Wind in Chowan County. In 2017, Amazon Wind became the first commercial utility-scale wind project operating in the southeastern United States, with a 208 MW generating capacity across 104 turbines. The project generates $1.1 million annually in tax revenue and community benefits to the two counties, as well as annual lease payments to landowners.[22] Timbermill Wind, which began operations in 2024, has 189 MW of capacity across 45 turbines. Over its lifetime, the project is expected to contribute $33 million in tax revenue, making it the largest taxpayer in Chowan County.[23]

North Carolina's mountain regions also offer competitive opportunities for wind development. Neighboring Appalachian states — including West Virginia, Maryland, Tennessee, and Pennsylvania — have already leveraged similar wind resources for energy production. However, the Mountain Ridge Protection Act of 1983 prohibits the construction of "tall buildings or structures" on protected mountain ridges (at 3,000 feet in elevation or more). In laymen's terms, this law effectively restricts utility-scale wind project development in the North Carolina mountains as modern turbine heights far exceed the Act's 40-foot vertical structure height limit.[24]

Offshore wind presents unique opportunities and challenges compared to land-based wind projects. Offshore wind projects are larger in scale, require higher upfront capital investment, and depend on

North Carolina has high-quality wind supply both on the coast and in the mountains.



This map shows wind supply curves, which characterize the quantity and quality of land-based wind resources in North Carolina. Source: U.S. Energy Information Administration. Graphic created with Datawrapper.

21. *The percent of time that wind turbines are generating energy is the "capacity factor". For example, a capacity factor of 0.50 means that a wind turbine is generating electricity approximately 50% of the year.*
22. *iberdrola.com/about-us/what-we-do/onshore-wind-energy/-amazon-wind-us-east-onshore-wind-farm*
23. *assets.nationbuilder.com/timbermillwind/pages/33/attachments/original/1735681110/Timbermill_Project_Fact_Sheet_2024_%281%29.pdf?1735681110*
24. *ncleg.net/enactedlegislation/statutes/html/byarticle/chapter_113a/article_14.html*

substantial manufacturing and infrastructure to support components like monopiles, undersea cables, and offshore substations. The Coastal Virginia Offshore Wind project, for example, has employed approximately 800 people in its construction phase and is projected to support around 1,000 ongoing jobs in operations and maintenance — comparable to the workforce at North Carolina's Brunswick Nuclear Plant.[25]

North Carolina has both industrial capacity and geographic advantages to support offshore wind development. One study estimates that North Carolina's coast has 28,000 square kilometers of shallow coastline with the potential to generate 140,000 MW of power — the most of any East Coast state — and second only to Texas nationally.[26] Shallow waters provide a competitive advantage because they can support fixed-bottom foundations, which are less costly to deploy than floating systems.[27]

In addition to its coastal assets, North Carolina has the industrial base necessary to support large, capital-intensive offshore wind projects. Among coastal states, North Carolina has the largest manufacturing economy — generating $88 billion in GDP — and maintains one of the largest manufacturing workforces. Research using data from the National Renewable Energy Laboratory (NREL) found that North Carolina is more competitive than other East Coast states in addressing the technical skills gaps required for complex offshore wind projects. Beyond a strong workforce, the state has two deep-water ports that developers and other stakeholders can use for near-shore staging and offshore construction. These strengths position North Carolina to meet the logistical demands of fabricating, installing, and maintaining offshore wind projects.

Timbermill Wind, Chowan County, NC.

---

25. coastalvawind.com/about/wind-energy/economic-benefits

26. docs.nrel.gov/docs/fy10osti/45889.pdf

27. atb.nrel.gov/electricity/2024/offshore_wind

NUCLEAR

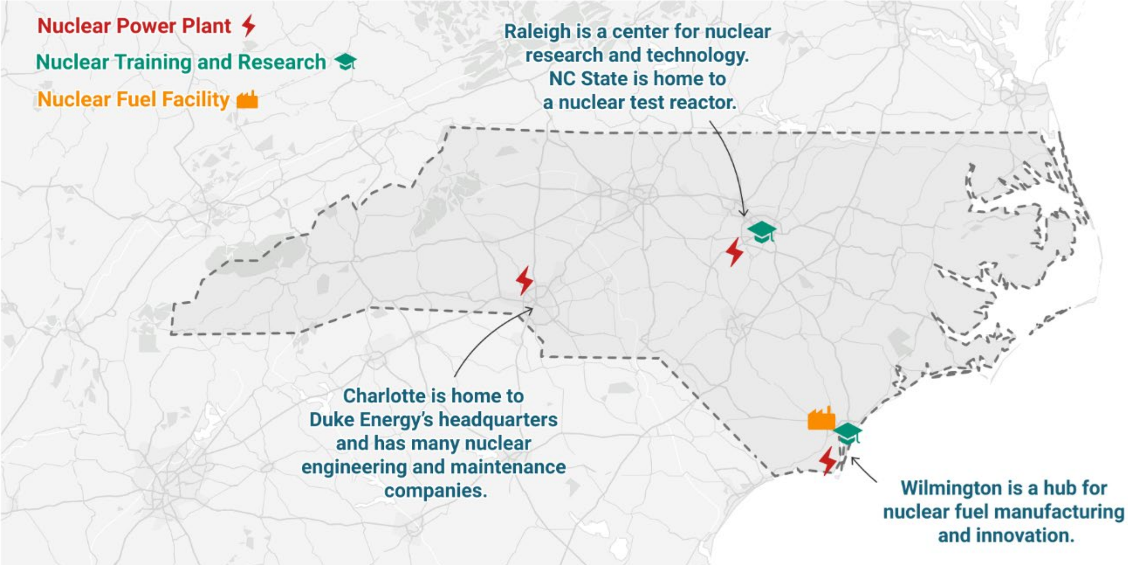
North Carolina's industrial capacity also supports other complex energy development, including nuclear power generation. Three regions in North Carolina play critical roles across various aspects of the nuclear energy sector, such as fuel production, plant maintenance, engineering, and research.

Wilmington is one of the nation's most important hubs in the nuclear fuel supply chain. At the Global Nuclear Fuel-Americas campus, enriched uranium is manufactured into fuel assemblies for use in light-water boiling reactors worldwide. This process includes forming uranium into pellets, assembling them into fuel rods, and bundling them into reactor-ready configurations. These assemblies support both today's boiling water nuclear fleet and emerging technologies like small modular reactors (SMRs) being developed by GE Hitachi Vernova. The Wilmington Campus is one of only three in the U.S. that manufactures these assemblies for commercial use, providing fuel for both existing reactors and advanced designs under development.[28]

A second facility is also under development on the Wilmington campus to produce advanced nuclear fuel for TerraPower's first commercial advanced reactor in Wyoming, with operations expected to begin by the early 2030s.[29]

Charlotte is a center for engineering and technical services that supports the operation and maintenance of the nuclear fleet. Firms based here provide specialized expertise in reactor design, outage management, plant performance, and other services critical to keeping reactors running safely and efficiently. Typically, operators will plan outages to exchange about a third of the fuel assemblies every 18 to 24 months.[30] During these outages — which typically last 30 days — large amounts of skilled labor are needed to switch fuel and conduct other critical maintenance while the reactor is down. Once again, North Carolina relies on its skilled workforce to support both the state's current nuclear fleet and potential new reactors.

North Carolina's Current Nuclear Power Capabilities



Graphic created with Datawrapper.

28. nrc.gov/info-finder/fc/index.html#facility-list
29. nrc.gov/materials/fuel-cycle-fac/ur-enrichment.html#separation
30. eia.gov/energyexplained/nuclear/the-nuclear-fuel-cycle.php

Raleigh serves as a hub for nuclear engineering education, research, and innovation. In 1953, NC State University established the world's first university-based research reactor. Seventy years later, the PULSTAR reactor at NC State remains one of only two ever built and the only one still in operation, supporting education, research, and industry partnerships.

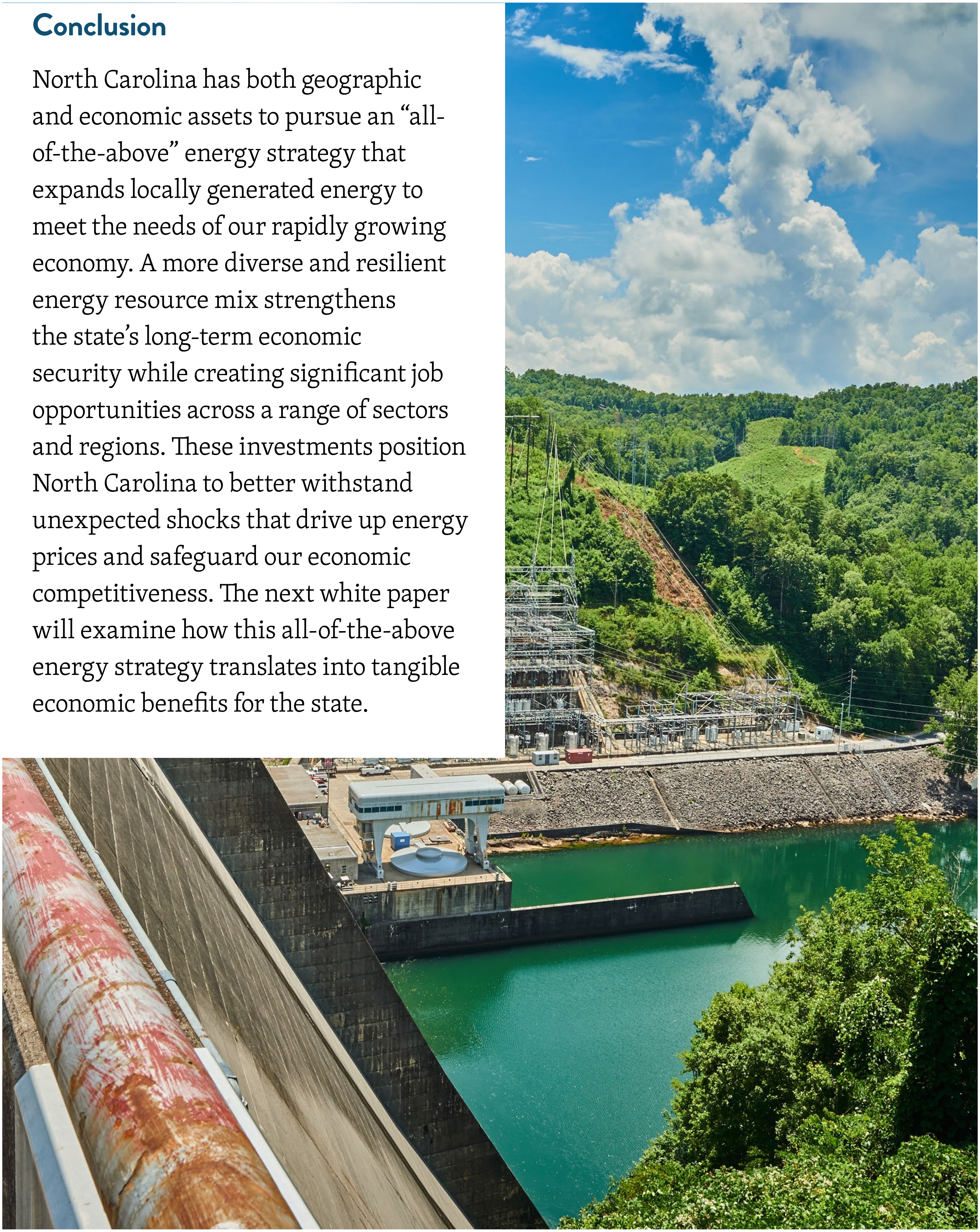
In 2025, NC State completed a feasibility study for a next-generation sodium-cooled research and test reactor, which would be the only facility of its kind in the U.S. This advanced design could simulate both traditional and next-generation commercial reactors, enabling testing and research that current reactors cannot support. This capability is critical for accelerating deployment of advanced small modular reactors and closing the nuclear fuel lifecycle by supporting research into fuel recycling and waste reduction. The project aligns with federal priorities under the CHIPS and Science Act, as well as the administration's recent executive orders aimed at streamlining nuclear development.[31]

McGuire Nuclear Plant on Lake Norman, Mecklenburg County, NC.

31. *whitehouse.gov/presidential-actions/2025/05/deploying-advanced-nuclear-reactor-technologies-for-national-security*

Conclusion

North Carolina has both geographic and economic assets to pursue an "all-of-the-above" energy strategy that expands locally generated energy to meet the needs of our rapidly growing economy. A more diverse and resilient energy resource mix strengthens the state's long-term economic security while creating significant job opportunities across a range of sectors and regions. These investments position North Carolina to better withstand unexpected shocks that drive up energy prices and safeguard our economic competitiveness. The next white paper will examine how this all-of-the-above energy strategy translates into tangible economic benefits for the state.



Hiawassee Dam on the Hiawassee River, Cherokee County, NC.

The Energy and Infrastructure Office (EIO) at the North Carolina Department of Commerce helps the state capture future economic opportunities by ensuring access to affordable, reliable, and diverse energy sources. EIO guides communities, businesses, and policymakers through the energy transition while maximizing economic benefits from an "all-of-the-above" strategy. The office collaborates with local governments, utilities, industry leaders, and workforce experts to promote job creation in the evolving energy economy and position North Carolina's industries for long-term competitive advantage.

NC DEPARTMENT
***of* COMMERCE**
ENERGY & INFRASTRUCTURE