

Energy ⁱⁿ Action

South Carolina
State Energy Plan

OFFICE OF REGULATORY STAFF



This material is based upon work supported by the Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), under Award Number DE-EE0006996.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

South Carolina Office of Regulatory Staff

Energy Office

2016



Old Town

Content

Message from the Executive Director	4
Acronyms	6
INTRODUCTION: THE BASICS	8
Who is Responsible for Energy Regulation in South Carolina?	10
Who is Responsible for Energy Planning in South Carolina?	11
Who Developed the South Carolina State Energy Plan?	12
How was the State Energy Plan Developed?	13
How is the State Energy Plan Informed by South Carolinians?	13
PART ONE: POLICY RECOMMENDATIONS	14
State Energy Plan Top Tier Policy Recommendations	17
Integrated Resource Planning Process	18
Natural Gas Infrastructure	18
Building Energy Codes	19
Funding for Needed Energy Upgrades	19
Act 236 Progression	20
Environmental Justice Assessment	22
Lead by Example – State Transportation	23
Facilitation of State Agency Energy Efficiency	23
PART TWO: SOUTH CAROLINA’S ENERGY SYSTEM	24
South Carolina’s Energy Landscape	26
Demographic Snapshot	26
Economic Output: Gross Domestic Product (GDP) and Manufacturing	28
Environmental Outlook	30
Electric and Natural Gas Utilities	34
Electric Transmission System Overview	45
South Carolina Natural Gas Overview	49
South Carolina Natural Gas Infrastructure	50

South Carolina Propane Infrastructure	51
Pipeline Safety	52
Electric and Natural Gas Generation and Demand	54
Generation	54
Capacity	56
Consumption	57
Utility Energy Efficiency Programs	59
Renewable Energy Programs	60
Biomass	61
Wind	61
Solar Programs and Leasing	62
Energy for Transportation	65
Public and Mass Transit Programs	66
Carpooling and Ridesharing	67
Alternative Fuel Infrastructure	67
Regulations and Statutes Affecting Utilities	68
Resource Planning	69
Integrated Resource Plan	69
Utility Forecast Modeling	70
Electric Utility Collaboratives	72
Statewide Generation Resources	72
Grid Modernization	73
Future Outlook: Projected Generation and Capacity Mix	74
Glossary	79
Thank You	84

Message

from the
**Executive
Director**
C. Dukes Scott

Early in my career, I ran across a 1930s advertisement at an electric utility office. The ad boldly proclaimed, "Electricity is Cheap – Use It Freely." Intrigued with my find, I made a copy to display as a reminder of days gone by. It hangs in our office conference room and has sparked many a conversation.

A decade later in 1992, I was working with the South Carolina Energy Office where talk began of the need for a statewide energy plan to coalesce the many and often competing interests into a unified vision for our energy future. It was a worthy goal, and in fact a legislative mandate for the Energy Office, but too far ahead of its time to gain the traction necessary to become a reality.

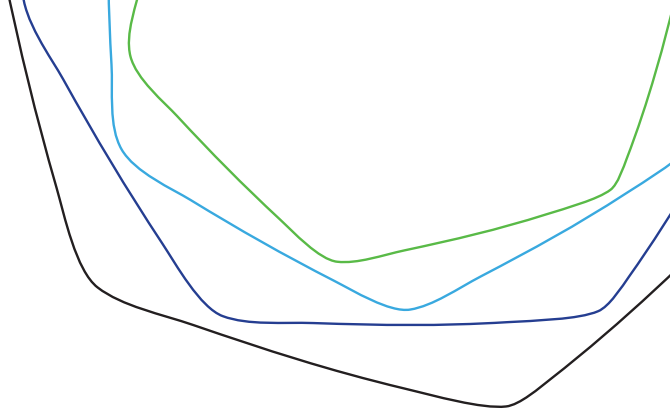
Fast-forward twenty-three years to 2015. The South Carolina General Assembly, as part of state government restructuring, re-created the Energy Office within the Office of Regulatory Staff, the agency that represents the public interest in utility regulation. With a sense of having come full circle, I found myself once again considering the prospect of an energy plan for South Carolina.

This time, the timing was right. In the intervening years, advances in renewable energy technology, a national focus on carbon-emissions reduction, and a series of federal and state energy-efficiency initiatives had raised our collective sense of urgency to create a statewide energy plan. Contrary to my advertising relic, electricity was definitely not cheap and using it freely – without regard to monetary or environmental costs – was to remain in the past. The only path for us is forward.

This State Energy Plan is a marvel of collaboration. It represents steady, earnest work by more than 130 professionals representing over sixty organizations for close to two years. The breadth of interests that came to the table is amazing: investor-owned electric and natural gas utilities, state agencies, not-for-profit electric cooperatives, state-owned and municipal utilities, conservationists, sharp legal minds, and concerned citizens. While there were challenges along the way, all persevered with a common goal: to accomplish what some said could not be done – a comprehensive energy plan for South Carolina. For bringing this monumental effort to fruition, I am truly grateful to each of you.

**Plans are nothing;
planning is everything.**

Dwight Eisenhower got it right when he said, "Plans are nothing; planning is everything." This energy plan is energy in action – a dynamic blueprint for planning that must evolve as the state's needs evolve.



In these pages you will find baseline information on South Carolina’s current energy system, a set of five- and ten-year outlooks, and policy recommendations for actions to ensure a stable, equitable energy future. Some ideas contained in this report are more far reaching than others and will require continued study, such as implementing a coordinated building approach to new electricity generation and joint dispatch of the state’s electric generation resources. The arrangement of the report by section – with policy recommendations as a stand-alone piece – reflects our commitment to update and fine-tune the contents as necessary.

Actions express priorities. This State Energy Plan is an expression of our collective priorities. It represents a culmination of thought and effort to develop an energy system that will create jobs, promote a thriving economy, and protect our natural environment. Like the proverbial three-legged stool, all must be on an equal footing to ensure a successful future.

Bold, wise, and steadfast.

What has become of my advertisement from a bygone era? It is still on the wall – but now serves as a reminder of how far we have come. This journey demands the best of us, and we must be prepared to give it: to be bold in our vision, wise in our actions, and steadfast in our commitment to securing a resilient, clean, and affordable energy system for South Carolina residents and businesses. Working together for South Carolina’s future, we are energy in action.



C. Dukes Scott
Executive Director
South Carolina Office of Regulatory Staff

ACRONYMS

ACEEE – American Council for an Energy-Efficient Economy

ACP – Atlantic Coast Pipeline

AFV – Alternative Fuel Vehicles

AMI – Advanced Metering Infrastructure

AMR – Automatic Meter Reading

ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

ATC – Available Transfer Capacity

BCA – Bill Credit Agreements

BCC – Building Codes Council

BCF – Billion Cubic Feet

BES – Bulk Electric System

BLRA – Base Load Review Act

BOEM – Bureau of Ocean Energy Management

BTU – British Thermal Unit

CAA – Clean Air Act

CAFE – Corporate Average Fuel Economy

CCR – Coal Combustion Residuals

CDC – Community Development Corporation

CDFI – Community Development Financial Institutions Fund

CFL – Compact Fluorescent Light

CHP – Combined Heat and Power

CNG – Compressed Natural Gas

C-PACE – Commercial Property-Assessed Clean Energy

CPW – Commission of Public Works

CWA – Clean Water Act

CZC – Coastal Zone Consistency

DCGT – Dominion Carolina Gas Transmission

DEC – Duke Energy Carolinas

DEP – Duke Energy Progress

DER – Distributed Energy Resources

DHEC – South Carolina Department of Health and Environmental Control

DIMP – Distribution Integrity Management Program

DNR – South Carolina Department of Natural Resources

DOC – South Carolina Department of Commerce

DOE – US Department of Energy

DOT – US Department of Transportation

DSM – Demand Side Management

Duke – Duke Energy Corporation

ECSC – Electric Cooperatives of South Carolina

EE – Energy Efficiency

EIA – Energy Information Administration

Energy Office – South Carolina Office of Regulatory Staff State Energy Office

EM&V – Evaluation, Measurement, and Verification

EPA – US Environmental Protection Agency

EPAct – Energy Policy Act of 2005

EPC – Engineering, Procurement, and Construction

ERC – Emission Rate Credit

FERC – Federal Energy Regulatory Commission

GDP – Gross Domestic Product

GWh – Gigawatt-Hours

HVAC – Heating, Ventilation, and Air Conditioning

IECC – International Energy Conservation Code

IEEE – Institute of Electrical and Electronics Engineers

IOUs – Investor-Owned Utilities

IRC – International Residential Code

IRP – Integrated Resource Plan

kV – Kilovolt

kW – Kilowatt

kWh – Kilowatt-Hour

LDC – Local Distribution Company

LED – Light-Emitting Diode

LEED – Leadership in Energy and Environmental Design

LNG – Liquefied Natural Gas

Lockhart Power – Lockhart Power Company

LPG – Liquid Propane Gas

MACT – Maximum Achievable Control Technology

Mcf/d – Million Cubic Feet per Day

MED – Major Event Day(s)

MW – Megawatt

MWa – Average Megawatt

MWh – Megawatt-Hour

NAAQS – National Ambient Air Quality Standards

NERC – North American Electric Reliability Corporation

NGA – Natural Gas Authorities

NGO – Non-Governmental Organizations

NPDES – National Pollutant Discharge Elimination System

NRC – Nuclear Regulatory Commission

OASIS – Open Access Same-Time Information System

OCS – Outer Continental Shelf

ORS – South Carolina Office of Regulatory Staff

OSE – South Carolina Office of State Engineer

PACE – Property-Assessed Clean Energy

PBI – Performance-Based Incentive

PBF – Public Benefit Fund

PCA – Pollution Control Act

PSI – Pounds per Square Inch

PHMSA – Pipeline and Hazardous Materials Safety Administration

PNG – Piedmont Natural Gas Company

POD – Point of Delivery

POR – Point of Receipt

PPA – Power Purchase Agreements

PSC – Public Service Commission of South Carolina

PURC – State Regulation of Public Utilities Review Committee

PURPA – Public Utility Regulatory Policies Act

RC – Reliability Coordinator

RFP – Request for Proposals

RMDAC – Recycling Market Development Advisory Council

ROW – Right of Way

RPS – Renewable Portfolio Standards

SAIDI – System Average Interruption Duration Index

SAIFI – System Average Interruption Frequency Index

Santee Cooper – South Carolina Public Service Authority

SCADA – Supervisory Control and Data Acquisition (electric)

SCAMPS – South Carolina Association of Municipal Power Systems

SCCCL – South Carolina Coastal Conservation League

SCDOT – South Carolina Department of Transportation

SCE&G – South Carolina Electric and Gas

SCPGA – South Carolina Propane Gas Association

SNG – Southern Natural Gas

SELC – Southern Environmental Law Center

SFAA – State Fiscal Accountability Authority

TIMP – Transmission Integrity Management Program

TOU – Time-of-Use

Transco – Transcontinental Pipeline

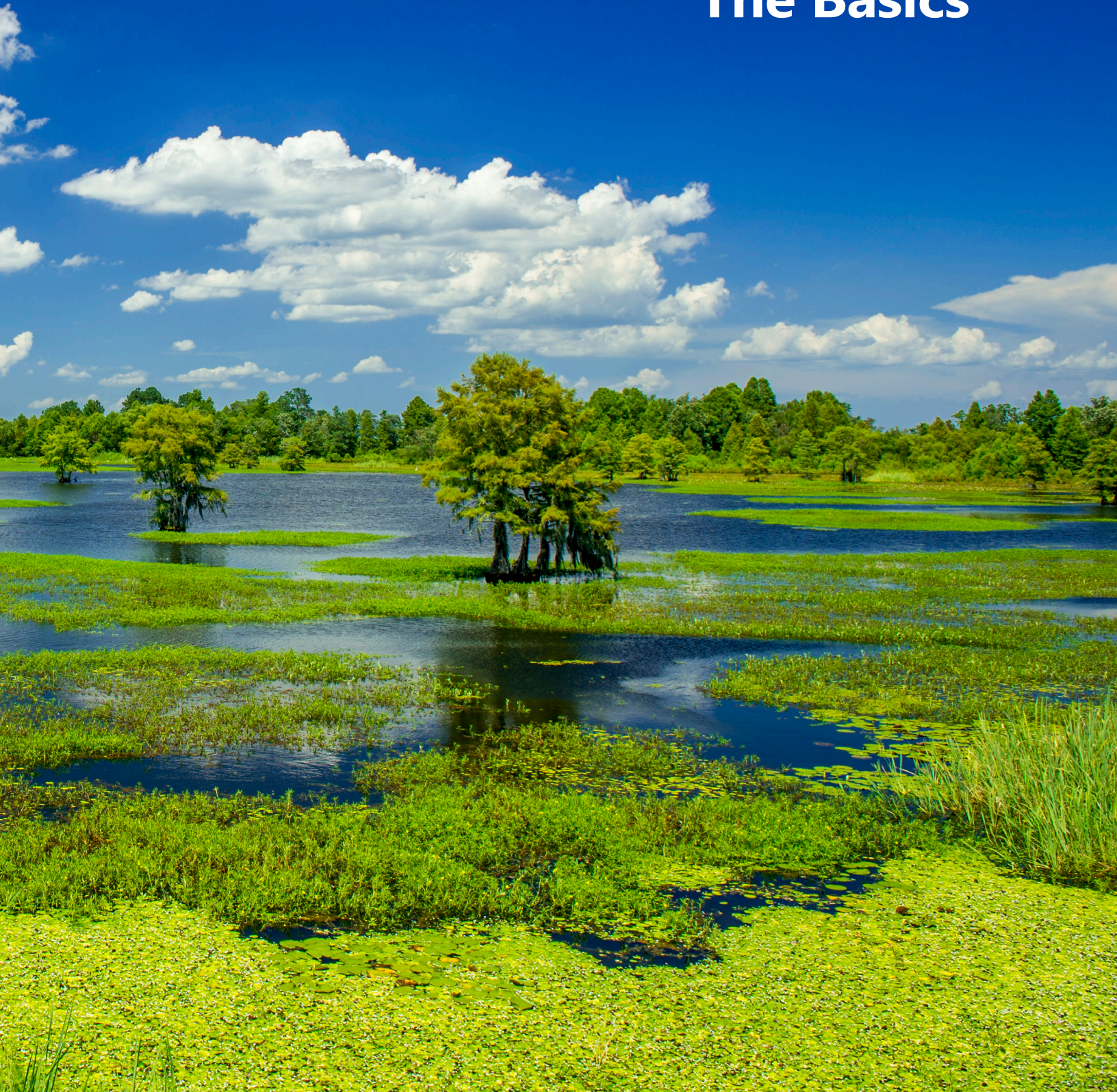
VMT – Vehicle Miles Traveled

WAP – Weatherization Assistance Program



Introduction

The Basics





The South Carolina State Energy Plan (State Energy Plan) is a comprehensive blueprint for a reliable, resilient, clean, and affordable energy system for South Carolina residents and businesses. Specifically, the State Energy Plan is designed to maximize (to the extent practical) reliability, environmental quality, energy conservation, and energy efficiency while minimizing the cost of energy throughout the state.

Who is Responsible for Energy Regulation in South Carolina?

In the electric utility area, the General Assembly has established governance for investor-owned utilities (IOUs).

In 2004, the South Carolina General Assembly created the South Carolina Office of Regulatory Staff (ORS) to represent the public interest in utility regulation. In the agency's enabling legislation, public interest is defined as a balance among the interests of the public, the economic development of South Carolina, and the financial integrity of the state's public utilities.

The Public Service Commission of South Carolina (PSC) is the adjudicative arm of public utility regulation in South Carolina. The seven commissioners (each elected to four-year terms by the South Carolina General Assembly) make rulings in regulatory proceedings for utilities with regard to programs, tariffs, and rate changes. The PSC also promulgates regulations affecting IOUs.

The South Carolina Public Service Authority (Santee Cooper) has a statutorily established governing board that is appointed by the Governor, deemed qualified by the State Regulation of Public Utilities Review Committee (PURC), and confirmed by the state Senate. The state's electric distribution cooperatives are governed by boards of trustees that are elected by their members. Municipal electric systems are governed either by city council or an elected commission or board of public works.

The PURC is also charged with oversight of the PSC and ORS and with making policy recommendations to the General Assembly. The PSC also promulgates regulations affecting IOUs.

The SC Department of Health and Environmental Control (DHEC) is the state's environmental regulatory agency and also plays an important role in South Carolina's energy landscape. Other state agencies having an impact on South Carolina's energy landscape include the SC Department of Commerce (DOC), SC Department of Natural Resources (DNR), SC Department of Transportation (SCDOT), and the state Agriculture and Forestry Commissions.

Who is Responsible for Energy Planning in South Carolina?

Development of a State Energy Plan is the responsibility of the ORS State Energy Office (Energy Office), which became part of the ORS in July 2015 as a result of legislation restructuring South Carolina state government. The Energy Office is charged with serving as the principal energy planning entity for the state.

While the regulatory role of the ORS applies primarily to IOUs, the planning role of the Energy Office is different and covers the entire electric and natural gas sectors as well as others like the transportation sector.



*SCE&G's 430 MW Cope Station,
located near Orangeburg, SC*



Who Developed the South Carolina State Energy Plan?

Development of the State Energy Plan was directed by the Energy Office, as specified in statute. The Energy Office created a Steering Committee to bring together knowledgeable parties to discuss South Carolina's energy landscape. The following organizations were represented on the Steering Committee with several other organizations being represented in the working subcommittees to assist in development of the State Energy Plan:

- Conservation Voters of South Carolina
- Duke Energy Corporation
- Electric Cooperatives of South Carolina
- South Carolina Association of Municipal Power Systems
- South Carolina Coastal Conservation League
- South Carolina Department of Health and Environmental Control
- South Carolina Electric & Gas Company
- South Carolina Energy Users Committee
- South Carolina Office of Regulatory Staff
- South Carolina Public Service Authority
- Southern Environmental Law Center
- State Regulation of Public Utilities Review Committee staff

How was the State Energy Plan Developed?

In developing the State Energy Plan, the Energy Office organized its effort in accordance with the tenets outlined in state statute (SC Code Section 48-52-210). These efforts have been managed by a Steering Committee and aided by several working subcommittees. Over 130 professionals, representing more than 60 organizations, participated in over 45 subcommittee meetings. The drafting of the State Energy Plan consisted of two Phases. The content of the final document was produced by the various subcommittees. Phase I focused on the development of a baseline to reflect the current status of energy in the state. Phase II focused on policy recommendations. Ultimately, over 80 recommendations were submitted by the subcommittees for review.

The Energy Office also held five public engagement sessions at locations across the state. The purpose of the meetings was to understand what stakeholders in attendance believed should be addressed in a State Energy Plan. Each engagement session consisted of three main parts: an overview of the development of the State Energy Plan, polling of the audience on specific issues, and an open forum discussion and comment period. Results of each session's poll were made available on the Energy Office website.

In addition to these sessions, three stakeholder surveys were developed, one of which was made available on the ORS website. The other two surveys were designed with specific stakeholders in mind. These were distributed by electronic mail. A summary of the results of these surveys is included in Appendix A.

The Energy Office was also asked to present information related to the development of the State Energy Plan at several meetings and conferences, including but not limited to the Biomass Council, local Council of Governments meetings, and the South Carolina Clean Energy Business Alliance's Clean Energy Summit. In addition, the Energy Office was invited to participate in the annual continuing legal education seminar hosted by the Electric Cooperatives of South Carolina, Inc. (ECSC) and the Coastal Conservation League (CCL). The 2016 seminar was dedicated to the development of the State Energy Plan. The seminar consisted of panel discussions aimed at addressing the key tenets of state energy policy as outlined in statute. Participants engaged in vigorous discussions that covered important energy-related issues such as electric and natural gas reliability and costs, economic development, transportation, and environmental justice.

How is the State Energy Plan Informed by South Carolinians?

Comments on the State Energy Plan were solicited throughout the process from stakeholders and members of the public through public hearings and a public comment page on the Energy Office website.

Comments received throughout the public hearing and comment process are available online. See Appendix B for South Carolina legislation regarding the State Energy Plan, Energy Office, the ORS, PSC, and DHEC.

Managed by SCE&G, Lake Murray serves as a major recreation area and resource for drinking water, fisheries, and wildlife habitats. The lake was built in 1930 to provide a source of energy for the Columbia area through the Saluda Hydroelectric generating plant.



Part One

Policy Recommendations







State Energy Plan Top Tier Policy Recommendations

The Energy Office coordinated an extensive stakeholder process consisting of six working subcommittees to develop the State Energy Plan’s policy recommendations. Of the over 80 (consensus and non-consensus) recommendations produced by the subcommittees, the recommendations described below emerged as recommendations that could encompass several policy ideas, or that were particularly timely. They reflect significant cross-cutting issues and, in most cases, arose in more than one subcommittee.

As part of its initial work, the Energy Office will dedicate its resources to implementing these policy recommendations. Each recommendation produced by the working subcommittees is presented in a format that provides sufficient detail to encourage other entities and stakeholders to champion the remaining policy recommendations either individually or in collaboration.

See Appendix C for a complete list of policy recommendations.

Integrated Resource Planning Process

Challenge: Ensure that electric utility Integrated Resource Plans (IRPs) clearly demonstrate and reflect access to energy supplies at the lowest practical environmental and economic cost and that demand-side options are pursued wherever economically and environmentally practical.

Background: Electric utility IRPs vary. A robust analysis is important to accurately demonstrate the lowest practical environmental and economic cost for consumers statewide. This analysis should consider economic and environmental metrics; a minimum set of alternative resource portfolios; a minimum set of alternative scenarios for analysis; joint dispatch of generating resources; and coordinating the construction of new electricity generation.

Approach: The Energy Office should establish a committee to study matters related to the IRP process including the costs and benefits that can be achieved by changes to the IRP process. The study committee should consist of representatives from investor-owned utilities, Santee Cooper, the electric cooperatives, conservationists, and other interested stakeholders.

Natural Gas Infrastructure

Challenge: Ensure that natural gas is a viable energy option for residential, commercial, industrial, and power generation customers across South Carolina and enable South Carolina to continue to attract economic development prospects.

Background: Since natural gas is not produced in South Carolina, all natural gas is transported into South Carolina by three underground interstate pipelines: Dominion Carolina Gas Transmission (DCGT), Transcontinental Pipeline (Transco), and Southern Natural Gas (SNG). The natural gas is then delivered to local distribution companies, municipalities, power generators, and industrial customers.

South Carolina has thousands of miles of underground transmission and distribution pipelines that bring and move natural gas across the state to serve the needs of industrial, commercial, and residential customers. Natural gas is in high demand due to several factors – increased availability of low-cost, domestic natural gas; increasing environmental regulation of GHG; and manufacturing and population growth in South Carolina. However, the lack of availability of natural gas also creates issues for economic development and other interests. It seems likely that in order to continue to serve the growing demand for natural gas in South Carolina, additional natural gas transmission and distribution pipeline capacity are needed. The process for planning additional natural gas pipeline capacity begins only when necessary end-user commitments have been finalized. Large construction projects do not begin until the pipeline has been reviewed and approved by all required regulatory bodies. The process to submit and receive approval to expand or construct a major pipeline system can take years.

Approach: A study committee should meet as quickly as practical to review policies. The committee should also consider issues that prevent natural gas from being an option for many and evaluate the costs and benefits of various methods of providing natural gas as an option for South Carolina energy consumers. Consideration should be given to education, funding, and long-term planning, in light of the lengthy approval process.

Building Energy Codes

Challenge: Ensure that buildings are designed to minimize operational costs for energy and to keep the state from falling behind other states as energy codes advance.

Background: Energy building codes are important for building owners to ensure that buildings are constructed to be as energy efficient as is practical, thereby minimizing operating costs. They are also important to utilities, since they control the energy use in new buildings. In 2009, Governor Sanford signed H.3550 into law that mandates the 2006 International Energy Conservation Code (IECC) for all new and renovated buildings, effective July 1, 2009, but removes the code from the normal adoption process. Future updated versions of the energy code must also be adopted by statutory amendment, unlike other building codes. The South Carolina General Assembly last updated the energy code to the 2009 IECC during the 2012 legislative session (Act 143) via a statutory amendment signed by the Governor. The most current iteration of the IECC is the 2015 version.

Approach: Convene a task force of building design and construction professionals, building owners and major tenants, local and state elected officials, general commercial contractors, commercial subcontractors, homebuilders, insurers, lenders, the Building Codes Council, local building officials, and the conservation community. The task force should begin investigating the impact of the adoption of the most current building efficiency standards (2015 IECC and American Society of Heating, Refrigeration, and Air Conditioning Engineers Standard 90.1-2013) and identifying the potential impact of outdated energy codes on the public's health, safety, and wellness and on the cost to the public and private sector to operate and maintain the buildings they own or lease. The task force should also consider the question of whether the state's energy code should be returned to the former adoption process through the state's Building Codes Council.

Funding for Needed Energy Upgrades

Challenge: The state lacks a revenue stream to advance energy efficiency, renewable energy, and alternative transportation opportunities that support policy goals.

Background: SC Code Section 58-37-50 allows electric utilities to offer on-bill financing of energy-efficient home improvements to their customers. The loans are tied to the meter, instead of the customer, so the obligation of repayment is passed on to subsequent account holders who

also enjoy the benefits of the energy-efficient home improvement. Public Benefits Funds (PBFs) exist in 27 states, with some of them providing funds for both energy efficiency and renewable energy. PBFs are generally funded through a surcharge on utility bills (not a utility charge) but could be created through legislative action rather than involving utilities in collection. Other options include Property Assessed Clean Energy (PACE) programs or Commercial Property Assessed Clean Energy (C-PACE) programs that allow for energy-retrofit loans to be repaid through property taxes or special assessment districts in the case of C-PACE. Still another example is the Help My House program administered by Central Electric Power Cooperative and the ECSC that targets high energy users and has made 551 energy efficiency loans repaid through on-bill financing. A study of homes retrofitted in Help My House's initial pilot program found an average annual energy reduction of 34 percent or 11,000 kilowatt hours (kWh) per year. Funding to support retrofits for disadvantaged and/or low-income residents presents a particular opportunity and may require more targeted action.

Approach: A study committee should examine: potential solutions to the problem of financing energy efficiency improvements, including whether changes to the on-bill financing statute and program design could encourage expansion of the programs; whether a PBF is a viable option; whether low-interest sources of financing may be available to utilities that want to make these programs available to their customers; how low-income residents may be more effectively served regardless of utility provider; and alternative transportation.

Act 236 Progression

Challenge: Determine the needs of the state in terms of renewable energy in the context of Act 236 and beyond.

Background: Recognized nationally as landmark legislation, the South Carolina Distributed Energy Resources (DER) Program Act of 2014 (Act 236) was passed unanimously by the South Carolina General Assembly and signed into law by the Governor. Designed collaboratively by policy makers, investor-owned utilities, electric cooperatives, the ORS, environmental and conservation groups, renewable energy developers and installers, large energy users, and other stakeholders in the state, this legislation represents multiple public policies. These policies support the adoption and integration of various types of renewable energy technologies in South Carolina — from small customer-generators like rooftop solar to large, “central plant” renewable generation — as well as distributed energy resources like energy storage.

Over the past two years, much has been accomplished under Act 236. To build on the growing South Carolina solar industry, we need to look at how to continue to incorporate more renewables, including wind, into future IRPs or through legislative actions that allow the utilities to operate their grids safely, reliably, economically, and equitably. In addition, as the price of solar continues to fall and the industry grows and matures, it is important for consumers to understand the economics of their purchasing decisions.



Approach: A study committee consisting of interested stakeholders drawn from the individual Duke Energy Progress (DEP), Duke Energy Carolinas (DEC), and South Carolina Electric & Gas Company (SCE&G) DER advisory groups, augmented with other stakeholders as appropriate, should be formed. Also, joint cooperation is recommended — beginning with a meeting in 2017 to discuss not only the progress each utility has made toward fulfilling the goals of Act 236 but also to consider:

- renewable resources in addition to those included in current DER plans;
- program modifications required for an advanced, integrated grid to manage and optimize the increasingly dynamic flow of electricity such as energy storage, microgrids, electric vehicles, power quality, and system security; and
- opportunities to enhance current policy or regulations to further expedite infrastructure modernization, expansion, and service reliability.

Environmental Justice Assessment

Challenge: Decisions for energy and transportation facilities may inadvertently affect environmental justice communities because of compounding impacts and/or cumulative effects of various stressors. Multiple agencies may have responsibilities in this arena, with minimal coordination among them.

Background: Impacts of energy and transportation infrastructure — including waste disposal, rights-of-way (ROW) locations and management, and transmission corridors on environmental justice communities — are varied. They may range from emissions and depositions of pollutants to the more intangible “disrupting the cohesiveness of a community.” While many agencies have responsibilities to evaluate environmental justice considerations, both the methodology and the parameters of the analysis vary. To ensure a continued commitment toward addressing environmental justice issues, an adaptive management framework for identifying, recommending, and implementing environmental justice policies and solutions should be established.

Approach: Establish a statewide environmental justice advisory panel that will serve as a “think tank” and resource center for environmental justice issues. The advisory panel will work with and advise all entities throughout the state on environmental justice issues. It will develop and submit additional policy recommendations on environmental justice issues for consideration in future State Energy Plan revisions. The panel could also consider necessary changes in state policy related to energy and environmental justice.

Lead By Example – State Transportation

Challenge: Currently, only a small portion of state-owned or leased fleet vehicles are fueled by a US Department of Energy (DOE) established alternative fuel. As a result, the state's fleet lacks diversity, and its fuel supply is vulnerable. These limitations compromise fuel efficiency and diversity in transportation.

Background: An increase in transportation fuel efficiency and diversity is considered a priority by the federal government as a means of reducing dependence on foreign oil, thereby reducing security risks. Some state agencies have expressed an interest in greater access to alternative fuel vehicles, but little is known about options and availability of fueling stations.

Approach: Conduct a survey of state agencies, local governments, and municipalities to determine their interest and willingness to lease, purchase, use, or convert to alternative fuel vehicles or equipment. Assuming interest is expressed, convene a task force whose purpose would be 1) to educate government entities on the positive and negative aspects of alternative fuel use and 2) to determine what, if any, barriers currently exist that limit their ability to lease, purchase, use, or convert to alternative fuel vehicles or equipment. The task force could consider developing recommendations regarding statewide goals and incentives to promote a more diverse fuel base.

Facilitation of State Agency Energy Efficiency

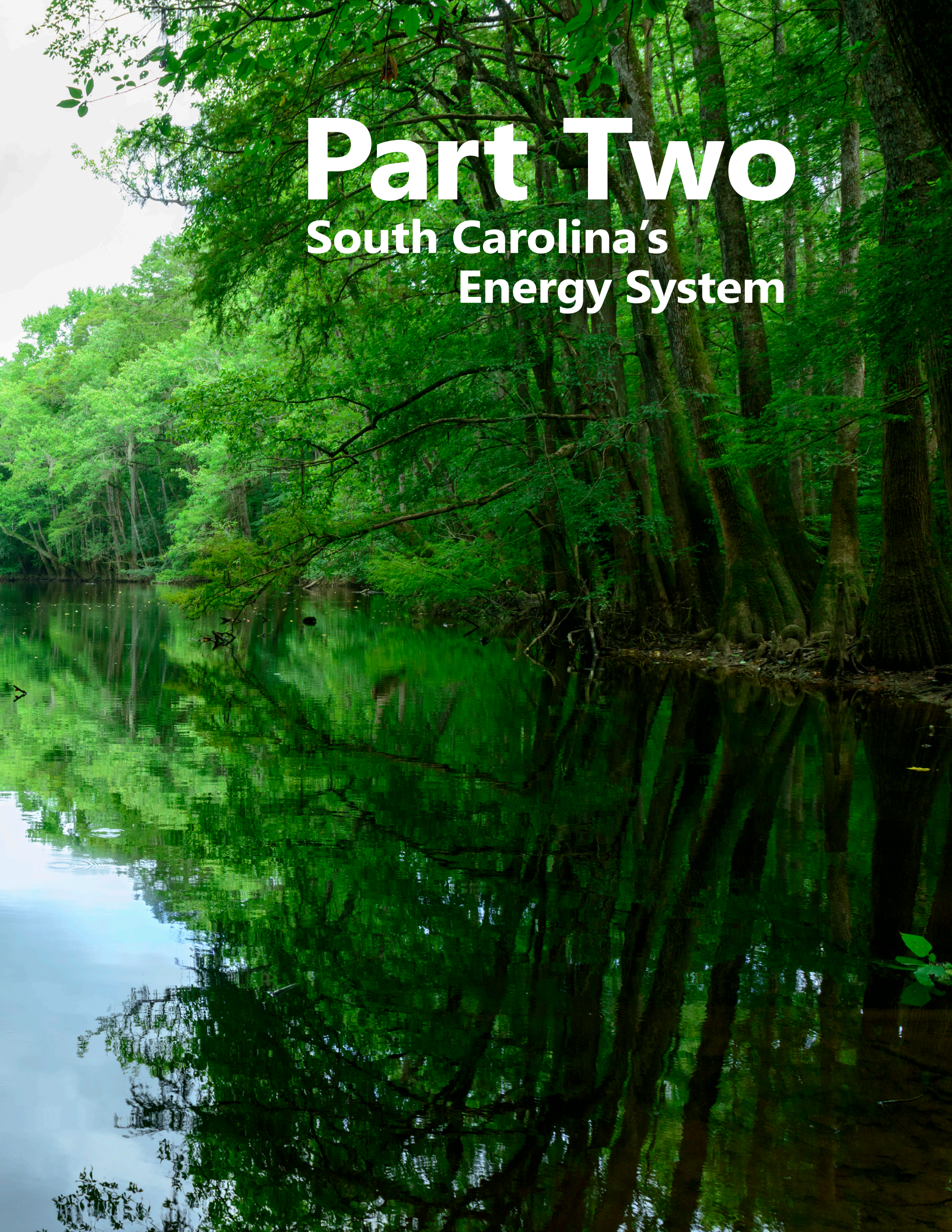
Challenge: The process of performing energy audits, as a precursor to state agency energy efficiency retrofits, can be very difficult.

Background: Many state agencies are unable to go through the lengthy process of a Guaranteed Energy Savings Contract due to uncertainty about the process, lack of personnel resources, and lack of knowledge about the qualifications required of the firms performing the work. The South Carolina Office of State Engineer (OSE) has the expertise to select qualified firms and put them on state contract available to all state agencies. However, for the OSE to make these selections, a State Fiscal Accountability Authority (SFAA) policy must be in place (similar to other existing policies) that will allow OSE to qualify multiple firms for an extended period.

Approach: The OSE is proposing a policy that can be submitted to the SFAA for approval. If approved, OSE will proceed with the qualification-based selection of firms qualified to perform energy audits on state buildings.

For a comprehensive list of recommendations produced by the working subcommittees, see Appendix C.





Part Two

South Carolina's Energy System



SOUTH CAROLINA'S ENERGY LANDSCAPE

Consumers of energy across all fuel types, within all utilities, and across the state are diverse. Population, age, housing, income, and the interplay among these socioeconomic and demographic metrics all affect energy use in South Carolina. A detailed picture of the major economic and demographic drivers for South Carolina is included in Appendix D.

According to the United States (US) Census Bureau:

Demographic Snapshot

Population: The state has outpaced the nation in percentage growth in population for the past 40 years due to both natural growth within the state itself and a gradual population shift toward the southeastern US. South Carolina's exponential job growth, tier 1 research universities, and low cost of living have attracted new residents from all over the US to South Carolina. Moreover, South Carolina's population growth is expected to continue at an estimated rate of 11 percent over the next 10 years; however, roughly one quarter of the state's counties (11 out of 46) have and will likely continue to experience a decline in population.

Age: South Carolina is a relatively young state, with an average age of 37.9. Though South Carolina is a popular destination for retirees and baby boomers (a trend that is expected to continue), there are more households with residents under the age of 18 than over the age of 65.

Housing: Approximately two thirds of housing stock in the state is single-family homes. The remaining one third is split almost equally between mobile homes and multi-family dwellings. Multi-family housing generally uses much less energy because of smaller square footage, while mobile homes use relatively more energy due to lack of insulation and their stand-alone construction.

Income: South Carolina’s real median household income has fluctuated considerably over the past 30 years (1984-2014), with relatively low growth equating to an increase of 0.1 percent annually. In 2013, the state’s poverty rate was still the ninth highest in the nation, with just over 18 percent of the population classified as living in households with income below \$23,550. While conventional wisdom has suggested that lower income equates to lower energy use, recent research by the state’s electric cooperatives indicates that the relationship between income and energy use is complicated, with middle-income residents using less energy per person than those with the lowest incomes (see Appendix E).

Energy Use and Expenditure per Capita: The average American spent \$3,052 per person (2012 data) while the average South Carolinian spent \$3,310 per person for residential and transportation energy combined. South Carolinians consumed 347 million British Thermal Units (BTUs) of energy per person in 2009, compared to an average of 308 million BTUs for the average US resident. Based on 2009 BTU consumption data by the DOE, South Carolina ranked 18th out of all states.



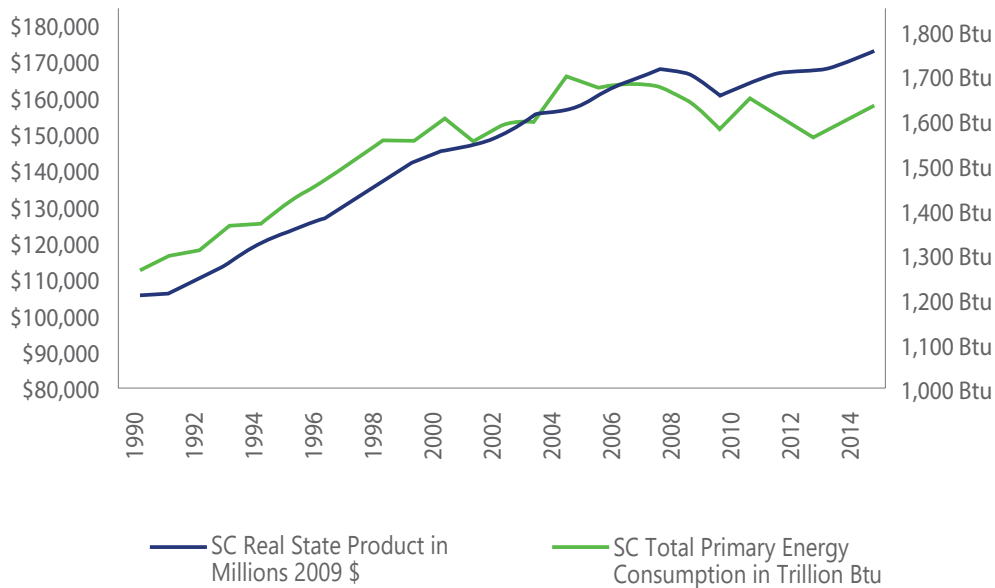
Jocassee Pumped-Storage Hydroelectric Station in Pickens County, South Carolina. The generating facility can reverse its turbines and pump water from Lake Keowee into Lake Jocassee.

Economic Output: Gross Domestic Product (GDP) and Manufacturing

GDP in South Carolina

Economic activity is heavily dependent upon adequate and reliable sources of energy, so the growth trends for measures of South Carolina’s economic output are important. A growing state economy and population require energy. Households use natural gas and electricity to heat and cool their homes, cook meals, watch television, and perform a host of activities that make up everyday life. Gasoline fuels the tens of millions of miles that are driven each year in South Carolina by households and businesses, and manufacturers use energy in all of its forms to create durable and nondurable goods. The chart below shows a strong relationship between economic activity and energy consumption in South Carolina. However, it is evident that over the past decade real state GDP has grown more quickly than primary energy consumption. This trend mirrors national ones and is due to a number of factors. Among them are more efficient air-conditioners, heat pumps, and furnaces; replacement of incandescent light bulbs with compact fluorescent light (CFL) bulbs and light-emitting diode (LED) bulbs; more efficient electric motors used in manufacturing; higher miles per gallon for both cars and trucks; and conservation-oriented building codes, to name a few. This decoupling of economic activity and energy use has been going on since the 1970s, but the positive relationship between the two still exists and will continue in the future.

Relationship Between Economic Output in SC and Energy Consumption, 1990-2014



South Carolina Industrial Output by Major Sectors



Manufacturing

Manufacturing plays a significant role in South Carolina’s economy and is expected to continue to do so in the future. In 2014, South Carolina’s manufacturing sector consumed 543.2 trillion BTUs, according to the Energy Information Administration (EIA), more than any other sector. In comparison, the transport sector used 444.2 trillion BTUs, followed by the residential and commercial sectors with 376.7 and 268 trillion BTUs, respectively. The chart above shows a projected 20 percent increase in total industrial output over the next ten years. When the total is split into its two main components — durable and nondurable manufacturing — the strong growth in durable (28 percent) is over three times higher than that of nondurable (9 percent). This large differential is primarily due to the decline of the textile industry, which is part of the nondurable sector. Increases in manufacturing output will require more energy resources in the future. Not only will more energy be needed, the reliability and quality of the energy provided will be critical.

Environmental Outlook

The continued growth of South Carolina's economy and its energy needs requires continued and focused decisions on clean, safe, reliable, and economical sources of power throughout the state. Consequently, environmental considerations are one part of the equation that seeks to optimize how energy is generated, consumed, and distributed in South Carolina.

Environmental impacts result from all types of energy production and use, including the combustion of fossil fuels in internal combustion engine vehicles; the combustion of fossil fuels for electric generation; and the combustion of fossil fuels in industrial, commercial, and residential applications. The environment can also be affected by other energy-related activities including the installation of transmission wires and pipes, the management and storage of by-products such as coal ash or spent nuclear fuel, and the impacts of renewable energy facilities.

Historically, electric generation was predominantly from the combustion of fossil fuels that resulted in air emissions, wastewater discharges, and solid waste disposal. Even though laws, regulations, and agencies were created to manage these byproducts in a manner protective of human health and the environment, it has generally been recognized that less dependence on fossil fuels preserves our resources and results in less environmental impacts.

Air emissions from industrial facilities, electric utilities, and vehicle exhaust affect the quality of the air we breathe. Wastewater discharges and water consumed for power generation affect the quality and quantity of water in our lakes and rivers. Coal ash and nuclear waste require special handling.

In South Carolina, DHEC is the lead regulatory agency directing utility and industry compliance with air, water, and other environmental standards (see Appendix B). Many federal regulations also come into play (see Appendix F). As a result, utilities have significantly reduced particulate matter, sulfur dioxide, nitrogen oxides, and mercury, among other pollutants. Through these efforts, South Carolina is meeting or doing better than required under the ever tightening federal standards.

Energy decisions potentially affect the quality of South Carolina's environment in many ways; therefore, it is important to consider key environmental indicators in order to assess how a State Energy Plan balances economic and environmental impacts over time.

Ambient Air Quality

The Clean Air Act (CAA), which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants that are common in outdoor air, considered harmful to public health and the environment, and that come from numerous and diverse sources including fossil fuel-fired power plants. The CAA established two types of national air quality standards. Primary standards set limits to protect public health, including the health of at-risk populations such as people with pre-existing heart or lung disease (for example, asthmatics), children, and older adults. Secondary standards set limits to protect

public welfare, including protection against visibility impairment and protection from damage to animals, crops, vegetation, and buildings.

The EPA must designate areas as meeting (attainment) or not meeting (nonattainment) the NAAQS. States are required to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated as nonattainment.

In addition, emissions of carbon dioxide (CO₂), methane, and other greenhouse gases from facilities in South Carolina are facing increased attention as part of federal regulatory efforts. The EPA recently developed greenhouse gas regulations for the electric power sector's existing facilities. Although the EPA's Clean Power Plan (CPP) mandates are currently stayed by the US Supreme Court (Chamber of Commerce v. EPA, 136 S. Ct. 999 (2016)), greenhouse gases from electric power utilities may still be subject to regulations in the future (see Appendix G).

Large fossil fuel units are classified as major stationary sources and are required to install pollution-control equipment and to meet specific emissions limitations. In addition, under the 1990 Clean Air Act amendments, major stationary sources must obtain operating permits. Smaller fossil fuel units may not have extensive pollution control devices, but may instead have efficiency standards.

Because of environmental policies developed or implemented by DHEC, South Carolina is currently in attainment with all primary and secondary NAAQS. Appendix H provides more information on ambient air concentration trends.

Mercury in the Environment

According to a 2007 study by Donna Mergler and others, mercury is a naturally occurring metal that can cause adverse health effects to exposed humans and other animals. That same year, a study by Steve Lindberg and others found that mercury can be released into the environment by natural causes, such as forest fires and volcanic eruptions, or by anthropogenic activities, such as the combustion of fossil fuels. This study also found that if mercury is released into the atmosphere, it can be deposited in terrestrial and aquatic ecosystems far from its original source. After deposition, mercury can be methylated through biochemical processes into methylmercury (MeHg), and it is this form that can be biomagnified in the food chain, according to a 2007 study conducted by John Munthe and others. For this reason, according to a 2010 study by James Glover and others, various government agencies have issued consumption advisories for fish and other aquatic life that may pose a health risk to humans. Appendix H provides information on consumption advisories in South Carolina.

A 2007 Mercury Deposition Network report by Tom Butler and others indicated that while there may be pockets of localized mercury deposition from US power plants, it is recognized that the majority (over 75 percent) of mercury deposition that occurs within the US originates from outside of the US. In order to minimize the US portion of utility emissions, the EPA finalized the Mercury Air Toxics Rule in April

2012. This rule required US coal-fired power plants to install maximum achievable mercury-control technology no later than April 2016. This rule requires what amounts to a 90 percent reduction of mercury from US sources, thus minimizing man-made US mercury emissions.

It is important to again note that the impact of anthropogenic mercury occurs when the deposited mercury is converted to methylmercury and enters the food chain. Methylmercury conversion primarily occurs in blackwater swamps and wetlands. The work of DHEC with the Mercury Air Toxics Rule will greatly minimize US deposition and further reduce conversion and impact to the environment.

Water Quality

Water pollutants and temperature variances are regulated under the Clean Water Act (CWA). The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. The “Clean Water Act” became the Act’s common name with amendments in 1972.

The CWA makes it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained. The EPA’s National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. The SC Pollution Control Act (PCA) is the basis of South Carolina’s water-pollution control and water-quality protection programs and provides the authority for DHEC to permit facilities, including power plants that must apply for and maintain five-year renewable discharge permits. NPDES permits are issued by DHEC. Facilities are required to monitor these discharges on a regular basis and submit results monthly to DHEC. DHEC maintains several tools to share information with the public about water quality issues in the state (SC Watershed Atlas and SC Water Quality Tool).

Water Quantity

Growing population and energy use continue to stress the available water supply for energy generation, drinking water, recreation, agriculture, fish and wildlife, and other important uses in South Carolina. Water is withdrawn from South Carolina lakes and rivers and used for both power generation (hydroelectric facilities including pumped storage) and cooling. In fact, most manmade lakes were created specifically for these purposes (for example, Lake Monticello, Lake Murray, and Lake Wateree). While over 20.4 trillion gallons are used for these purposes, over 85 percent of this usage is non-consumptive and does not affect water supply. In addition, any water used and returned to the environment must be permitted by DHEC and meet water-quality standards.

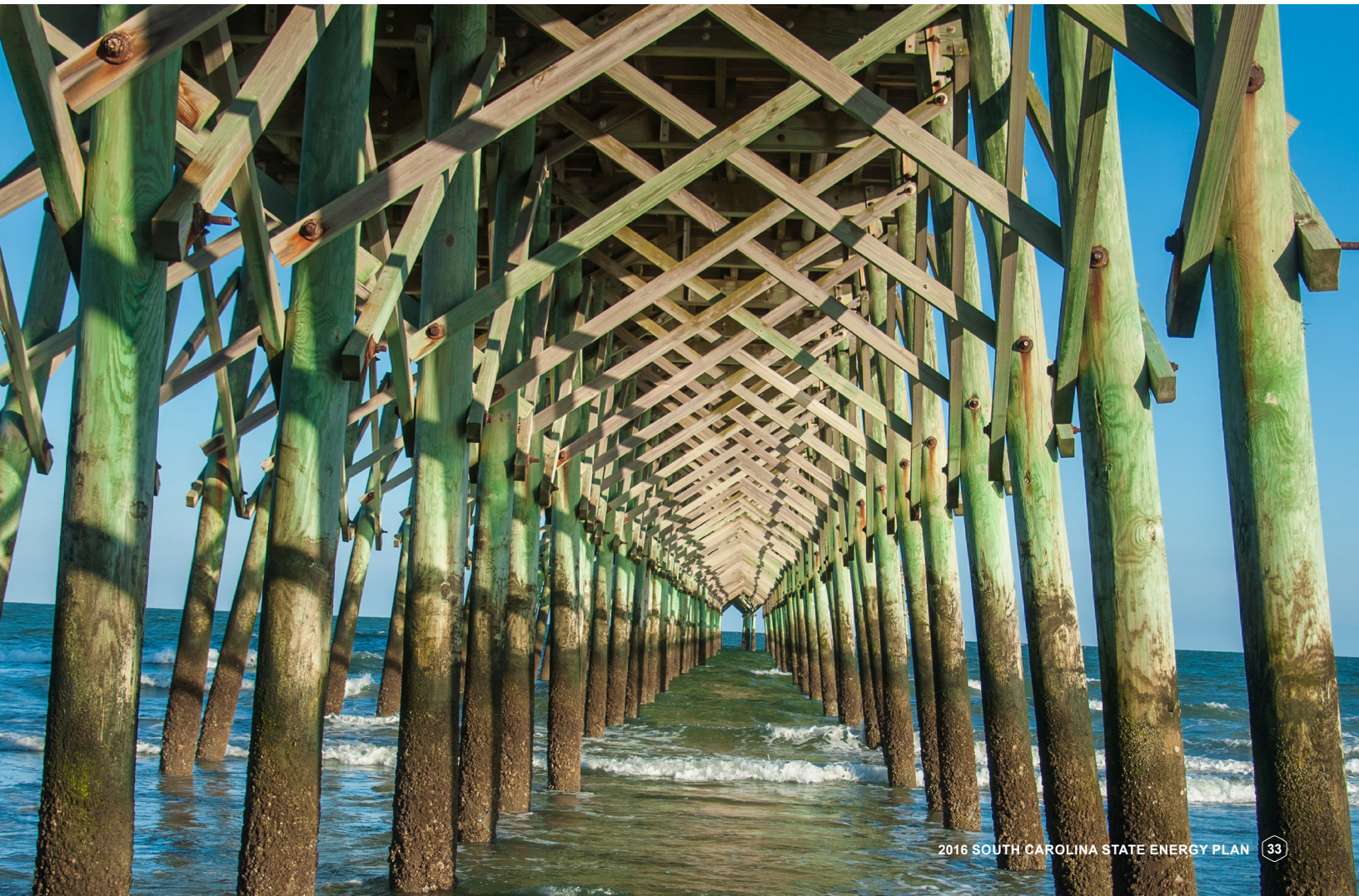
DHEC and the DNR are currently developing basin-wide surface water models assessing existing surface water systems and demands in South Carolina, as well as updating the DNR’s State Water Plan. The results of this assessment will provide a decision-support tool for surface-water permitting, water-policy development, water planning, and drought management.

Coal Combustion Residuals

Fly ash, bottom ash, and gypsum are byproducts of coal combustion known as coal combustion residuals (CCR) and can contain low levels of heavy metals such as arsenic, mercury, selenium, cadmium, and chromium. The EPA's recently finalized CCR Rule (April 2015) regulates coal ash as a non-hazardous waste. Santee Cooper, SCE&G, and Duke Energy are all developing plans to comply with this rule.

Nuclear Waste

South Carolina, along with Connecticut and New Jersey, are members of the Atlantic Interstate Low Level Radioactive Waste Management Compact for low-level radioactive waste disposal. Commercial low-level radioactive waste produced in South Carolina, Connecticut, and New Jersey is disposed of at the Barnwell Low-Level Radioactive Waste Disposal Facility, which is licensed by DHEC. The operating margin for this facility is set by state statute, with the PSC approving expenses and the ORS approving disposal rates. High-level radioactive waste disposal is managed at the federal level. Spent fuel rods are currently stored on-site at South Carolina's nuclear power plants until the federal government opens a permanent disposal site. Both low-level and high-level radioactive waste disposal are regulated by the Nuclear Regulatory Commission (NRC).





ELECTRIC AND NATURAL GAS UTILITIES

Forty-six electric distribution utilities and 16 natural gas distribution utilities currently operate in South Carolina. These utilities serve the over 4.8 million residents of the state. Furthermore, these utilities are responsible for the electric transmission and distribution lines as well as the natural gas pipeline systems that crisscross South Carolina.

These utilities can be grouped into six categories: IOUs, state-owned utility, electric cooperatives, municipal electric utilities, municipal natural gas utilities, and wholesale power producers (see Appendix I for complete listings of utilities by category).



Located at the base of the Lake Murray Dam, SCE&G's 250 MW McMeekin Station uses cooling water drawn from the bottom of the lake, thus increasing the plant's efficiency and reducing air pollution.

Investor-Owned Electric Utilities

IOU rates are regulated by the PSC, and they are allowed to earn a rate of return on their investments. The four South Carolina investor-owned electric utilities are:

- Duke Energy Carolinas (DEC)
- Duke Energy Progress (DEP)
- Lockhart Power Company
- South Carolina Electric & Gas Company

Duke Energy

Headquartered in Charlotte, NC, Duke Energy is a Fortune 125 company serving approximately 7.4 million electric customers in six states.

Duke Energy's subsidiaries, DEC and DEP, are regulated public utilities primarily engaged in the generation, transmission, distribution, and sale of electricity to approximately four million customers in portions of North Carolina and South Carolina. In 2012, Duke Energy and Progress Energy merged to form today's Duke Energy, one of the largest electric power holding companies in the US. However, DEC and DEP continue to operate as separate utilities under their parent company Duke Energy. DEC and DEP maintain separate costs, rates, and service-area responsibilities.

Duke Energy's history began with the Catawba Power Company in 1904, when the first power plant — Catawba Hydro Station in South Carolina — began providing electricity to Victoria Cotton Mills in Rock Hill, SC. Over the next century, the company's generation fleet expanded into coal, nuclear, natural gas, and solar to serve the ever growing demand for the conveniences that electricity could provide.

Today, Duke Energy utilities serve 30 counties in South Carolina and provide electric service to more than 733,000 retail customers. This retail base is made up of approximately 612,000 residential, 119,000 commercial, and 2,100 industrial customers.

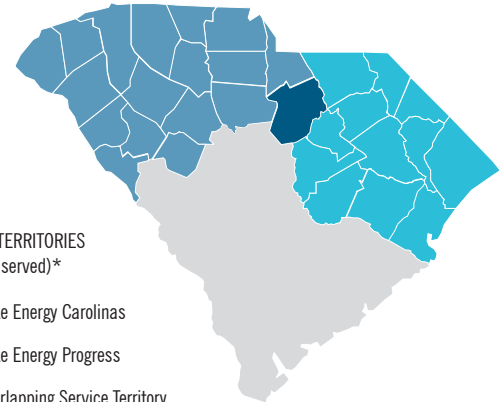
In 2015, DEP delivered 6,357 gigawatt-hours (GWh) of electricity, and DEC delivered 21,290 GWh to South Carolina retail customers.

DEC operates and maintains 25,546 miles of distribution lines and 5,031 miles of transmission lines in South Carolina. DEP operates and maintains 9,034 miles of distribution lines and 930 miles of transmission lines in South Carolina.

Duke Energy owns and operates nearly 34,400 megawatts (MW) of generation capacity across the Carolinas. While Duke Energy provides power to South Carolina customers from sources in both North Carolina and South Carolina, 9,779 MW of capacity is based in South Carolina.

Duke Energy is working to reduce the environmental impact of its existing plants and investing in energy efficiency initiatives that can reduce the need to build new ones. The company is also developing smart grid technologies that will create a digital, interconnected network – to provide customers with new ways to save energy, money, and the environment. Duke Energy is investing in renewable energy sources and has added wind and solar assets to its portfolio in the past decade.

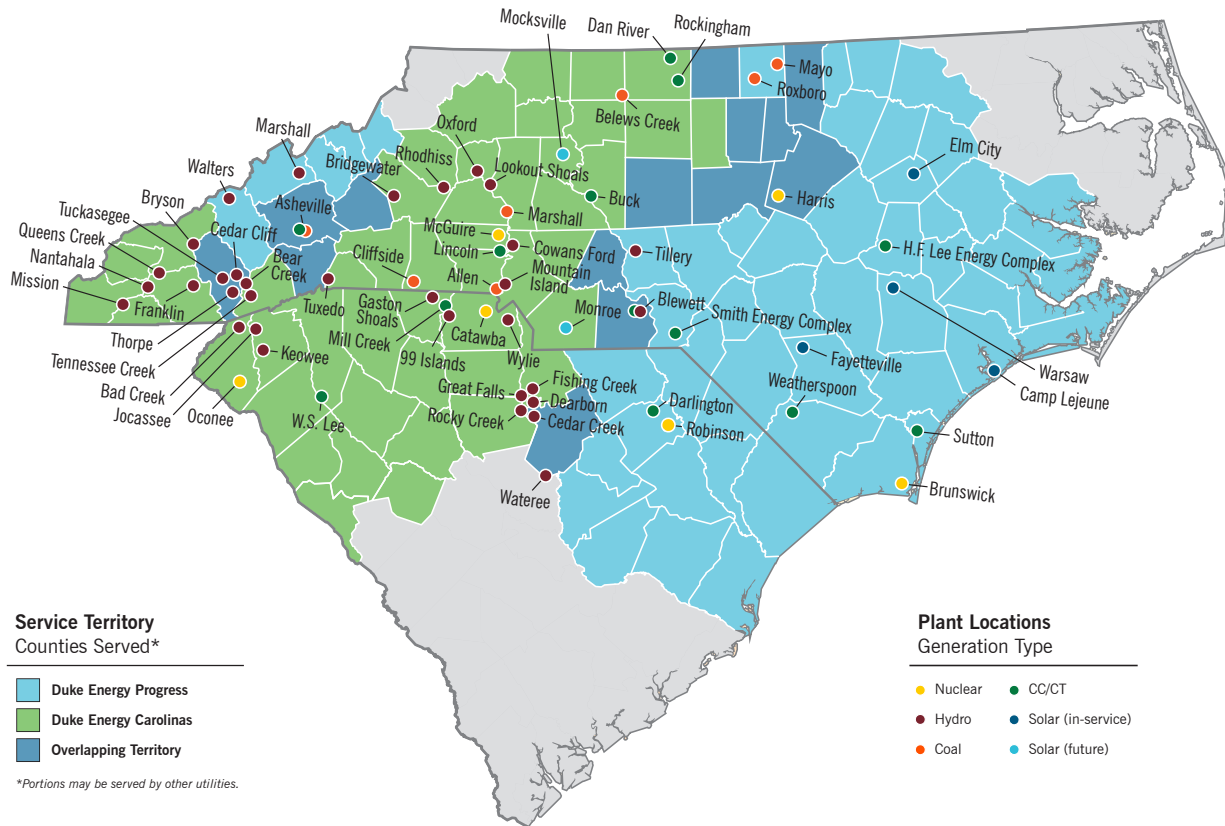
See the map below for the locations of Duke Energy’s North and South Carolina-based generation.



SERVICE TERRITORIES
(counties served)*

- Duke Energy Carolinas
- Duke Energy Progress
- Overlapping Service Territory

*Portions may be served by other utilities.



Service Territory
Counties Served*

- Duke Energy Progress
- Duke Energy Carolinas
- Overlapping Territory

*Portions may be served by other utilities.

Plant Locations
Generation Type

- Nuclear
- CC/CT
- Hydro
- Solar (in-service)
- Coal
- Solar (future)

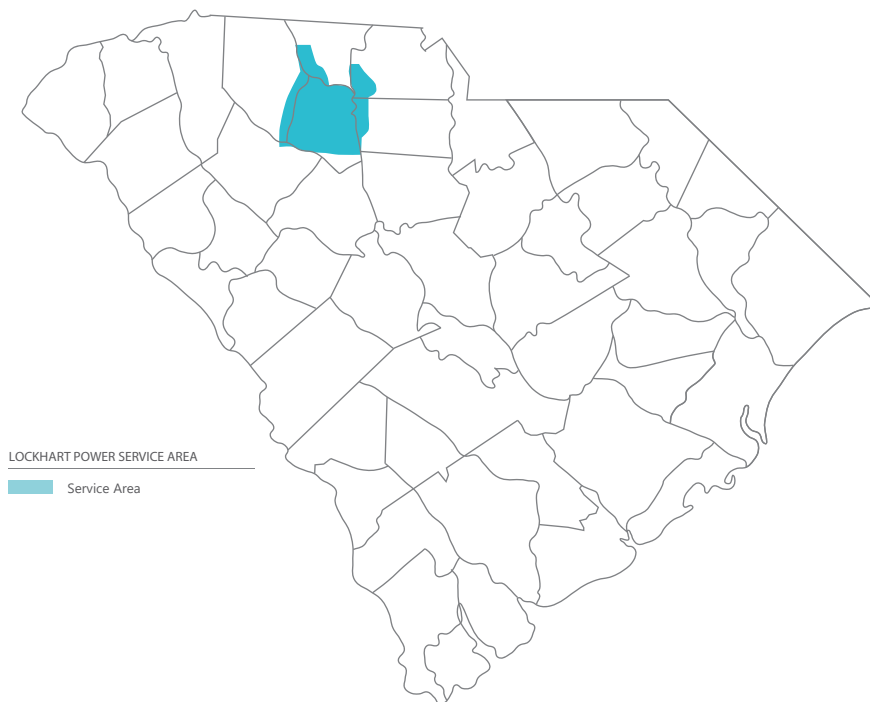
Lockhart Power Company

Lockhart Power Company (Lockhart Power) is an investor-owned electric utility located in the Upstate of South Carolina. Lockhart Power provides power generation, transmission, distribution, and lighting services to a range of residential, commercial, industrial, and wholesale customers. Their service area spans portions of five South Carolina counties: Spartanburg, Union, Cherokee, Chester, and York. Lockhart Power provides electricity to 6,226 customers: 4,954 residential, 1,263 commercial, and nine industrial. Lockhart Power was incorporated in 1912 by an act of the South Carolina General Assembly. It was a wholly owned subsidiary of Milliken & Company (or a predecessor company) until 2007, when Roger Milliken decided to integrate it into the newly created Pacolet Milliken Enterprises.

The site of the existing Lockhart Hydro Project was originally developed by South Carolina as a canal lock system in the 1820s. In 1893-1894, the original canal was enlarged, and a dam was built to supply the newly constructed Lockhart Textile Mill with water for its hydromechanical water wheels. The current Lockhart Power hydroelectric facility was developed for the purpose of supplying electricity to the textile mill and later to the surrounding communities.

Lockhart Power began generating renewable hydroelectric power in 1920, and nearly 100 percent of Lockhart Power's current electric generation is derived from renewable resources, including hydroelectric and landfill gas-generated power. Lockhart Power also manages and operates the Columbia Canal Hydroelectric Project. This facility was constructed in 1896 to provide power for the adjacent Columbia Mill, which was the first textile mill in the US to use AC motors and generate power away from the mill.

See the map below for Lockhart Power's South Carolina service area.



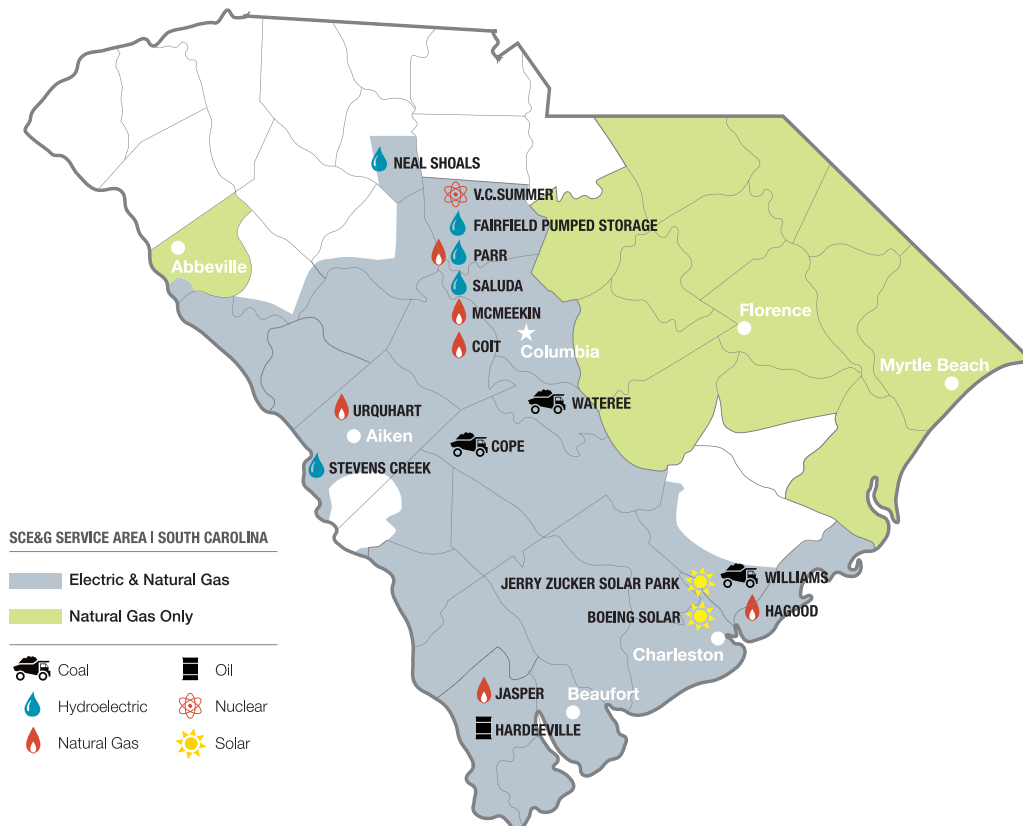
South Carolina Electric & Gas Company

SCE&G traces its roots in South Carolina to 1846 when a group of local business leaders met to form the Charleston Gas Light Company. Two years later, the company lit the streets of Charleston with gas streetlights.

Today, SCE&G provides electric service to roughly 698,000 electric customers in a service area covering more than 17,000 square miles in 24 counties in the central, southern, and southwestern portions of South Carolina. Major metro areas served by SCE&G are Columbia, Charleston, and Aiken. As of 2015, sales among the three largest customer groups are somewhat evenly divided — with 37 percent residential, 30 percent commercial, and 29 percent industrial.

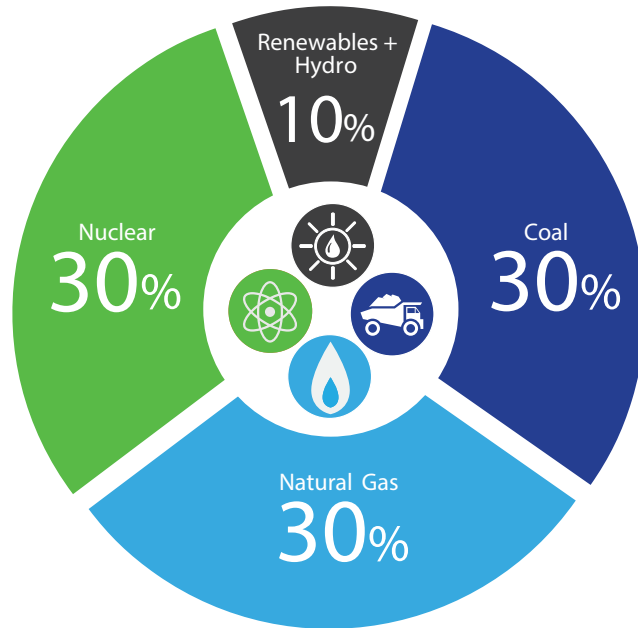
SCE&G also provides natural gas to approximately 352,000 customers in 35 counties in a service area covering more than 22,000 square miles. Natural gas service is also provided to the same metro areas listed above, plus Myrtle Beach and Florence. Natural gas usage is weighted more heavily toward the industrial sector — which comprises 42 percent of traditional sales — followed by commercial with 30 percent and residential with 28 percent.

To deliver power safely and reliably to its customers, SCE&G operates and maintains a network of 18,146 miles of distribution lines, of which 5,126 are located underground. SCE&G also operates and maintains 3,631 miles of transmission lines, almost exclusively overhead. This electric



infrastructure includes many Supervisory Control and Data Acquisition (SCADA) automated devices. The approximately 1,000 SCADA switches and reclosers across the system can detect system outages and operate automatically in order to isolate sections of line with problems, thereby minimizing the number of affected customers.

SCE&G's energy portfolio includes a diverse mix of approximately 5,237 MW of generation capacity across South Carolina including hydro, biomass, natural gas, coal, and nuclear. SCE&G continues to diversify its generation resources as it works toward a more balanced energy portfolio including new renewable and clean energy sources. In partnership with Santee Cooper, SCE&G is building two new nuclear units at V.C. Summer Station near Jenkinsville, SC. When these new units come online, SCE&G's generation by dispatch will be approximately 60 percent non-carbon-emitting, with roughly 30 percent of the generation by capacity coming from nuclear, 30 percent from natural gas, 30 percent from coal, and 10 percent from renewables and hydro. This generation mix is expected to result in a reduction of carbon emissions by SCE&G of almost 50 percent from 2005 levels.



Natural Gas IOUs

South Carolina has two natural gas IOUs: SCE&G and Piedmont Natural Gas (PNG).

South Carolina Electric & Gas Company

SCE&G delivers gas to approximately 352,000 residential, commercial, and industrial customers in 35 of the 46 counties in the Midlands, Pee Dee, and coastal communities of South Carolina. In 2015, SCE&G purchased a total volume of 62 billion cubic feet (BCF) of natural gas from multiple suppliers that were transported into the state by Dominion Carolinas Gas Transmission (DCGT), Transco, and Southern Natural Gas (SNG).

SCE&G delivers natural gas through 447 miles of high-pressure transmission pipelines and 9,064 miles of distribution mains to serve South Carolina's growing cities and communities. The transmission steel pipe ranges from 4 inches to 20 inches in diameter and operates at 469 to 1,200

pounds per square inch (psi). The distribution system consists of 1) steel pipe ranging from ¾ inch to 12 inches with pressure ranges from 25 to 250 psi and 2) plastic pipe ranging from ½ inch to 8 inches with pressure ranges from 25 to 60 psi. The newer plastic pipe represents 57 percent of the overall distribution system.

SCE&G's pipeline projects have led to an annual customer growth rate approaching three percent since 2014. As the demand for natural gas continues to grow, SCE&G is consistently improving and expanding its infrastructure to ensure the delivery of natural gas.

SCE&G also operates two liquefied natural gas (LNG) facilities in Goose Creek, SC and Salley, SC. These facilities have the capacity to hold 23 million gallons of LNG, the equivalent of approximately 2 BCF of natural gas. When required, these facilities can supply an additional 105 million cubic feet of natural gas per day for delivery into the local distribution systems.

Piedmont Natural Gas

Founded in 1950, PNG Company provides regulated natural gas transmission and distribution service to over one million residential, commercial, and industrial/power generation customers in North Carolina, South Carolina, and Tennessee. The company's South Carolina service area includes major



portions of Anderson, Greenville, Spartanburg, and Cherokee Counties. Total customer growth across the company's three-state service area was approximately two percent in 2015. In South Carolina, PNG serves approximately 139,000 customers. Due to its proximity and interconnection with major natural gas transmission pipeline infrastructure that crosses state lines, PNG's natural gas pipeline delivery system in South Carolina has helped to establish the Upstate as South Carolina's leading manufacturing and industrial hub. PNG delivered approximately 20 BCF of natural gas to its South Carolina customers in 2015.

In South Carolina, PNG operates and maintains 3,789 miles of transmission and distribution mains at operating pressures between 15 and 800 psi. Coated and cathodically protected steel distribution mains account for 1,450 miles of the total with the remaining 2,228 miles being constructed in plastic. Steel pipe diameters range from ¾ inch to 16 inches, and plastic pipe diameters range from ½ inch to 8 inches. In addition, PNG operates LNG facilities located in Huntersville, NC and Bentonville, NC. These facilities have the capacity to hold the equivalent of 2 BCF of natural gas. When required, these facilities can supply an additional 220,000 dekatherms of natural gas per day for delivery into local distribution systems.

PNG also owns and operates three publicly accessible compressed natural gas (CNG) fueling stations in South Carolina to fuel its own vehicles and meet the growing demand for CNG from both public and private fleet operators. Approximately one third of PNG's 1,100 company vehicles operate on CNG with 73 registered in South Carolina. See a map of PNG's gas service territory on the preceding page.

State-Owned Electric Utility

Santee Cooper

Santee Cooper is a state-owned electric and water utility governed by a 12-member board of directors who are appointed by the governor, vetted by the PURC, and confirmed by the state Senate. The board approves adjustments to rates, the issuance of debt, and other business decisions as described in Title 58 Chapter 31 of the South Carolina Code of Laws. Santee Cooper is the only state-owned utility in South Carolina.

Santee Cooper is a public power provider and the primary source of electricity, either directly or through electric cooperatives, for approximately two million people in all 46 counties of South Carolina. Santee Cooper serves more than 174,000 residential and commercial customers directly in Berkeley, Georgetown, and Horry counties. It also supplies electricity to the state's 20 electric distribution cooperatives; the cities of Bamberg and Georgetown; and 27 large industrial customers including Joint Base Charleston, the Alabama Municipal Electric Authority, and the 10 member-cities that form the Piedmont Municipal Power Agency.

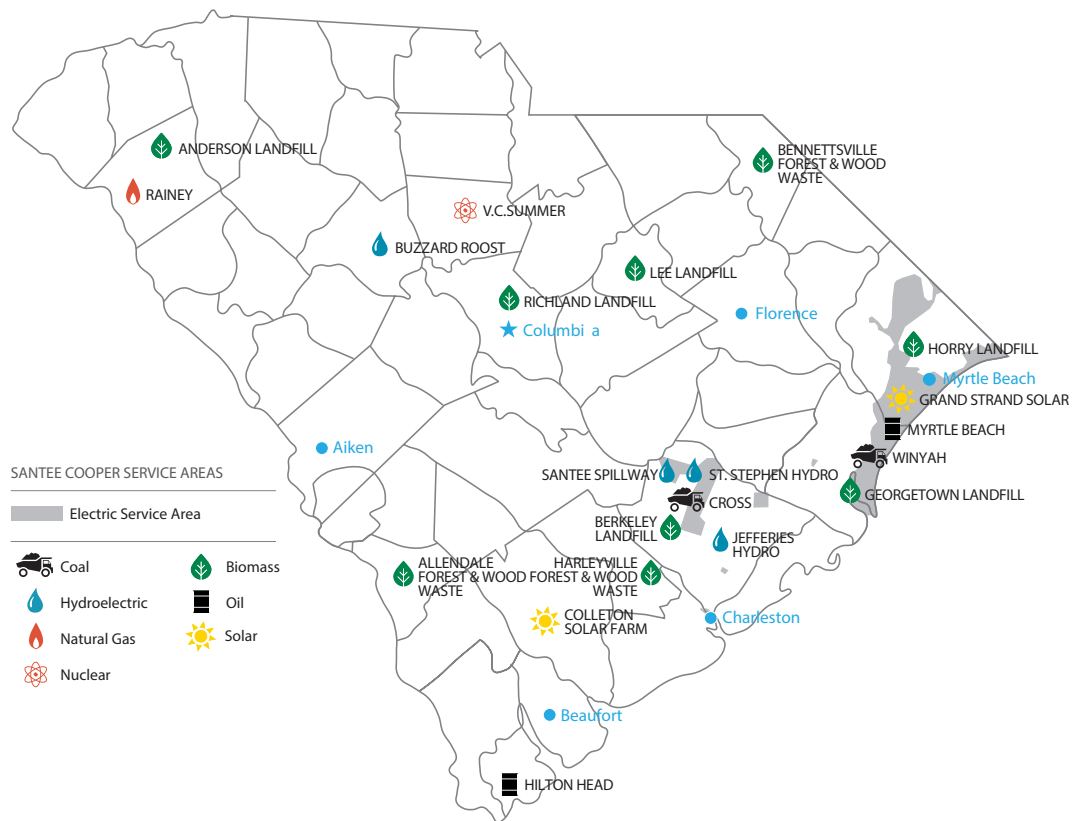
Santee Cooper was created in 1934 as a rural electrification and public works project. Santee Cooper generated its first electricity in February 1942. The project saw the creation of Lakes Marion and Moultrie, along with over 40 miles of dams and dikes, and the world's highest single-lift navigation lock at the time.

Santee Cooper operates an integrated transmission system that includes lines owned and leased by Santee Cooper as well as those owned by Central Electric Power Cooperatives, Inc. The transmission system, consisting of both overhead and underground transmission lines, includes the following: approximately 1,285 miles of 230 kilovolt (kV); 1,847 miles of 115 kV; 1,753 miles of 69 kV; 10 miles of 46 kV; and 97 miles of 34 kV. Santee Cooper operates 104 transmission substations and switching stations serving 86 distribution substations and 468 delivery points. The utility has 5,029 line miles of transmission and 2,841 line miles of distribution.

Santee Cooper has closed and retired four coal units and two oil units in recent years. In 2015, 48 percent of its generation came from coal, 41 percent came from natural gas and purchases, nine percent came from nuclear, and the balance came from hydro and other renewables. Santee Cooper has partnered with SCE&G to build two new nuclear units at V.C. Summer Station near

Jenkinsville, SC. Scheduled to come online in 2019 and 2020, these new units will significantly adjust Santee Cooper's generation mix and are instrumental in achieving the utility's goal to provide 40 percent of its customers' energy needs by 2020 through non-greenhouse gas emitting resources, renewable energy, conservation, and energy efficiency. The new nuclear units also will contribute significantly to reducing the utility's CO₂ emissions by 40 percent from the 2005 levels.

Santee Cooper also generates renewable power, with 130 MW online or under contract. The utility is committed to helping customers use less electricity through its Reduce The Use energy-efficiency program. Santee Cooper also provides wholesale water through the Santee Cooper Regional Water System and Lake Marion Regional Water System.



Electric Cooperatives

Twenty-two non-profit electric cooperatives operate in South Carolina. This list is provided in Appendix I. Twenty of these electric cooperatives are distribution cooperatives, which only deliver electricity to retail customers. As customer-owned entities, the members of these distribution cooperatives (consumers) elect a board of trustees to represent them in setting policies for their cooperatives and rates for their electricity.

The 20 independent distribution cooperatives serve approximately 720,000 members in all 46 counties and deliver electricity to more than 1.3 million South Carolinians. These distribution cooperatives operate the largest distribution system in the state, including more than 72,000 miles of power lines covering 70 percent of South Carolina's land area.

South Carolina's 20 distribution cooperatives are supported by two statewide organizations. Central Electric Power Cooperative, Inc. provides planning, wholesale power aggregation services, and wholesale transmission delivery services to the 20 distribution cooperatives in South Carolina through power-purchase agreements with Santee Cooper, DEC, and the Southeastern Power Administration.

The ECSC is the statewide trade association that provides political representation of member cooperatives' energy and economic development interests at the local, state, and federal policy levels. The ECSC also provides member cooperatives with a variety of ancillary programs and services and produces one of the state's largest print publications, *South Carolina Living*.

Municipal Electric Utilities

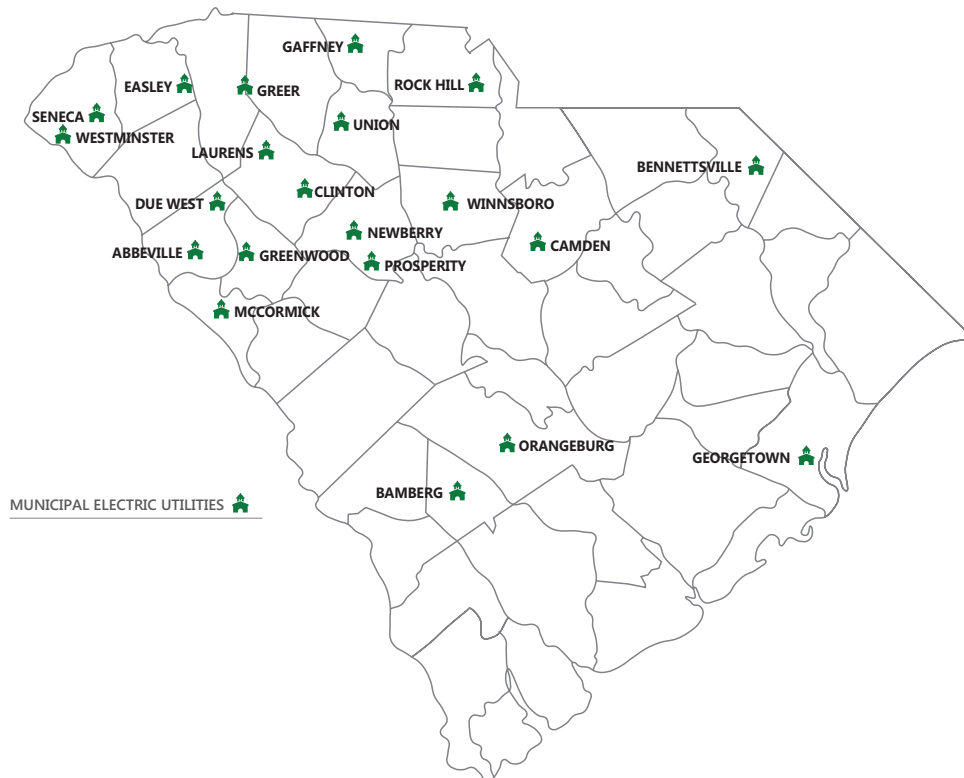
Twenty-one municipalities in South Carolina own and operate electric distribution systems and provide electric service to residential, commercial, and industrial customers in their municipality and to a limited number of customers outside of the incorporated boundaries. Municipalities include a broad category of utilities owned and operated by a city, town, county, township, or any other corporation existing, created, or organized as a governmental unit under the constitution or laws of the state, except a consolidated political subdivision. Policy for these systems is established by local elected officials. In 14 of the 21 cities, the electric system is governed by city council. A separate commission or board of public works oversees the seven remaining utilities. Summaries of each are provided in Appendix I.

The 21 independent electric systems serve approximately 170,000 customers or roughly seven percent of South Carolina's electric customers. The cities in total maintain more than 3,600 miles of overhead and underground power lines operating at 2400/4160 volts, 7200/12,400 volts, or 14,400/24,900 volts, with a peak load of 996 MW. The peak occurs most often in the summer.

In 1979, 10 of the 21 electric cities located in the northwest section of South Carolina incorporated the Piedmont Municipal Power Agency, a joint-action agency. The agency provides wholesale electric services to its members primarily through a 25 percent ownership interest in unit two of the Catawba Nuclear Station, located in York County, SC. The remaining cities purchase their electricity on the wholesale market, typically through contracts with IOUs.

All 21 municipal electric systems are members of the South Carolina Association of Municipal Power Systems (SCAMPS). SCAMPS serves as an unincorporated nonprofit organization for the cooperation of municipalities providing municipal electric utility services. Primary functions of SCAMPS include coordinating emergency mutual aid assistance for municipal electric providers; promoting training and education programs; collecting, compiling and distributing information concerning municipal electric utilities; sharing legal services; advocating for municipal utilities on legislative issues; and serving as a forum for the discussion of issues of mutual concern. A board of directors elected by its membership sets policy for and governs SCAMPS. The Municipal Association of South Carolina, by contract, operates and manages SCAMPS under direction from the board.

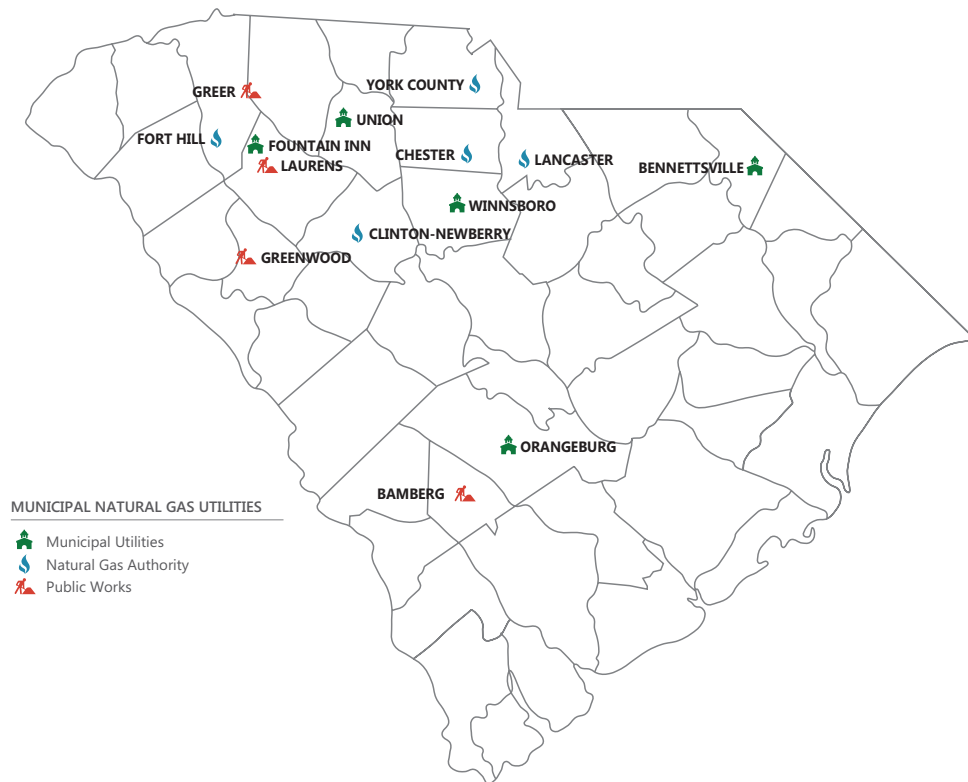
Members of SCAMPS participate in the Emergency Management Assistance Compact. This compact provides a centralized organization through which utilities can respond to or receive aid from one another in times of emergencies and ensure compliance with Federal Emergency Management Agency guidelines. It also provides a uniform way of handling emergencies.



Municipal Natural Gas Utilities

Fourteen natural gas systems operating in South Carolina are municipal systems, a broad term that includes any system organized as a governmental unit under the state constitution and laws. Three distinct categories of municipal natural gas utilities exist. They are 1) departments or divisions of a city or town governed by an elected council 2) a utility governed by an elected commission or board of public works and 3) utility authorities established by state legislation. Details of each category, including the systems contained in each, are provided in Appendix I.

Municipal gas systems in our state serve approximately 239,000 customers and operate and maintain approximately 9,000 miles of natural gas pipeline that represent 61 percent of the statewide distribution infrastructure. Collectively, these systems serve approximately 32 percent of the state's natural gas customers. Summaries of each are provided in Appendix I.



Electric Transmission System Overview

The nation's electric delivery system is more than 100 years old. Much of the equipment (for example, transformers, capacitors, and regulators) was installed decades ago, and this fundamental infrastructure is still the basis for the electric grid in the US. In South Carolina (and for South Carolina utilities operating in North Carolina), this electric grid delivery system was primarily designed to transport electricity from large centralized generation plants to customers across the Carolinas, sometimes hundreds of miles away.

South Carolina electric utility transmission planning practices develop and coordinate modifications to the state's transmission system to ensure the delivery of reliable and economical electric energy. These planning practices include determination of the current capacity of the electric network and a ten-year schedule of future additions and modifications to the system. The purpose of these additions and modifications is to support customer growth, provide emergency assistance, and maintain economic opportunities for electric customers while meeting industry transmission performance standards.

Utility transmission systems are integrated into the regional transmission system serving the southeastern area of the US and the Eastern Interconnection, which reaches from Canada to the Atlantic coast (excluding Quebec), south down to Florida, and west toward the Rocky Mountains. Each utility has separate interchange agreements with each interconnected company; these agreements provide for mutual exchanges of electric power. In the Carolinas and Virginia, a special organization has been developed called the Virginia-Carolinas Reliability Agreement.

Transmission organizations and utilities must follow the North American Electric Reliability Corporation (NERC) Reliability Standards for Transmission Planning, as approved by the NERC Board of Trustees and the Federal Energy Regulatory Commission (FERC), as well as practices put forth by the Southeastern Electric Reliability Corporation. On a quarterly basis, each IOU must provide to the PSC and to the ORS the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI). This data can be found in Appendix J.

Electric providers in South Carolina have been implementing technology to monitor and control grid operations and, in some cases, even remotely self-heal power outages on the grid. Smart meters allow electric providers to remotely "see" what the consumer experiences regarding power quality and hence make adjustments to improve their electric utility service without requiring the consumer to initiate contact with their provider. Utility implementation of smart grid technology is outlined in Appendix J. Distribution system planning in South Carolina follows a similar process. Modeling studies are performed to assess the capacity of distribution lines and other infrastructure to support expected load growth and grid conditions. The results of these studies help identify any upgrades needed to fulfill reliability standards and maintain the safety of the distribution system. Details regarding the electric transmission system can be found in Appendix J.

Duke Energy employees inside the control room at the Catawba Nuclear Station in York County, South Carolina

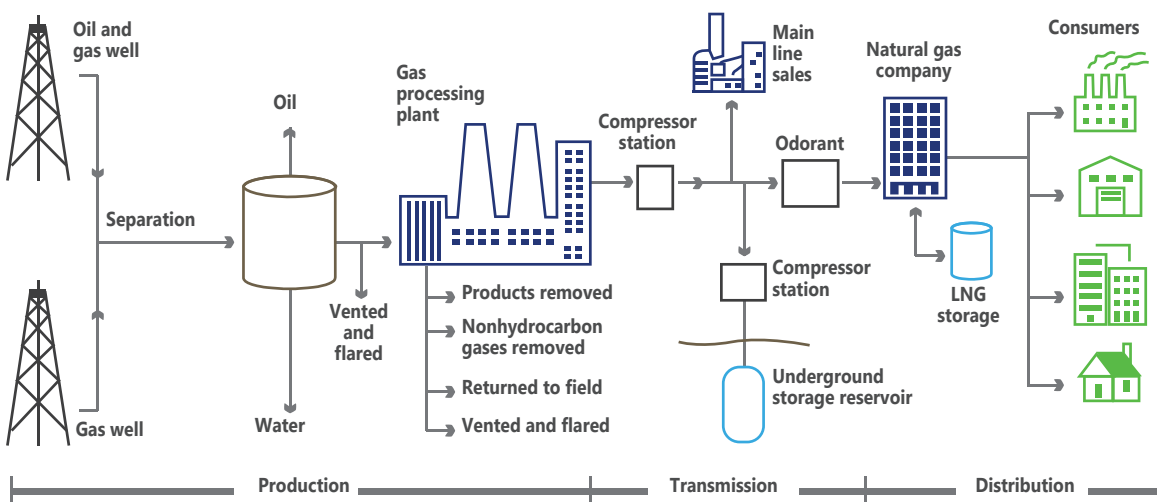


US Natural Gas System Overview

As illustrated below, the nation's natural gas system consists of production, processing, transmission, storage, and distribution systems that provide for delivery to consumers. South Carolina has no in-state oil or natural gas production or processing facilities. The state's natural gas system begins at the transmission portion of the supply chain.

When natural gas leaves a processing plant, it often enters an interstate pipeline. These pipelines are generally large systems that cross multiple states and are regulated by the FERC. Interstate pipelines provide the transportation of natural gas from production zones to take-away points and market demand centers. These pipelines are critical for the delivery of natural gas to South Carolina since it has no internal natural gas supply. An overview of the various systems that exist to provide for the delivery of natural gas are outlined in the next section.

Natural Gas Production and Delivery



Supply and the Effects of Shale Gas Growth

Shale gas growth has provided a significant new source of natural gas supply for end-users and is changing the supply dynamics of the US. Historically, the majority of natural gas consumed by end-users in the state originated in the Gulf Coast production region. Interstate pipelines have transported this natural gas from various supply access points and production areas to interconnection points into the state.

With the shale gas growth that has occurred over the last several years, natural gas supply sources and traditional pipeline flows across the nation are in the process of changing (see Appendix L for additional graphics on shale production and Appendix M for projected growth in natural gas infrastructure).

South Carolina Natural Gas Overview

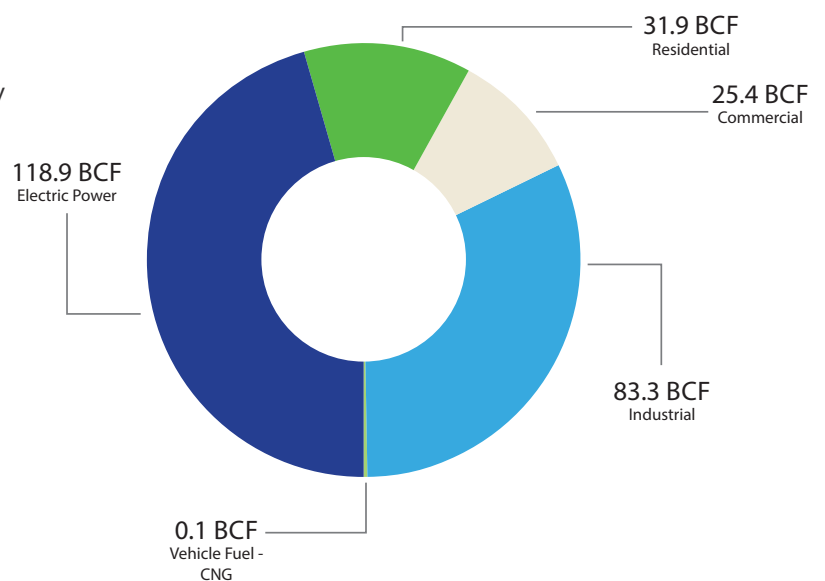
South Carolina’s natural gas systems are the transmission and distribution infrastructure that provides for the delivery of natural gas to the state’s residential, commercial, industrial, electric generation, and CNG end-users. The state’s natural gas infrastructure consists of four interstate pipelines, two IOUs, five natural gas authorities (NGAs), four commissions of public works (CPWs), and five municipalities (see Appendix I).

South Carolina’s IOUs, NGAs, and municipalities are all responsible for the delivery of natural gas to support the needs of end-users. Gas distribution systems have general service area assignments, but no specific state requirement exists that requires a duty or obligation to serve customers in those areas. Interstate pipelines also deliver directly to industrial and electric generation customers in the state. The IOUs are subject to the oversight and regulation of the PSC whereas the government-owned gas utilities are not.

The ORS represents the public interest with regard to the regulation of the two natural gas IOUs in South Carolina: PNG and SCE&G. With the exception of safety issues, the ORS does not have the responsibility for oversight of non-jurisdictional utilities including municipal systems, NGAs, and liquid propane systems. However, the ORS does monitor overall activities in the state to provide information on policy matters. As outlined above, interstate pipelines are regulated by the FERC. DHEC also oversees in-state environmental regulatory aspects of natural gas pipelines such as water-discharge permits, land-disturbing activities along the coast, and permits to construct sources of air pollution (see Appendix K).

South Carolina Natural Gas Consumption and Supply

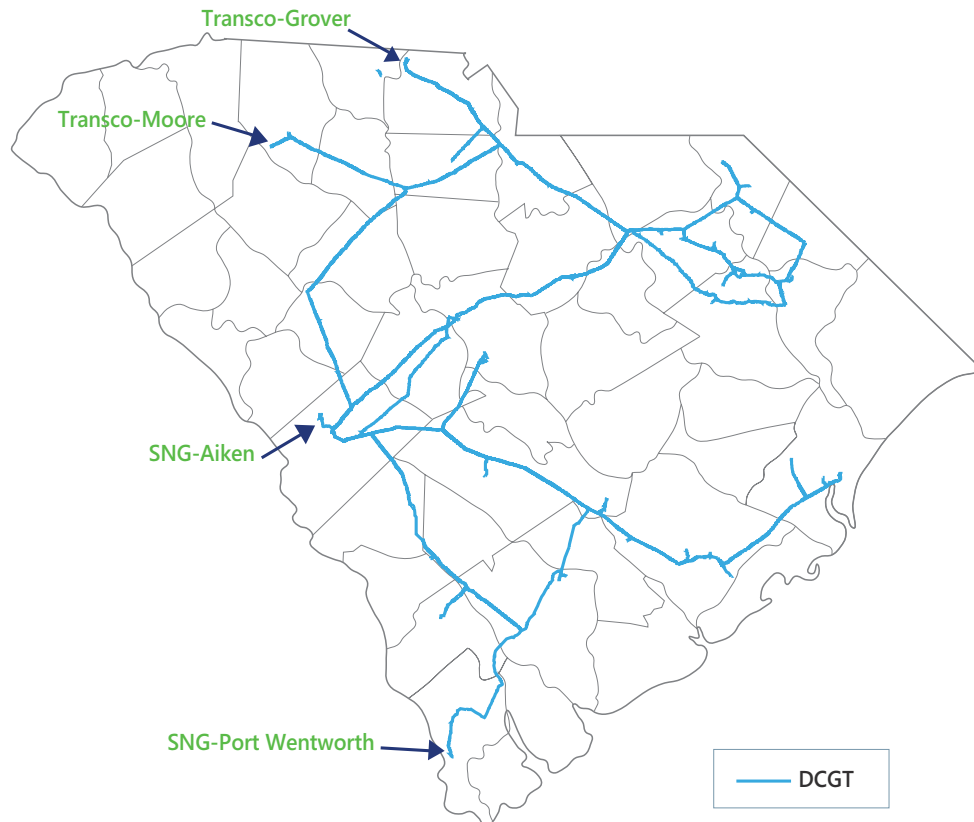
According to the American Gas Association’s current South Carolina state profile, the state has approximately 650,735 natural gas customers (see Appendix I for breakdown by utility and customer category). This number consists of 593,286 residential, 55,997 commercial, and 1,452 industrial customers. In 2014, state customers consumed approximately 259.6 BCF according to the EIA.



South Carolina Natural Gas Infrastructure

Three interstate pipeline companies deliver natural gas to support the needs of South Carolina end-users. These pipelines are DCGT, SNG, and Transco. The figure below shows the location of the interstate pipelines that serve the state. Further descriptions of each pipeline are summarized in Appendix L.

Interstate natural-gas pipelines are regulated by the FERC and the Pipeline and Hazardous Materials Safety Administration (PHMSA) under the US Department of Transportation (DOT). The FERC regulates interstate natural gas pipeline permitting, routing for new pipeline projects, and determine public need for a project, as well as potential landowner and environmental impacts. In addition, the FERC reviews and approves tariff provisions and transportation rates that pipelines are permitted to charge for interstate shipments. For more on PHMSA, see the next section on pipeline safety.



South Carolina Propane Infrastructure

South Carolina has one interstate propane pipeline and one underground cavern storage facility. The majority of the state's propane is sourced from Dixie Pipeline; however, in-state rail facilities and out-of-state truck deliveries also exist. A new rail terminal — that can unload eight 30,000 gallon railcars per day and has on-site track storage to hold up to 40 railcars — was just opened in Heath Springs, SC to accept large shipments of propane from the Northeast's booming Marcellus and Utica shale regions.

Dixie Pipeline is a common carrier pipeline that is owned and operated by Enterprise Products Partners. It is a 1,306 mile pipeline originating in Mont Belvieu, Texas and terminating in Apex, NC. Mont Belvieu is the nation's propane hub, but the majority of supply reaching the Carolinas is injected into the pipeline downstream in Louisiana and Mississippi. The pipeline can deliver approximately 75,000 barrels per day to South Carolina, which is 3,150,000 gallons. Dixie Pipeline has two truck terminals within the state that allow the loading of propane transport trailers, which hold approximately 10,000 gallons each.



Source: Enterprise

Plains Liquid Propane Gas Services, a subsidiary of Plains All American Pipeline, owns and operates Tirzah Storage cavern and the pipeline that connects it to Dixie Pipeline. The facility is located in unincorporated Tirzah, which is in York County, SC. When Plains purchased the facility in 2007, the mined granite cavern was reported to have 57.5 million gallons of storage capacity. This is the only below-ground propane storage facility in the Mid-Atlantic and may still be the largest underground mined cavern in the US. In addition, Tirzah has 360,000 gallons of above-ground storage. A 62-mile pipeline extends from Dixie Pipeline at Bethune, SC to Tirzah. Rail service was removed many years ago. Plains receives propane for storage in the cavern from Dixie via the pipeline. Propane is also shipped northward through the same pipeline from Plains' new rail facility in Heath Springs. Both the Tirzah cavern and Heath Springs rail facility have the capability to load propane in transport trucks for delivery to customers in South Carolina and surrounding states. See Appendix N for details regarding propane distribution in South Carolina.

Pipeline Safety

Natural gas operators in South Carolina have achieved an impressive safety record providing natural gas service to millions of customers safely and efficiently. Aware of the potential hazards associated with their product, the operators are very knowledgeable concerning both safety precautions and operations-and-maintenance requirements that must constantly be observed. Many organizations, volunteer groups, and associations — along with state and federal regulators — contribute to the success of the natural gas industry.

The ORS has pipeline safety oversight responsibility for the intrastate operators of natural gas distribution and transmission pipeline systems, liquefied natural gas facilities, certain liquefied propane systems, landfill gas systems, and lateral pipelines from interstate pipeline systems. Other areas of responsibility include field inspections of intrastate facilities, accident investigations, and various types of operator training.

The ORS enforces the federal pipeline safety regulations set forth by the DOT in addition to state rules and regulations governing gas systems. The state of South Carolina has an agreement with PHMSA wherein all operators in the state must comply with these guidelines. The ORS undergoes annual program evaluation by PHMSA.

Many gas-related incidents result from damage to buried pipelines during excavation activities. Known as “third party damage,” this type of excavation incident is one of the leading causes of pipeline damage throughout the industry each year.

Welders installing 12 inch natural gas pipeline in Anderson County.





ELECTRIC AND NATURAL GAS GENERATION AND DEMAND

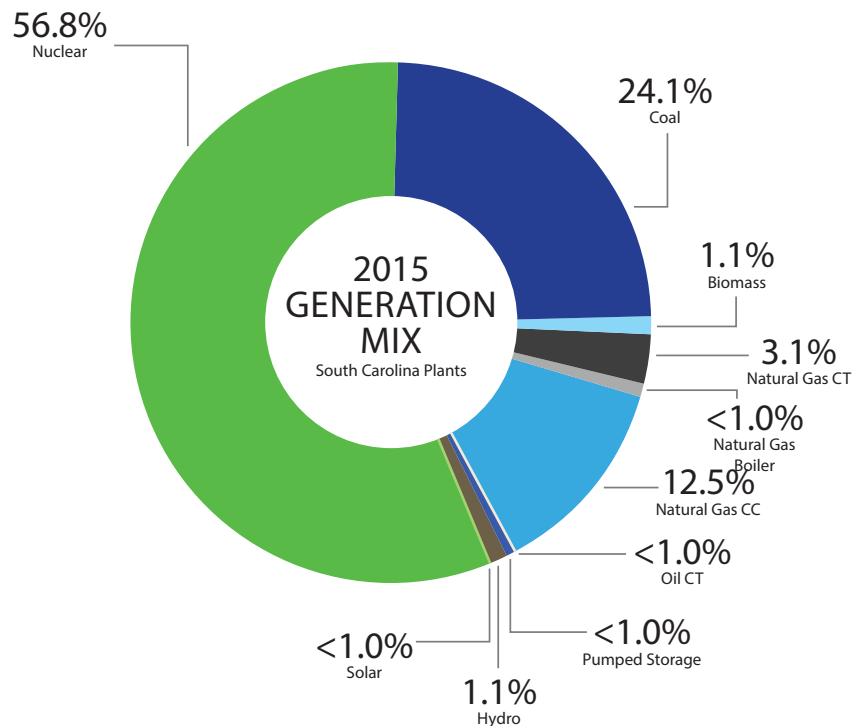
Generation

Generation is the amount of electricity a generator produces over a specific period of time, measured in megawatt-hours (MWh). For example, a generator with 1 MW capacity that operates at that capacity consistently for one hour will produce 1 MWh of electricity.

South Carolina's electricity is produced by a diverse set of generating resources known as its generation mix. These resources produce electricity to meet the demand of the using and consuming public. The order in which a generating resource is utilized varies based on numerous factors, including fuel cost and unit availability.

The figure and table on this page show that more than half of the electricity generated in South Carolina comes from nuclear power. Coal and natural gas make up the bulk of the remaining generation. Hydroelectric and biomass are the largest renewable electricity generation resources in the state.

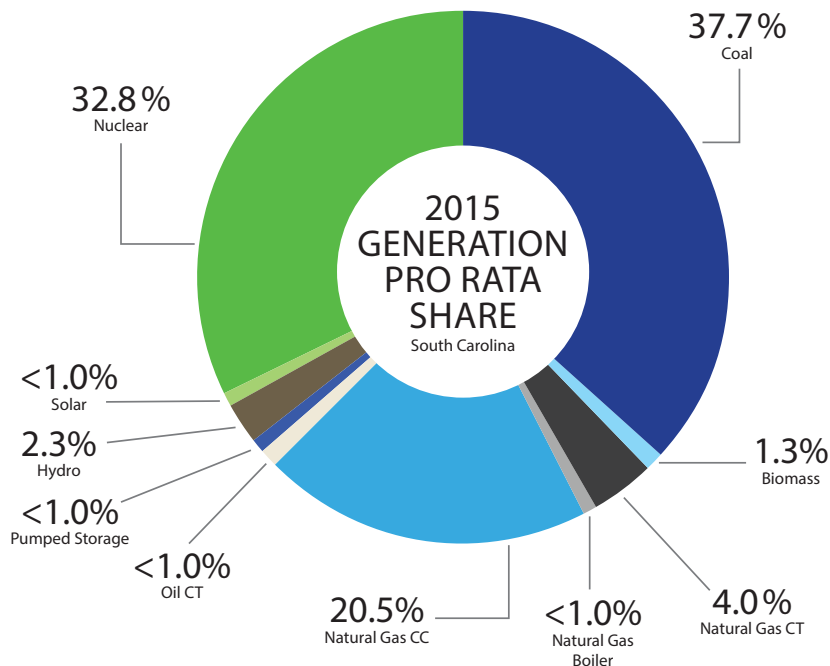
Fuel	Total MWh
Nuclear	53,260,220
Coal	22,622,900
Natural Gas Combined Cycle	11,742,440
Natural Gas Combustion Turbine	2,912,582
Biomass	1,060,960
Hydro	1,046,540
Natural Gas Boiler	640,790
Pumped Storage	461,014
Oil Combustion Turbine	10,523
Solar	4,224
TOTAL	93,762,193



However, it is important to note that electricity generated in South Carolina is not necessarily consumed in the state. South Carolina has two multi-state utilities (DEC and DEP) that share the electricity generated in both South Carolina and North Carolina among their customers in the Carolinas. Consequently, the generation fuel mix does not solely represent the consumption by South Carolina customers, due to electric resources being shared across both states.

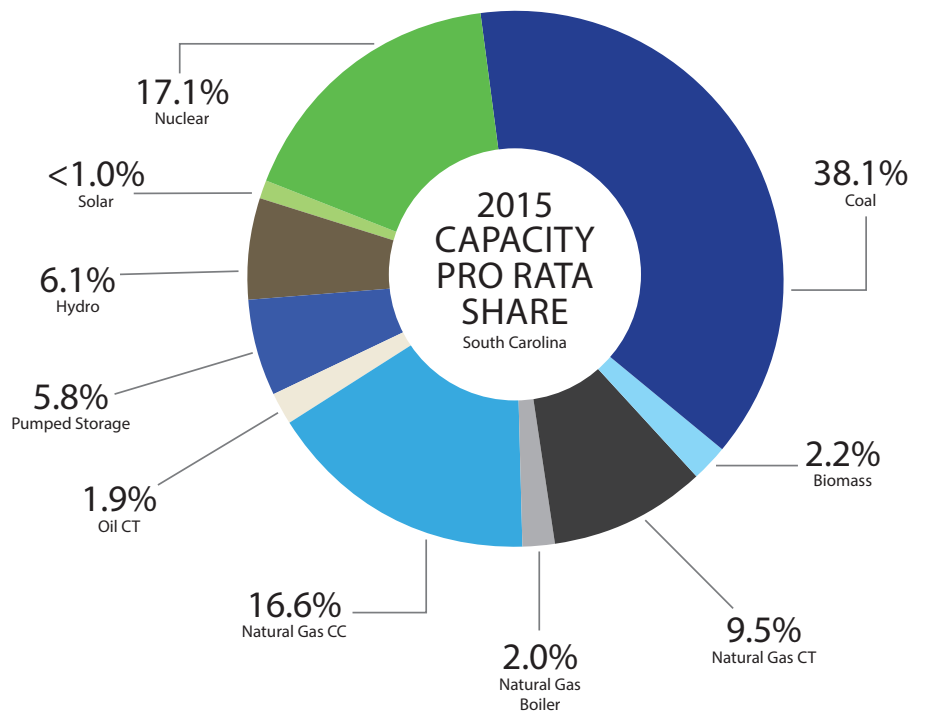
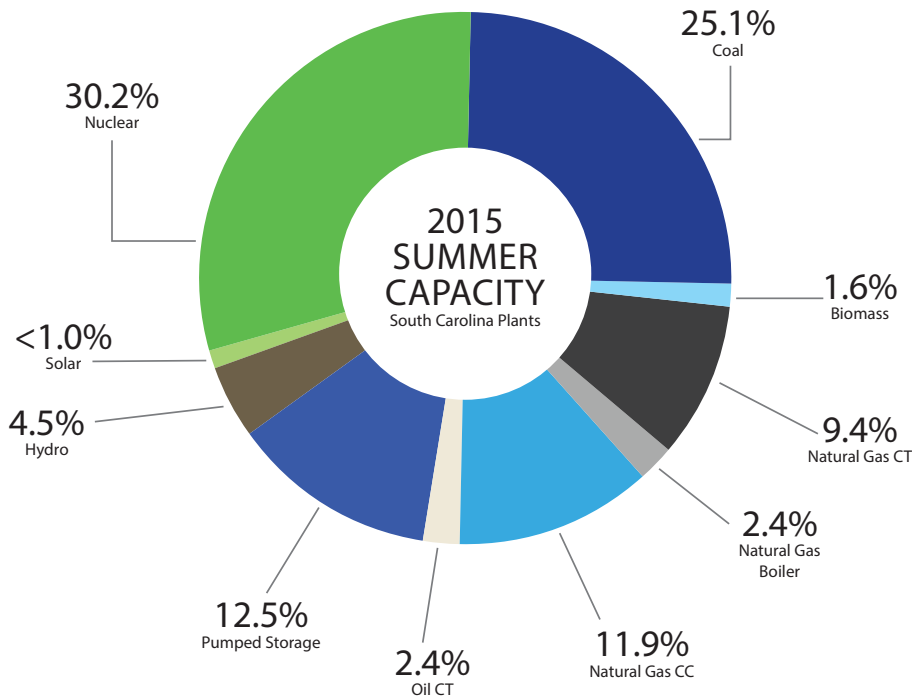
The following figure and table show the amount of electricity consumed in South Carolina: approximately 38 percent from coal, 33 percent from nuclear, and 21 percent from natural gas.

Fuel	Total MWh
Coal	31,590,680
Nuclear	27,513,355
Natural Gas Combined Cycle	17,201,254
Hydro	1,931,188
Natural Gas Combustion Turbine	3,340,007
Biomass	1,060,960
Natural Gas Boiler	640,790
Pumped Storage	461,014
Oil Combustion Turbine	50,603
Solar	4,224
TOTAL	83,794,075



Capacity

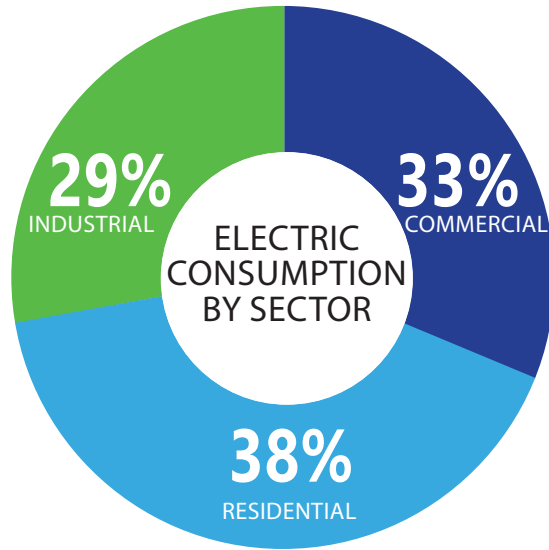
The demand for electricity is weather dependent — with peaks related to air conditioning in the summer and heating demand in the winter. Most of South Carolina’s utilities tend to hit their peak demand in the summer, although recently they have experienced peaks in both summer and winter. The ability to meet this demand is referred to as capacity, which is defined as the maximum electric output a generator can produce under specific conditions and is measured in MW.



Capacity differs based on provider. More specific information on utility provider capacity can be found in Appendix O.

Consumption

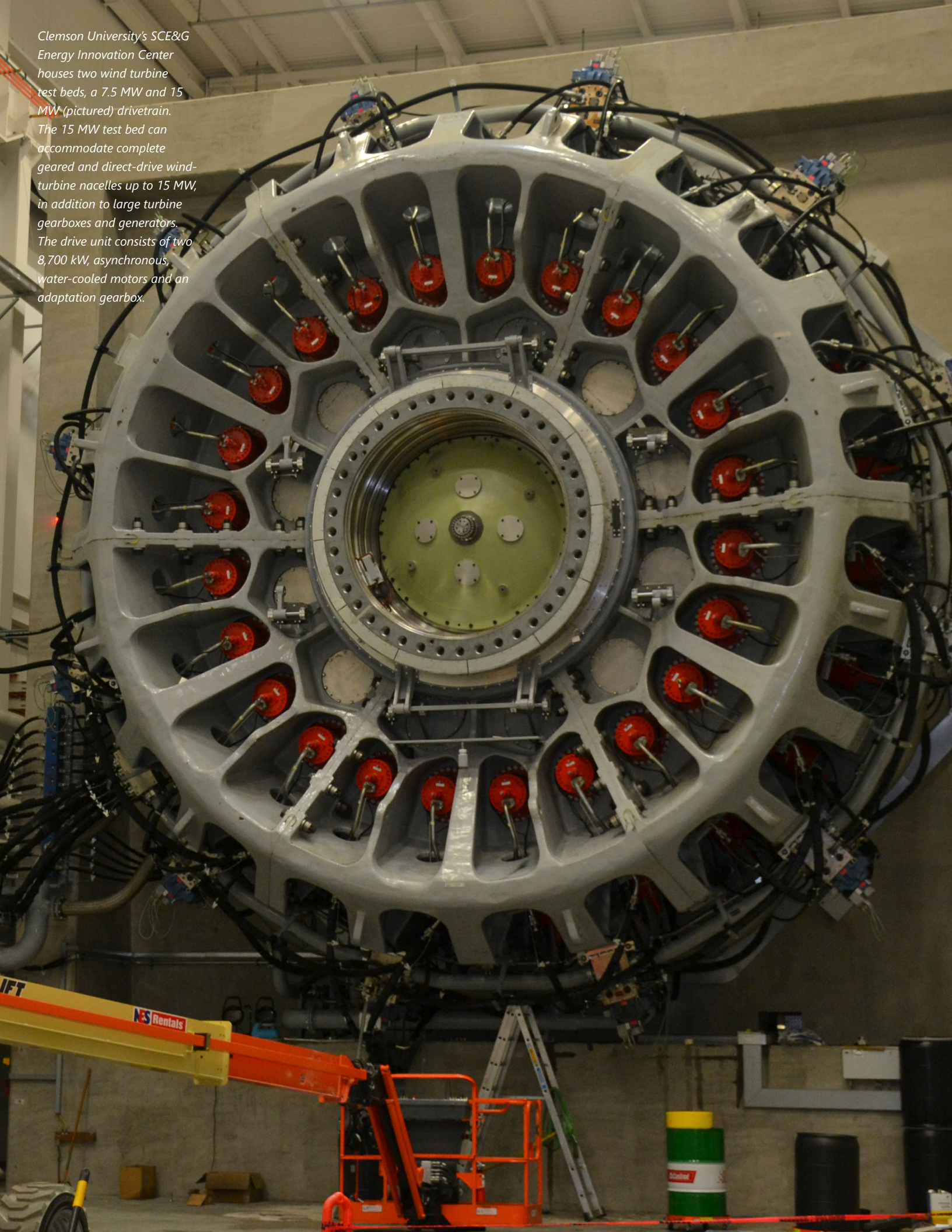
Consumption is the amount of electricity used by a utility's customers. Electric consumption by provider can be found in Appendix P. The chart below reflects statewide consumption data from South Carolina electric utilities. It shows a fairly equal distribution of consumption by sector.



** Military and street lighting are included with commercial consumption.*



Clemson University's SCE&G Energy Innovation Center houses two wind turbine test beds, a 7.5 MW and 15 MW (pictured) drivetrain. The 15 MW test bed can accommodate complete geared and direct-drive wind-turbine nacelles up to 15 MW, in addition to large turbine gearboxes and generators. The drive unit consists of two 8,700 kW, asynchronous, water-cooled motors and an adaptation gearbox.





UTILITY ENERGY EFFICIENCY PROGRAMS

Energy efficiency is often recognized as the lowest cost option for reducing energy use and emissions. The Lawrence Berkeley National Laboratory (LBNL) found that the average levelized cost of energy saved from efficiency programs is 2.1 cents/kWh (using a six percent discount rate, to compare the future value of money to current rates). A 2014 study by the American Council for an Energy-Efficient Economy (ACEEE) also found that, on average, the levelized cost of energy saved is approximately 2.8 cents/kWh under a five percent discount rate and 2.5 cents/kWh under a three percent discount rate.

In 2010, the South Carolina General Assembly passed a law that allows the state's utilities to make on-bill financing available to their customers (SC Code Section 58-37-50). Under this law, a utility may finance residential energy efficiency improvements through a meter conservation charge that is tied to the account serving the premises. If the customer moves, the meter conservation charge is assumed by the subsequent account holder and remains in place until the energy efficiency measures are paid.

Five of South Carolina's electric cooperatives have on-bill financing programs that use the common brand, "Help My House." The programs use the "whole house" approach to evaluate the house as a system. Efficiency improvements include air-sealing the home and ductwork; upgrading the heating, ventilation, and air conditioning (HVAC) system; and installing insulation. As of May 2015, 548 homes have been retrofitted through the Help My House programs, with an average loan of \$9,505. The programs have a default rate of under one percent and are saving approximately 4,140 MWhs of electricity per year. Annual average energy savings have remained consistent over a three-year period.

Santee Cooper also augments its "Reduce The Use" program with low-interest loans to help eligible customers make a variety of residential energy efficiency upgrades. Santee Cooper has loaned \$41 million since the program began, and it has made 30 loans for renewable energy installations since adding that component in 2008. Customers can repay the loans through their monthly utility bill payments.

Several South Carolina IOUs offer energy efficiency programs aimed at increasing efficiency. These programs, a description of how they are measured, and their results are outlined in Appendix Q.



RENEWABLE ENERGY PROGRAMS

South Carolina law “encourage(s) the development and use of indigenous, renewable energy resources” (SC Code Section 48-52-210). Renewable energy — which includes biomass, wind, solar, hydropower, geothermal, and hydrogen derived from renewable sources — can mitigate South Carolina’s dependence on imported energy and help meet state air-quality goals.

In 2012, the South Carolina PURC Energy Advisory Council sought to update a 2007 Black & Veatch report on renewable resources available in the Carolinas to incorporate more recent research and include additional resources for consideration. In addition, the 2012 report also sought to develop an inventory of the technical and constrained resources available in South Carolina for use in electricity production. The table below (Table 1-1 from the 2012 Report) provides a summary of the potential for each of these resources.

Renewable Energy Potential in South Carolina

RESOURCE	TECHNICAL POTENTIAL			CONSTRAINED POTENTIAL		
	ENERGY (MBTU/YR)	GENERATION (GWH/YR)	CAPACITY (MW) ^(*)	ENERGY (MBTU/YR)	GENERATION (GWH/YR)	CAPACITY (MW) ^(*)
Wind						
Onshore	N/A	440-2,920 ^(*)	185-1,215	N/A	440 ^(*)	185
Offshore	N/A	280,000 ^(*)	70,000	N/A	13,000 ^(*)	3,300
Solar Photovoltaic	N/A	67,000 ^(*)	51,000	N/A	1,120-2,230 ^(*)	850-1,700
Hydroelectric^(*)	N/A	5,500	(630 MWa) 1,260-1,575	N/A	1,400	(164 MWa) 328-410
Landfill Gas Projects	958,200-1,384,000	90.4-130.6	12.1-17.5	958,200-1,384,000	90.4-130.6	12.1-17.5
Biomass						
Woody Biomass	96,700,000	7,150	960	31,920,000	2,360	317
Agricultural Residues	37,230,000	2,770	370	6,450,000	470	63
Energy Crops	22,750,000-56,870,000	1,690-4,210	227-565	2,310,000-5,700,000	170-420	23-56
Anaerobic Digestion of Organic Waste	3,412,000	350	46	2,090,000	210	28
Pulping Liquors	0	0	0	0	0	0
Waste Oil	1,974,000	254	38	0	0	0

^(*)Onshore wind net generation includes 15 percent system losses.

^(*)Offshore wind net generation includes 20 percent system losses.

^(*)Solar PV generation estimate is based on 15 percent annual capacity factor.

^(*)To convert the annual mean MW (MWa) of the hydroelectric potential to hydroelectric capacity potential, a range of capacity factors (40 to 50 percent) is assumed.

^(*)All generation capacity is measured in alternating current (AC).

Source: www.scstatehouse.gov/CommitteeInfo/EnergyAdvisoryCouncil/ResourceStudyComments/SCEACResourceStudy_FINAL.pdf

Based upon the analysis in this report, not all renewable resources as outlined above are being pursued in an equal manner in South Carolina for the production of energy.

Biomass

Biomass energy is a renewable energy source that includes trees, farm crops, manure, plants, and landfill gas. How biomass works is very simple. The waste wood, tree branches, and other scraps are gathered together from factories and farms and transported to a biomass power plant. Here the biomass is dumped into huge hoppers. This material is then fed into a furnace where it is burned. The heat is used to boil water in a boiler, and the energy in the steam is used to turn turbines and generators.

Biomass can also be tapped right at the landfill or in a digester at a power plant. When garbage decomposes, it gives off methane gas (natural gas is made up of methane). At a landfill site, pipelines are installed to collect the methane gas that can then be used in power plants to make electricity. This type of biomass is called landfill gas. At a power plant, when organics are decomposed in the controlled anaerobic environment of a digester, methane gas is also produced to make electricity by a method similar to that used at landfill sites.

Biomass is a renewable energy source because we can always grow more trees and crops, and waste will always exist. For a list of current permitted biomass facilities, please see Appendix R.

Wind

In late 2008, the South Carolina General Assembly passed Act 318 to create the Wind Energy Production Farms Feasibility Study Committee (SC Code Section 48-52-620). The purpose of this Committee was to review, study, and make recommendations regarding the feasibility of wind farms in the state. The focus of the Committee included, but was not limited to, whether South Carolina is a suitable site for wind production on land or in offshore areas; the economic and environmental impact to the state; and the cost of wind farm installation and operation in the state. Committee members included elected officials and other leaders knowledgeable about wind energy. The Committee was staffed by the Energy Office. The Energy Office also created a Coastal Clean Energy Task Force in 2008 that consisted of state regulators and others likely to play a key role in regulating wind energy-related infrastructure in state waters. The intent of the task force was to be ready to address offshore wind development when and if it occurred.

In 2009, the President announced the final regulations for the Outer Continental Shelf (OCS) Renewable Energy Program, which was authorized by the Energy Policy Act of 2005 (EPAAct). These regulations provide a framework for issuing leases, easements, and ROW for OCS activities that support production and transmission of energy from sources other than oil and natural gas. The US Department of the Interior's Bureau of Ocean Energy Management (BOEM) is responsible for overseeing offshore renewable energy development in federal waters.

BOEM's South Carolina Intergovernmental Renewable Energy Task Force

BOEM's activities include the establishment of the BOEM South Carolina Renewable Energy Task Force, which met for the first time in March 2012. The task force, consisting of federal, state, and local government representatives, was established to identify potential areas for commercial offshore wind development in South Carolina while taking into account ecologically sensitive areas and minimizing any space-use conflicts.

On November 25, 2015 (80 FR 73817), BOEM published the Call for Information and Nominations to 1) gauge the offshore wind industry's interest in acquiring commercial wind leases in four offshore South Carolina areas totaling more than 1,100 square miles on the OCS and 2) request comments regarding site conditions, resources, and other uses in and near those areas.

For more information on the task force or the Call for Information and Nominations, please refer to Appendix S.

Solar Programs and Leasing

What is Solar Energy?

Solar energy, which is radiant light and heat from the sun, utilizes the light from the sun to produce power. Unlike fossil fuels, solar energy is available virtually anywhere on earth. Solar energy technologies include solar heating, solar photovoltaics, solar thermal electricity, solar architecture, and artificial photosynthesis.

Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert, and distribute solar energy. Active solar techniques include the use of photovoltaic panels, commonly referred to as solar panels, and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

Distributed Energy Resource Program Act (Act 236)

Recognizing the potential of renewable energy, the South Carolina General Assembly passed legislation in 2014 to encourage its development (SC Code Section 58-39-110). The electric IOUs agreed, as part of a settlement agreement, to file an application to establish an initial DER Program consistent with the goals of Act 236. The Act required that any DER program shall, at a minimum, result in the development by January 1, 2021, of renewable energy facilities located in South Carolina. The facilities of each electric utility are to have a cumulative installed nameplate capacity equal to at least two percent of the previous five-year average of that electric utility's South Carolina retail peak demand. One percent shall be met by facilities sized between 1 and 10 MW (utility scale). The other one percent shall be met by facilities sized less than 1 MW (customer

scale), with a quarter of this one percent nameplate capacity being from renewable energy generation no greater than 20 kilowatts (kW) (small scale). The Act also provided the following incentive to each electric utility after the two percent goal was met — to allow utility investment in facilities greater than 1 MW and less than or equal to 10 MW with a cumulative installed nameplate capacity equal to at least two percent of the previous five-year average of each electric utility’s South Carolina peak demand. Appendix T provides more information about Act 236.

DER GOALS by Electric IOU

	SCE&G	DEC	DEP
Total Goals	84.50 MW	80 MW	26 MW
Utility Scale	42.25 MW	40 MW	13 MW
Customer Scale	42.25 MW	40 MW	13 MW

Solar Leasing

Act 236 provides for the lease of renewable electric generation facilities in South Carolina. The Act requires lessors to obtain a Certificate of Fit, Willing, and Able from the ORS prior to the leased renewable electric generation facility being marketed or the facilities installed in South Carolina (SC Code Section 58-27-2600).



Located in North Charleston, the 500 kW Jerry Zucker Solar Park is SCE&G's first utility-scale solar facility

UPS Compressed Natural Gas fueling station in West Columbia.



UPS

Compressed Natural Gas Vehicle
USDOT 021800

2

TruStar
Energy CNG



ENERGY FOR TRANSPORTATION

Transportation and its relationship to the State Energy Plan can be categorized as follows: fuel, transportation choices, and land use.

Fuel: Transportation (and the energy used to support it) is crucial to South Carolina’s economic development efforts and can also have a significant effect on regional air-quality considerations. Therefore, any plan for the state’s energy future must consider how changes in transportation will affect the way we use transportation fuel — the mix of fuel needed, the distribution of transportation fuel across the state, and the efficiency with which we use these fuels.

Choice: Transportation choices, or how we travel and move goods from point A to point B, affect the amount of energy consumed per person and affect regional mobility and congestion as well. Transit choices that allow more people to share a vehicle — for example, rideshare, bus, bus rapid transit, and rail — reduce individual fuel consumption. Choices about the fuel and mode used to move goods, as well as intermodal considerations, will also have a significant effect on energy consumed per person or per unit of gross state product.

Land Use: How our communities develop affects our transportation fuel use and choices. Long distances between employment and home increase our daily fuel use. In addition, reliance on highways and high-speed roadways without bicycle and pedestrian infrastructure reduces our ability to travel without a car, thus further adding to fuel consumption. Compact urban environments have proved to create fewer vehicle miles traveled (VMT) and fewer vehicle trips per day, thus reducing fuel use and encouraging transportation choices such as transit, bicycling, and pedestrian activity.

Based on 2013 EIA data, approximately 28 percent by BTU of the total energy used in South Carolina is used for transportation. Of the 482.6 trillion BTU of petroleum used in the state in 2013, 452.9 trillion BTUs were accounted for by the transportation sector. According to the EIA, the state’s petroleum consumption is at the national median. However, motor gasoline consumption per capita is among the highest in the nation due to “extensive motor travel on the state’s major interstate corridors.” Interestingly, although the state does not have any ethanol plants, and does not require ethanol to be blended into conventional motor fuels, the EIA reports that approximately two percent of the nation’s fuel ethanol consumption occurs in South Carolina.

According to the SCDOT Multimodal Transportation Plan 2040, issued in 2016 the SCDOT maintains the fourth largest state-owned system of roads in the US, with 41,392 centerline miles and over 90,000 lane miles of roadway. On the state’s roads in 2013, VMT were approximately 49

billion, a decrease from the peak VMT in 2007 of 51 billion. Approximately 29 percent of VMT occur on interstates, which collectively account for only two percent of the public roads in the state.

In addition to the state's roads, transportation modes that will affect the state's fuel demand include the following:

Aviation: The state has 53 airports (six primary commercial service airports, 45 general aviation facilities, and two reliever airports to provide pilots with alternatives to congested hub airports).

Ports: The South Carolina Ports Authority owns and operates two seaports at Charleston and Georgetown. The container traffic passing through the Port of Charleston increased approximately 10 percent between 2011 and 2012 and is projected to increase with the completion of two major projects. The port is building a new container terminal that is expected to boost container capacity by 50 percent. Harbor dredging beyond 45 feet is permitted and will be completed by 2020; this improvement will allow the port to accommodate post-Panamax ships (larger vessels able to fit through the expanded Panama Canal) with greater frequency.

Inland Port: An inland port was established in Greer, which allows shippers to access more than 95 million consumers within a one-day drive. A second hub is being considered in Dillon.

Rail: Freight moves over 2,378 miles with 11 different rail carriers. The two largest, CSX and Norfolk Southern, account for 2,044 miles of the system. The state has 11 Amtrak stations along three routes that use track owned by CSX (2) and Norfolk Southern (1). Rail access for many of these projects, such as the ports, is imperative in order to reduce energy consumption.

Efficiencies that may help to reduce the demand for fuel include the following: changes in Corporate Average Fuel Economy (CAFE) standards that specify target miles per gallon for the nation's vehicles; state and local programs that promote public transit, carpooling, or ridesharing; local programs including Park-and-Ride programs; incentives for alternative-fuel vehicles; and incentives for transit-oriented development.

Public and Mass Transit Programs

Mass Transit: Public transit is available to residents of 40 out of 46 counties, with 25 publicly supported transit agencies operating in 27 areas of the state. Sixteen of these operate in rural or non-urbanized areas. SCDOT's plan notes that "counties without established general public transit service were Abbeville, Cherokee, Greenwood, Laurens, Saluda, and Union Counties."

Intercity Bus: Greyhound Lines and Southeastern Stages serve Columbia, Greenville, Myrtle Beach, and Orangeburg, with additional routes to regional destinations. The long-distance Megabus also began service in South Carolina recently.

Bicycle and Pedestrian Travel: Approximately 1,260 miles of bike lanes on state-maintained and local roads existed in 2014 when the 2040 Multi-Modal Transportation Plan was prepared. More than 7,000 additional miles have been proposed in regional plans.

Appendix U includes specific information about available public transit in South Carolina.

Carpooling and Ridesharing

Those choosing to reduce personal VMT may be able to make use of SmartRide options — parking lots where motorists from a wide area may park and share public transit to a large employment hub. The SmartRide Commuter Focused Transit Program is operated by SCDOT, the Newberry County Council on Aging and the Santee Wateree Regional Transit Authority. SmartRide services bring commuters into downtown Columbia from the Camden/Lugoff area or the Newberry area. The Camden/Lugoff system is operated by the Santee Wateree Regional Transit Authority and the Newberry area system is operated by the Newberry Council on Aging.

Additional Park-and-Ride locations offer commuters a safe place to park and carpool to their final destination. Large facilities are located in Greenville, Sumter and North Augusta, with smaller, less formal sites scattered throughout the state. For location details, see Appendix U.

Alternative Fuel Infrastructure

Alternative fuel vehicles — which include CNG, LNG, propane, and electric vehicles — form a very small but increasing share of vehicles in South Carolina. See Appendix U for a table showing registration of all vehicles, including alternative fuel vehicles, by county as of 2014.

According to the DOE Alternative Fuels Data Center, these vehicles are served by fueling stations across South Carolina. Many of these stations are public, but some serve only the company that installed them.

Fuel Type	Number of Stations
Biodiesel	28
CNG	12
E85	68
Electric	179
H ₂ Fuel Cell	2
LNG	2
LPG	55



REGULATIONS AND STATUTES AFFECTING UTILITIES

Several federal and state statutes govern and affect the way utilities operate in South Carolina. These laws and regulations have and will play a significant role in shaping energy production, infrastructure, and planning in the state.

The recent passage of Act 236 (see Appendix T) has paved the way for increased renewable energy development in South Carolina. In addition, the Base Load Review Act (BLRA) — which allows for South Carolina utilities to finance the cost to construct new base load electric generating units — has also had a significant impact in shaping energy production with the construction of new nuclear capacity.

See Appendix F for an inventory of state and federal statutes relevant to energy growth and use.



SCE&G and its partners place the reactor vessel in the containment building of V.C. Summer Unit 2.



RESOURCE PLANNING

South Carolina’s electric utilities have an obligation to serve their customers. To satisfy this obligation, utilities conduct long-range planning to ensure that adequate generating resources are in place to meet customer demand. This planning process allows utilities to determine the most reasonable and economical approach — such as acquiring and/or constructing electric generation capacity — to meet this demand. To respond to system load, utilities typically operate their fleet of electric generating facilities based on economic dispatch modeling. The long-range resource plans are developed using these models.

Integrated Resource Plan

In accordance with SC Code Section 58-37-40, IRPs are prepared by electric IOUs and the state-owned electric utility, Santee Cooper, and are required to be submitted to the Energy Office for evaluation and comment. Each electric IOU is also required to submit an IRP to the PSC. Once the IRPs are received by the PSC, a docket is established. Interested parties may intervene and file comments. The IRPs must be submitted every three years, and updates must be submitted on an annual basis. The IRPs articulate the utilities’ resource plans for meeting projected customer demand. They use economically priced energy and reliable combinations of conventional electric generation, renewable generation, and demand side management/energy efficiency (DSM/EE) while maintaining system flexibility and considering environmental laws and regulations.

The IRPs include, but are not limited to, the following:

- Statement of long-term and short-term objectives
- Incorporation of lowest cost options
- Customer incorporation
- Evaluation of the cost effectiveness of supply-side and demand-side options
- Environmental costs

- Demand forecasts
- Energy forecasts
- Risk assessments
- Transmission improvements and/or additions
- Maintenance and refurbishment of existing units
- Anticipated major problems
- Explanation and/or description of any new technologies
- Identification of future supply-side options and anticipated locations

SC Code Section 58-37-40 also requires the Energy Office to evaluate and comment on IRPs as well as coordinate the preparation of an overall IRP for the state. Accordingly, the Energy Office intends to consider suggestions offered during the development of the State Energy Plan including, but not limited to, the following: evaluating economic and environmental outcome metrics; creating a minimum set of alternative resource portfolios; creating a minimum set of alternative scenarios for analysis; considering joint dispatch of generating resources, and coordinating the construction of new electric generation.

Through transmission planning practices, the electric utilities in South Carolina develop and coordinate modifications to the state's transmission system to ensure delivery of reliable and economical electric energy. These planning practices include determination of the current capacity of the electric network and a ten-year schedule of future additions and modifications to the system. The purpose of these additions and modifications is to support customer growth, provide emergency assistance, and maintain economic opportunities for electric customers while meeting industry transmission performance standards — that is, the NERC Reliability Standards for Transmission Planning, as approved by the NERC Board of Trustees and the FERC.

Distribution system planning in South Carolina follows a similar process. Modeling studies are performed to assess the capacity of distribution lines and other infrastructure to support expected load growth and grid conditions. The results of these studies help identify any upgrades needed to fulfill reliability standards and maintain the safety of the distribution system.

Utility Forecast Modeling

All electric and gas generation capacity projects are researched and evaluated using a system-planning model. The models themselves are used to determine whether utilities should buy/build capacity by weighing the costs included with construction, financing, fuel, operations, maintenance, and emissions against energy and capacity needs over 15 to 40 years. These models are used to meet growing energy and capacity needs of customers within a utility's service area with the lowest cost impact to customers.

The Arthur Ravenel Jr. Bridge, a cable-stayed bridge over the Cooper River in Charleston, SC



Electric Utility Collaboratives

To enhance resource planning, collaborative relationships have been established. As directed by the PSC, the electric IOUs operating in South Carolina are required to establish advisory groups to consider and make recommendations to each IOU with respect to DSM/EE programs. Based on a settlement agreement, SCE&G agreed to consider efficiency potential studies; new program ideas; modifications to existing programs; outreach and education programs and funding; and Evaluation Measurement and Verification (EM&V) plans associated with a DSM/EE collaborative (Order No. 2010-472, July 15, 2010). Based on a settlement agreement, DEP and DEC also agreed to establish a DER Program Collaborative Group to further the progress and goals of Act 236 to include evaluating the viability of future incentives or offerings (Order No. 2015-514, July 15, 2015, and Order No. 2015-515, July 15, 2015, respectively). The terms of each settlement agreement define the goals as well as the schedule that the parties agreed to adhere to in order to advance collaboration that encourages and incents distributed energy and energy efficiency initiatives.

Statewide Generation Resources

South Carolina's energy portfolio includes a diverse mix of electric generation plants across the many utility fleets. Fuel diversity provides benefits to the citizens of South Carolina including 1) the economical dispatch of generating facilities based on the lowest fuel prices at the time of consumer demand needs 2) the reliable and continuous base load power that customers count on each day and each night and 3) the incorporation of environmental aspects toward the reduction of emissions such as CO₂. The continued growth of South Carolina's economy and its energy needs requires continued and focused decisions on clean, safe, reliable, and economical sources of power throughout the state. Furthermore, pursuant to SC Code Section 48-52-210(B)(3), electric utilities should design and offer rates that fully support pursuit of reasonable demand-side options and efficient consumer behavior, such as time-of-use rates, real-time pricing rates, and curtailable/interruptible rates.

This strategy further relies upon the following tactics: increasing the amounts of non-greenhouse gas emitting nuclear and renewable electric generation; increasing the use of natural gas for generation due to the lower cost of natural gas; switching fuels at some plants from coal to natural gas; and continuing the use of existing fossil-fuel fired plants with proven emissions controls. In addition, the increased energy efficiencies of products and the energy-saving measures implemented by South Carolina customers contribute to lower energy demands.

Resource Roles

Some generators are very good for base load power production such as nuclear, coal, and combined-cycle natural gas plants. To a lesser degree, certain biomass facilities can provide

meaningful generation in a similar fashion; in other words, base load plants provide optimal 24x7 power production efficiently, reliably, and cost effectively.

Some generators provide intermediate power, and others provide peaking power. Typically, peaking power plants do not run until it is really hot or really cold. They are called upon to meet loads for a few hours, and on short notice, because of their fast-ramping capabilities. They can be less efficient, however, and consist primarily of turbine generators that use either oil or natural gas.

Several pumped-storage hydro facilities are used throughout South Carolina and provide an excellent resource for peak shaving, or reducing the amount of energy purchased from a utility during peak hours. Water is pumped uphill to a storage reservoir when there is ample base load, such as at night during the summer, then released downhill to produce power during peak periods.

Renewable energy is self-dispatching — when the wind blows or the sun shines, those generators make electricity. With proper planning, system upgrades, and integration with the electric grid, these resources can play a very positive role in furthering energy diversity and lessening environmental impacts.

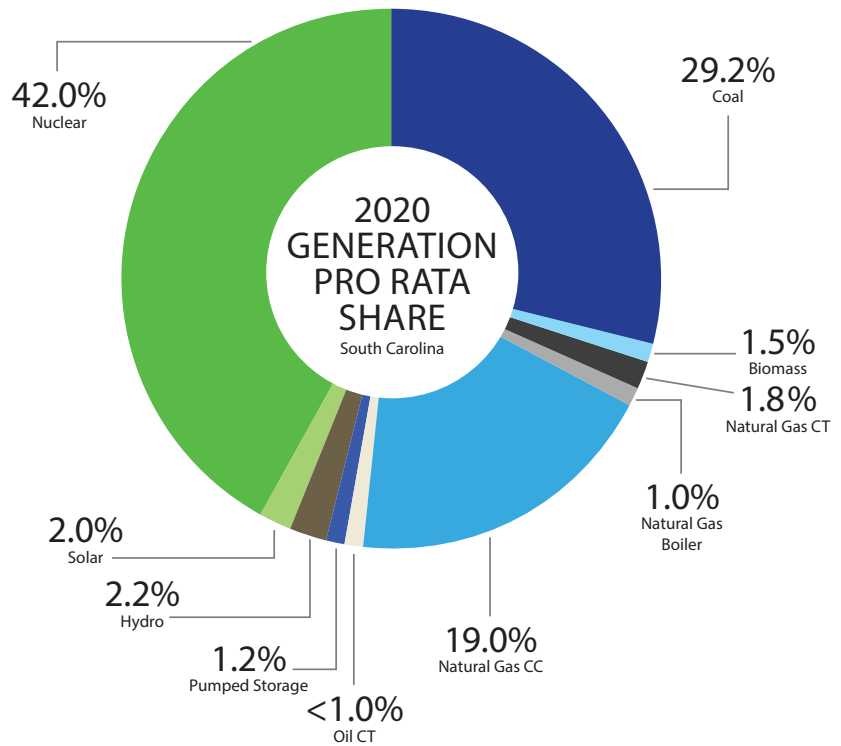
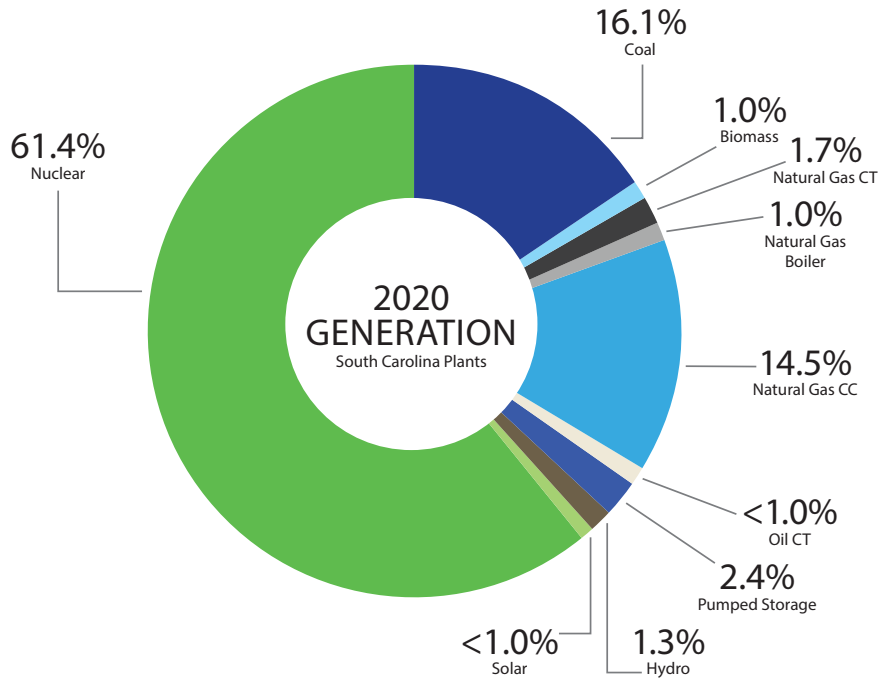
Grid Modernization

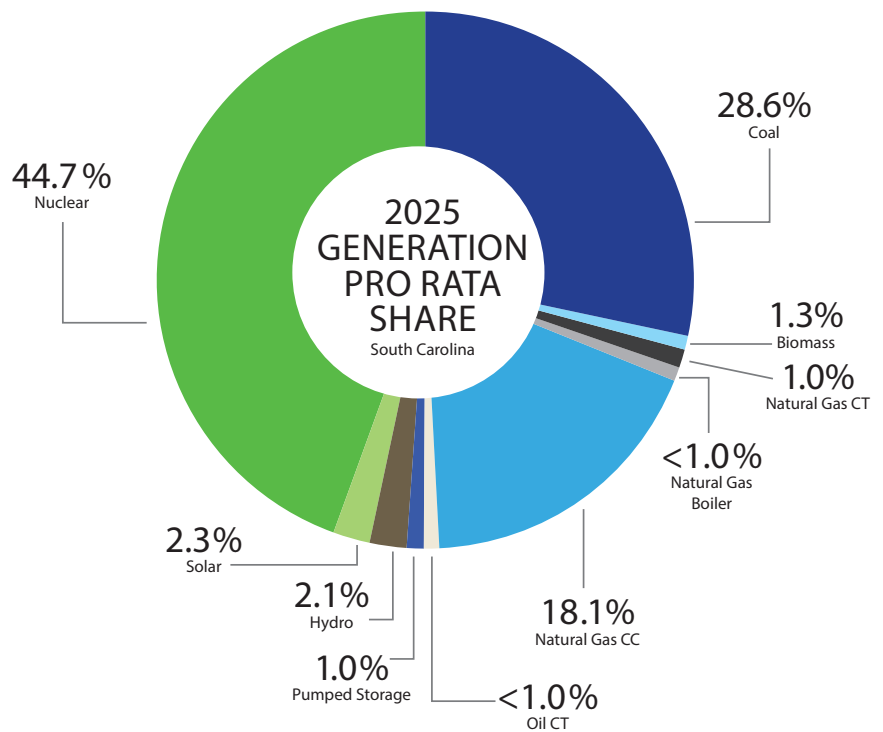
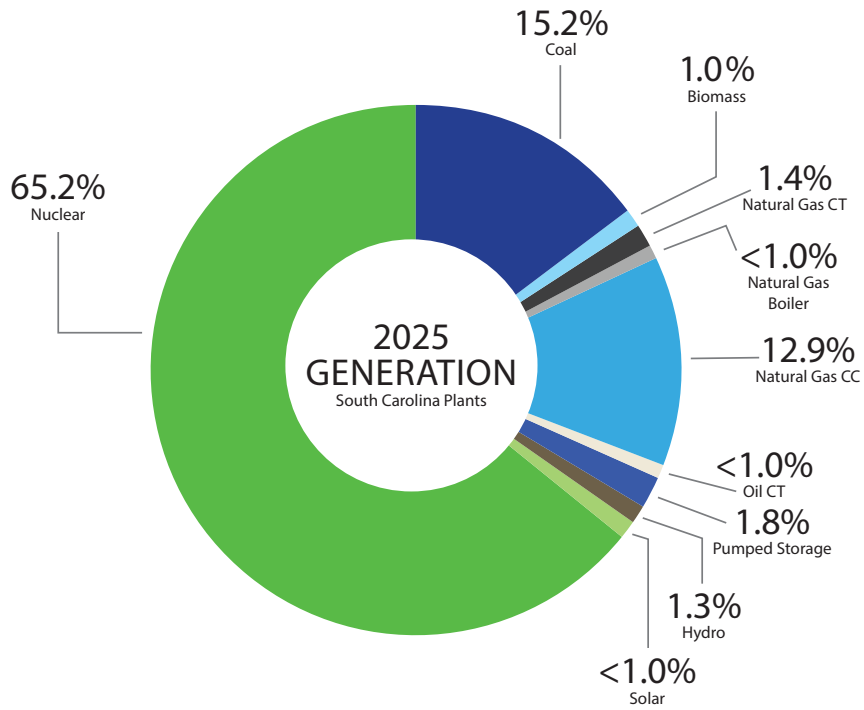
In addition to considering generation and resources, it is likewise necessary to consider the integrated nature of the electric grid. Keeping the grid running reliably is a balancing act, where the amount of power put into the grid must equal the amount taken out. A utility's control system continuously ramps generating units up or down to meet electric demand of the customers it serves. The nation's electric delivery system design is more than 100 years old, and much of the equipment installed across the country has been in place for decades (for example, transformers, capacitors, regulators). This fundamental infrastructure is still the basis for the electric grid used today. However, this balance is increasingly difficult to maintain due to several factors — the increase in diverse and dynamic demands such as increased distributed energy resources, reliability challenges, and grid hardening/security requirements.

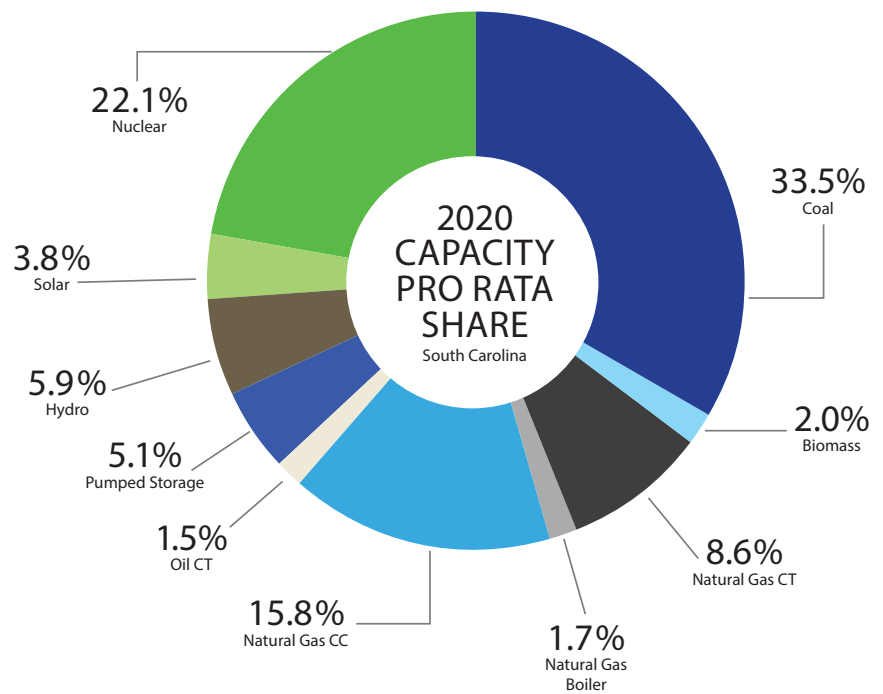
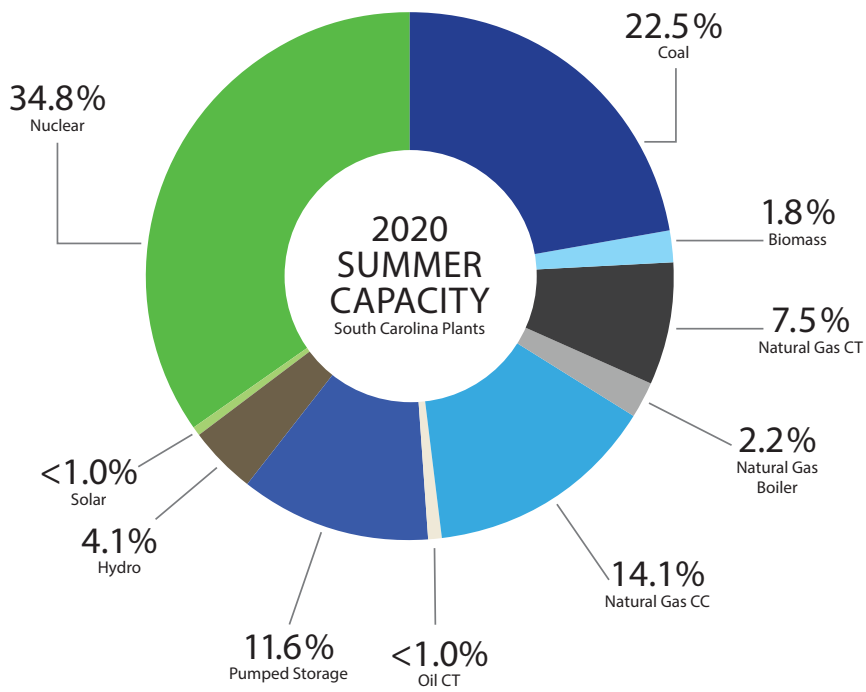
Grid enhancements have taken place in South Carolina. However, utilities foresee the need for growing such investments. Meeting customer expectations for power and providing immediate restoration when an outage does occur require enhancements and improvements to South Carolina's electric infrastructure. A modernization of the existing infrastructure will also allow electric utilities to respond to challenges such as battery storage and microgrids, expanding customer expectations, and increasing environmental regulation.

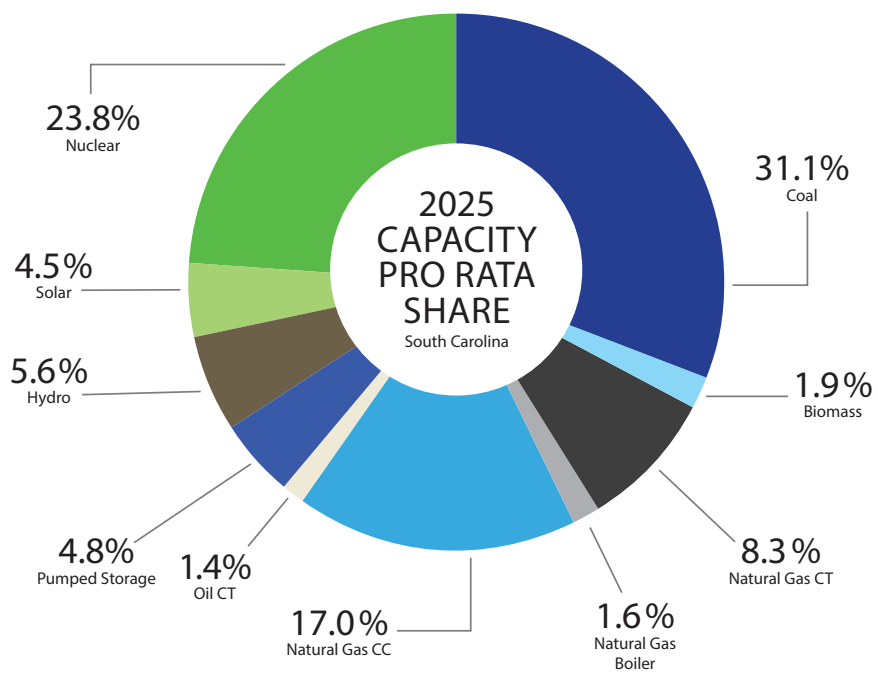
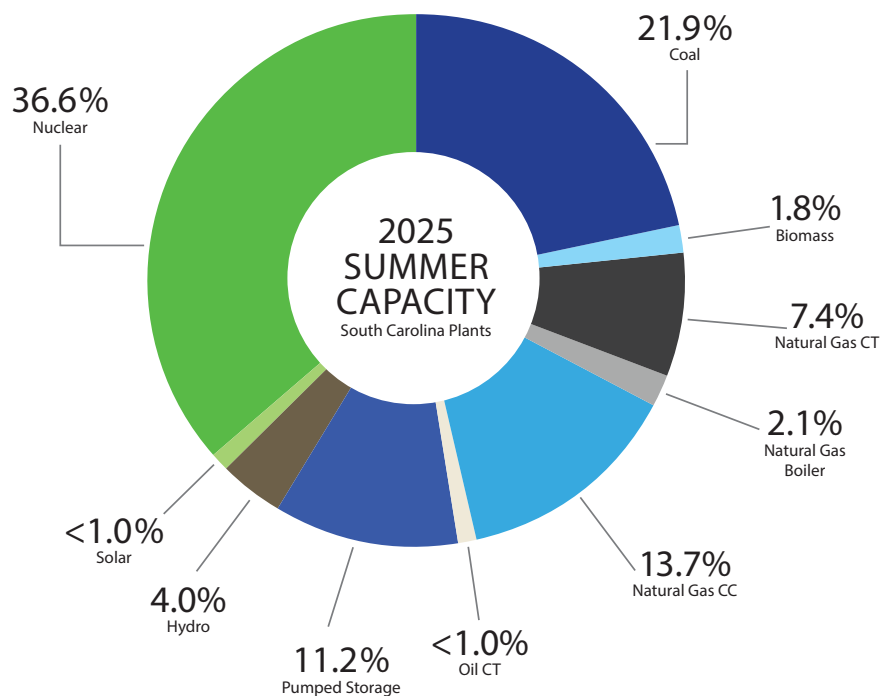
Future Outlook: Projected Generation and Capacity Mix

The following charts depict South Carolina's projected generation mix and capacity mix in 2020 and 2025 based on in-state resources as well as South Carolina's pro-rata share of generating resources that it shares with North Carolina.









To effectively plan for South Carolina's energy future, it is prudent to invest in a diverse mix of electric generation. However, it is also essential to address other key factors in terms of decision making. First, utilities need to comply with state and federal statutes and regulations to ensure that safety is addressed and the environment is adequately protected. Second, it is important to consider the investments already made in existing resources in an effort to keep power-production costs down and electric rates competitive. Third, a comprehensive energy plan must ensure that the energy needs of all South Carolina citizens are met. Therefore, both the production of energy and dispatch of generation should address any economic and environmental disparities that might arise. Finally, the creation of a comprehensive State Energy Plan should strive to produce energy and dispatch generation in a manner that is both flexible and innovative.



Solar panels atop Riverbanks Zoo and Garden's guest relations center help generate electricity and create awareness about alternative energy.

GLOSSARY



American Council for an Energy-Efficient Economy (ACEEE) A nonprofit corporation established in 1980 to advance energy efficiency policies, programs, technologies, investments and behaviors.

Anaerobic Decomposition Decomposition in the absence of oxygen, as in an anaerobic lagoon or digester, which produces CO₂ and CH₄.

Billion Cubic Feet/British Thermal Unit (BCF/BTU) Natural gas unit of measure (1 BCF = 1 trillion BTUs).

Biomass Organic nonfossil material of biological origin constituting a renewable energy source.

Bureau of Ocean Energy Management (BOEM) Located within the US Department of the Interior, the BOEM is responsible for overseeing offshore renewable energy development in federal waters.

Capacity The maximum electric output a generator can produce under specific conditions measured in MW.

Clean Air Act (CAA) A federal law enacted in 1963 and amended in 1990 that defines the Environmental Protection Agency's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer.

Clean Power Plan (CPP) A final rule enacted by the EPA in 2015. The rule provides the final guidelines for states to follow in developing plans to reduce greenhouse-gas emissions from existing fossil fuel-fired electric-generating units.

Clean Water Act (CWA) A federal law that establishes the basic structure for regulating discharges of pollutants into the waters of the US and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972.

Commission of Public Works (CPW) Various city commissions throughout South Carolina that provide electricity, water distribution, and sewer collection/treatment to residents.

Compact Fluorescent Light (CFL) A type of energy-efficient fluorescent light that produces the same amount of light while consuming less energy.

Compressed Natural Gas (CNG) Naturally compressed to a pressure at or above 200-248 bar (that is, 2900-3600 psi) and stored in high-pressure containers. It is used as a fuel for natural gas-powered vehicles.

Consumption The amount of electricity used by an electric utility's customers.

Corporate Average Fuel Economy Standards (CAFE Standards) Enacted by Congress in 1975 to decrease energy usage of vehicles by increasing standards for the fuel economy of cars and smaller trucks.

Distributed Energy Resources (DER) Smaller power sources, such as solar farms, wind turbines, and microgrids that can be aggregated to provide power necessary to meet regular demand.

Dominion Carolina Gas Transmission (DCGT) A natural gas transportation company serving wholesale and direct industrial customers throughout South Carolina.

Eastern Interconnection One of the major AC (Alternate Current) electric grids in North America. This grid reaches from Canada to the Atlantic coast (excluding Quebec), south down to Florida, and west toward the Rocky Mountains.

Emergency Management Assistance Compact A natural disaster relief compact established in 1996 and ratified by Congress. EMAC offers assistance to states during governor-declared states of emergency through a responsive, straightforward system that allows states to send personnel, equipment, and commodities to help disaster relief efforts in other states.

Federal Energy Regulatory Commission (FERC) The federal agency with jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas pricing, oil pipeline rates, and gas pipeline certification. FERC is an independent regulatory agency within the DOE and is the successor to the Federal Power Commission.

Greenhouse Gases Those gases — such as water vapor, CO₂, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride — that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere.

Gross Domestic Product (GDP) The total value of goods and services produced by labor and property located in the US. As long as the labor and property are located in the US, the supplier (that is, the workers and, for property, the owners) may be either US residents or residents of foreign countries.

Investor-Owned Utilities (IOUs) Utility distributors and generators managed as a private enterprise, as opposed to a state or federally owned distributor.

Liquefied Natural Gas (LNG) Natural gas (primarily methane) that has been liquefied by reducing its temperature to -260 degrees Fahrenheit at atmospheric pressure.

LNG Export Facilities Plants that distribute liquefied natural gas to natural gas companies for the purpose of energy distribution among residential, industrial, and commercial consumers.

Mass-Based Program An approach to CPP regulations; a state's goal is expressed by a maximum number of tons of CO₂ emissions.

National Ambient Air Quality Standards (NAAQS) A set of standards for pollutants (established by EPA as required by the CAA) that are common in outdoor air, considered harmful to public health and the environment, and that come from numerous and diverse sources.

North American Electric Reliability Corporation (NERC) A nonprofit corporation formed in 2006 as the successor to the North American Electric Reliability Council established to develop and maintain mandatory reliability standards for the bulk electric system, with the fundamental goal of maintaining and improving the reliability of that system. NERC consists of regional reliability entities covering the interconnected power regions of the contiguous US, Canada, and Mexico.

NERC Reliability Standards Standards enforced by the Federal Power Act that help sustain the reliable transmission and delivery of electricity in the country.

Petrochemical Plants Facilities that convert crude oil, minerals, and natural gas into products used in industrial processes.

Piedmont Natural Gas Company (PNG) A natural gas company that serves customers in North Carolina, South Carolina, and Tennessee.

Pipeline and Hazardous Materials Safety Administration (PHSMA) Department of Transportation agency that regulates and enforces safe and reliable operations of US pipeline transportation.

Public Service Commission (PSC) Regulates rates and services of public utilities in South Carolina.

Rate-Based Program An approach to CPP regulations; a state's emission goal is expressed as emissions of CO₂ per MWh of electricity generated.

Shale Gas Natural gas found trapped underground between shale formations in the US.

South Carolina Department of Health and Environmental Control (DHEC) A state agency responsible for the welfare of public health and the environment in South Carolina.

State Regulation of Public Utilities Review Committee (PURC) Evaluates the actions of the PSC, the members of the PSC, the ORS, and the Executive Director of the ORS on an annual basis and appoints the PSC Commissioners.

Supervisory Control and Data Acquisition – Electric (SCADA) A system of remote control and telemetry used to monitor and control the transmission system.

System Average Interruption Duration Index (SAIDI) The average electricity outage duration for each customer served. Used as a reliability indicator of electric distributors.

System Average Interruption Frequency Index (SAIFI) The average number of electricity interruptions of each customer served, usually in a given year.

Volt Electric unit of measure (1 kilovolt = 1,000 volts)

Watt A measure of energy per unit of time (1 kilowatt = 1,000 watts, 1 gigawatt = 1,000,000 kilowatts)



Large-scale manufacturing facility in South Carolina

thank you

to the following stakeholders who helped develop the State Energy Plan.

American Institute of Architects
Berkeley-Charleston-Dorchester Council of Governments
Capital Consulting
Central Midlands Council of Governments
Central Electric Power Cooperative, Inc.
City of Rock Hill
Clemson University
Clemson University International Center for Automotive Research
Coastal Conservation League
Conservation Voters of South Carolina
Department of Energy - Savannah River National Laboratory
Dominion Carolina Gas Transmission
Duke Energy
Electric Cooperatives of South Carolina
Federal Highway Administration
Fujifilm
Green Energy Fuels, LLC
Gregory Electric Company, Inc.
Greenville Technical College
InterTech Group
Keith Sanders Architecture & Consulting Services
Kimberly-Clark Corporation
League of Women Voters of South Carolina
Michelin
Midlands Technical College
Mount Vernon Mills
Municipal Association of South Carolina
Myrtle Beach Regional Economic Development Corporation
Nucor Corporation
Palmetto Cycling Coalition
Piedmont Natural Gas Company
Santee Cooper
Savannah River National Laboratory
South Carolina Electric & Gas Company
SC Association for Community Economic Development
SC Clean Energy Business Alliance
SC Conservation Voters
SC Department of Administration, Division of General Services
SC Department of Commerce
SC Department of Disabilities and Special Needs
SC Department of Education
SC Department of Health and Environmental Control
SC Department of Public Safety
SC Department of Transportation
SC Energy Users Committee
SC Office of the State Engineer
SC Propane Gas Association
SC Small Business Chamber of Commerce
SC Solar Business Alliance
SC Solar Council
Shiver & Associates, LLC
Sierra Club
Southern Alliance for Clean Energy
Southern Current
Southern Environmental Law Center
State Regulation of Public Utilities Review Committee staff
Sustainability Institute
Sustaining Way
Terreni Law Firm, LLC
Upstate Forever
University of South Carolina Upstate
Winthrop University
WNA Consulting (Woodberry & Associates)



ENERGY.SC.GOV

