North Carolina
Clean Energy Plan

Transitioning to a 21st Century Electricity System

Supporting Document

PART 1

Energy Sector Profile & Landscape

October 2019

NORTH CAROLINA
Department of Environmental Quality
State Energy Office

Preface

The Clean Energy Plan was written by the Department of Environmental Quality as directed by [Executive Order No. 80](https://files.nc.gov/ncdeq/climate-change/EO80--NC-s-Commitment-to-Address-Climate-Change---Transition-to-a-Clean-Energy-Economy.pdf).[1] DEQ was tasked with the creation of a CEP to encourage the use of clean energy resources and technologies and to foster the development of a modern and resilient electricity system. The purpose of the CEP is to outline policy and action recommendations that will accomplish these goals. The CEP is made up of the main document titled *Policy and Action Recommendations* and six supporting documents.

Part 1: Energy Sector Profile and Landscape
Part 2: North Carolina's Energy Resources
Part 3: Electricity Rates and Energy Burden
Part 4: Stakeholder Engagement Process and Comments
Part 5: Energy and Emissions Modeling
Part 6: Clean Energy Jobs and Economic Outlook

The purpose of this supporting report (Part 1: Energy Landscape) is to help the public build an understanding of how North Carolina uses energy and electricity today and how technical breakthroughs, market forces, customer choice, environmental considerations, and policy may drive the future generation and use of energy and electricity. The goals of this section include;

1) Present historical energy and electricity data for North Carolina,

2) Discuss important trends, changes, and issues with the economic use of energy and electricity,

3) Present data on periods of high energy and electricity use in North Carolina,

4) Provide more detailed information on the electricity sector including, providers, generators, transmission, and consumers, and rates, with a focus on recent trends and changes driven by technology, regulatory and market forces.

[1] https://files.nc.gov/ncdeq/climate-change/EO80--NC-s-Commitment-to-Address-Climate-Change---Transition-to-a-Clean-Energy-Economy.pdf

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ACP	Atlantic Coast Pipeline
AEO	Annual Energy Outlook
Boiler MACT	Boiler Maximum Achievable Control Technology
Btu	British thermal unit
CAFE	Corporate Average Fuel Economy
CHP	combined heat and power
CO2	carbon dioxide
DEC	Duke Energy Carolinas
DEP	Duke Energy Progress
DEQ	North Carolina Department of Environmental Quality
DER	distributed energy resource
EE	energy efficiency
EMC	Electric Membership Cooperative
GHG	greenhouse gas
GSP	gross state product
IOU	investor-owned utility
IPP	independent power producer
IRP	Integrated Resource Plan
kWh	kilowatt-hour
LCOE	levelized cost of energy
MMBtu	million British thermal units
MMcf	million cubic feet
MMT	million metric tons
Mpg	miles per gallon
MVP	Mountain Valley Pipeline
MW	megawatt
MWh	megawatt-hour
NCEMC	North Carolina Electric Membership Cooperative
NCEMPA	North Carolina Eastern Municipal Power Agency
NCMPA1	North Carolina Municipal Power Agency Number 1
NCTPC	North Carolina Transmission Planning Collaborative
NCUC	North Carolina Utilities Commission
NGCC	natural gas combined cycle
NHTSA	National Highway Traffic Safety Administration
O&M	Operations and Maintenance
PJM	Pennsylvania-Jersey-Maryland regional transmission organization
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
REPS	Renewable Energy and Energy Efficiency Portfolio Standard
RTO	regional transmission organization
SAFE	Safer Affordable Fuel-Efficient Vehicles Rule
SEDS	State Energy Data System
SERC	Southeastern Electric Reliability Council
SRVC	Southeastern Electric Reliability Council - Virginia/Carolina Subregion
TBtu	Trillion British thermal units
TDF	tire derived fuel
TVA	Tennessee Valley Authority
US	United States
US DOE	US Department of Energy

US DOT	US Department of Transportation
US EIA	US Energy Information Administration
US EPA	US Environmental Protection Agency
VACAR	Virginia Carolinas Subregion
VMT	vehicle miles traveled

1 North Carolina's Energy Landscape

This section provides an overview of energy in North Carolina with a focus on consumption trends. This section can be read in conjunction with other documents produced by the State for a more comprehensive understanding of energy in North Carolina. These documents include:

- 2018 Energy Policy Council Biennial Report;[2]
- North Carolina Greenhouse Gas Inventory (1990-2030); [3] and
- 2018 North Carolina Utilities Commission Report. [4]

The majority of the data presented in this section relies on a database of historical energy use from the United States Energy Information Administration (US EIA) State Energy Data System (SEDS). [5] The data is presented as the heat content of fuels or energy sources in trillion British Thermal Units (TBtu).[6] When data has an alternate source, the dataset source will reference.

1.1 Energy Demand in All Sectors

Historically, North Carolina consumes an average of 2,600 TBtu of energy per year across all of its economic sectors: industrial, commercial, residential, and transportation. This value includes 1) energy consumed on site for heating or to do work 2) energy consumed to generate and transmit electricity to retail customers, 3) energy used to transport people and goods, and 4) fossil fuels used in commercial and industrial products, such as asphalt, lubricants, and plastics.

Figure 1-1 presents the energy consumed by each economic sector from 2000 to 2016, the last year of available energy data.[7] Total energy use remained almost constant, with only a 1% decrease between the years 2000 and 2016. This leveling of energy use occurred while the State has had a 32% increase in its Gross State Product (GSP) over the same time period.[8]

---

[2] Energy Policy Council Biennial Report, May 2018, Energy Policy Council, North Carolina Department of Environmental Quality, accessed at https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-policy-council.

[3] North Carolina Greenhouse Gas Inventory (1990-2030), North Carolina Department of Environmental Quality, Division of Air Quality, January 2019, accessed at https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory.

[4] 2018 North Carolina Utilities Commission Report - Volume XLIX. Major Activities through December 2018 with Statistical and Analytical Data through 2017, North Carolina Utilities Commission, accessed at https://www.ncuc.net/statbook/2018report.pdf.

[5] All data in this section is from the following reference unless otherwise noted. North Carolina State Energy Data System (SEDS): 1960-2016 (complete), US Energy Information Administration, released June 29, 2018, accessed at https://www.eia.gov/state/seds/seds-data-complete.php?sid=NC#Consumption.

[6] British Thermal Units are defined at https://www.eia.gov/energyexplained/index.php?page=about_btu.

[7] Consumption of electricity in megawatt-hours (MWh) is converted to heat energy in billion Btu. See SEDS documentation at https://www.eia.gov/state/seds/sep_use/total/csv/use_csv_doc.pdf.

[8] North Carolina's Gross State Product (GSP) in 2009 dollars obtained from the North Carolina Office of State Budget and Management in March 2018.

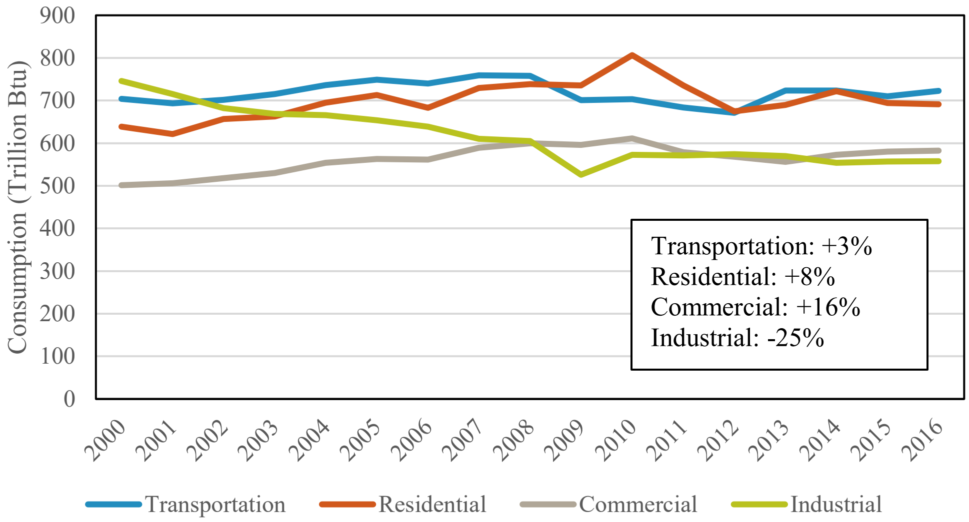


Figure 1-1: Total Consumption in Trillion Btu by Economic Sector (includes electricity)

There have been larger changes within each economic sector due to changes in North Carolina's population and economy. The industrial sector has seen a 25% decrease in consumption (TBtu) since 2000, while the commercial sector has increased by 16%. This is primarily due to the shift from a manufacturing to a service economy. Residential energy use increased by 8%, which is much less than the State's growth in population of 26% over the same time.[9] Transportation energy use increased by only 3% since 2000. The increase in transportation has been limited by the improvements in the federal fuel efficiency standards for this sector.[10] (See Transportation subsection for more detailed information.)

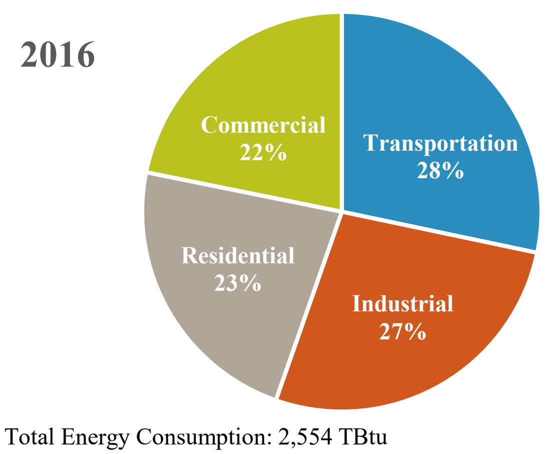
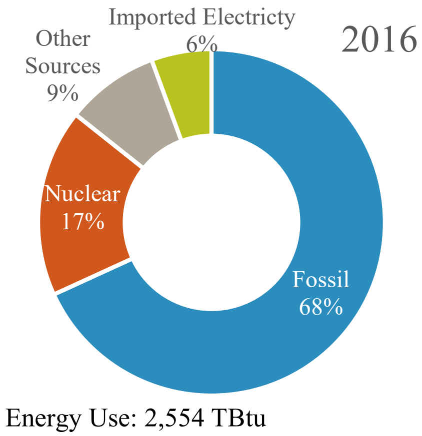


Figure 1-2: Total Consumption by Sector for 2016

As shown in Figure 1-2, transportation is the largest consumer of energy in the State, representing 28% of all energy use in 2016. This is followed by residential energy use at 26%, commercial use at 23%, and finally industrial use at 22%. Approximately 8% of the energy consumed annually by the industrial sector was not combusted but used in products such as asphalt or for lubrication.

[9] North Carolina Census data provided by North Carolina Office of State Budget and Management in January 2018.
[10] https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-ghg-emissions.

1.2 Energy Sources Used by All Sectors



This chart summarizes North Carolina's energy sources in 2016. The majority of the energy used was derived from fossil fuels, approximately 68%. Nuclear represents 17% of the energy used. The US EIA SEDS database uses the term "renewable energy" to represent biomass, geothermal, hydropower, solar, and wind. This category will be referred to as "other sources" in this report and represents 9% of the total energy consumed.[11] Imported electricity currently represents 6% of energy consumed and comes from power plants using a variety of energy sources.

Figure 1-3: Summary of Energy Sources in 2016

Figure 1-4 is a breakout of the energy sources presented above as estimated for 2016.[12] Motor gasoline represents the largest energy resource (531 TBtu) followed closely by natural gas (540 TBtu). Nuclear is a significant resource as well, using 448 TBtu of energy for electricity generation. Coal has declined in prominence but is still a resource that the state relies heavily upon at 382 TBtu, mostly for electricity generation. All renewable energy sources comprise 239 TBtu of energy used in North Carolina. Biomass has been an important energy source over the years, supplying 147 TBtu to thermal, electricity, and transportation end users. Other renewable energy sources, mainly solar, are trending upwards, producing 75 TBtu of energy in 2016.

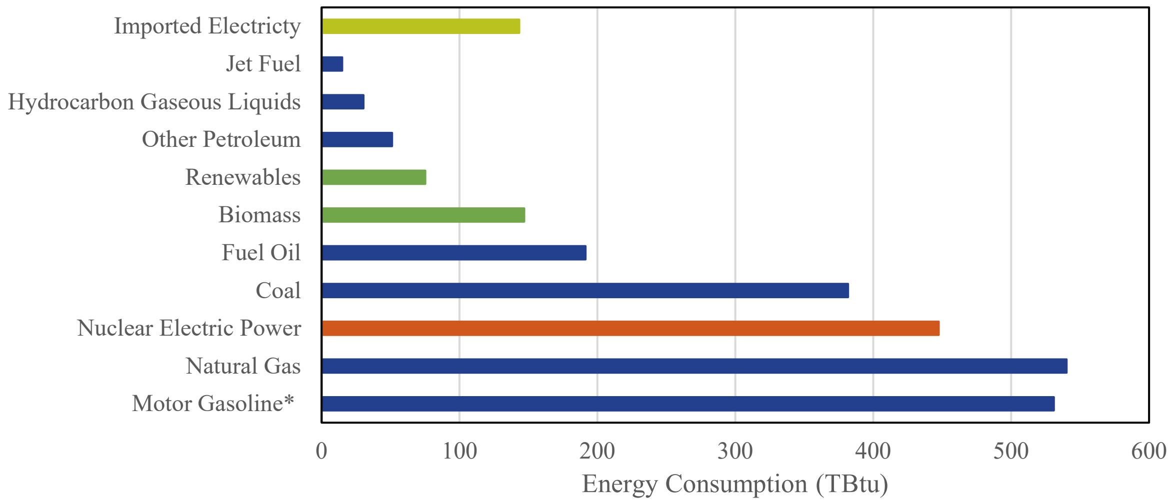


Figure 1-4: Energy Consumption Estimates by Resource Type in 2016

[11] Other sources include biomass (wood, ethanol, waste), hydropower, solar, wind and geothermal.
[12] North Carolina Energy Consumption Estimates 2016, State Energy Data System, US Energy Information Administration, https://www.eia.gov/state/?sid=NC

1.2.1 Fossil Fuel Sources

North Carolina's dependence on fossil fuel has decreased by 10% from 2000 to 2016 on a heat input basis despite the state's growing population and economy (from 1,935 TBtu to 1,741 TBtu). This is primarily due to state, federal, and private energy efficiency (EE) efforts in all sectors and increased use of other energy sources (biomass and renewables). The decrease in coal use, 51% as shown in Figure 1-5, is attributed to both decreased use for 1) electricity generation (See Coal Resource Section) and 2) industrial space/process heating.[13] Natural gas use has increased substantially, by 124%, due to increases in its availability provided by new extraction methods (hydraulic fracturing) and the accompanying decrease in its price. Use of petroleum has decreased by 10% primarily due to 1) its decreased use as a primary fuel in the electricity and industrial sectors and 2) increased fuel efficiency in the transportation sector.

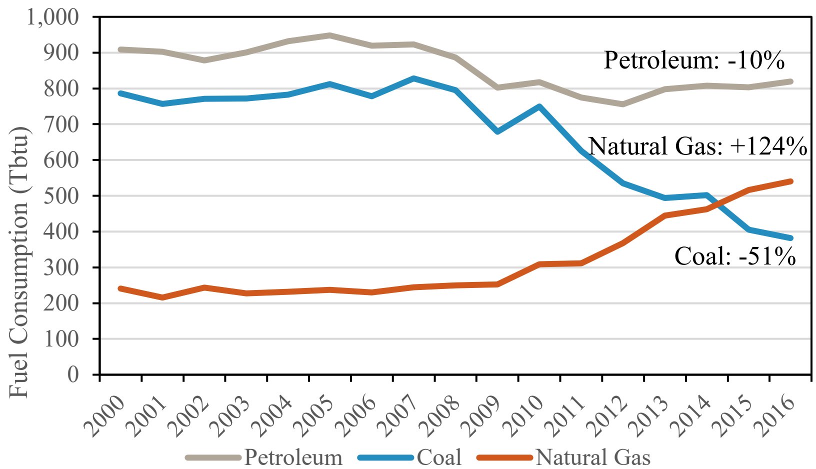


Figure 1-5: Trends in Fossil Fuel Consumption by All Sectors (TBtu)

Table 1-1 presents the quantity of fossil fuel consumed in the state in physical units for select years. Most of the fuel is combusted for energy, and only 2% is used in industrial products. North Carolina is ranked as the 12th highest state for total energy consumption by the US EIA. North Carolina is ranked 15th in the nation for the amount of coal consumed, even with the 51% decrease in use. The state is ranked high for the other fuels as well, 17th for natural gas use and 12th for petroleum use.

Table 1-1: Quantity of Fossil Fuel Consumed in North Carolina

Fossil Fuels	Units	2000	2005	2010	2015	2016	Percent Change
Coal	thousand short tons	31,371	32,860	30,529	16,364	15,447	-51%
Petroleum	million barrels	171,111	178,329	163,495	161,194	164,061	-4%
Natural gas	million cubic feet	233,717	229,715	304,148	498,575	521,952	123%

[13] Process heating refers to the use of energy to raise the temperature within a process vessel such as a kiln or a boiler to produce steam for either heating or to do work.

1.2.2 Natural Gas Use

As discussed above, North Carolina has substantially increased its use of natural gas. Figure 1-6 presents the increase in use of natural gas from 2000 to 2016 for all economic sectors. The growth in natural gas for electricity generation and the commercial sector were the largest, over 2,000% and 30% respectively. The industrial sector decreased slightly use of natural gas up through 2009. In 2010, its use began to increase as plants switched from coal to natural gas, however, its overall use from 2000 levels has decreased by 1%. The apparent lack of growth in industrial sector natural gas despite increased manufacturing activity may reflect improvements in the efficiency of thermal generation as well as on the process side. The residential sector's use of natural gas has remained flat except for increases during colder years to provide additional heat.

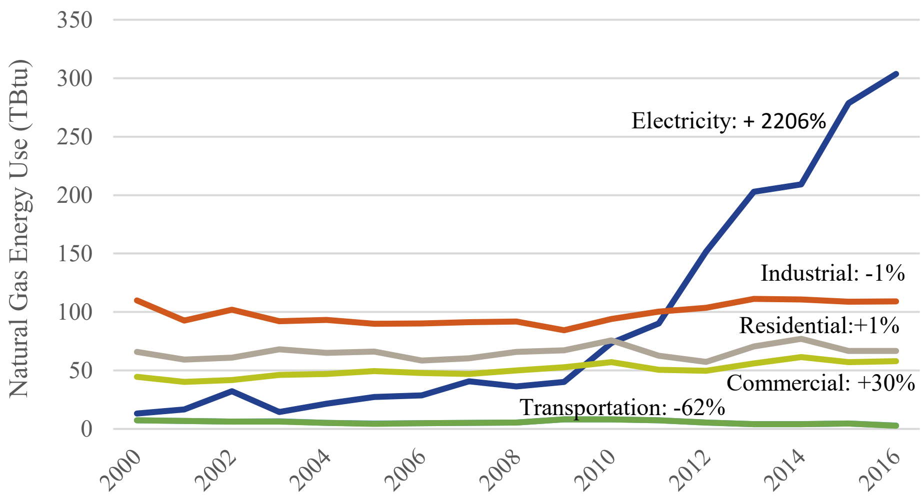
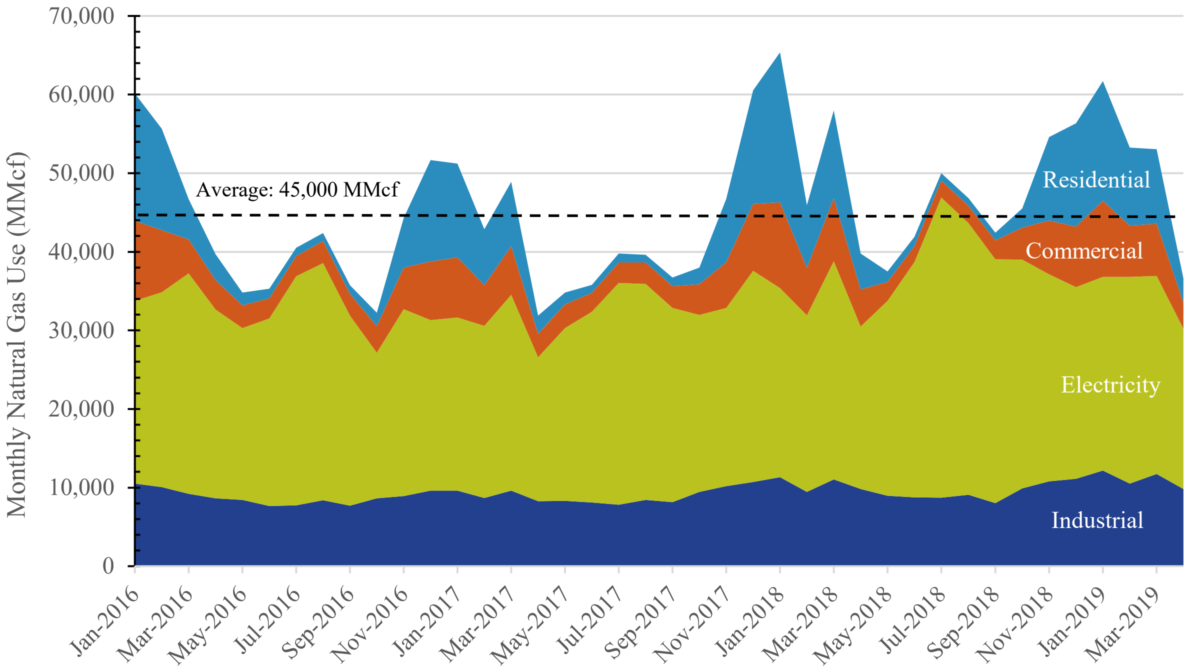


Figure 1-6: Increase in Natural Gas Energy Use by Sector (TBtu)

Monthly natural gas use is seen in Figure 1-7 from January 2016 through April of 2019.[14,15] The graph indicates that there is a cyclic nature to the use of natural gas. The average over the time period is 45,000 million cubic feet (MMcf) of gas while January peaks can be from 33% to 44% higher than this average monthly use. The graph also indicates the industrial use of natural gas is fairly constant while commercial and residential consumption increase sharply during the winter months, especially during the polar vortex of 2018 (late December 2017 through early January 2018). Consumption of natural gas for electricity generation is highest during the summer months, when natural gas prices are low and demand for electricity to provide cooling is high. This is especially evident during July of 2018.

[14] North Carolina Natural Gas Consumption by End Use, Series 6, Monthly, US EIA, Release Data June 28, 2019, File name: ng_cons_sum_dcu_snc_m.xls, accessed at https://www.eia.gov/dnav/ng/NG_CONS_SUM_DCU_SNC_M.htm.
[15] This data does not include natural gas used for transportation.



*January 2018 industrial use was estimated based on average of 2017 and 2019

Figure 1-7: Monthly Natural Gas Use in North Carolina (MMcf)

The United States (US) natural gas pipeline network is a highly integrated network that moves natural gas throughout the continental US. North Carolina is mainly dependent on the Transco Gas Pipeline for its natural gas requirements. This pipeline provided most of the 521,952 MMcf of gas used by North Carolina in 2016, more than double what was provided in the year 2000. In addition to the pipeline, North Carolina has 4 natural gas liquefaction and storage facilities.[16]

Approximately 80% of the natural gas used by the transportation sector, as shown in Figure 1-6, consists of fuel combusted at natural gas pipeline compressor stations.[17] The amount of fuel used in natural gas transportation has decreased by over 60% since 2000, even as natural gas consumption has increased by 124% in the State of North Carolina as shown in Figure 1-5. Note that the volume of natural gas transmitted through the pipelines is larger than what is consumed in North Carolina since the pipeline supports multiple states.

Pipeline quality natural gas is composed of 95% to 98% methane, a greenhouse gas (GHG).[18] There is public concern over the amount of GHG emissions associated with natural gas pipelines. Emissions of GHGs from the operation of the natural gas transmission and storage system, including natural gas consumed by compressor stations and fugitive emissions, were estimated in North Carolina Department

---

[16] Bill Gilmore, North Carolina Utilities Commission, "Natural Gas Facilities in North Carolina," email transmittal to Andy Bollman, NC Division of Air Quality, January 23, 2018.

[17] Transportation energy sector includes all energy used to transport goods, not just mobile transportation.

[18] For information on greenhouse gases, see https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

of Environmental Quality's (DEQ) GHG inventory as 1.35 million metric tons (MMT) for 2016.[19] This analysis was restricted to pipeline operations in the State per US Environmental Protection Agency (US EPA) methodologies. For comparison, GHG emissions from natural gas combustion by the various economic sectors in 2016 was estimated at 27.23 MMT.

There are currently three natural gas pipelines being proposed for North Carolina, the Atlantic Coast Pipeline (ACP), the Mountain Valley Pipeline (MVP), Southgate Project, and the Southeastern Trail expansion project. The ACP is being developed by four leading domestic energy companies: Dominion Energy, Duke Energy, Piedmont Natural Gas, and Southern Company Gas in North Carolina. A detailed discussion of these projects is beyond the scope of this document, but information can be found in the 2018 Energy Policy Council Biennial Report and the DEQ website.[20, 21]

1.2.3 Other Energy Sources

North Carolina's use of other energy sources, including biomass, has increased by 59% since the beginning of 2000. This increase is largely in biomass including both wood and landfill gas, together representing a 37% increase in use from 2000 to 2016 as shown in Figure 1-8.[22] Hydropower, which varies in production based on available water volume, represents between 20% to 40% of other energy sources in the State during the years from 2000 to 2016. Solar energy has seen a dramatic increase of 2,600% in use for both electricity generation and thermal energy, however, it still represents only 15% of the total renewable energy use in North Carolina and just 2% of the primary energy consumed in the State.[23] Geothermal and wind energy represent a small fraction of renewable energy generation on a heat input basis, that when combined is approximately 0.5% in 2017.

[19] North Carolina Greenhouse Gas Inventory (1990-2030), North Carolina Department of Environmental Quality Division of Air Quality, January 2019, accessed at https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory.
[20] Energy Policy Council Biennial Report, May 2018, Energy Policy Council, North Carolina Department of Environmental Quality, accessed at https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-policy-council.
[21] https://deq.nc.gov/news/key-issues/atlantic-coast-pipeline and https://deq.nc.gov/news/press-releases/2018/08/17/ferc-announces-public-comment-period-meetings-mountain-valley.
[22] Biomass in the US EIA SEDS database represents only energy consumed in the North Carolina, not exported biomass.
[23] Primary energy refers to thermal energy and electricity minus losses for transmission of electricity.

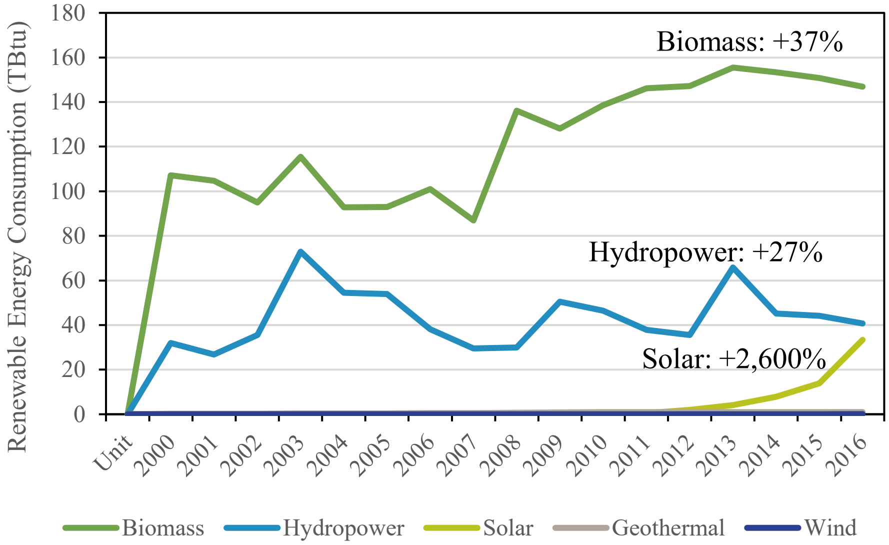


Figure 1-8: Use of Other Energy Sources in All Sectors (TBtu)

1.3 Energy Use Per Capita and Gross State Product

As discussed previously, North Carolina's population increased 26% and its GSP increased 32% from 2000 to 2016. However, the use of energy in the State has decreased by 1% as shown above in Figure 1-1. The ratio of the population, GSP, and energy use between 2000 and the year of interest is shown in Figure 1-9. The graph shows the relative increase in the population, GSP, and energy use based on 2000 levels so that the reader can easily see the growth of each over time. It indicates that even while the population and economy are growing, energy use has remained flat. North Carolina ranks 37th in the nation for total energy consumption per capita, which is in the bottom quarter.[24]

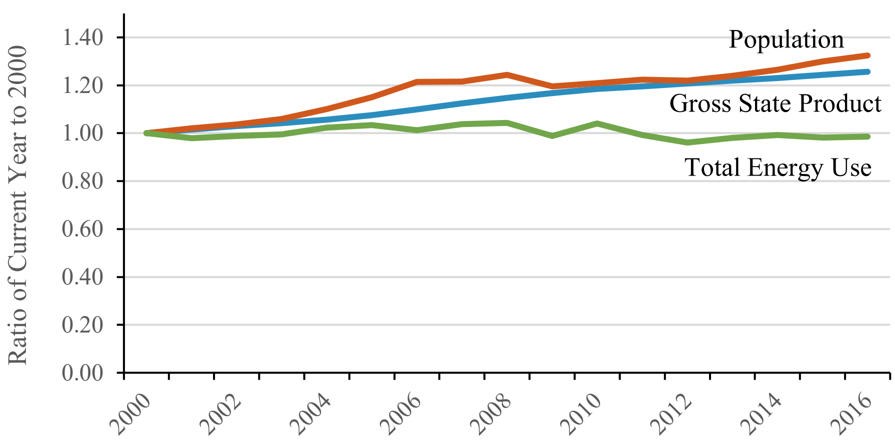
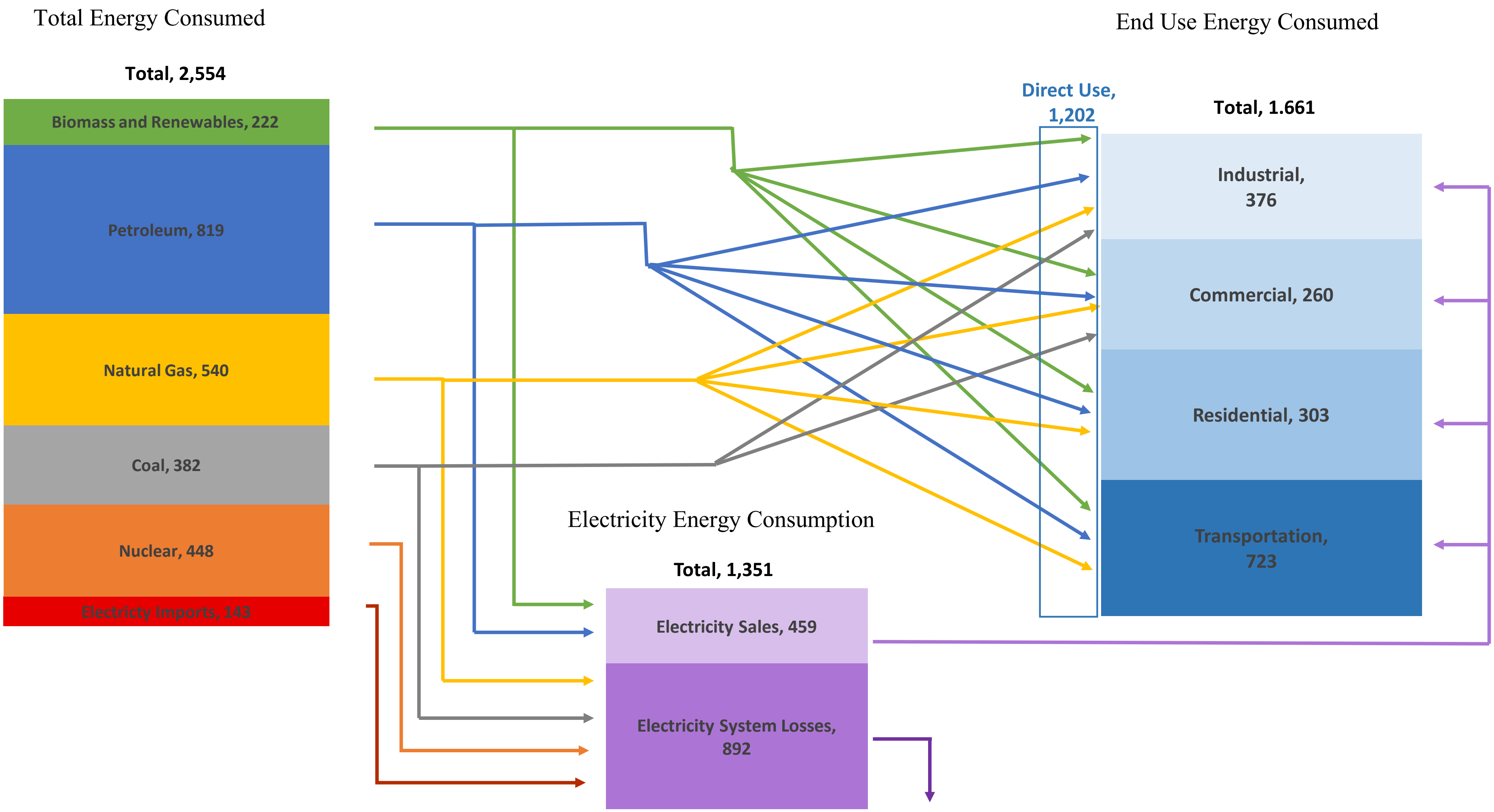


Figure 1-9: Relative Change in Energy Use, Gross State Product and Population

[24] US EIA, State Energy Consumption Estimates, 1960 through 2016, DOE/EIA-0214(2016), (June 2018), Table C13, Energy Consumption per Capita by End-Use Sector, Ranked by State, 2016.

1.4 North Carolina Energy Flow

Figure 1-10 presents the overall flow of energy in the State for 2016. The energy consumed by source type is presented in the left most column chart. The energy use for electricity generation, including the estimated system losses due to energy conversion, plant equipment, transmission, and distribution, are given in the middle column chart. The column chart on the right presents the end-use consumption for each economic sector. Electricity system losses (892 TBtu) represent 66% of the total energy used to generate electricity. The direct use energy also includes approximately 44 TBtu of energy that was consumed to produce goods such as asphalt, lubricants, and plastics.



Source: EIA State Energy Data System

Figure 1-10: North Carolina Energy Flow Diagram for 2016 (Trillion Btu)

1.5 Energy Use for Direct Use, Electricity, and Transportation

The next three sections break down the energy use in the State, based whether the energy is used for 1) on-site heating or to do work (direct use), 2) generation of electricity for sale to consumers, or 3) transportation of people and goods. Each of these categories has a distinct fingerprint regarding how each sector uses energy and its source of energy.

Figure 1-11 presents the use of energy in each category during 2016. Notice that direct use is the smallest category of energy use in the State. Second comes electricity, when system losses are removed from its total.[25] Transportation dominates the use of energy in the State, representing 40% of total energy use.

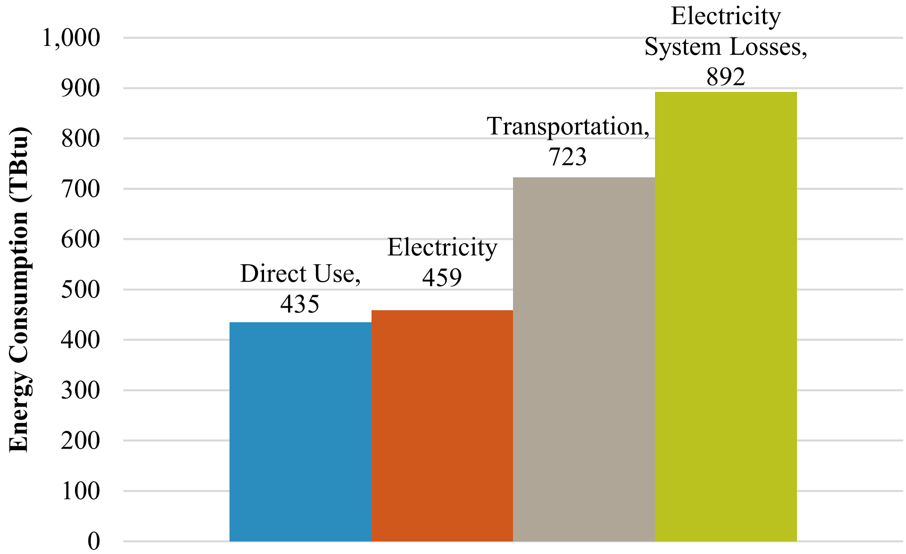


Figure 1-11: Energy Use for Electricity, Thermal and Transportation in 2016 (TBtu)

The total electricity system's energy loss represents the largest energy use at 892 TBtu in 2016. Approximately 90% of the system losses are due to energy conversion (from heat/energy to electricity) while the remaining 10% is due to use of plant equipment, transmission, and distribution. There are substantial energy losses when converting energy to heat or work for direct use at facilities and for transportation as well. The US EIA does not quantify these losses because there are many different factors affecting the estimation of this value.

1.5.1 Direct Use of Energy in Residential, Commercial and Industrial Sectors

Direct use energy refers to all energy consumed at facilities and residences for space heating, process heating, and to perform work. A small number of facilities and residences also generate electricity for use directly at the site, which is sometimes referred to as "behind the meter" generation. Figure 1-12 presents historical trends in direct use energy for the residential, commercial and industrial sectors in North Carolina since 2000. It shows a drastic decrease in use of energy in the industrial sector, a 27 % reduction from 2000 levels. However, the industrial sector still represents the largest energy user in the State due to

[25] The average annual energy loss due generation and transmission of electricity are 36% of the total energy consumed in the State.

its use of energy for both space and process heating and to generate electricity on-site. Commercial energy use increased by 21% over the same time as the economy shifts away from heavy industry and manufacturing. Residential energy use peaked in 2008 at 121 TBtu and decreased by 22% from 2000 to 2016, despite the growing population. Direct energy use has decreased by 18% from all three sectors combined.

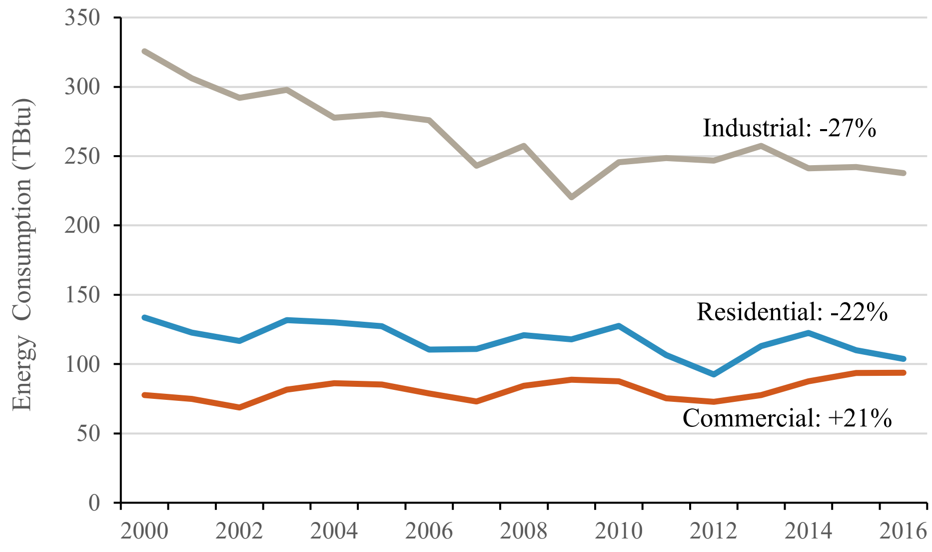


Figure 1-12: Direct Energy Use by Residential, Commercial, and Industrial Sectors

The historic trend in energy sources used directly on-site in the residential, commercial, and industrial sectors is given in Figure 1-12. Coal use has decreased by 66%, and petroleum use has decreased by 37% between 2000 and 2016. Natural gas use has increased by 6% due to its low price. On average each year, 94% of the other energy used for space and process heating and to generate electricity on site consists of wood. Its use fluctuates from year to year but overall has remained fairly constant, with an overall change of -5% between 2000 and 2016.

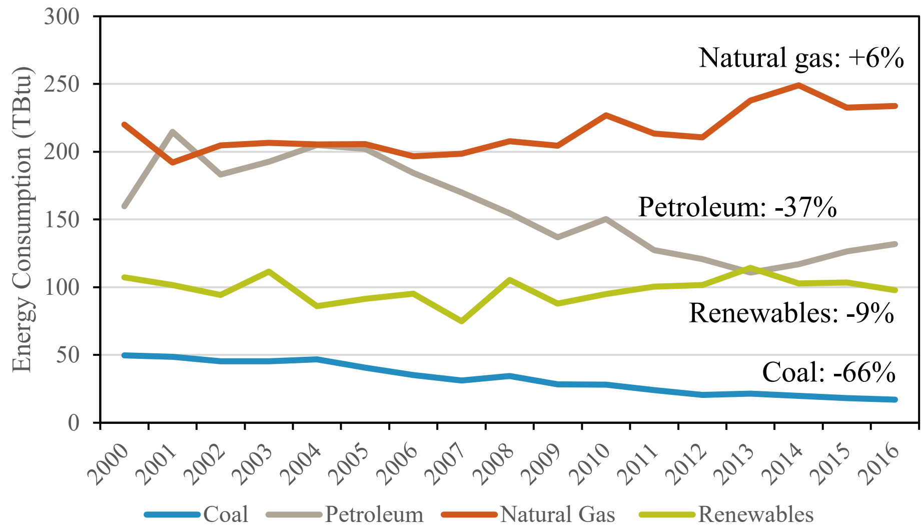


Figure 1-13: Trends in Energy Sources for Thermal and Direct Use Energy (TBtu)

As discussed above, use of other energy sources is dominated by wood used in the industrial and residential sectors. Figure 1-13 shows the change in the use of renewable sources over time. Hydropower in the industrial sector has dropped off considerably. Solar energy, primarily for electricity generation, has seen a large increase in both the residential and commercial sectors. Ethanol is seeing increased use in the industrial and commercial sectors. The figure also indicated a steady increase in the use of geothermal energy to heat homes (heat pumps).

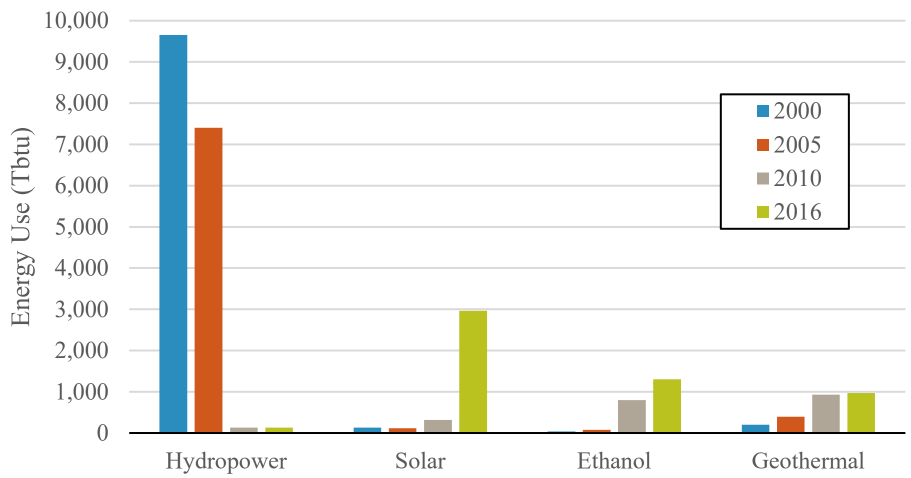


Figure 1-14: Renewable Sources used for Direct Use Energy from 2000 to 2016 (TBtu)

1.5.2 Transportation

As discussed earlier, Transportation is the largest energy use sector in North Carolina, approximately one-third of total energy use. This sector includes both "highway mobile" and "non-highway mobile" sources whose primary purpose is to transport people and/or goods. Highway mobile sources are transportation vehicles that operate on public roadways, while non-highway mobile sources are vehicles that perform transportation in off-road settings. Table 1-2 lists some of the vehicle types included in this sector.

Vehicles whose primary purpose is not transportation (e.g., construction equipment, farming vehicles, and warehouse equipment) are classified in the sector of their primary use. In this report, natural gas used in the operation of natural gas pipelines is included in the transportation sector.

Table 1-2: Vehicle and Equipment Types included in Transportation Sector

Highway Mobile	Off-Road Transportation
Passenger Cars	Airplanes
Passenger Trucks	Trains
Buses	Marine Vessels
Commercial Trucks	Recreational Vehicles
Motorcycles	Natural Gas Pipelines

The energy use data presented for transportation uses US EIA state-level fuel use data. This data set is based on fuel purchases and assumes that the fuel purchased in a state is also consumed in that state.

Figure 1-15 presents the historic energy use for transportation by fuel type from 2000 to 2016. Energy use for the Transportation sector steadily increased from 704 TBtu in 2000 to 758 TBtu in 2008. There was a decrease in energy used for transportation when the national economic downturn occurred in 2009 through 2012. However, for the last four years, transportation energy use has been relatively flat, with an annual average energy use of 720 TBtu, which is only a 2% increase from energy use in 2000.

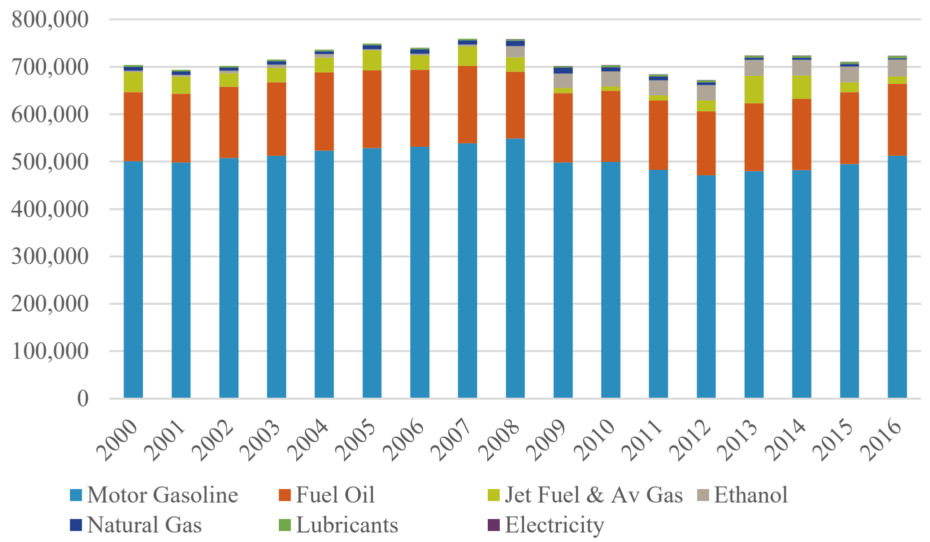
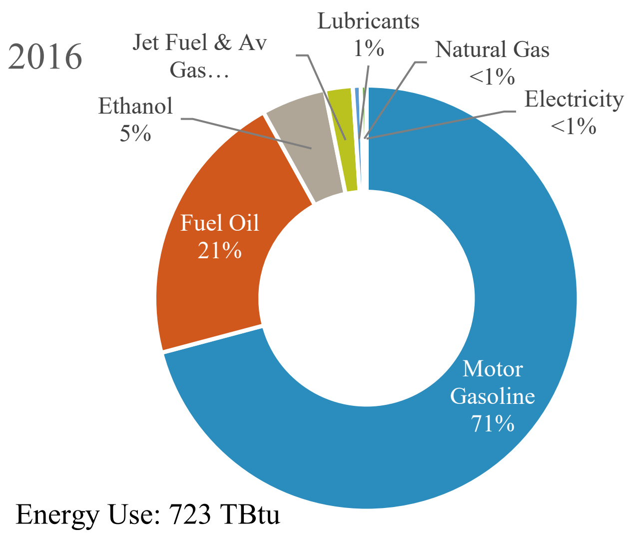


Figure 1-15: Historic Energy Use in the Transportation Sector by Fuel Type



Motor Gasoline is the primary fuel used for transportation, representing 71% of all energy as shown in Figure 1-16. Fuel oil, distillate and residual, is the second most used energy source at 21%. Ethanol, which is a biofuel mixed with motor gasoline, comprises 5% of fuel use in 2016. Jet fuel and aviation gas now represent less than 2% of North Carolina's energy use in the State. All other fuels represent a small amount of energy. Note the Charlotte train system is the primary user of electricity.

Figure 1-16: Energy Sources for Transportation in 2016

Highway mobile transportation can also be tracked as vehicle miles traveled (VMT), giving an alternate measure of the overall energy use in North Carolina. North Carolina's estimated VMT is presented in Figure 1-17.[26] The figure shows an increase in VMT of 30% from 2000 to 2016. As shown in the figure, the majority of the miles are driven by light duty vehicles, approximately 90% in any given year. In 2016, vehicles driving on North Carolina roads traveled 116.75 billion miles, which is more than 244,300 trips to the moon and back. The national estimate of vehicle miles traveled in 2016 is 3.22 trillion miles making North Carolina's share 3.6% of the total VMT, which is slightly higher than our share of the US population, 3.2%.

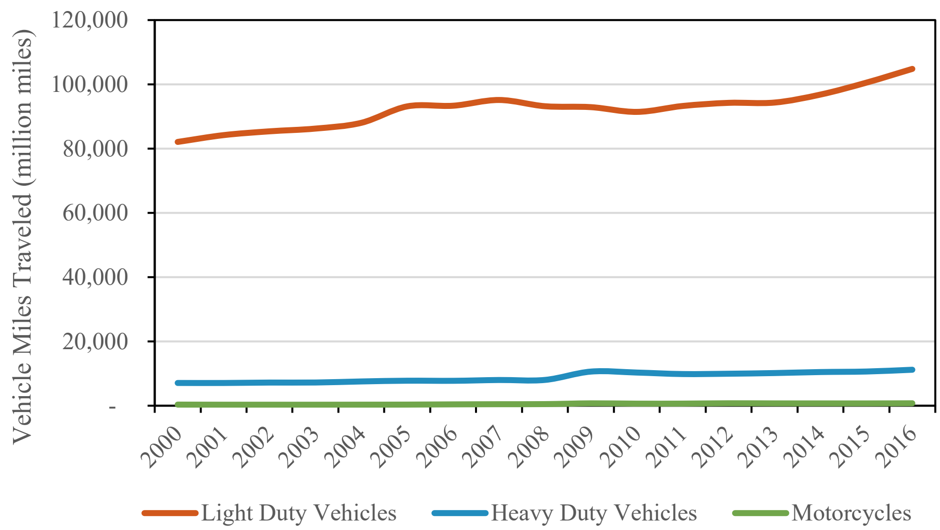


Figure 1-17: Estimated Vehicle Miles Traveled by Highway Mobile Sources

[26] Table VM-2, Highway Statistics 2017, Federal Highway Administration, accessed at https://www.fhwa.dot.gov/policyinformation/statistics.cfm.

Table 1-3 shows the growth in VMT and the annual percent increase over time. Between years 2006 and 2012, there was an annual average increase in VMT of only a half percent per year. Starting in 2013, however, the annual increase in VMT rose to an average of 3.5% reflecting the growth in the economy in recent years. This resulted in an 11% increase in VMT between 2013 and 2016 alone.

Table 1-3: Increase in Total Vehicle Miles Traveled and Percent Annual Increase (million miles)

Type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total VMT	89,504	91,580	92,894	93,759	95,903	101,268	101,515	103,598	101,712	104,260	102,385	103,772	104,950	105,213	108,012	111,879	116,749
Overall Increase		2%	4%	5%	7%	13%	13%	16%	14%	16%	14%	16%	17%	18%	21%	25%	30%
Annual Increase		2%	1%	1%	2%	6%	0.2%	2%	-2%	3%	-2%	1%	1%	0.3%	2.7%	3.6%	4.4%

This increase in VMT contrasts with the total energy use in the transportation sector discussed above, which only increased by 2%. Figure 1-18 presents the relative increase in VMT and motor gasoline use from 2000 to 2016 as a ratio of the levels in 2000 to the year of interest. This figure indicates that while VMT rose 30%, motor gasoline use, including use of ethanol, only rose by 10%. This decoupling of VMT and fuel use occurred largely because of improvements in the fuel efficiency standards of highway vehicles under the US EPA and the US Department of Transportation's (US DOT) Corporate Average Fuel Economy (CAFE) and Light-Duty Vehicle Greenhouse Gas Emissions Standards issued in 2012.[27]

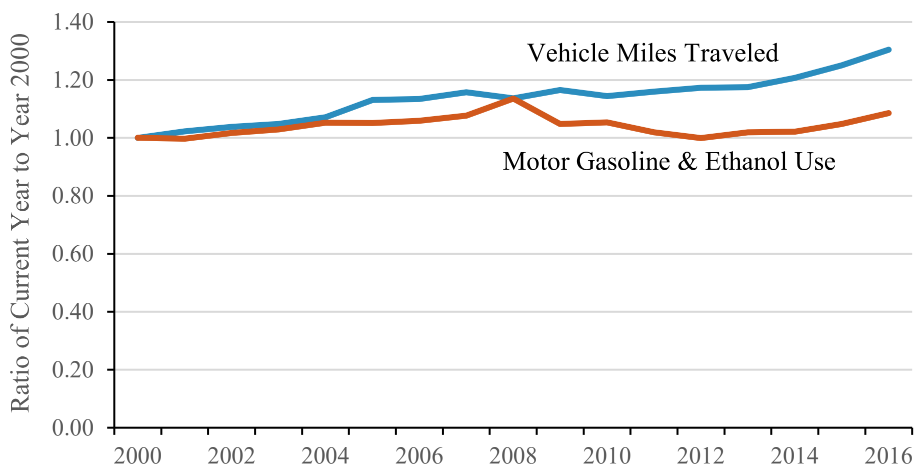


Figure 1-18: Relative Change in Vehicle Miles Traveled and Transportation Fuel Use

The fuel efficiency standards discussed above are currently being reviewed by the Trump Administration. The US EPA and US DOT's National Highway Traffic Safety Administration (NHTSA) released a notice of proposed rulemaking, referred to as the Safer Affordable Fuel-Efficient Vehicles Rule (SAFE Vehicles Rule) for Model Years 2021-2026 Passenger Cars and Light Trucks in August of 2018.[28] This rulemaking

[27] US EPA Regulation for Emission from Vehicles and Engines. *Regulations for Greenhouse Gas (GHG) Emissions.* https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-ghg-emissions.

[28] Federal Register Volume 83, No. 165 pp 42986-43500, August 24, 2018, accessed at https://www.epa.gov/regulations-emissions-vehicles-and-engines/safer-affordable-fuel-efficient-safe-vehicles-proposed#rule-summary

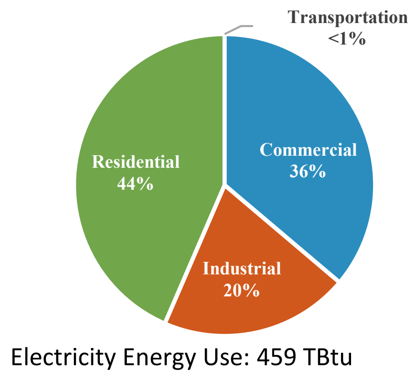
would freeze the standards at 2020 levels for model years 2021-2026. For the rulemaking, the US EPA projected the overall industry average fuel efficiency at 37.0 miles per gallon (mpg), which is a decrease from the current industry average of 46.7 mpg for vehicles manufactured in 2017 through 2025. The revised standard would increase daily fuel consumption by 2% to 3%, as estimated by the US EPA.[29] The US EPA also estimated the increase in GHG emissions over the lifetime of the vehicles purchased in those years for the entire US as 809 MMT. Lastly, the US EPA estimated that the rule would increase domestic petroleum consumption by 0.5 million barrels per day by 2030 compared to the previous rule. The impacts to North Carolina were not readily available.

On May 1, 2018, California and 16 other states filed a petition for review of the proposed rule in the U.S. Circuit Court of Appeals for the District of Columbia.[30] Other lawsuits regarding the rule have also been filed since that time.

1.5.3 Electricity Use

This section presents a high-level summary of electricity use by economic sector. It presents the data as heat input in TBtu rather than generation in megawatt-hour (MWh) to enable comparison with thermal energy consumed. The section Deeper Dive: North Carolina's Electric Power Landscape presents a detailed look at North Carolina's electricity sector.

This section does not include the energy losses due to electricity transmission (892 TBtu) presented in Figure 1-11. On average, these losses represent 66% of the energy used to generate electricity in the State each year (1,351 TBtu) and 35% of the total energy used (2,554 TBtu). This approach also allows for a better comparison between thermal and electricity use in the State.



On average, on-site electricity use represents only 16% to 18% of the total energy used in the State in a given year. Of that amount, the residential sector used the largest amount of electricity in 2016, 44% as shown in Figure 1-19. The commercial sector used 36%, and the industrial sector used only 20% of the total electricity. Less than 1% of the electricity use was for transportation, primarily the train system in Charlotte, North Carolina.[31]

Figure 1-19: Electricity Use by Sector in 2016

Figure 1-20 shows the historical use of electricity for each sector. Total electricity use on an energy basis was 459 TBtu in 2016. This represents a 12% increase from the use in 2000. Industrial use of electricity

[29] MYs 2021-2026 CAFE Proposal - by the Numbers, EPA-420-F-18-901, U.S. EPA, August 2, 2018, accessed at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100V26H.pdf.
[30] State of California, ET AL. (2018). "On Petition for Review of An Action of the United States Environmental Protection Agency". https://www.epa.gov/sites/production/files/2018-05/documents/states_18-1114_pfr_05012018.pdf.
[31] City Lynx Rail Service, City of Charlotte, https://charlottenc.gov/cats/rail/Pages/default.aspx.

has decreased to below 100 TBtu per year, a 20% decrease. Both commercial and residential electricity use on a Btu basis has increased since the year 2000 to approximately 170 TBtu and 200 Btu, respectively. This represents an increase of 24% for the commercial sector and a 26% for the residential sector, which mirrors the growth in population.

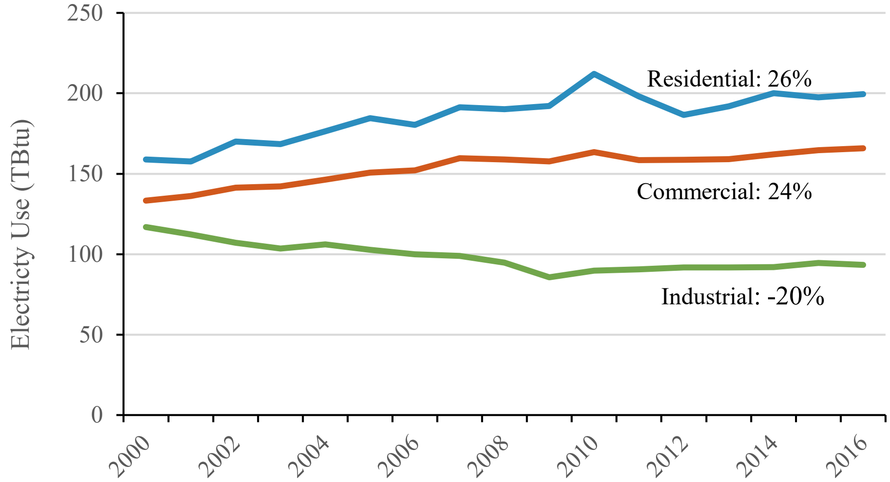


Figure 1-20: Electricity Use for each End-Use Sector (TBtu)

2 Deeper Dive: North Carolina's Electric Power Landscape

Electric generation in North Carolina is evolving to reduce air pollution emissions, employ greater efficiency, and include more renewable and distributed energy resources. This evolution includes managing the existing nuclear fleet, continuing to replace older, more polluting, coal, natural gas, and oil units with cheaper and more efficient natural gas generation, and adding new utility-scale investments in renewable energy sources. In North Carolina, these changes have occurred while electricity rates held steady and the State's growing population and economy grew.

This section provides an overview of energy in North Carolina with a focus on consumption trends. This section can be read in conjunction with other documents produced by the State for a more comprehensive understanding of energy in North Carolina. These documents include: 2018 Energy Policy Council Biennial Report, North Carolina Greenhouse Gas Inventory (1990-2030), and 2018 North Carolina Utilities Commission Report.

The majority of the data presented in this section relies on a database of historical energy use from the US EIA SEDS [32]. 2018 data from US EIA has not been finalized and was not used in this report. In addition, 2017 data was used over 2016 data due to the rapid deployment of renewables.

2.1 Electricity Suppliers

In North Carolina, electricity is primarily distributed to consumers by three large investor-owned utilities (IOUs): Duke Energy Carolinas (DEC), Duke Energy Progress (DEP), and Dominion. While DEC and DEP merged in 2012, they still operate as separate companies. The North Carolina Utilities Commission (NCUC) regulates these IOUs and requires them to file integrated resource plans (IRPs) that project future electricity demand and describe long-term infrastructure plans. The NCUC also regulates two small university-owned electric utility systems, New River Light and Power (Appalachian State) and Western Carolina University. Electric membership cooperatives (EMCs) or municipal utilities distribute 25% of the state's electricity; they are not regulated by the NCUC.

[32] EIA Detailed State Data, 1990 – 2017. (EIA-861, EIA-906, EIA-920, and EIA-923), accessed at https://www.eia.gov/electricity/data/state/.

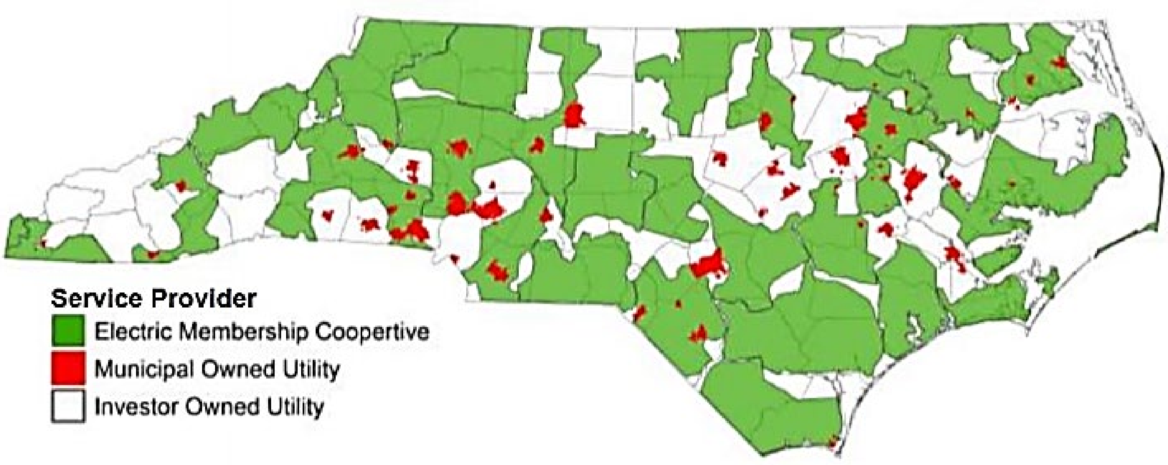


Figure 2-1: Service Provider Territories for IOUs, EMCs, and Municipalities

Figure 2-1 presents the service provider territories operating in the State.[33] Thirty-one electric membership cooperatives (EMCs) provide wholesale power to 1,450,000 residents that live in 93 of the 100 North Carolina counties. The EMCs are independent, non-profit corporations run by their boards. Five of these cooperatives are headquartered out of the state. Twenty-six of the EMCs are members of the North Carolina EMC (NCEMC), a generation and transmission services cooperative. EMC providers generally have power purchase agreements with the IOUs.

There are also 72 municipally-owned electric utilities. Fifty-one of the municipalities are participants in either North Carolina Eastern Municipal Power Agency (NCEMPA), or North Carolina Municipal Power Agency Number 1 (NCMPA1). The remaining municipally owned electric utilities generate their own electric power or purchase electric power from wholesale electric suppliers. All 72 are members of ElectriCities of North Carolina, Inc., a non-profit organization that provides many of the technical, administrative, and management services required by its members in North Carolina, South Carolina, and Virginia.

See pages 44-50 of the 2018 NC Utilities Commission Report for names and locations of the electricity suppliers in North Carolina.[34]

2.2 Electricity Generators

Electricity is either generated and distributed to customers directly or sold at wholesale to EMCs and municipal-owned suppliers. Some electricity is also generated for on-site use or generated as part of

---

[33] "Residential Electricity Rates and Pricing in North Carolina 2014", David Tucker and Jennifer Weiss, Environmental Finance Center, School of Government, University of North Carolina at Chapel Hill, July 2014, accessed at https://efc.sog.unc.edu/sites/default/files/Residential%20Electricity%20Rates%20and%20Pricing%20in%20North%20Carolina%202014_FINAL.pdf.

[34] 2018 N.C. Utilities Commission Report - Volume XLIX. Major Activities through December 2018 with Statistical and Analytical Data through 2017, North Carolina Utilities Commission, accessed at https://www.ncuc.net/statbook/2018report.pdf.

combined heat and power (CHP) systems.[35] Traditionally, only large industrial and institutional sites, such as paper mills and universities, produced electricity for on-site use using CHP systems. However, with the advent of small (less than 1 MW) renewable power systems, many commercial, institutional, and residential sites are generating a portion of their power on-site for their own use or to supply the grid. These small on-site generators are referred to as “distributed energy resources” (DERs) (See Table 1 for DER generation).

Figure 2-2 shows the electricity generation by producer type in 2005 and 2017.[36] The IOUs currently produce 89% of the electricity in North Carolina. Most of the large fossil fuel facilities are owned and operated by DEC and DEP. EMCs and municipal utilities self-generate just 1% in-state and purchase the rest from IOUs in North Carolina and neighboring Southern states. In addition, several western EMCs have contracts with Tennessee Valley Authority (TVA), a federally owned utility corporation. Several North Carolina municipalities and universities have also begun to diversify their electricity sourcing, entering into contracts with independent power producers (IPPs).[37] This demand has grown the market share for IPPs in North Carolina, from only 1% in 2005 to 9% of North Carolina’s electricity in 2017.[38] That share is projected to grow to 11% once a new 500 MW natural gas combined cycle plant owned by an IPP in Rockingham County comes online.

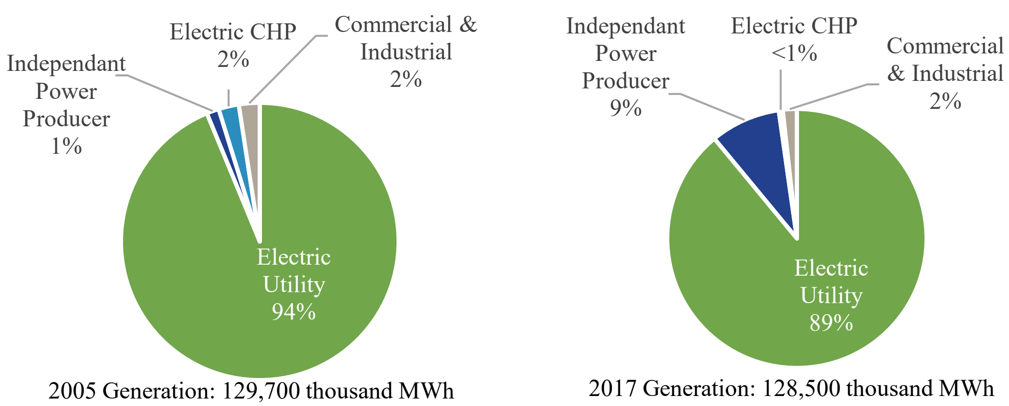


Figure 2-2: Percentage of Electricity Generation by Producer Type

Meanwhile, electricity generation by CHP plants is decreasing. Many of these systems are older, use coal for fuel, and are less economical. On-site industrial generation using coal has decreased significantly due

[35] Combined heat and power, also known as co-generation, is an energy efficient system that generates electricity and utilizes the waste heat to provide useful thermal energy, such as steam or hot water for processes or space heating.
[36] Ownership is shown as generation rather than capacity since many of the independent power producers operate solar, wind, natural gas combined cycle, and combustion turbines which have unique generation profiles. Presenting the data by capacity does not accurately reflect their influence on the power system.
[37] See, e.g., Joe Dexter, NTE Official: Reidsville Energy Center Construction Slated for October; Means 300 Construction and 15-plus Permanent Jobs, Rockingham Now (May 9, 2019)
[38] U.S. EIA, North Carolina Electricity Profile 2017, Table 1 Summary Statistics (indicating IPP and Combined Heat and Power projects generated 14,106,129 MWh of electricity, or 10.9% of total generation).

to both changes in environmental regulations and economics. This decrease has been offset by new commercial on-site generation using renewable sources.

2.3 Capacity by Resource Type

Capacity is the infrastructure needed to produce electricity measured in megawatts (MW). The historical electricity generation capacity for each source type is shown in Figure 2-3.[39] Note these data do not include industrial and commercial electricity capacity (See Figure 2-4). Overall, the total electricity generating capacity has grown by over 9,000 MW since 2000, an increase of almost 30%. As depicted in Figure 2-3, nuclear energy has maintained its same capacity except for small uprates due to system improvements. Coal steam boiler capacity has dropped from 13,000 MW to 10,500 MW from 2000 to 2017. This is coupled with a tripling of natural gas capacity, primarily natural gas combined cycle (NGCC) capacity, from 3,300 MW to 10,700 MW.[40] Lastly, renewable electricity capacity, including hydroelectric power and Qualifying Facility projects constructed in response to the Public Utility Regulatory Policies Act of 1978 (PURPA), expanded beginning in 2008 with the passage of the state Renewable Energy and Energy Efficiency Portfolio Standard (REPS).[41] Renewable capacity in the electricity generation sector represented 5,900 MW of installed capacity of 2017. (See North Carolina Electricity Policy Landscape for more information on PURPA and REPS.) Note that this graphic and this entire chapter considers biomass resources as part of "renewable energy" due to its inclusion in the REPS.

[39] EIA Detailed State Data, 1990-2017 Existing Nameplate and Net Summer Capacity by Energy Source, Producer Type and State (EIA-860), accessed at https://www.eia.gov/electricity/data/state/.
[40] See Natural Gas Resource Section for information on NGCC power plants.
[41] Session Law 2007-397, "North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard (REPS), August 20, 2007, http://www.ncuc.commerce.state.nc.us/reps/reps.htm.

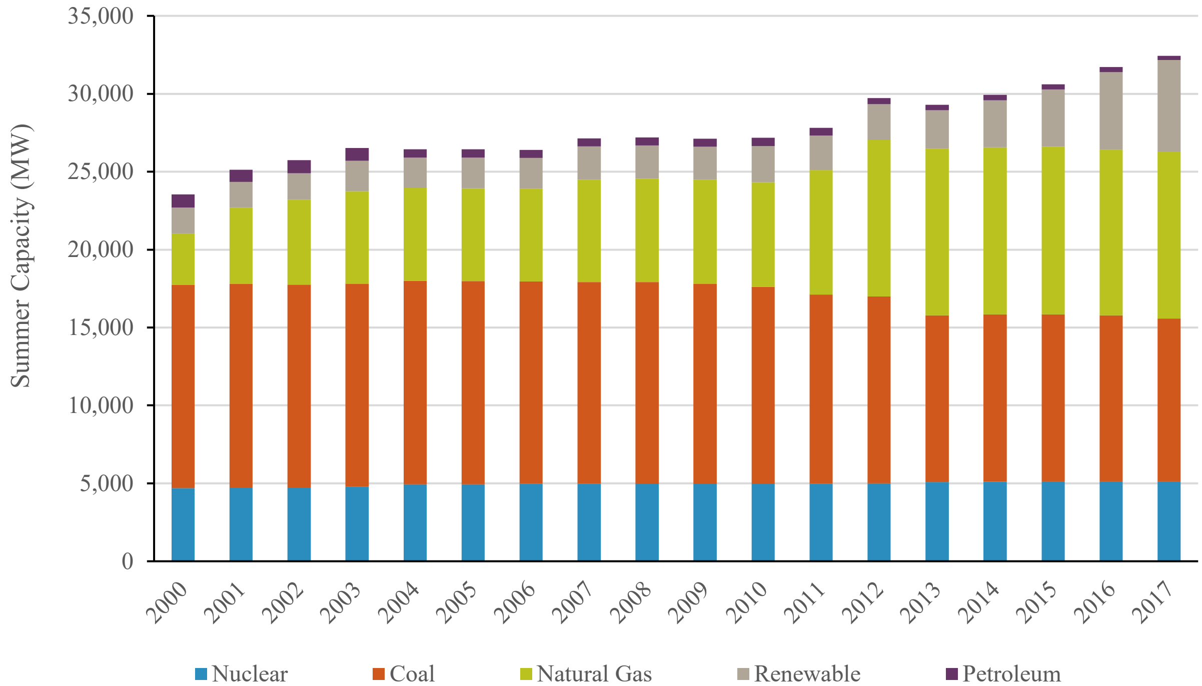


Figure 2-3: Historical Summer Capacity Owned by Electricity Generators (MW)

Figure 2-4 presents the electricity generation capacity for industrial and commercial electricity generators.[42] The graph indicates that the use of coal to generate electricity in the industrial sector has fallen even more steeply in this sector, decreasing by over 70% since 2000. This reduction is due partly to the Environmental Protection Agency's "Boiler MACT Rule" finalized in 2015, which required fossil fuel and wood steam boilers and process heaters to install control systems to reduce emissions of hazardous air pollutants.[43] A number of fossil fuel boilers were retired; fewer retirements of biomass boilers occurred, since wood is a free source of fuel for these sites. Biomass generation, primarily at pulp and paper plants, still makes up 40% of available industrial and commercial capacity. Natural gas and petroleum units have increased only slightly since 2000. Historically and through the early 2000s, at renewable energy used to generate electricity for industrial and commercial firms was dominated by hydropower. Today, the renewable energy capacity in these sectors is less than 20% what it was in 2000 and is made up primarily of solar.

[42] EIA Detailed State Data, 1990-2017 Existing Nameplate and Net Summer Capacity by Energy Source, Producer Type and State (EIA-860), https://www.eia.gov/electricity/data/state/https://www.eia.gov/electricity/data/state/

[43] Federal Register, Vol. 80, No. 224, pp Fed. Reg. 72790 – 72837, November(Nov. 20, 2015,), accessed at https://www.epa.gov/stationary-sources-air-pollution/industrial-commercial-and-institutional-boilers-and-process-heaters.

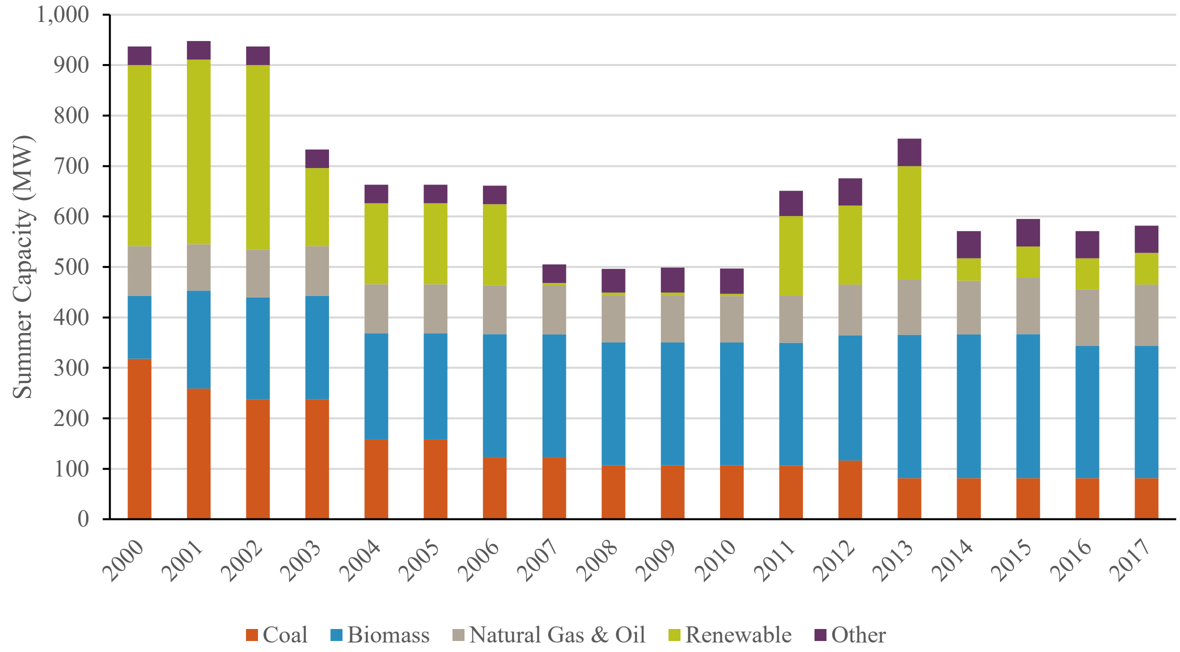


Figure 2-4: Historical Summer Capacity Owned by Industrial and Commercial Generators (MW)

A breakout of the growth renewable energy generation is presented below in Figure 2-5 for all generator types.[44] As with the commercial and industrial sectors, historically hydroelectric power provided the majority of renewable electricity capacity, averaging around 2,000 MW. That capacity has persisted in the electricity generation sector, sustaining a relatively constant one-third share of overall renewables capacity from 2000 to 2017. Biomass, primarily wood and landfill gas, represents a very small fraction of total renewables, only 430 MW or 7% of all renewables capacity in 2017. This resource did not grow as expected under the REPS. By contrast, solar photovoltaic (PV), began to grow substantially in 2012, due to PURPA implementation, REPS, state tax credit, and large decreases in the cost of solar panels. U.S. EIA in 2017 reported close to 480 solar projects with a total of 3,300 MW of solar PV in North Carolina.[45] This represents more than half of all installed renewables capacity in the state, more than 10% of installed electricity capacity, and has made North Carolina #2 in the nation for installed solar capacity.

One 208 MW wind facility began operating in North Carolina in 2016. An 18-month moratorium on new wind energy projects passed in 2017 prevented further expansion.[46] This moratorium has expired, but a new moratorium was proposed in 2019 under Senate Bill 377 (SB-377).[47] As of June 25, 2019, the wind moratorium language has been removed from SB-377.

[44] Ibid, same footnote 11.
[45] Solar Energy Industries Association, North Carolina Solar (last visited July 20, 2019); U.S. EIA, 2017 North Carolina Electricity Data, Table 14, Capacity Factors.
[46] House Bill 589, Session Law 2017-192, North Carolina General Assembly, 2017, https://www.ncleg.net/gascripts/BillLookUp/BillLookUp.pl?Session=2017&BillID=h589&submitButton=Go.
[47] Senate Bill 377 Military Base Protection Act, accessed at https://www.ncleg.gov/BillLookUp/2019/s377.

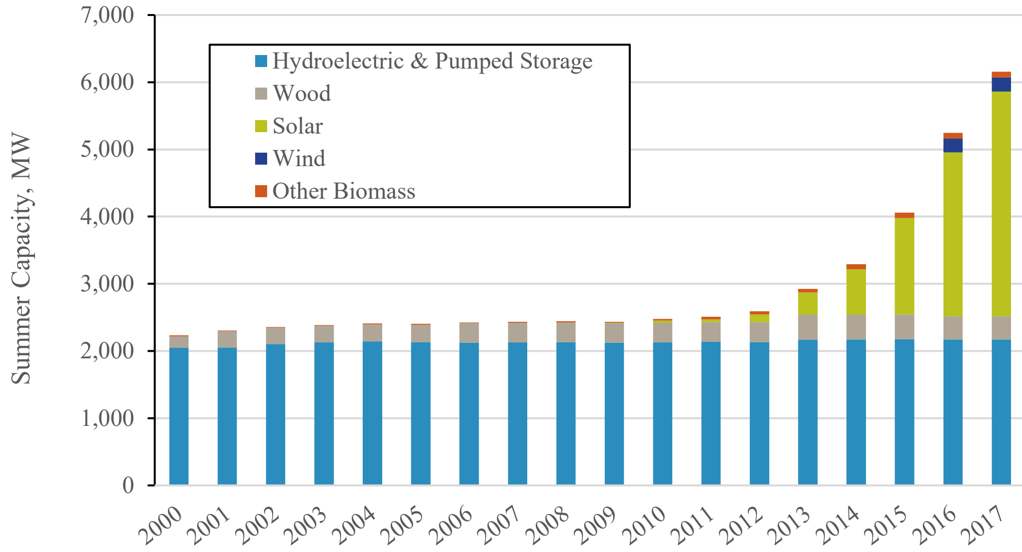


Figure 2-5: Historical Summer Capacity of Renewable Sources (MW)

2.4 Generation

Generation is the actual electricity being produced, measured in kilowatt-hours (kWh) or megawatt-hours (MWh). Generating facilities do not run at 100% capacity, every hour of every day. They may be taken offline for maintenance or repairs or experience an unplanned outage. In addition, some units are not capable of generating all of the time; for instance, solar PV requires sunlight to generate electricity. Finally, some generating units are called on to provide baseload energy, while others remain in reserve in case demand increases or a baseload is unavailable. Figure 6 presents the historical net generation from all producer types, including commercial, industrial, and combined heat and power plants.[48, 49] (Net generation subtracts the electricity that the power plant uses on-site.) Since 2000, North Carolina experienced two peaks in generation: 130,000 thousand MWh in 2007, and 131,000 thousand MWh in 2016. In 2017, North Carolina ranked 7th in the nation for the amount of electricity generated, at 128,500 thousand MWh.[50] Of that generation, 2% was for direct use by industrial or commercial sites.

Figure 2-6 shows nuclear as the primary baseload source of electricity. It also presents the dramatic transition from coal to natural gas combined cycle generation starting in 2010. Since 2010, coal capacity decreased by 20% percent, but coal generation decreased over 50% percent. This large decrease in generation relative to the decrease in capacity demonstrates that in addition to coal retirements, remaining coal units are no longer operated as baseload plants but as intermediate and peaking plants. (See Coal Resource Section). Natural gas generation has increased to 4.5 times the level in 2010 (See Natural Gas Resource Section). There is a small increase in nuclear generation overtime due to the nuclear uprates

---

48 EIA Detailed State Data, 1990 – 2017 Net Generation by State by Type of Producer by Energy Source (EIA-906, EIA-920, and EIA-923), accessed at https://www.eia.gov/electricity/data/state/.

49 Note that the generation data for 2018 is not included since it is not expected to be finalized until November of 2019 and the data for renewable sources in the preliminary file was estimated.

50 North Carolina Electricity Profile 2017, U.S. EIA, accessed at https://www.eia.gov/electricity/state/northcarolina/

discussed previously. Generation from other fuels, such as petroleum and tire derived fuel (TDF), remains at a non-significant level.

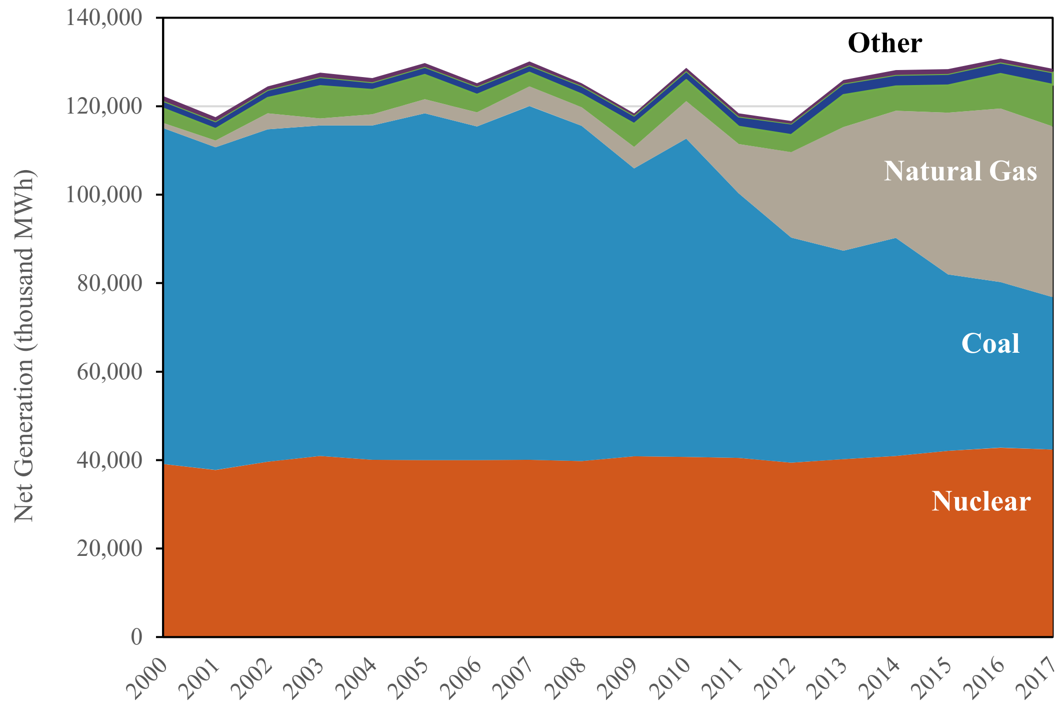


Figure 2-6: Net Generation for All Sources, 2000 to 2017 (thousand MWh)

Figure 2-7 breaks out the annual generation for renewable resources.[51] This figure shows how solar and wind generation have increased since 2008 when the REPS legislation became effective. By 2017, solar has grown to 4% of total generation while wind represents approximately one-half percent. Biomass has increased only slightly under the REPS, from 1,800 thousand MWh in 2000 to 2,800 thousand MWh in 2017, despite a carve-out for energy produced from swine and poultry waste. Hydroelectric power has remained fairly constant but fluctuates slightly each year, between 2% and 5% of total generation.

North Carolina's total generation from renewables in 2017 was 12,215 thousand MWh. The 2017 REPS requirement for IOUs is that 6% of retail electricity sales must be from renewable sources, or about 7,242 thousand MWh out of 2017 retail sales by DEC and DEP of 120,705 thousand MWh.[52] This indicates that North Carolina is exceeding its REPS target with in-state renewables generation. In 2018, the REPS target increased to 10% of IOU retail sales. North Carolina is very close to meeting that target as well, using 2017 values for retail sales and renewables generation.

[51] Ibid.
[52] Annual Electric Power Industry Report, Form EIA-861 detailed data files for 2017, US Energy Information Administration, accessed at https://www.eia.gov/electricity/data/eia861/.

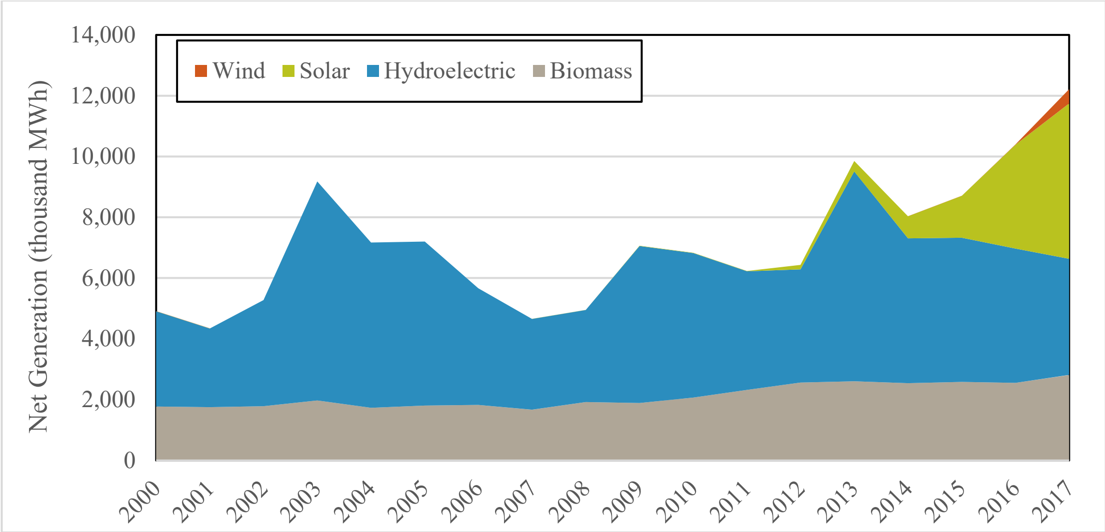


Figure 2-7: Annual Net Generation by Renewable Sources, 2000 to 2017 (thousand MWh)

Renewable generation is an intermittent source, due to seasonal and daily patterns that govern its availability and productivity for generation. Figure 2-8 presents the seasonal generation in MWh for utility-scale solar and wind resources providing power to the grid in 2017.[53, 54] The graph shows the seasonal change in the capacity factor for wind generation, with the highest in spring at 35% and the lowest in summer at 19%, while fall and winter have a 26% capacity factor. It is difficult to draw a similar conclusion for solar since multiple units came online during 2017. However, the graph does illustrate that there is an increase in generation during the summer months when the sun is out longer and at a higher angle in the sky. Generation decreased by almost 40% between the peak in July and December of 2017.

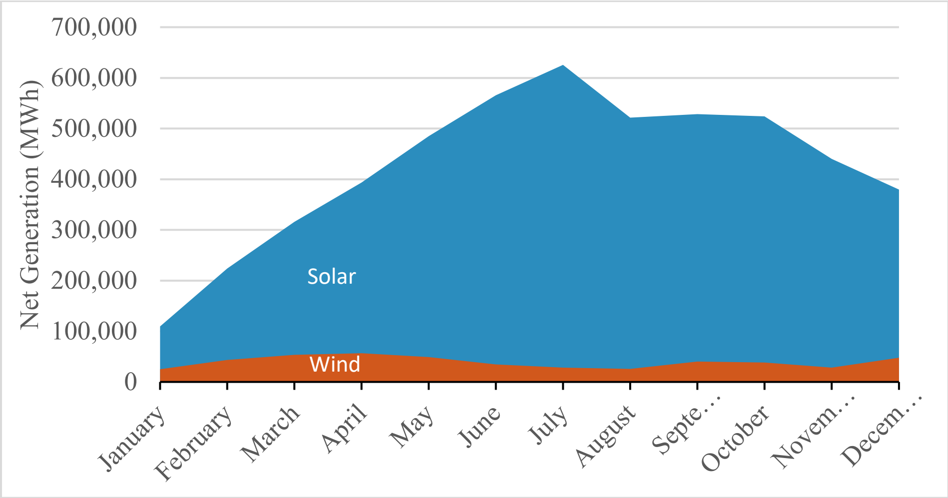


Figure 2-8: Monthly Net Generation for Solar and Wind in 2017 (MWh)

[53] EIA Form 923 Monthly Generation and Fuel Consumption Time Series File, 2017 Final, accessed at https://www.eia.gov/electricity/data/eia923/.

[54] Note that 2017 was used for this analysis since 2018 net generation data from U.S. EIA is not final until November of this year and generation for renewables was estimated for the early release version of this data set.

In addition, a growing amount of renewable energy generation is occurring "behind the meter" at commercial and industrial facilities and residences. These systems are not included in the estimates above. Table 2-1 presents the historic electricity generation in thousand MWh used directly at the source site.[55] Total DER generation (307 thousand MWh) represented only 0.3% of the total generation in 2016 (130,125 thousand MWh).

Table 2-1: Electricity Generation from Distributed Energy Resources (thousand MWh)

Source	Sector	2000	2002	2004	2006	2008	2010	2012	2014	2016
Hydropower	Commercial	10	8	17	12	8	12	11	14	14
	Industrial	936	1062	688	494	2	2	375	0	0
	Total	**946**	**1071**	**705**	**506**	**10**	**13**	**386**	**14**	**14**
Solar	Commercial	0	0	0	0	4	6	38	139	238
	Industrial	0	0	0	0	0	0	0	0	4
	Residential	0	0	0	0	1	3	3	11	51
	Total	**0**	**0**	**0**	**0**	**5**	**9**	**41**	**150**	**293**

2.5 Electricity Imports

North Carolina customers consume more electricity than electricity providers generate in the State. In addition, as noted above, some EMCs and municipal utilities own generation or have bilateral contracts with electricity suppliers in other states. Therefore, North Carolina power providers import electricity from neighboring states via the interconnected electricity transmission system or grid.

Table 2-2 presents North Carolina's electricity imports and the percent of retail sales that imports represent.[56] This data includes estimated losses for transmission of the electricity from out of state. The highest level of imports, 18%, occurred in 2011 and 2012 when North Carolina retired several coal plants and replaced them with NGCC plants. On average, North Carolina is importing 12% of the electricity it consumes. DEC and DEP have a Joint Dispatch Agreement for North Carolina and South Carolina, enabling them to meet increased demand over a day or season with the least expensive incremental generation from either service territory. DEC/DEP may also meet demand with imports from neighboring balancing authorities, including Southern Company affiliates, TVA, and the Pennsylvania-Jersey-Maryland regional transmission organization (PJM) wholesale energy market.

[55] North Carolina State Energy Data System (SEDS): 1960-2016 (complete), U.S. Energy Information Administration, released June 29, 2018, accessed at https://www.eia.gov/state/seds/seds-data-complete.php?sid=NC#Consumption.
[56] Ibid.

Table 2-2: Imported Electricity in MWh and as Percent of Retail Sales

Year	Sales (thousand MWh)	Imports (thousand MWh)	Percent of Retail Sales	Year	Sales (thousand MWh)	Imports (thousand MWh)	Percent of Retail Sales
2000	119,855	9,823	8%	2009	127,658	20,738	16%
2001	119,027	12,561	11%	2010	136,415	19,743	14%
2002	122,686	11,347	9%	2011	131,085	23,879	18%
2003	121,335	5,791	5%	2012	128,085	22,632	18%
2004	125,657	12,900	10%	2013	129,780	15,113	12%
2005	128,335	10,967	9%	2014	133,133	15,948	12%
2006	126,699	13,041	10%	2015	133,848	16,479	12%
2007	131,881	14,630	11%	2016	134,404	14216	11%
2008	130,069	17,715	14%				
Average Annual Electricity Imports							**12%**

2.6 Fossil Fuel Use

Tables 2-3 and Table 2-4 present the historical fossil fuel use in physical quantities and as heat input to make the values comparable.[57] Fossil fuel combustion for electricity generation peaked in the 2005 to 2007 timeframe. Since that time, fossil fuel combustion for electricity has steadily declined on a heat input basis due to the decreased use of coal steam power plants and increased use of more efficient NGCC plants. Since 2005, total fossil fuel heat input decreased by 17%. Most of this decrease was in coal, which had a 60% reduction in use since 2005. Natural gas has replaced the use of coal as an electricity fuel and in 2018 its use was 12 times higher than in 2005.

***Table 2-3:** Fossil Fuel Consumption for Electricity Generation*

Fossil Fuel	Physical Units	2005	2010	2015	2018
Coal	short tons	31,184,176	29,341,626	15,634,201	12,550,193
Natural Gas	million cubic ft.	27,108,494	73,375,968	270,334,143	335,023,514
Petroleum	barrels	792,159	566,283	801,205	976,816

***Table 2-4:** Fossil Fuel Heat Input for Electricity Generation (MMBtu)*

Fuel Resource	2005	2010	2015	2018
Coal	768,212	717,971	386,523	311,088
Natural Gas	27,482	73,880	279,750	344,648
Petroleum	4,749	3,305	4,646	5,668
Total	**802,448**	**797,166**	**672,934**	**663,422**

[57] Ibid. see footnote 1.

2.7 Generation During Peak Demand

Peak demand refers to the hours in the year during when demand for electricity is the highest. Utilities are required to have enough capacity to meet peak demand without interruption of service, plus a reserve margin to hedge against unplanned generation outages or other unforeseen circumstances.[58] To meet peak demand, the utility has several options: increase generation, purchase power from another source, lower demand, or curtail customer usage.

Historically, North Carolina's peak demand occurred in the afternoon hours of the summer months, when electricity demand for cooling was high. In recent years, the winter peak demand during the morning hours of January, has been higher than the summer peak hours.[59]

Figure 2-9 shows the generation by resource type for peak and shoulder months during 2010. At that time coal accounted for roughly 57% of the generation across all seasons, reflecting the system's reliance on coal as a baseload source of electricity. Nuclear, another baseload source, provided roughly 32% across all seasons. Natural gas and oil turbines provided peaking power for July.

Figure 2-10 indicates that by 2017, coal dropped to about 30% of total generation in all seasons, except July where it is used more (37% of total generation) to support summer peak demand. NGCC generation replaced coal as a baseload resource, growing from single digits of share of generation to 23-29% across both peak demand and shoulder seasons. Nuclear still provides baseload generation in all seasons. In 2017, natural gas and oil turbines were utilized about 2% to 3% in all three seasons, not ramping up during summer or winter peak seasons but likely used during peak hours in all seasons.

Figure 2-10 also shows the use of solar and wind during the shoulder and peak seasons. Solar has been providing roughly 5% of total generation in July 2017, but only 1% of total generation in the winter. North Carolina's 208 MW of wind provides approximately 1% of generation during the shoulder season of April but drops to less than 1% during peak seasons.

[58] DEC and DEP each included a 17% winter reserve margin in their 2018 Integrated Resource Plan filings. See North Carolina Utilities Commission Docket No. E-100, Sub 157 (2018).
[59] Annual Report Regarding Long Range Needs for Expansion of Electric Generation Facilities for Service In North Carolina, received by the Governor Of North Carolina and the Joint Legislative Commission on Governmental Operation, submitted by The North Carolina Utilities Commission, December 21, 2018, accessed at https://www.ncuc.net/reports/longrange18.pdf .

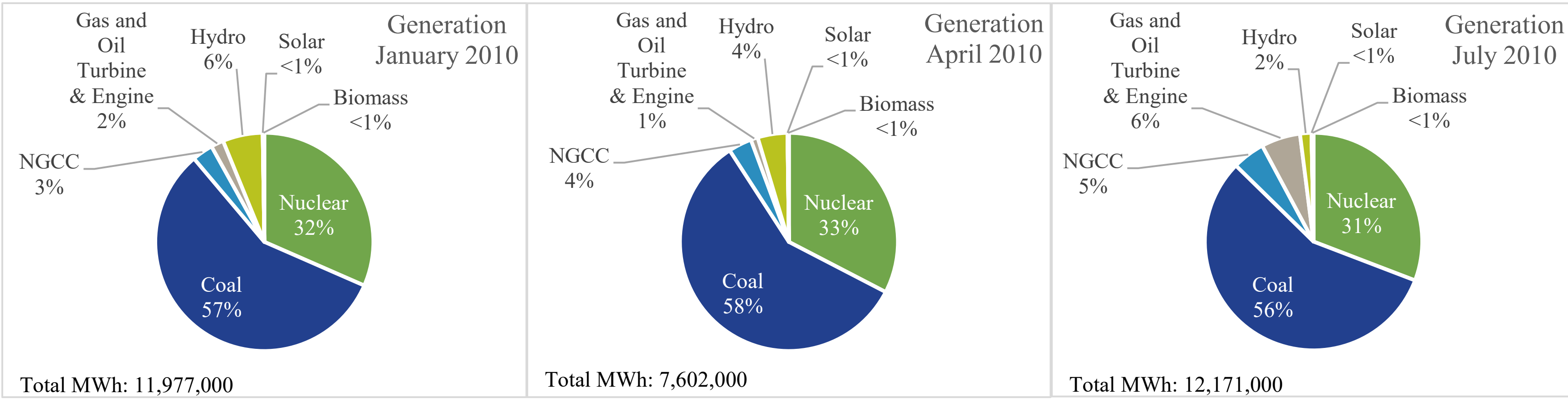


Figure 2-9: Percentage of 2010 Peak and Shoulder Month Generation by Resource Type

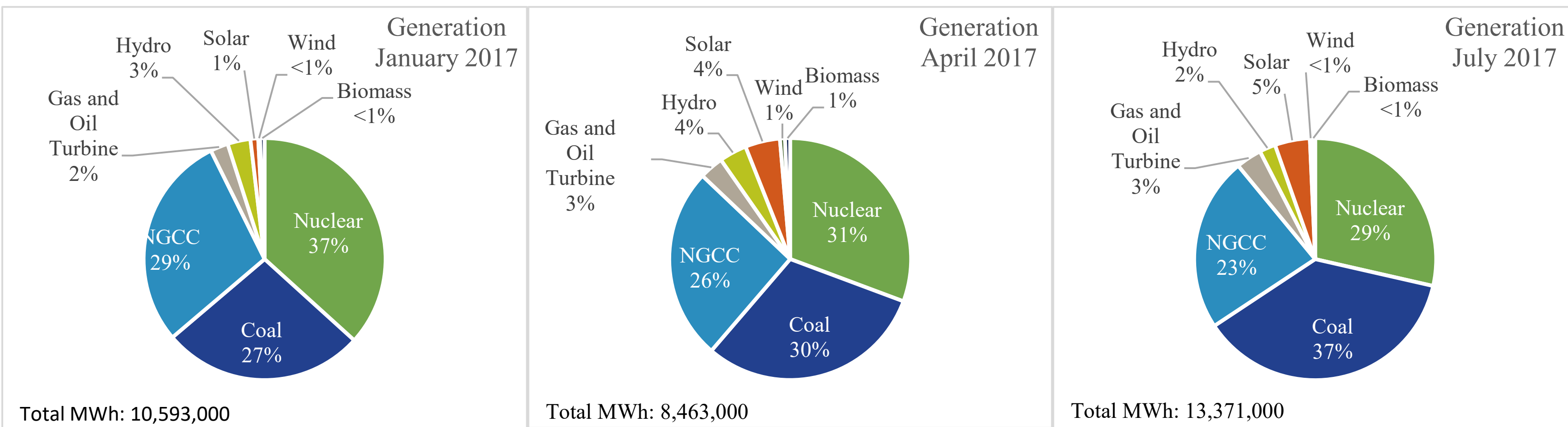


Figure 2-10: Percentage of 2017 Peak and Shoulder Month Generation by Resource Type

The use of coal for intermediate and peaking loads is especially evident during early January 2018 when a polar vortex occurred for several days. Figure 2-11 presents daily generation for January 2018 from only fossil fuel resources.[60] NGCC provides base load and coal generation provides power during short (3 to 5 day) periods when large amounts of power are required. Natural gas turbines provide generation to meet changes in daily and hourly peak demand. Coal provided 37% of the generation during January 2018, as opposed to only 27% in January 2017.

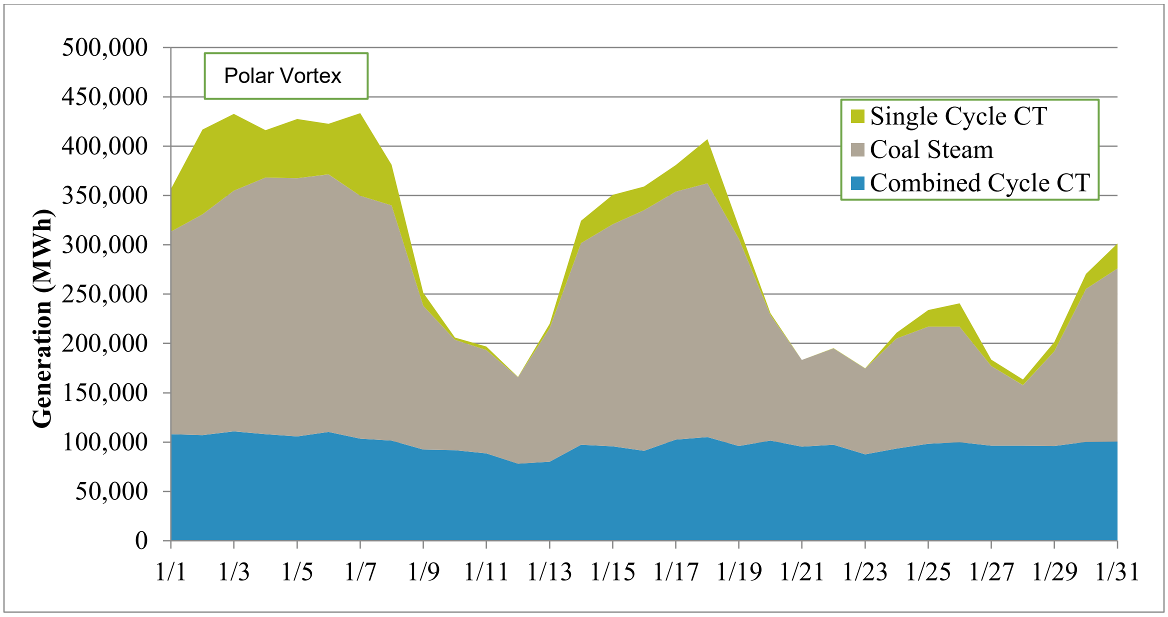


Figure 2-11: Fossil Fuel Use for Electricity Generation During January 2018

This increase in the peak use of coal had a large impact on carbon dioxide (CO_2) emissions in that month, as shown in Table 2-5. CO_2 emissions from coal steam boilers were 64% higher in January 2018 than in January 2017.[61] Combustion turbines used both gas and oil to provide additional power during the event, which significantly increased emissions from these. (Recall that in 2017, oil and gas turbines. use did not appear to change with the season.) CO_2 emissions from all fossil fuels were approximately 54% higher in January 2018 than in January 2017.

Table 2-5: CO_2 Emissions from Fossil Fuel Power During January 2017 and 2018

Fossil Fuel	2017 (tons)	2018 (tons)	Percent Difference
Coal	2,912,789	4,779,725	64%
Combined cycle	1,273,115	1,338,089	5%
Combustion turbine	71,313	419,372	488%
Total	**4,259,234**	**6,539,204**	**54%**

[60] Air Markets Program Data (AMPD), U.S. EPA, accessed in April of 2019 at https://ampd.epa.gov/ampd/.
[61] Ibid.

2.8 Regional Electricity Grid and Plant Dispatch

Electricity generated at power plants moves along a complex system of transmission lines, transformers, substations, and distribution lines to consumers and is referred to as the "electricity grid."

North Carolina is part of the Eastern Interconnect, one of three continental U.S. electric power grids. Within the Eastern Interconnect, North Carolina is in the Southeastern Electric Reliability Council (SERC). More specifically, we are part of the Virginia Carolinas Subregion (VACAR) of SERC, as shown in Figure 2-12. Electricity can be provided to customers in North Carolina by the following 12 states: all or most of Florida, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, North Carolina, South Carolina and parts of Missouri, Kentucky and Texas.[62]

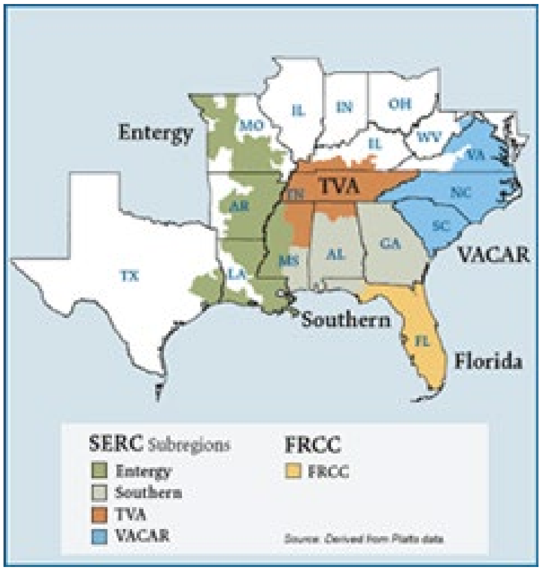


Figure 2-12: Southeastern Regional Electricity Council (SERC)

Each regional grid system is managed by local system operators. Most of North Carolina's transmission grid is owned and operated by DEC and DEP, who plan and manage their respective transmission systems. Dominion, which provides power to northeastern North Carolina, is part of the PJM system, a regional transmission organization (RTO) that manages wholesale electricity in 13 states and the District of Columbia.

Transmission owners in North Carolina participate in the voluntary planning organization called the North Carolina Transmission Planning Collaborative (NCTPC or Collaborative), which was established in 2005. Members include DEC, DEP, the North Carolina Electric Membership Cooperatives (NCEMC), and municipal power systems (ElectriCities). The NCTPC coordinates a joint transmission planning

[62] More information is available online at: http://www.ferc.gov/market-oversight/mkt-electric/southeast.asp.

process with its members. An NCTPC study in 2016 asserted that the state will need 7 new major transmission projects totaling $657 million by 2025.[63]

Electricity flows continuously, therefore, entities operating the regional power grid must constantly "balance" electricity generation with electricity demand.[64] The grid operators decide how to dispatch generation from each available power plant in response to the following:

a) demand for electricity,
b) the cost of generation at each plant,
c) grid stability and reliability, and
d) transmission and operational constraints.

This process involves a real-time bidding process where each available plant provides a price bid to the grid operator. First, there are "must take" resources such as nuclear. After that, the dispatch order is based on cost. The least-cost power plants are dispatched first, then more expensive plants are brought online as electricity demand increases. In this "least-cost dispatch" process, renewable energy resources generally have low variable costs and can displace higher cost fossil-fuel generation, such as older coal-fired plants. In some systems, renewable resources are considered "must-take" resources and are dispatched ahead of fossil fuel resources. If available in-state resources are insufficient or higher cost, electricity may be imported from power plants in neighboring states.

Note that the power from the wind farm in North Carolina is delivered out of state to a facility in Virginia owned by Amazon. This is due to both PJM having higher electricity rates, allowing 3rd party sales. The electricity rates are higher in the PJM grid region and it can get a better price for its electricity.

2.9 Grid Modernization in North Carolina

The electric grid in North Carolina was designed, constructed, and operated based on the concept of large, centralized power generation. The increased use of EE, demand response, and DERs in North Carolina requires modernization of the current grid system in order to allow utilization of benefits such as reductions in peak load, clean energy generation and enhanced resiliency. Additional information on grid modernization can be found in the North Carolina Energy Policy Council's modernization latest biennial report.[65]

2.10 Customer Electricity Consumption

North Carolina has both a growing population and economy. The number of electricity customers in the state has grown steadily since the 1990s. Table 2-6 provides the number of residential, commercial, and

---

[63] North Carolina Transmission Planning Collaborative. Report on the NCTPC 2018-2028 Collaborative Transmission Plan. Accessed April 2019. http://www.nctpc.org/nctpc/document/REF/2019-01-17/2018-2028_NCTPC_Report_1_17_2019_FINAL.pdf.
[64] For more information on dispatching see https://www.eia.gov/todayinenergy/detail.php?id=7590.
[65] Energy Policy Council Biennial Report, North Carolina Department of Environmental Quality, May 2018, https://files.nc.gov/ncdeq/Energy%20Mineral%20and%20Land%20Resources/Energy/Energy%20Policy%20Council/2018%20EPC%20Biennial%20Report%20-%20FINAL.pdf.

industrial customers from 2007 to the present.[66] During that time period, the number of residential customers increased by 9%.[67] The number of commercial and industrial customers also increased, by 6% and decreased by 6%, respectively. North Carolina's population grew 13% and its economy grew 11% in that same time frame.[68, 69]

Table 2-6: Increase in Number of Electricity Customers from 2007-2017

Year	Residential Customers	Commercial Customers	Industrial Customers
2007	4,090,510	639,997	10,748
2017	4,488,036	680,963	10,045
Percent Increase	**9%**	**6%**	**-6%**

North Carolina ranks 9th in the nation for electricity consumption.[70] Electricity consumption for each economic sector, residential, commercial, industrial, and transportation, is given in Figure 2-13.[71] Residential consumption is the highest followed by commercial and industrial. In 2017, use of electricity for transportation was not significant compared to other economic sectors.

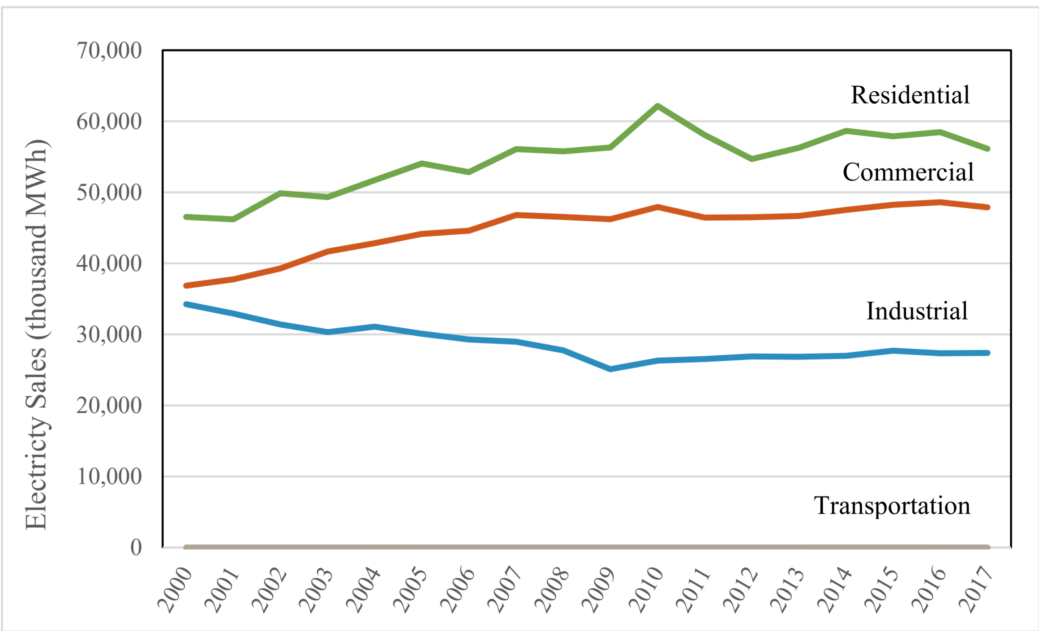


Figure 2-13: Electricity Consumption by End-Use Sector from 2000 to 2017 (thousand MWh)

---

[66] Annual Electric Power Industry Report, EIA Form 861, U.S. Energy Information Administration, accessed in May of 2019 at https://www.eia.gov/electricity/data/eia861/
[67] Customer data for years prior to 2007 was not available.
[68] North Carolina census data provided by North Carolina Office of State Budget and Management in January 2018.
[69] North Carolina's Gross State Product (GSP) in 2009 dollars obtained from the North Carolina Office of State Budget and Management.
[70] North Carolina Electricity Profile 2017, U.S. EIA, accessed at https://www.eia.gov/electricity/state/northcarolina/
[71] Annual Electric Power Industry Report, U.S. EIA Form 861, US Energy Information Administration, accessed in May of 2019 at https://www.eia.gov/electricity/data/eia861/.

Total demand for electricity in all sectors grew steadily from 120,000 thousand MWh in the year 2000 to 136,000 thousand MWh in 2009. In 2009, the national economic downturn occurred and demand decreased. Demand has remained flat in recent years, with current demand at 131,000 MWh.

This growth trend between 2000 and 2009 can be seen in both the residential and commercial sectors. After 2009, the residential sector began a steady decline; today, consumption is about 90% of the 2009 peak, likely due to investment in EE. The commercial sector also reduced its consumption, but only for a few years, and has now returned to its peak level. The industrial sector was at its highest in 2000 at 35,000 MWh and slowly declined to 25,000 MWh in 2009. After 2009, it began to rise again and now holds at 27,000 MWh. The train system in Charlotte, NC is electric and began operation in 2012. Its use peaked in 2015 at 8 thousand MWh and has declined in the last two years to 3 thousand MWh, or 38% of its peak.

Starting in 2008, the REPS helped to reduce both residential and commercial consumption of electricity, by enabling the use of EE for a percentage of REPS compliance.[72] Many large commercial and industrial consumers may opt out of participation in utility EE programs because these customers are allowed to opt out of the EE programs offered by utilities. (See North Carolina Electricity Policy Landscape for more information on REPS.)

Figure 2-14 presents the electricity consumption of each economic sector as a share of total demand in 2000 and 2017.[73] The residential sector increased by 3%, relative to the other sectors, while commercial grew by 5%. Meanwhile, the industrial sector decreased from 29% of overall demand to 21%. These shifts reflect the growth in population and a shift from a manufacturing to a service economy.

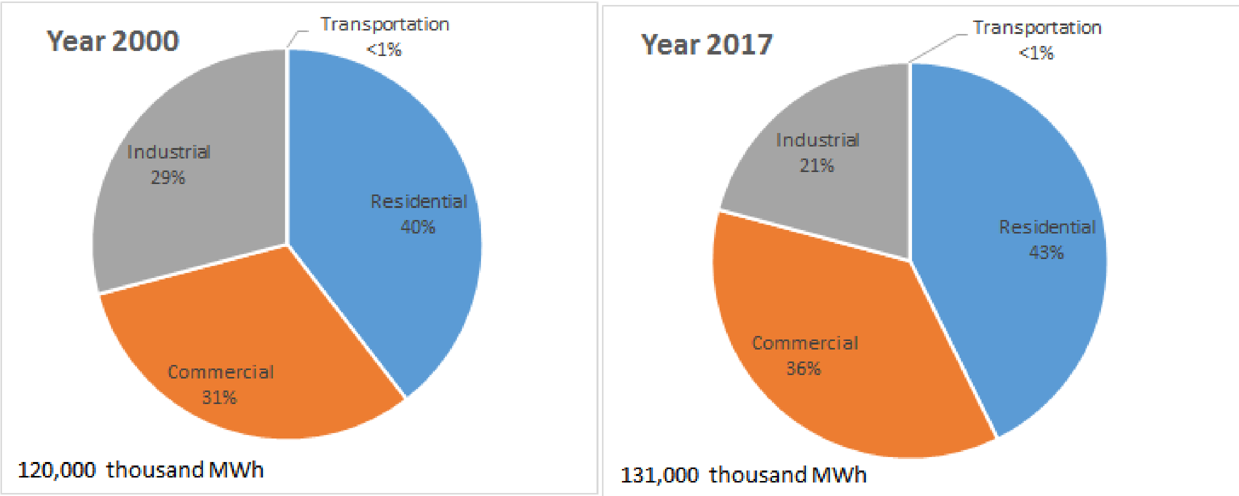


Figure 2-14: Percentage of Electricity Consumption by End Use Sector in 2000 and 2017

[72] Session Law 2007-397, "North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard (REPS), August20, 2007, http://www.ncuc.commerce.state.nc.us/reps/reps.htm.
[73] Ibid.

2.11 Costs for New Electricity Resources

North Carolina electric utilities are required to provide electricity generation and demand reduction at "least-cost" for their customers. This requires an evaluation of the cost of each resource that could be built (or avoided) to meet demand for electricity in a given region. The cost to build a given resource (installed cost) does not paint a complete picture of the economics of the various electricity generating sources. Therefore, the projected life-cycle costs are calculated to give a more accurate method for comparing the different resources. The lifecycle cost is then divided by the estimated electricity production for each resource to put the various resources on the same basis, in dollars per mega-hour ($/MWh). This economic measure is referred to as the "levelized cost of electricity" (LCOE).[74]

As discussed above, LCOE represents the total cost of building and operating a power plant over an assumed lifetime. Key inputs to calculating LCOE include capital costs, fuel costs, fixed and variable operations and maintenance (O&M) costs, financing costs (discount rate), and an assumed utilization rate for each plant type (capacity factor). The availability of various incentives, including state or federal tax credits also affects the calculation of LCOE.[75] Lastly, the LCOE calculation adjusts the life cycle costs to the "present value" of the costs rather than summing the costs from different years.[76]

The importance of each of the factors discussed above varies across technologies. Also, costs vary regionally and are subject to changes resulting from technology developments and fuel availability and prices. Lastly, LCOE is not the only factor in deciding what resource to install. Decisions are affected by other technological and regional characteristics of a project, including, but not limited to, the ability of the resource to supply dispatchable electricity (and the times the resource can provide electricity), the system upgrades needed to incorporate the resource, the existing mix of electricity resources, environmental impacts, and the resiliency of the resource.

For each resource, Table 2-7 presents the 2023 total system LCOE and total system LCOE adjusted for renewable tax incentives calculated for the entire U.S. as estimated by the U.S. EIA and presented in the Annual Energy Outlook for 2019.[77] It also provides the components of calculating LCOE and the estimated LCOE. Not all resources are expected to be built due to high costs or external factors to cost that make the investment unattractive to utilities. Only a select number of renewable technologies benefit from existing tax incentives as shown in the table.

---

[74] LCOE represents the average revenue per unit of electricity generated that would be required to recover the costs of building and operating a generating plant during an assumed financial life and duty cycle.

[75] Information on the Production Tax Credit is found at https://www.energy.gov/savings/renewable-electricity-production-tax-credit-ptc. Information on the Investment Tax Credit is fond at https://www.energy.gov/eere/solar/downloads/residential-and-commercial-itc-factsheets.

[76] Present value (PV) is the current value of a future sum of money or stream of cash flows given a specified rate of return.

[77] "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2019" U.S. Energy Information Administration, February 2019, accessed at https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf.

New coal plants were assumed to require 30% carbon capture and sequestration to comply with an US EPA greenhouse gas rule for new coal plants; with this requirement, these plants are not economical.[78] This rule is currently under review and may be replaced with a less stringent rule.[79] Assuming the rule becomes less stringent under the current US EPA administration, it is not clear what the LCOE for new coal power would be. However, the costs for coal are still expected to be high and the risk associated with carbon regulations under a future administration may still make new coal plants unattractive.

[78] Federal Register, Vol 80 No. 205, pp 64510- 64660, October 23, 2015, accessed at https://www.govinfo.gov/content/pkg/FR-2015-10-23/pdf/2015-22837.pdf.

[79] Proposed NSPS for GHG Emissions from New, Modified, and Reconstructed EGUs, US EPA, accessed at https://www.epa.gov/stationary-sources-air-pollution/proposal-nsps-ghg-emissions-new-modified-and-reconstructed-egus.

Table 2-7: Estimated levelized cost of electricity for new generation resources entering service in 2023 (2018 $/MWh)

Plant type	Capacity factor (%)	Levelized capital cost	Levelized fixed O&M	Levelized variable O&M	Levelized transmission cost	Total system LCOE[1]	Levelized tax credit[2]	Total LCOE including tax credit
Dispatchable technologies								
Coal with 90% CCS[3]						***NB***		***NB***
Coal with 30% CCS[3]						***NB***		***NB***
Advanced NGCC with CCS						***NB***		***NB***
Advanced NGCC	87	7.1	1.4	30.7	1	**40.2**		**40.2**
Conventional NGCC	87	8.1	1.5	32.3	0.9	**42.8**		**42.8**
Advanced CT	30	17.2	2.7	54.6	3	**77.5**		**77.5**
Conventional CT						***NB***		***NB***
Advanced nuclear						***NB***		***NB***
Biomass	83	37.3	15.7	37.5	1.5	**92.1**		**92.1**
Non-dispatchable technologies								
Wind, onshore	44	27.8	12.6	0	2.4	**42.8**	-6.1	**36.6**
Wind, offshore	45	95.5	20.4	0	2.1	**117.9**	-11.5	**106.5**
Solar PV[4]	29	37.1	8.8	0	2.9	**48.8**	-11.1	**37.6**
Hydroelectric[5]	75	29.9	6.2	1.4	1.6	**39.1**		**39.1**

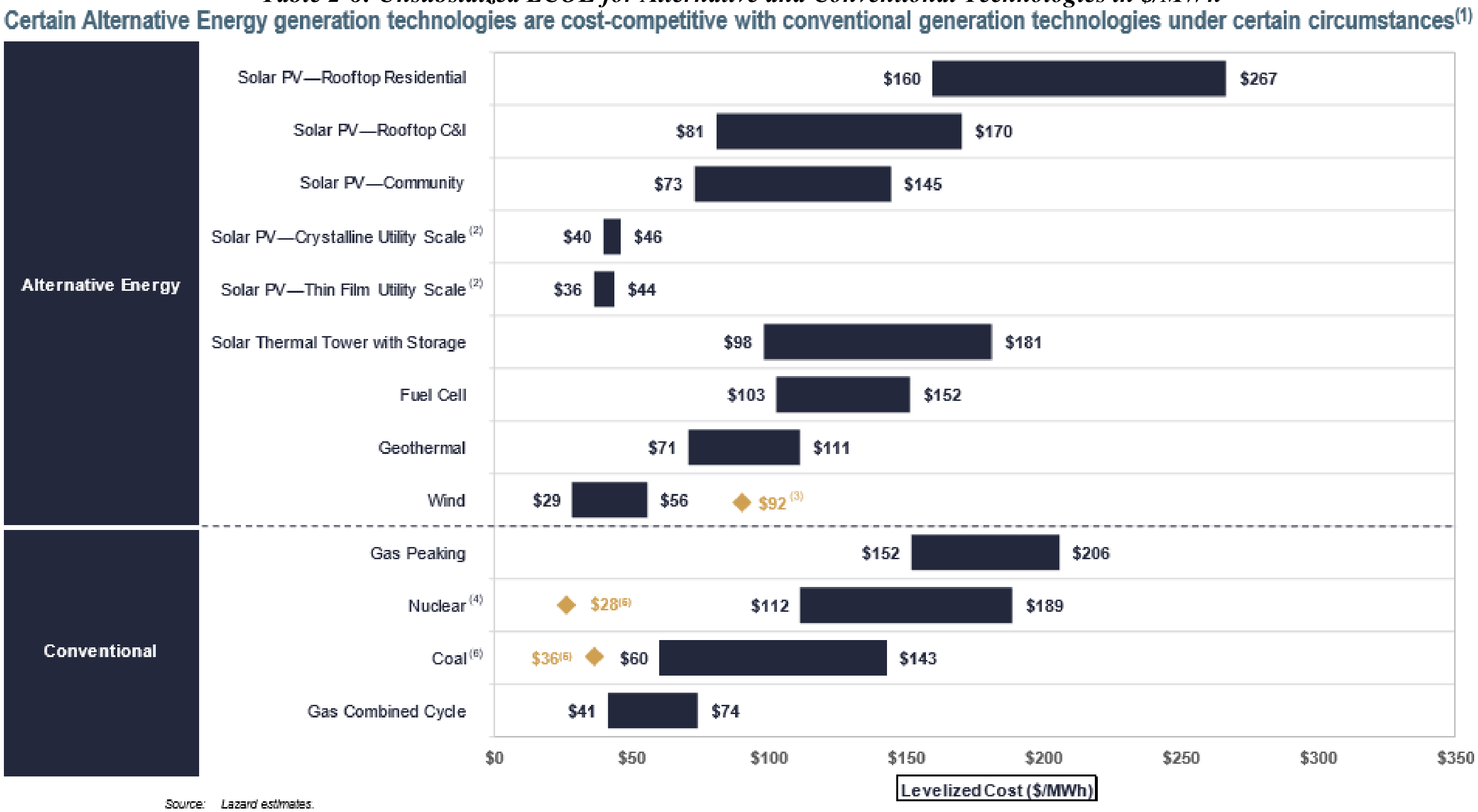
CCS=carbon capture and sequestration, NGCC= natural gas combined-cycle, CT=combustion turbine, PV=photovoltaic.
NB = Not built, NA = Not available.
1 Calculated using capacity-weighted average levelized cost for new capacity online in 2021–2023.
2 Tax credits include federal Production Tax Credit (PTC) or Investment Tax Credit (ITC) assumed available through 2023. State/local incentives are not included.
3 New Source Performance Standards (NSPS) under Clean Air Act Section 111(b) requires new coal plants to have carbon capture and sequestration (CCS).
4 Costs are expressed in terms of net AC power available to the grid for the installed capacity.
5 AEIA assumes that hydroelectric generation has seasonal storage, but overall operation is limited by resources available by site and season.

Advanced NGCC and solar PV are projected to be the best investment due to their projected low cost and high revenue compared to other technologies through 2023. The LCOE are $40.2/MWh for advanced NGCC and $36.6/MWh for solar PV (including tax incentives for solar). Onshore wind is also competitive at $36.6/MWh, but this resource requires a more local analysis to determine if wind is economical in a given region or state. Any new wind capacity is expected to be built prior to the phase out of the federal tax credits in the early 2020s. Hydroelectric is also competitive but requires an available hydrological resource and has significant siting issues.

Table 2-8, compiled by Lazard, compares the LCOE of different technologies if subsidies are not considered.[80] The Lazard LCOE unsubsidized costs for utility-scale PV and wind are competitive with conventional combined cycle gas. These results are similar to the EIA comparison of PV and wind to combined cycle gas discussed above and provides another analysis showing LCOE for some alternative energy generation technologies being competitive with combined cycle gas. Batteries were not included in the LCOE analysis presented in Table 2-8; however, they have minimal operating and maintenance costs, which may lower their total system LCOE below advanced combustion turbines, providing a more cost-effective peaking resource.

[80] "Lazard's Levelized Cost of Energy Analysis – Version 12.0", Nov 2018, accessed at https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf

Table 2-8: Unsubsidized LCOE for Alternative and Conventional Technologies in $/MWh



1. Such observation does not take into account other factors that would also have a potentially significant effect on the results contained herein, but have not been examined in the scope of this analysis. These additional factors, among others, could include: import tariffs; capacity value vs. energy value; stranded costs related to distributed generation or otherwise; network upgrade, transmission, congestion or other integration-related costs; significant permitting or other development costs, unless otherwise noted; and costs of complying with various environmental regulations (e.g., carbon emissions offsets or emissions control systems). This analysis also does not address potential social and environmental externalities, including, for example, the social costs and rate consequences for those who cannot afford distribution generation solutions, as well as the long-term residual and societal consequences of various conventional generation technologies that are difficult to measure (e.g., nuclear waste disposal, airborne pollutants, greenhouse gases, etc.).
2. Unless otherwise indicated herein, the low end represents a single-axis tracking system and the high end represents a fixed-tilt design.
3. Represents the estimated implied midpoint of the LCOE of offshore wind, assuming a capital cost range of approximately $2.25 – $3.80 per watt.
4. Unless otherwise indicated, the analysis herein does not reflect decommissioning costs or the potential economic impacts of federal loan guarantees or other subsidies.
5. Represents the midpoint of the marginal cost of operating fully depreciated coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned coal plant is equivalent to the decommissioning and site restoration costs. Inputs are derived from a benchmark of operating, fully depreciated coal and nuclear assets across the U.S. Capacity factors, fuel, variable and fixed operating expenses are based on upper and lower quartile estimates derived from Lazard's research. Please see page titled "Levelized Cost of Energy Comparison—Alternative Energy versus Marginal Cost of Selected Existing Conventional Generation" for additional details.
6. Unless otherwise indicated, the analysis herein reflects average of Northern Appalachian Upper Ohio River Barge and Pittsburgh Seam Rail coal. High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

3 Energy Policy Landscape

3.1 North Carolina Utilities Commission

The North Carolina Utilities Commission (NCUC) is an agency of the State of North Carolina created by the North Carolina General Assembly (NCGA) to regulate the rates and services of public utilities in North Carolina. This includes investor-owned electric utilities (IOUs), electricity resellers, electric merchant plants, and renewable energy (RE) facilities. The NCUC does not regulate electric membership corporations (EMCs) or municipally-owned electric utilities.

The Public Utilities Act, Chapter 62 of the North Carolina General Statutes (NCGS), governs the work of the NCUC and directs it to "promote the inherent advantage of regulated public utilities" while also protecting the public interest.[81] The Public Utilities Act declares it to be the policy of the state of North Carolina to:

- Promote adequate, reliable, and economical electricity service;
- Require least cost energy planning and fixing of rates;
- Provide just and reasonable rates and charges for electricity services;
- Promote energy conservation;
- Promote resource planning to meet future growth; and
- Promote the development of RE and energy efficiency (EE).[82]

The key provisions in Chapter 62 and the Commission rules and dockets that impact the use of clean energy resources for electricity generation are summarized in Table 1.

Table 3-1: Key NC Utilities Commission Rules Regarding Electric Utilities

Provision	Chapter 62	Commission Rules / Dockets
Promotion of "adequate, reliable, and economical" electricity service	NCGS 62-2(a)(3)	
Least cost energy planning (*see* integrated resource planning)	NCGS 62-2(a)(3a)	Rule R8-60
Demand Side Management (DSM) and Energy Efficiency (EE)	NCGS 62-133.9	Rule R8-69
Renewable Energy and Energy Efficiency Portfolio Standard (REPS)	NCGS 62-133.8	Rule R8-67
Fixing of rates	NCGS 62-133	
Interconnection		Docket No. E-100, Sub 101
Net Metering	NCGS 62-126.4	Docket No. E-100, Sub 83

The NCUC docket is available online at https://starw1.ncuc.net/NCUC/portal.aspx.

[81] NCGS 62-2. Chapter 62 Public Utilities. North Carolina General Statutes. Retrieved from https://www.ncleg.net/enactedlegislation/statutes/html/bychapter/chapter_62.html

[82] NCGS 62-2(a). Chapter 62 Public Utilities, Declaration of policy. North Carolina General Statutes. Retrieved from https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_62/GS_62-2.pdf

3.1.1 *Rate Setting, Rate Design and Customer Billing*

The NCUC has historically considered changes to rate designs under general rate cases in order to address impacts to utility revenues and customer allocation issues. The NCUC has noted that there are challenges to implementing new rate designs outside a general rate case since changes to one rate structure may impact other rate structures. Recently, NCUC required DEC to implement a pilot rate design that allows customers to shift peak and energy use based on AMI meters which were recently rolled out. In addition, NCUC opened a docket (E-100, Sub 161) to seek information on setting rules related to customer billing data.

3.1.2 *Grid Hardening and Resiliency*

The NCUC currently requires Duke Energy to submit quarterly System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency SAFI) data. There is also a docket (E-100 Sub 138) that addresses standardizing the indices used to measure and report service quality. The NCUC is overseeing efforts by the utilities to strengthen the electricity grid from storms, cyber attacks and physical attacks

3.1.3 *Microgrids*

NCUC has recently approved distributed energy resources (DER) and microgrid pilot projects including:

- Duke Energy Progress Hot Springs Microgrid in May 2019 (Docket E-2, Sub 1185),
- Duke Energy Carolinas community solar program (Docket E-2 Sub 1169 and E-7 Sub 1168), and
- Duke Energy Carolinas microgrid projects in Mount Holly and Charlotte.

3.1.4 *Utility Customer RECS Purchase Program*

Duke Energy has recently filed under several dockets for a proposed program that would allow utility customers to purchase Renewable Energy Credits (RECS) to offset their electricity consumption. (See Dockets E-2 Sub 1190, E-7 Sub 1185, and E-100 Sub 90). This program would be in addition to the community solar program under HB 589.

3.1.5 *Stakeholder Processes and Technical Conferences*

There are a number of areas where the NCUC has ordered a stakeholder process to address issues before the NCUC. A number of deliverables have been produced by these stakeholder processes and informed NCUC orders in various dockets. Below is a list of these efforts since 2017 and their current status.

1. Demand side management and energy efficiency (ongoing)
2. Interconnection standards (ongoing - Docket No. E-100, Sub 101)
3. Swine and poultry generation (ongoing)
4. Transmission planning collaborative (ongoing)
5. Smart Grid/Power Forward (ongoing – Dockets E-2, Sub 1142 and E-7, Sub 1146)
6. Competitive procurement of renewable energy (ongoing)
7. Interconnection queue reform (ongoing – Docket E-100, Sub 101)
8. Avoided costs and ancillary markets (ongoing – Docket E-100, Sub 158)
9. Energy storage (NCSU)
10. Battery storage (NCSEA)
11. Electric vehicles
12. HB 589

The NCUC has also held numerous technical conferences to informally receive information and investigate issues. These efforts include the following areas:

1. Interconnection Standards (Docket E-100, Sub 101)
2. Integrated Resource Planning (IRP) (Docket E-100, Sub 157)
3. Competitive procurement of renewable energy (Docket E-100, Sub 159)
4. Meter testing and data access (Docket E-100, Sub 153)
5. Expanding the Scope of the IRP Process on August 28, 2019 (Docket E-100 Sub 157), which includes ways to identify the locational value of DER systems.

3.2 North Carolina Transmission Planning Collaborative

Transmission owners in North Carolina participate in the voluntary planning organization called the North Carolina Transmission Planning Collaborative (NCTPC), which was established in 2005. Members include Duke Energy Carolinas, Duke Energy Progress, the North Carolina Electric Membership Cooperatives (NCEMC), and municipal power systems (ElectriCities). The NCTPC coordinates a joint transmission planning process with its members. An NCTPC study in 2016 asserted that the state will need 7 new major transmission projects totaling $657 million by 2025.[83]

3.3 Public Utility Regulatory Policies Act

The Public Utility Regulatory Policies Act (PURPA) was enacted into federal law on November 9, 1978, as part of the National Energy Act.[84] Created in response to the 1973 energy crisis, it was meant to promote energy conservation by reducing demand and promote greater use of domestic energy and RE by increasing the available supply. While this is a federal policy, the way North Carolina implemented the law had a profound influence on the growth of solar energy in the state.

The PURPA was developed to open utility generation markets to independent power producers. As directed by PURPA, the Federal Energy Regulatory Commission (FERC) issued rules that required electric utilities to purchase electricity from "qualifying cogeneration and small power production facilities" – generators of 80 MW or less using hydro, wind, or solar technologies.[85] The rates for purchase were directed to be "just and reasonable", non-discriminatory, and meet the utility's "avoided cost" of having to build or acquire elsewhere the same amount of capacity.[86]

Each state's utility commission has undertaken proceedings to determine the "avoided cost" rate at which utilities must purchase electricity from qualifying facilities. Before the passage of state HB 589 (see below), North Carolina had generous avoided cost rates and longer contracts (15 years) relative to other states.[87] Moreover, in 2005, Congress removed PURPA guarantees for larger qualifying facilities in states

---

[83] North Carolina Transmission Planning Collaborative. Report on the NCTPC 2018-2028 Collaborative Transmission Plan. Accessed April 2019. http://www.nctpc.org/nctpc/document/REF/2019-01-17/2018-2028_NCTPC_Report_1_17_2019_FINAL.pdf.
[84] Pub.L. 95–617, 92 Stat. 3117.
[85] 18 C.F.R. § 292.303(a); *see also,* What is a Qualifying Facility?, FERC website, *and* Ari Peskoe and Kate Konschnik, Climate Implications of FERC Proceedings, Harvard Environmental Law Program (Nov. 27, 2017), at 22-23.
[86] 18 C.F.R. § 292.304.
[87] *See, e.g.,* U.S. EIA, North Carolina has more PURPA-qualifying Solar Facilities Than Any Other State, Today in Energy (Aug. 23, 2016).

where utilities participated in competitive wholesale electricity markets.[88] (The Carolinas and the states in Southern Company's footprint do not belong to a market). In response, solar developers flocked to North Carolina to build competitive utility-scale solar facilities, making NC #2 of all states in installed solar capacity over the last several years.

3.4 Clean Smokestacks Act and Amendments

The NCGA enacted the Clean Smokestacks Act (SB 1078) in 2002, establishing utility-wide caps for nitrogen oxide (NOx) and sulfur dioxide (SO_2) pollution from coal-fired power plants in the state.[89, 90] The caps were projected to lower NOx emissions from coal-fired power plants in North Carolina 77% from 1998 levels by 2009, and SO2 emissions 73% from 1998 levels by 2013.[91] In fact, NOx emissions dropped 83% and SO_2 emissions dropped 89% over that time period, through the installation of modern air pollution controls on some coal units and the retirement of others. The NCGA subsequently found that with this law "North Carolina became a national leader in multipollutant air emissions reduction strategies."[92, 93, 94]

In 1990, Congress had enacted the Acid Rain Program, reducing the same pollutants from coal-fired power plants.[95] The federal program allowed utilities to buy and sell pollution credits as needed, so long as the total number of credits did not exceed the national caps. The Clean Smokestacks Act required deeper, state-specific reductions. Moreover, it empowered the Governor to bank the excess federal credits generated by the utilities when they reduced their NOx and SO_2 pollution to comply with the state law.[96] This prevented North Carolina from exporting its pollution through the sale of these credits.

The Clean Smokestacks Act also required North Carolina's Department of Natural Resources (now, the Department of Environmental Quality or NC DEQ) to evaluate the possible control of mercury and carbon dioxide (CO_2) from coal-fired power plants. It turned out that reducing SO_2 and NO_X using

---

88 Energy Policy Act of 2005, Section 1253; 16 U.S.C. § 824a-3(m).
89 Session Law 2002-4, "An Act to Improve Air Quality in the State by Imposing Limits on the Emission of Certain Pollutants from Certain Facilities that Burn Coal to Generate Electricity and to Provide For Recovery by Electric Utilities of the Costs of Achieving Compliance with those Limits", June 20, 2002, Retrieved from https://www.ncleg.net/Sessions/2001/Bills/Senate/PDF/S1078v5.pdf.
90 N.C. Gen. Stat. § 143-215.107D(b)-(e). Separate caps were set for the fleet owned by Duke Energy (now Duke Energy Carolinas) and Progress Energy (now Duke Energy Progress).
91 *See* "Clean Smokestacks Act," North Carolina Department of Environmental Quality, https://deq.nc.gov/about/divisions/air-quality/air-quality-outreach/news/clean-air-legislation/clean-smokestacks-act.
92 Implementation of the "Clean Smokestacks Act", a Report to the Environmental Review Commission and the Joint Legislative Commission on Governmental Operations, submitted by the North Carolina Department of Environment and Natural Resources and the North Carolina Utilities Commission (Report No. XII) (May 30, 2014), https://files.nc.gov/ncdeq/Air%20Quality/news/leg/2014_Clean_Smokestacks_Act_Report.pdf, at 2.
93 The Clean Smokestacks Act allowed the utilities to pass on the costs of installing pollution controls, unless thoe costs were "required to comply with a final order or judgment rendered by a state or federal court under which an investor-owned utility is found liable for a failure to comply with any federal or state law". N.C. Gen. Stat. § 62-133.6. At the time, the state's largest utility, Duke Energy, was being sued by the U.S. EPA for alleged violations of the Clean Air Act.
94 Session Law 2009-390, S.B. 1004, Section 1(a)(2).
95 Clean Air Act Title IV, 42 U.S.C. §§ 7641-7642.
96 North Carolina Gen. Stat. § 143-215.107D(i).

certain control technologies had the co-benefit of reducing mercury emissions; as a result, North Carolina utilities complied with the 2011 federal Mercury and Air Toxics Standard (MATS) without much added cost.[97, 98] In 2005, the NC Division of Air Quality (part of NC DEQ) compiled a report outlining various issues and options to reduce CO_2 emissions from power plants.[99] At that time, the only cost-effective option identified was a reduction in fossil fuel consumption by conservation, efficiency technologies or other means. It also recommended RE incentives for electricity generation.

In 2009, the NCGA revisited the Clean Smokestacks Act. Finding that the "retirement of coal-fired generating units and installation of generating units that use natural gas as the primary fuel will reduce emissions of carbon dioxide (CO_2) and mercury (Hg) significantly more that would the installation of sulfur dioxide (SO_2) emissions controls on the coal-fired units," the legislation expedited permits to build new natural gas plants at a site where the utility already owns coal units.[100] In addition, investor-owned utilities could "retain the North Carolina retail allocation of the system fuel and fuel related cost savings" generated by buying or constructing renewable energy facilities, and use deferral accounting for the fuel savings realized through these projects.[101] These provisions apparently sought to accelerate the transition from coal-fired electricity generation in North Carolina to generation by other sources including natural gas and renewables.

3.5 NC GreenPower

A landmark initiative approved by the NCUC in 2003, NC GreenPower is the first statewide green energy program in the nation, supported by all the state's utilities and administered by Advanced Energy, an independent nonprofit corporation located in Raleigh, N.C. NC GreenPower has an independent board, comprised of state-government officials, consumers, RE advocates and staff from electric utilities and nonprofit organizations. North Carolina's three IOUs -- Dominion North Carolina, Duke Energy Carolina and Duke Energy Progress -- and many of the state's municipal utilities and electric cooperatives participate in the NC GreenPower Program.

NC GreenPower encourages the development of RE resources through consumers' voluntary funding of green power purchases either directly through NC GreenPower or through electric utilities in North Carolina. The program revenues provide financial incentives for generators of electricity from renewable

---

[97] US EPA. (2019). Mercury and Air Toxics Standards (MATS). U.S. Environmental Protection Agency, Retrieved in May 2019 from https://www.epa.gov/mats/regulatory-actions-final-mercury-and-air-toxics-standards-mats-power-plants

[98] DEQ (2012). Final Report of the Division of Air Quality to the Environmental Management Commission on the Control of Mercury Emissions from Coal-Fired Electric Steam Generating Units. North Carolina Department of Environment and Natural Resources, Division of Air Quality. July 1, 2012. Retrieved from https://deq.nc.gov/about/divisions/air-quality/air-quality-outreach/news/clean-air-legislation/clean-smokestacks-act.

[99] NC DAQ. (2005). "Carbon Dioxide (CO_2) Emissions Reduction Strategies for North Carolina: Final Report". North Carolina Division of Air Quality (NC DAQ). September 1, 2005.

[100] Session Law 2009-390, S.B. 1004, Section 1.(b); N.C. Gen. Stat. § 62-110.1(h).

[101] Session Law 2009-390. S.B. 1004, Section 2; N.C. Gen. Stat. § 62-133.10.

sources and for developers of projects mitigating greenhouse gas emissions. The program also supports the mitigation of greenhouse gas emissions through consumers' voluntary funding of carbon offsets.

In 2015, NC GreenPower launched the Solar Schools Program, providing matching grants for 3-5 kW solar educational projects at K-12 schools, complete with a weather station, real-time monitoring, curriculum and training for teachers. To date, the program has provided access to solar projects and curriculum for 24 schools across the state, trained 104 teachers, and 24,907 NC students.[102]

3.6 North Carolina Renewable Energy Portfolio Standard

On August 20, 2007, Session Law 2007-397 also referred to as Senate Bill 3 (SB-3), was signed into law.[103] Under this law, IOUs in North Carolina will be required to meet up to 12.5% of their energy needs in year 2021 through RE resources or EE measures. The EMCs and municipal electric suppliers are subject to meet 10% of retail sales in electricity by 2018 with RE or EE. On February 29, 2008, the NCUC issued an order adopting final rules implementing the statute.

The electric power suppliers may comply with the REPS requirement in a number of ways, including:

a. use of renewable fuels in existing electric generating facilities,
b. generation of power at new RE facilities,
c. purchase of power from RE facilities,
d. purchase of RE certificates, or
e. implementation of EE measures.

Under the statute, RE includes solar photovoltaic (PV), solar thermal hot water, wind, geothermal, tidal energy and biomass resources. Eligible biomass resources include agricultural waste, animal waste, wood waste, energy crops and landfill methane. Also, specific portions of the RE must be derived from solar PV, swine waste and poultry waste. A renewable energy certificate (REC) is a tradable financial certificate, which represents 1 megawatt-hour (MWh) of RE electricity that was generated from an eligible RE source.

Under the statute, an EE measure is defined as equipment or program changes that results in less energy used to perform the same function. Eligible EE measures must result in measurable and verifiable reductions in energy consumed by a utility customer. The statute defines a DSM measure as an activity or program undertaken by an electric power supplier or its customers to shift the timing of electricity use from peak to non-peak demand periods. Credits are also issued for EE measures.

The REPS rule requires IOUs to reduce electricity demand incrementally under the schedule given in Table 3-2.

[102] NC GreenPower website, accessed 8/5/19. https://www.ncgreenpower.org/solar-schools/
[103] Session Law 2007-397, "North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard (REPS), August20, 2007, http://www.ncuc.commerce.state.nc.us/reps/reps.htm.

Table 3-2: REPS Compliance Schedule for IOUs

Calendar Years	REPS Requirement for IOUs
2012 - 2014	3% of 2011 NC retail sales
2015 - 2017	6% of 2014 NC retail sales
2018 - 2020	10% of 2017 NC retail sales
2021 and thereafter	12.5% of 2020 NC retail sales

An IOU can meet the REPS percent reduction requirements using EE. However, they are limited in the amount of EE which can be applied. Up through year 2020, utilities have the option to meet up to 25% percent of the REPS requirement through measurable EE programs. Beginning in calendar year 2021, electric utilities may meet up to 40% of the of the REPS requirement through energy saved as a result of EE and DSM programs. Table 3 gives the percent to retail sales that can apply EE measures to meet REPS. EE reductions achieved in excess of the 25% can be banked via RECs for future use.

Table 3-3: Maximum Energy Use that EE Can Supply to Meet REPS

Calendar Years	Maximum EE that Can Be Used to Meet REPS
2012-2014	0.75 % of 2011 NC retail sales
2015-2017	1.5% of 2014 NC retail sales
2018-2020	2.5% of 2017 NC retail sales
2021 and thereafter	5.0% of 2020 NC retail sales

EMCs and the municipal suppliers are required to supply 10% of retail electricity sales from eligible resources by 2018. These suppliers may meet 100% of their REPS requirements through EE and DSM measures once set aside requirements are met. These suppliers are also allowed to meet up to 30% of their requirements through large hydropower projects.

As stated above, specific portions of the RE must be derived from solar photovoltaic, swine waste and poultry waste. The IOUs, EMCs and the municipal suppliers must meet these set asides. These set asides will provide approximately 1% of the electricity demand in year 2020. The set aside requirements are presented for each year in Table 3-4.

Table 3-4: Solar, Swine Waste and Poultry Waste Set Asides Required by REPS

Year	Requirement	Solar	Swine Waste	Poultry Waste
2010	0.02%	0.02%	-	-
2012	3.00%	0.07%	0.07%	170,000 MWh
2013	3.00%	0.07%	0.07%	700,000 MWh
2014	3.00%	0.07%	0.07%	900,000 MWh
2015	6.00%	0.14%	0.14%	900,000 MWh
2018	10.00%	0.20%	0.20%	900,000 MWh
2021+	12.50%	0.20%	0.20%	900,000 MWh

3.6.1 Interconnection

The North Carolina Utility Commission (NCUC) standards (following FERC Order 792) uses a three-tiered approach to simplify the interconnection process:

Table 3-5: Interconnection Process

Eligible Systems	Type of Interconnection
Systems ≤20 kW	Inverter Process
Systems >20 kW and ≤2 MW	Fast-Track Process
Systems that fail to qualify for the Fast Track Process	Study Process

Interconnection requires both an administrative and technical review process by the NCUC. There is an "interconnection queue" based on a first come first serve approach. NCUC currently analyzes each project separately. If a project requires additional study during a phase of the interconnection review process, the project may lose its place in the interconnection queue and be required to start over. (See Interconnection Docket No. E-100, Sub 101)

Duke Energy has already connected a large number of solar PV projects. Interconnection requests grew by 300% since 2013, resulting in a large number of project in the interconnection queue. There is localized transmission congestion in the eastern part of North Carolina (in DEP east) where there are over 100 in-service or under construction solar PV facilities totaling 1,348 MW. The number of projects requesting interconnection has resulted in some issues that are listed below.

1. There are 24 substations with 4 or more projects seeking to interconnect at the same substation.
2. Each solar PV project that is added to a substation results in impacts to the substation. As more projects are added, the cumulative impacts lead to difficulty with interconnecting the later projects.
3. Difficulty with interconnection can raise some financing issues for developers and site owners.

In June of 2019, the NCUC ordered revisions to the interconnection process which:

- Adjusted fees for utilities to recover costs,
- Provided clarity on timelines for developer action,
- Allows for post-commissioning utility inspections, and
- Added provisions for adding energy storage at existing solar PV sites.

The NCUC recently made a decision on an order related to hosting capacity maps and a developing a timeline enforcement mechanism. An interconnection queue reform process is being studied and a stakeholder group has been meeting. The NCUC stated that the studies would likely take several years due to the complexity of the issues. Some objectives include:

- Improved efficiency of interconnection process and reducing the queue size,
- Aligning rules and workflows for both transmission and distribution level projects, and
- Moving from a serial interconnection process to a grouping or cluster process.

3.7 Renewable Energy Tax Credits

For homeowners and businesses who pay federal and state income taxes, RE tax credits can be used to reduce the cost of RE installation. Through 2016, the North Carolina Renewable Energy Tax Credit program provided North Carolina residents and businesses with a tax credit equal to 35% of the cost of eligible RE property constructed, purchased or leased by a taxpayer and placed into service in North Carolina during the taxable year. The credit has been amended several times since its original inception. House Bill 512 of 2009 extended the eligibility to geothermal equipment and extended the expiration date to December 31, 2015. House Bill 1829 of 2010 further extended this credit to combined heat and power systems.[104] The state tax credit expired on December 31, 2016.

3.8 House Bill 589

The Competitive Solutions for NC Act, also referred to as House Bill 589 (HB 589), was passed in 2017 and was the result of a nine-month stakeholder process.[105] It amends various laws related to energy policy, including:

- the reform of the State implementation of PURPA,
- the creation of a competitive bidding process for new RE facilities and;
- the enactment of the Distributed Resources Access Act to authorize leasing of third-party owned solar development.

Under this law, Duke Energy is required to procure 2,660 MW of RE over a 45-month period through a competitive procurement process for RE. The law also requires a community solar program which will allow Duke to install 40 MW of community solar in its service territories. HB 589 also has a solar rebate program that has quickly met annual enrollment caps. The rebate program will support up to 100 MW of solar installation at customer sites during the term of HB 589 which runs until December 2022.

HB 589 also established a Green Source Advantage Program, for large businesses, universities, and the military to directly procure 600 MW of RE, reserving 100 MW for military installations and 250 MW for the University of North Carolina System.[106] This program built on a three-year pilot program known as the "Green Source Rider."

In late 2013, the NCUC approved the Green Source Rider pilot program, proposed by Duke Energy Carolinas (DEC).[107] The pilot was designed to source RE for large customers with new load of at least 1 MW – for instance, new or expanded manufacturing facilities, new data centers for technology

[104] Database of State Incentives for Renewables and Efficiency (DSIRE), last updated February 2, 2017. https://programs.dsireusa.org/system/program/detail/541
[105] Session Law 2017-192, "An Act to Reform North Carolina's Approach to Integration of Renewable Electricity Generation Through Amendment of Laws Related to Energy Policy and to Enact the Distributed Resources Access Act," July 27, 2017, https://www.ncleg.net/Sessions/2017/Bills/House/PDF/H589v6.pdf.
[106] Session Law 2017-192, H.B. 589, Part III.
[107] State of North Carolina Utilities Commission, In the Matter of Application by Duke Energy Carolinas, LLC, for Approval of Rider GS (Green Source Rider) Pilot, Order Approving Rider (Dec. 19, 2013), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=12ccd38e-9021-475d-884e-d3d1c55799f6.

companies, or new locations for large retailers. In its petition for approval, DEC noted the program was a response to "customer requests" for this type of power.[108] Upon application to the program (including a fee of $2000), Duke would "either (1) enter into a purchased power agreement(s) (PPA) with one or more RE suppliers; or (2) supply the RE directly from one or more DEC renewable energy assets that are dedicated to serving Rider GS customers."[109] Once the supply was in place, DEC would bill the customer for their energy usage, plus 1) a Rider GS Administrative Charge of $500 per month and 2) 0.02 cents per kilowatt hour of RE "procured or produced" for the customer.[110] DEC would take steps to ensure that these PPAs would not affect the rates of nonparticipating customers.

Just three companies participated in the Green Source Rider pilot – Google, Amazon, and Apple.[111] Nevertheless, under HB 589 the legislature created a five-year, 600 MW program. The NCGA capped green source contracts at 125% of the maximum annual peak demand of each eligible customer, required utilities to offer contracts between 2 and 20 years in length, and directed that the program neither advantage nor disadvantage nonparticipating customers.[112] In January 2018, DEC and Duke Energy Progress (DEP) petitioned the NCUC for approval of the details of the Green Source Advantage program.[113] The NCUC approved the program with some modifications, over the concerns of several energy users in the state including the University of North Carolina at Chapel Hill, Google, and Apple. The program is just under way.

HB 589 also included an 18-month moratorium on wind farm permits to assess the impact of interference wind turbines could have on military operations. The moratorium on wind permits ended December 31, 2018.

3.9 Executive Order No. 11

In July 2017, North Carolina Governor Roy Cooper signed Executive Order No. 11 (EO 11) which aimed to promote wind energy in the state and mitigate the effects of the 18-month wind energy moratorium outlined in HB 589. The order strived to provide guidance for state agencies and other stakeholders to support the development of wind sources in North Carolina. It expedites the pre-application review of new and expansion wind projects to ensure they are able to come online quickly after the moratorium expired in December 2018. In addition, it directs state agencies to support innovative new wind projects and conduct a feasibility study of RE and EE projects on state-owned property.[114]

---

[108] Duke Energy Carolinas' Petition for Approval of Ride GS (Green Source Rider) Pilot, Docket No. E-7, Sub 1043 (Nov. 15, 2013), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=80abc1e7-28ed-460a-80f4-8b67a464ad08.
[109] Order Approving Rider, at 1.
[110] Id., at 2.
[111] John Downey, Solar Bill Expands Duke Energy "Green Source" Power Program, CHARLOTTE BUSINESS JOURNAL (June 8, 2017).
[112] N.C. Gen. Stat. § 62-159.2(b), (c), (e).
[113] In the Matter of Petition of Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC, Requesting Approval of Green Source Advantage Program and Rider GSA to Implement NCGS § 62-159.2, Order Modifying and Approving Green Source Advantage Program, Requiring Compliance Filing, and Allowing Comments (Feb. 1, 2019), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=b3fd2895-1183-4334-9f5a-fb141be2dc7a.
[114] https://files.nc.gov/governor/documents/files/EO11%20 %20Promoting%20Wind%20Energy%20Development.pdf

3.10 HB 329

HB 329 was signed into law on July 19, 2019 and has a number of important provisions that:

a. Exempts electric vehicle charging stations from regulation as public utilities,
b. Requires the Environmental Management Commission (EMC) to adopt rules developed by a DEQ stakeholder process to manage the end-of-life solar PV modules and energy storage system batteries, as well as decommissioning of utility-scale solar and wind energy facilities, and
c. Provide small hydroelectric power facilities the same treatment given to small swine and poultry waste power producers.

3.11 Utilities Savings Initiative

In July 2002, Governor Easley issued a memorandum officially establishing the Utility Savings Initiative (USI) program. Then in 2007, the North Carolina General Assembly passed a landmark bill in the State, Senate Bill 668, which codified the USI program requirements. USI is North Carolina's lead-by-example program supporting energy efficiency in public buildings, and being administered by NC DEQ State Energy Office. The program was created to assist North Carolina governmental units manage the use and cost of energy, water and other utilities in their facilities. The program serves state agencies, the University of North Carolina system, the state's community colleges, public schools, county and municipal governments. The effort includes oversight of the performance contracting process for governmental units. Each agency develops and implements a USI Strategic Energy Plan, which is updated annually and reviewed quarterly.

3.12 Proposed - Senate Bill 559 Storm Securitization/Alt. Rates

This proposed bill has two parts. First, it would create a new financing tool by permitting bond financing for certain storm recovery costs related to recent hurricanes and storms. Using a bond interest rate would cost ratepayers less money than the utilities' rate of return. Second, it would authorize the NCUC to approve rates in a general rate case proceeding that allows for electric public utilities to use a "multiyear rate plan" and "banding of authorized returns", or a combination of these mechanisms. The NCUC would be required to find that the rates mechanisms would establish rates that are just and reasonable, and which are in the public interest. A multi-year rate is based on pre-approving future rate increases based on known capital investments. Banding allows utilities to operate on higher or lower return on equity in between rate cases.

3.13 Policy and Programs Related to Electric Vehicles

3.13.1 Volkswagen Settlement Program

In June, 2016, the U.S. Department of Justice issued a partial consent decree settling claims by the U.S. EPA against Volkswagen AG (VW).[115] The civil complaint claimed that the automaker installed software on specific models of 2.0 liter diesel engine vehicles manufactured between 2009 and 2016 that 1) disabled emission controls under normal use and 2) turned on emission controls only when the vehicle was being tested. North Carolina was allocated $92 million of the settlement funds.

[115] *United States v. Volkswagen AG et al.*, Case No. 16-cv-295 (N.D. Cal.)

The settlement has requirements attached to the management and use of the funds. Governor Roy Cooper designated DEQ to manage North Carolina's share of the VW Mitigation Settlement. DEQ developed a mitigation plan for using North Carolina's allocation that was submitted for approval to the Trustee, Wilmington Trust, who manages the VW Mitigation Settlement funds nationally.[116] DEQ will allocate the funds between urban/suburban counties (68%) and rural counties (32%).[117] DEQ will use the funds for eligible projects throughout the state that will reduce or eliminate emissions of nitrogen dioxide (NOx), focusing on the most cost-effective projects, the quantity of NOx emission reductions and other factors.

North Carolina's plan involves three phases of funding for five programs for the duration allowed by the consent decree. Each phase of the plans will invest 33% of the overall funds ($30.68 million). DEQ will manage the VW settlement funds through two primary programs involving public transportation and zero emission vehicles (ZEV). The programs include several components that are listed below:

Diesel Bus & Vehicle Program

- School bus replacement program,
- Transit bus replacement program,
- Clean heavy-duty on-road equipment program, and
- Clean heavy-duty off-road equipment program.

Zero Emission Vehicle Infrastructure Program

- DC Fast Infrastructure program and
- Level 2 EV Infrastructure program.

The Division of Air Quality has begun to implement Phase 1 of the plan by releasing request for proposals related to the Diesel Bus & Vehicle Program and DC Fast Infrastructure Program. For more information on the DEQ's approach for the VW settlement and Phase 1 of the plan see https://deq.nc.gov/about/divisions/air-quality/motor-vehicles-and-air-quality/volkswagen-settlement.

3.13.2 Mobile Source Emission Reduction Grant Program

DEQ from 1995 to 2008 funded various EV related projects through the Mobile Source Emission Reduction Grant Program administered by the Division of Air Quality.[118] Examples of EV related projects funded include:

- Electric vehicle purchases for local governments, municipalities, colleges and non-profits
- Electric vehicle purchases for fleet demonstration and public education programs
- Publicly accessible EV charging stations for colleges
- Electric school bus demonstrations
- Solar electric EV charging stations

[116] DEQ (2019). State of North Carolina Volkswagen Mitigation Plan. Department of Environmental Quality, Division of Air Quality. August 2018. Retrieved from https://files.nc.gov/ncdeq/Air+Quality/motor/grants/files/VW/NC_Final_VW_Mitigation_Plan_082018.pdf
[117] The allocation is based on the distribution of violating vehicles registered across the state.
[118] DEQ (2019). Mobile Sources Emissions Reductions Grants. NC Division of Air Quality. Retrieved on July 26, 2019 from https://deq.nc.gov/about/divisions/air-quality/motor-vehicles-air-quality/mobile-source-emissions-reduction-grants/past-grants

- Various educational programs on EVs

NORTH CAROLINA
Department of Environmental Quality

North Carolina
Department of Environmental Quality

217 West Jones Street
Raleigh, NC 27603
877-623-6748
deq.nc.gov/cleanenergyplan