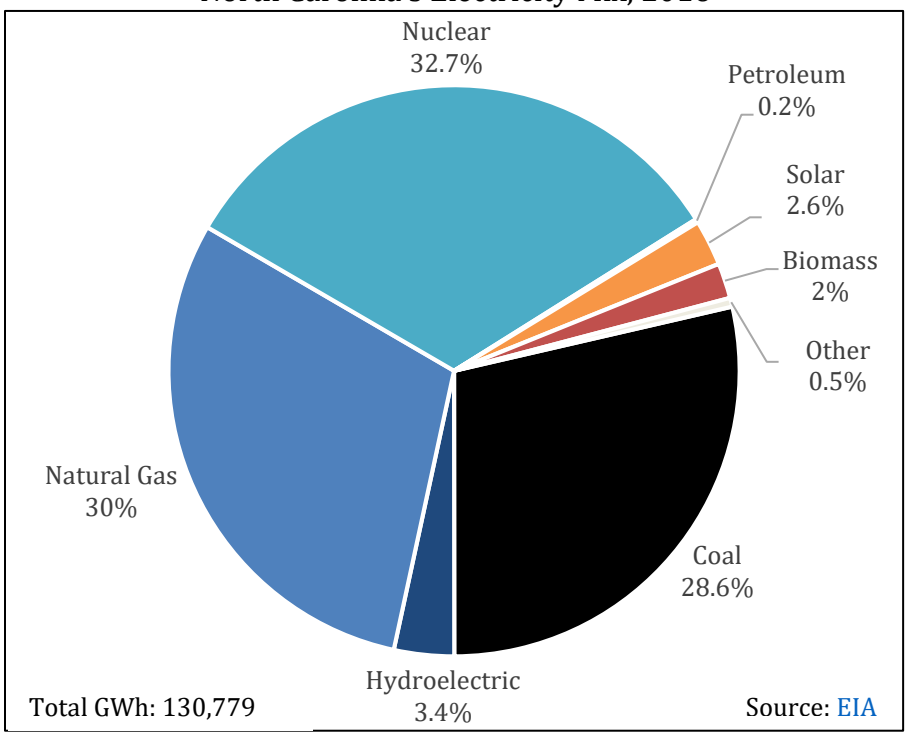
State Brief: North Carolina

BACKGROUND

Over the past decade, North Carolina has shifted away from a coal-dominated energy mix. While coal provided roughly half of the state's electricity in 2011, coal contributed only 28.6% to the energy mix in 2016, and preliminary data from the Energy Information Administration (EIA) for 2017 suggests this downward trend will persist. The decline of coal coincides with a sharp increase in natural gas-fired generation, jumping from 9.4% in 2011 to 30% in 2016. Nuclear plants have steadily produced approximately 40 gigawatt hours (GWh) annually since 2003 and nuclear is currently the state's primary source of energy. As of 2016, North Carolina is the ninth-largest producer of electricity, but ranks thirty-eighth in electricity consumption per capita.

North Carolina's Electricity Mix, 2016



The Tar Heel State has been a clean energy leader in the Southeast and is the only state in the region that has adopted a renewable portfolio standard (RPS). In 2016, North Carolina had 3,288 megawatts (MW) of installed solar capacity. In 2017, the Solar Energy Industries Association (SEIA) ranked North Carolina 2nd in the nation, behind California, in installed solar capacity and ranks the state 3rd in terms of the solar industry's projected growth. Due to a rigid permitting process and an 18-month moratorium[1] on new leases for wind projects established when House Bill 589 was enacted in 2017, progress in developing wind has been slow. Titled 'Competitive Energy Solutions for NC,' the act (Session Law 2017-192) reformed the state's implementation of the Public Utilities Regulatory Policy Act (PURPA) by modifying the eligibility of independent power producers for standard offer contracts and setting up a competitive procurement process for the interconnection of new renewable capacity, among other provisions. The state's first utility-scale wind farm, the Amazon Wind Farm US East, was completed in February 2017 and has a nameplate capacity of 208 MW. The state is also developing agricultural microgrids.

The seven members of the North Carolina Utilities Commission (NCUC) are appointed by the Governor and regulate the state's four investor-owned utilities (IOUs) and six natural gas companies. The NCUC has limited oversight over the state's 32 electric cooperatives. Republicans control both chambers of the General Assembly and Democrat Roy Cooper is the Governor.

POLICY STRENGTHS AND OPPORTUNITIES[2]

The National Renewable Energy Laboratory (NREL) developed the notion of "policy stacking,"[3] an important framework for policymakers to consider. The basic idea behind policy stacking is that there is an interdependency

[1] This moratorium is set to expire at the end of 2018.

[2] For more information on policy opportunities, please visit the SPOT for Clean Energy. For more information on specific policy actions related to these opportunities, please review the *Clean Energy Policy Guide for State Legislatures*.

[3] V.A. Krasko and E. Doris, *National Renewable Energy Laboratory*, 2012. Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions. http://www.nrel.gov/docs/fy13osti/56428.pdf.

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and sequencing of state policy that, when done effectively, can yield greater market certainty, private sector investment, and likelihood of achieving stated public policy objectives.

In theory, but not always in practice, clean energy policies can be categorized into one of three tiers of the policy stack. Tier 1, market preparation policies, remove technical, legal, regulatory, and infrastructure-related barriers to clean energy technology adoption. Tier 2, market creation policies, create a market and/or signal state support for clean energy technologies. Tier 3, market expansion policies, create incentives and other programs in order to expand an existing clean energy market by encouraging or facilitating technology uptake by additional market participants.

For example, before financial incentives for combined heat and power (CHP) will be successful, two key considerations for deployment are having clear interconnection standards and favorable stand-by rates for customers who opt to add CHP. In this example, states should adopt policies to address interconnection and stand-by rates before adopting financial incentive programs.

GRID MODERNIZATION

Policymakers can view grid modernization as creating a policy structure that supports and ties together many other initiatives, such as smart metering infrastructure, customer data management, energy storage, electric vehicle infrastructure, and utility business models.

In the last two decades, new digital technologies have enabled utilities to better manage the grid and provide opportunities for consumers to customize their services to fit their priorities. These technologies allow a two-way flow of information between the electric grid and grid operators and between utilities and their customers. Emerging technologies improve system reliability and resiliency by enabling better tracking and management of resources. These technologies allow grid operators to incorporate central and distributed energy resources, energy storage technologies, electric vehicles, and assist in addressing the challenges associated with planning, congestion, asset utilization, and energy and system efficiency. On the customer's side of the meter, advanced metering infrastructure, dynamic pricing, and other emerging technologies allow an exchange of information and electricity between a consumer and their electric provider.

In the GridWise Alliance's latest Grid Modernization Index, North Carolina is one of two states in the South (the other is Georgia) to place in the top half of states in terms of overall grid modernization. The state ranked in the top 10 in the "state support" category, which measures plans and policies supporting grid modernization, including incentives for energy storage, mandates for advanced grid technologies, policies improving system resiliency, and energy efficiency resource standards. The Department of Environmental Quality released the first Energy Policy Council Report in 2016, which lays out a comprehensive energy strategy for cleaner and more efficient energy development in the state. In the NC Clean Energy Technology Center's 50 States of Grid Modernization 2017 report, North Carolina falls just outside of the top five states in terms of grid modernization actions for the year. The state's notable activity includes mandating an energy storage study in the 'Competitive Energy Solutions for NC' Act mentioned above. The NCUC also considered interconnection rules for emerging technologies and data access rules. Additionally, during a Duke Energy rate case proceeding, the NCUC ordered a grid modernization workshop to take place in 2018.

Duke Energy unveiled its $13 billion Power/Forward Carolinas initiative in 2017, $7.8 billion of which was initially planned for grid upgrade investments. In response to the plan's announcement, renewable energy and environmental advocacy groups challenged the inclusion of a cost-recovery rider due to ambiguity in planning processes, lack of coordination with stakeholders, and the absence of specific investments. Duke and other parties reached a settlement in June 2018 which reduced the utility's grid modernization plan by $5.3 billion. As part of the settlement, the utility agreed to invest $25 million in electric vehicle (EV) charging, and will deploy at least 300 MW of energy storage by May 2026.

North Carolina demonstrates growing leadership in grid modernization. There are supportive policies that North Carolina's policymakers could adopt to support and advance in-state modernization efforts.

1. Develop a grid modernization strategy through a stakeholder process. States may also decide to require that utilities propose a ten-year grid modernization plan within a specified timeframe. Legislation could require plans to outline a clear set of grid modernization goals and describe methods to measure, report, verify, and enforce

progress towards those goals. States might also provide incentives or cost recovery mechanisms for utilities to meet grid modernization goals.

2. Require that utilities' integrated resource plans (IRPs) include plans to enhance cybersecurity, integrate distributed energy resources (including EVs and energy storage), increase smart meter deployment and demand response and/or demand-side management (DSM) programs, and measure and report on the results of grid modernization efforts. The NCUC required utilities to include Smart Grid Technology Plans (SGTPs) as a part of their biennial IRP filings in a 2013 order. SGTPs must detail and assess utility smart grid projects, such as overall impacts to the grid, costs/benefits of certain technologies, description of pilot projects, and customer access to data. According to the 2015 rule amendments, SGTPs are meant to be informative, and the filing requirement does not directly promote or induce utility deployment of smart grid technologies.

3. North Carolina does not have clear state policies governing customer data access and privacy protections. Some utilities in North Carolina have implemented the Green Button Connect program to ease customer access to energy data, and Duke Energy has committed to implementing Green Button for its customers as a part of its recent NCUC settlement (see above). To support this, policymakers could develop legislation or rules that, at minimum, do the following: clarify who owns the energy data associated with customer energy usage; protect customer privacy; outline the process for allowing direct access to data by third parties; and promote access to the highest resolution of data by third parties.

The adoption of incentives for or a requirement to integrate a certain amount of energy storage on the grid alongside enhancing renewable energy and electric vehicle policies would support modernization efforts and improve the chances of successful grid modernization.

ENERGY STORAGE

Energy storage offers a unique opportunity to dynamically manage supply and demand while maximizing the value of grid resources. By deploying storage in strategic locations, utilities can more effectively manage their energy portfolios. First, storage provides management of intermittent demand – helping to flatten peak demand requirements for the utility. Second, the responsiveness of energy storage can allow the utility to implement voltage regulation and other ancillary services, which are useful for improving system efficiency. Third, storage can dispatch power to better integrate intermittent resources like renewable energy. Finally, energy storage can help the commercial sector avoid costly demand charges. As utilities around the country consider extending demand charges to the residential sector, this will become an even more important issue.

The flexibility of battery storage, combined with advanced metering infrastructure, allows customers to control how and when they use energy from the grid or from solar panels installed on their home or business. In most cases, this can provide greater cost savings than standalone solar systems. Combined with time-varying rates or real-time pricing programs, state policy can further support customer choice and open a new market for energy services. Prices that better reflect the time-varying and location-dependent costs of producing and delivering electricity can lead to several economic and environmental gains.

Storage provides multiple benefits to both the customer and the utility. State planning and regulatory policies can help maximize these benefits by 1) establishing a framework for easy integration of energy storage into the grid and 2) establishing a marketplace that monetizes the benefits of energy storage for cost effective investment.

North Carolina's large renewable generation capacity makes the state prime for the deployment of energy storage technologies and development of supportive policies. While there are currently no procurement targets or financial incentives for energy storage, utilities in the state are actively pursuing energy storage technologies and developing storage projects. In 2016, Duke Energy began constructing a solar and battery storage microgrid project to power a remote communications tower in Great Smoky Mountains National Park. The utility also unveiled plans in 2017 to invest $30 million in two lithium-ion battery storage projects as part of their Western Carolinas Modernization Plan.

The 'Competitive Solutions for NC' Act directs the North Carolina Policy Collaboratory to conduct a study of economic feasibility, potential ancillary services, economic impacts, and policy recommendations for statewide energy storage

policy. The study is due to the Energy Policy Council and the Joint Legislative Commission on Energy Policy on December 1, 2018.

There are additional policy opportunities to take advantage of the growing technological advances in and declining costs of energy storage. Policymakers in North Carolina could consider the following:

1. Amend existing interconnection policies to ensure that storage can connect to the grid through a transparent and simple process. The Interstate Renewable Energy Council (IREC) has produced a series of interconnection protocols that states can easily adopt. The state could establish best practices for interconnecting storage in statute, or legislation could provide an instruction to the NCUC to update existing policy.

2. Require the inclusion of energy storage as a critical piece of the energy system as both a demand and supply management resource. Some states have required that utilities evaluate the cost effectiveness of non-wires alternatives (NWAs) to large transmission and generation investments. Alternatively, states might want to require utilities to develop a distribution investment plan that identifies the locations on the distribution system where energy storage or other distributed resources would offer the greatest value.

3. Consider adding a mandatory energy storage procurement target or requirement for energy storage with a documented process for periodic review of progress towards that goal. Procurement targets can jump-start market creation, spur fast learning, and guide the development of a regulatory framework. Five states currently have energy storage goals that range from five megawatt hours (MWh) to two gigawatts (GW).

4. Finance and incentivize energy storage for customers and utilities. Incentives in the form of rebates, grants, and tax credits could enable customers to use storage to manage their electric load, store locally produced renewable energy, and provide a bridge to scalable deployment for storage. Incentives could be designed to decline as storage values become more readily monetized. Policymakers could allow utilities that provide incentives to customers to recover the costs of installing smart meters. Furthermore, financing energy storage installations for commercial customers could help reduce their demand charges. A good place for policymakers to start is incentivizing solar system owners.

MAINSTREAMING RENEWABLES

As the renewable energy industry has matured, technology has improved, and global production of generating equipment has increased, renewable energy is increasingly seen as the least cost and lowest risk form of energy (excluding energy efficiency). A Bloomberg New Energy Finance report from this year predicts that at least 50% of total global electricity will be renewable by 2050. With increased deployment, utilities are learning more about how to integrate renewables effectively, investors are becoming more comfortable with the technologies, and building code officials are recognizing common standards and best practices. For these reasons, it is in the interests of policymakers to ensure that their states are well positioned to benefit from the transition to clean and sustainable energy resources.

To reduce barriers to customer and utility participation in the renewable energy market, North Carolina might consider several policy options.

Customer-Oriented Policies

1. Interconnection, net metering, and streamlined permitting – In general, customers want a clear, streamlined, affordable, and predictable system for connecting renewable energy systems to the grid. To ensure this, North Carolina's policymakers could consider adopting IREC's model interconnection procedures, removing net metering system size limitations and the aggregate capacity limit. Allowing aggregated net metering would be especially beneficial to the state's agricultural operations. Other applications for aggregated net metering include commercial properties and public entities like state and local governments, universities, and schools. The state might also consider establishing either statewide standards for streamlined permitting processes, or resources to support local governments that voluntarily implement a streamlined program, as Chapel Hill has done. State incentives, such as tax credits, financial incentives, or loans can be tied to systems that are established within a designated streamlined permitting jurisdiction, such as Catartert County's ordinance for wind siting. In 2017, the state enacted streamlined permitting for swine and poultry waste energy systems with a size of two MW or

less. This comes as part of North Carolina's rural electrification efforts. Duke Energy launched a solar rebate program in July 2018 to support the residential solar market.

2. Shared Renewables – Due to building and property attributes and ownership issues, many customers are unable to install renewable energy technologies. Allowing shared, or community, renewable energy projects addresses these barriers. These projects have multiple owners or subscribers who pay for a portion of the generation provided by the system. While no statewide program is in place, the 'Competitive Energy Solutions for NC' Act requires Duke Energy Carolinas and Duke Energy Progress to provide community solar programs, and there are at least three shared solar projects online in North Carolina. Duke Energy submitted its shared solar program to the NCUC for approval in 2018. To expand shared renewables, the state might consider adopting a virtual net metering policy. Virtual net metering allows a customer to receive credits from a shared system as if the generation were on site. Virtual net metering is different from a power purchase agreement (PPA), which pays the customer for the proportion of power they produce. Because it is treated as a credit on the customer's bill, the customer can avoid the tax implications of a PPA payment - which can adversely affect the economics of the system (and may come as a surprise to the participant).

   Low credit ratings often deter participation in renewable energy markets; this can affect low- and moderate-income (LMI) households' adoption of renewable energy solutions. Supportive policies for shared renewables can be designed to encourage participation by LMI households; this can increase adoption of renewable technologies and reduce energy costs. Low-income participation can be encouraged either through a percentage mandate for the overall annual contracted capacity, or by offering a higher rate of payment for the portion of shared solar capacity attributed to low-income customers. States that have a shared renewable program may want to coordinate this program with implementation of the federal Weatherization Assistance Program to provide recipients of assistance with participation in a shared renewable system.

   There are several additional policy options that North Carolina might consider to promote renewable energy uptake by low- and moderate-income consumers. Generally, successful state policies should be tailored to these customers, be cost-effective and financially sustainable, have measurable performance indicators, and be flexible enough to allow later changes in design.

3. Corporate Procurement – Many Fortune 100 and 500 companies have established either climate goals or commitments to purchase renewable energy. In just the last four years, over nine GW of renewable contracts have been announced by corporate entities. In the first quarter of 2018 alone, corporations signed 14 agreements for over 1,700 MW of renewable energy. North Carolina's policy allows companies to purchase renewable energy credits (RECs), develop onsite projects, and participate in community energy developments. Third-party PPAs are not allowed in the state. The 'Competitive Energy Solutions for NC' Act expands the corporate renewable market by requiring utilities to establish a standard contract for large customers, effectively extending Duke Energy's green source rider which expired in 2016. Under this statutory framework, public utilities pay renewable facility owners who supply electricity to large customers. The largest PPA in the state is the 80 MW solar farm contracted by Fifth Third Bancorp and built by SunEnergy1. The products available in North Carolina meet all six of the Corporate Renewable Energy Buyers' Principles. To expand corporate procurement, the state might consider allowing companies to enter into onsite third-party PPAs. In addition, it is prudent to incorporate corporate renewable purchase commitments into the IRPs that utilities submit to regulators to plan for resource needs over multiple decades. By integrating these renewable purchase commitments into the IRP process, regulators can avoid over-building resources and stranding generation assets.

Utility-Oriented Policies

Some states have created programs that aim to reduce greenhouse gas emissions and increase investments in clean energy resources. States might see an emissions or clean peak standard as the next step in a progression from RPSs. As mentioned above, North Carolina is the only southern state to have established a mandatory RPS of 12.5% by 2021, which set initial technology targets of 0.2% solar generation by 2018, 0.2% swine waste by 2020, and 900 GWh poultry waste by 2016. The NCUC sets an IOU compliance schedule out to 2021, with targets derived from the previous year's electricity sales. In the most recent annual report on RPS progress submitted to the NCUC, IOUs state that they are on track to achieve RPS targets. To increase utility adoption of clean energy technologies, North Carolina's policy makers might consider the following:

1. Emissions standards can take a technology neutral approach that looks at the total emissions of the utility portfolio and drive emissions down with a combination of renewables, traditional fuels, efficiency, and technological advances. Emissions reductions can be achieved through 1) a carbon portfolio standard approach, or 2) a market-based approach. A portfolio emissions standard sets emissions reduction targets to be achieved over time. This can be implemented through the IRP process or by establishing a maximum allowable rate of emissions per unit. Under a market-based approach, a state or a group of states might set a certain emissions reduction target, for example, 20% below 1990 levels by 2040. This reduction is achieved by the distribution of annual emission allowances that decrease to the point that the standard is met in 2040. One of the advantages of a market-based program is that it is designed to reduce emissions in the most economically efficient manner possible. Such a standard can also address other concerns such as pollution, asthma risk, environmental justice and water use.

2. Clean Peak Standards aim to increase the share of clean energy resources used to meet peak demand and decrease energy bills over the long-term by reducing peak demand in the hours when energy costs are highest. These objectives can be met through different policy options including: planning and procurement that focuses on peak demand; a moratorium on the construction of new peaking units or a phase out of existing units; incentives – including carve-outs in states with RPSs – for clean energy resources delivered during peak times; and/or adopting a new clean peak standard that sets a target for clean energy deliveries during peak times.

ELECTRIFICATION OF THE TRANSPORTATION SECTOR

An estimated 55% of new car sales will be electric by 2040. Therefore, a key part of building a modernized grid involves designing infrastructure that will facilitate easy connection of electric vehicles (EVs) to the grid. One of the most important barriers to increased adoption of EVs is the consumer's awareness of the availability of EV charging stations. Ultimately, drivers want to be sure that their car will get them where they need to go. Another important barrier to increased adoption of EVs is their higher up-front cost as compared to similar conventionally fueled vehicles. The good news is that both supportive policies for developing charging infrastructure and technological advancements have eased "range anxiety."

North Carolina offers a few incentives for alternatively fueled vehicles, including funding for fueling infrastructure, and a sales tax exemption for alternative fuels North Carolina is in a good position to explore the potential for new incentives or tax credits related to EVs or EV supply equipment (EVSE). There are a number of opportunities to expand the market for EVs in North Carolina:

1. EV and EVSE Financing and Financial Incentives – Providing additional financial incentives and innovative financing options can help spur greater market penetration of EVs. Sales, property, and income tax credits are some of the simplest methods for addressing high up-front costs of EVs and EVSE. While sales tax credits are typically applied at the time of purchase, property and income tax credits may do less to address upfront cost barriers as the credit is not applied at the time of purchase.[4] States have adopted other financial incentives including low-interest loans, grants, vouchers and rebates. A handful of states qualify EVSE under their property assessed clean energy (PACE) programs. A simple solution is to increase and expand existing tax credits to incentivize commercial, publicly available charging stations. While no incentives for the purchase of EVs are available from the state, Duke Energy offers rebates to customers who purchase an EV and is investing in EV charging infrastructure.

2. Charging Infrastructure Plan – Locating charging infrastructure is different from locating conventional fueling stations. For the most part, EVs are cars used for commuting and local trips. Furthermore, while a driver of a conventional vehicle stops only briefly at a gas station for the specific purpose of filling up, a driver of an EV is generally looking to refuel when they are parked for a longer period of time, for example when going shopping, going to a restaurant, or going to work. Charging infrastructure plans should target these types of locations and attempt to pair the appropriate level of charging infrastructure with a reasonable amount of time a person will be at that location. Legislation could direct a state agency to develop such a plan through a stakeholder process. North Carolina's existing registration fee for EVs could help fund these efforts. For example, in Washington a portion of each EV registration fee is used to fund charging infrastructure development across the state.

[4] A study by the Congressional Budget Office however suggests that tax credits are important tools for ensuring increased adoption of alternative-fueled vehicles.

Regional collaborations around the US are emerging to coordinate the development of electric transportation infrastructure. The REV West Plan and the Transportation and Climate Initiative (TCI) are in the process of planning regional EV charging corridors to reduce transportation sector carbon emissions. To alleviate range anxiety, bolster EV adoption, and coordinate transportation policy with other states, North Carolina might consider the potential for designing policy to link with the TCI regional network.

3. Parking Infrastructure Requirements – In tandem with the development of a statewide plan, legislation could set requirements for EV parking infrastructure. Some states have adopted permitting standards for parking lots, requiring, for instance, that for every 100 parking spaces, there must be at least one EV charging space. Legislation could also incentivize utilities to develop make-ready locations. These locations supply power to the point where a utility or third-party developer might install an EV charging station. North Carolina's statewide building energy code could also be updated to include requirements for EV charging infrastructure.

NEWS

- September 5, 2018: Average Atlantic Coast Offshore Wind Farm Could Add Billions to Economy & Thousands of Jobs
- September 5, 2018: Duke Energy Accounts for Large Boost in Solar Power in Its Latest Long-Range Plan
- September 4, 2018: In North Carolina, Low-Hanging Fruit of Energy Efficiency is Going to Waste
- August 23, 2018: Selling the Sun: NC Programs Offer Solar Rebates, Discount
- July 18, 2018: New Report Shows N.C. has Made Gains in Clean Energy Technologies
- July 11, 208: Duke Boosts Solar in North Carolina, but Storage Addition brings Controversy
- July 9, 2018: Duke Energy Solar Rebates Now Available In NC
- June 21, 2018: 'They Killed This': North Carolina's $92M VW Settlement at Risk, Critics Say
- June 7, 2018: Duke Energy Expands N.C. Community Solar Program
- June 4, 2018: Duke Agrees to Cut North Carolina Grid Modernization Plan by $5.3B
- May 9, 2018: Pig-powered Microgrid in North Carolina May be the Future of Rural Cooperative Supply

OTHER RESOURCES

- SPOT for Clean Energy, North Carolina: https://spotforcleanenergy.org/state/north-carolina/
- American Wind Energy Association (AWEA), North Carolina: http://awea.files.cms-plus.com/FileDownloads/pdfs/North%20Carolina.pdf
- North Carolina State Energy Office: http://www.energync.net/
- North Carolina Sustainable Energy Association: https://energync.org/
- U.S. Energy Information Administration, North Carolina: https://www.eia.gov/state/?sid=NC
- National Renewable Energy Laboratory Biomass Maps: https://www.nrel.gov/gis/biomass.html
- U.S. Department of Energy's Alternative Fuels Data Center, North Carolina: https://www.afdc.energy.gov/states/nc
- The Rocky Mountain Institute: From Gas to Grid – Building Charging Infrastructure to Power Electric Vehicle Demand
- The American Council for an Energy-Efficient Economy State and Local Policy Database, North Carolina: http://database.aceee.org/state/north-carolina
- The Database of State Incentives for Renewables and Efficiency, North Carolina: http://programs.dsireusa.org/system/program?state=NC
- The GridWise Alliance, EVs - Driving Adoption, Capturing Benefits: http://gridwise.org/evs-driving-adoption-capturing-benefits/
- The Regulatory Assistance Project, Performance-Based Regulation: https://www.raponline.org/event/performance-based-regulation-the-power-of-outcomes-part-1/

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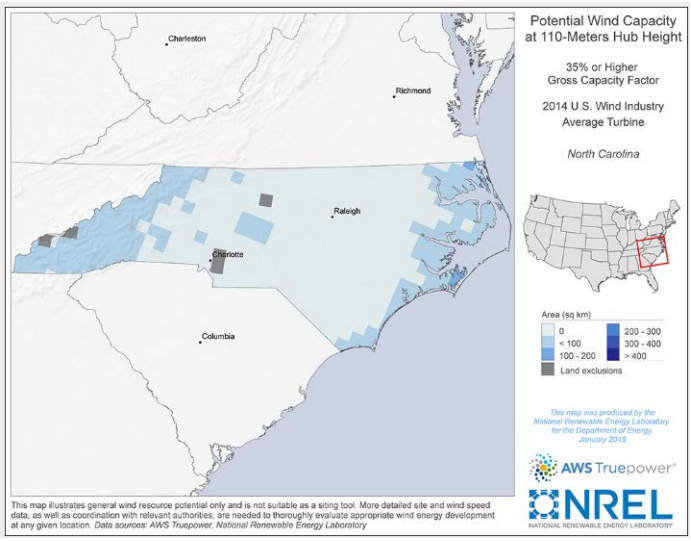
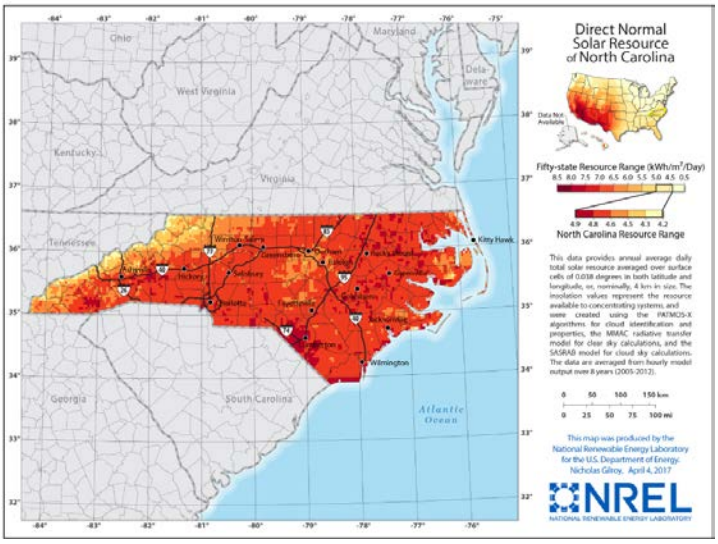
NORTH CAROLINA'S WIND AND SOLAR RESOURCES

WIND https://windexchange.energy.gov/states/NC[5]
SOLAR https://www.nrel.gov/gis/solar.html





Our Resources

CNEE Homepage: http://cnee.colostate.edu/

The SPOT for Clean Energy: https://spotforcleanenergy.org/

The Advanced Energy Legislation (AEL) Tracker: https://www.aeltracker.org/

Clean Energy Policy Guide for State Legislatures: http://cnee.colostate.edu/cleanenergypolicyguide/

The Energy Policy Podcast: http://energypodcast.colostate.edu/

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[5] Please see your packet for a higher resolution wind energy capacity map.

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