US Green Economy Report Series

Case Study - South Carolina

UK Government

CLIMATE ADVISERS

UNIVERSITY OF MARYLAND 1856

SCHOOL OF PUBLIC POLICY

CENTER FOR GLOBAL SUSTAINABILITY

South Carolina State Profile

South Carolina does not have a comprehensive climate agenda as the Republicans who currently dominate state politics have not prioritised the issue. That is in contrast to former Republican Governor Mark Sanford, who, in 2007, signed an executive order to establish a task force to tackle climate change in the state. The recommendations of his administration were never adopted. The current governor, Republican Henry McMaster, has signed legislation that helped expand access to solar, established a commission to deal with flooding and invested in clean public buses, but has not signalled that he would back a renewable portfolio standard or wide-ranging adaptation and resilience measures.

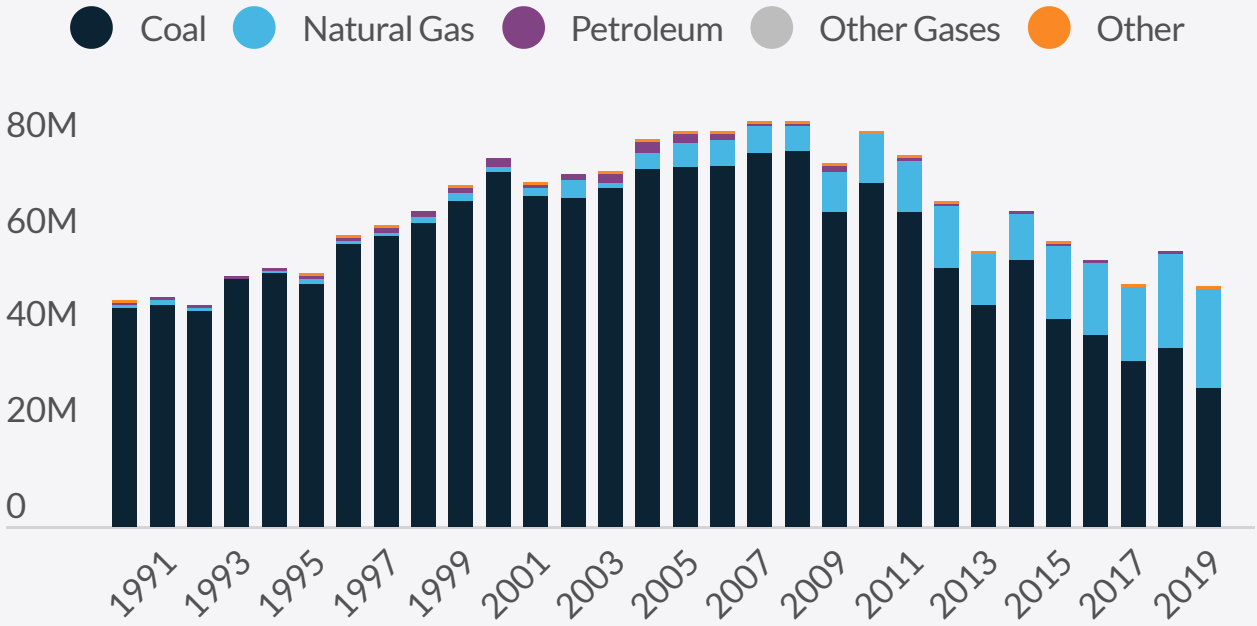
The major utilities in the state, Dominion and Santee Cooper, own nuclear power, which makes up almost 60 percent of the state's electricity generation. The two utilities had planned to pour $9 billion into building new nuclear plants, but abandoned the projects. Only a small portion of electricity generation comes from hydroelectric power and other renewables, mostly solar and biomass. With no climate plan, South Carolina has not determined how it will react to the various climate risks that threaten the state, such as flooding, hurricanes, coastal erosion, rising sea levels and high temperatures. Some cities in the state, however, such as Charleston, have put together long-term plans to mitigate these risks and cut emissions.

SOUTH CAROLINA STATE GOALS

2%

Renewables by 2021 (Voluntary)

ENERGY-RELATED GREENHOUSE GAS EMISSIONS



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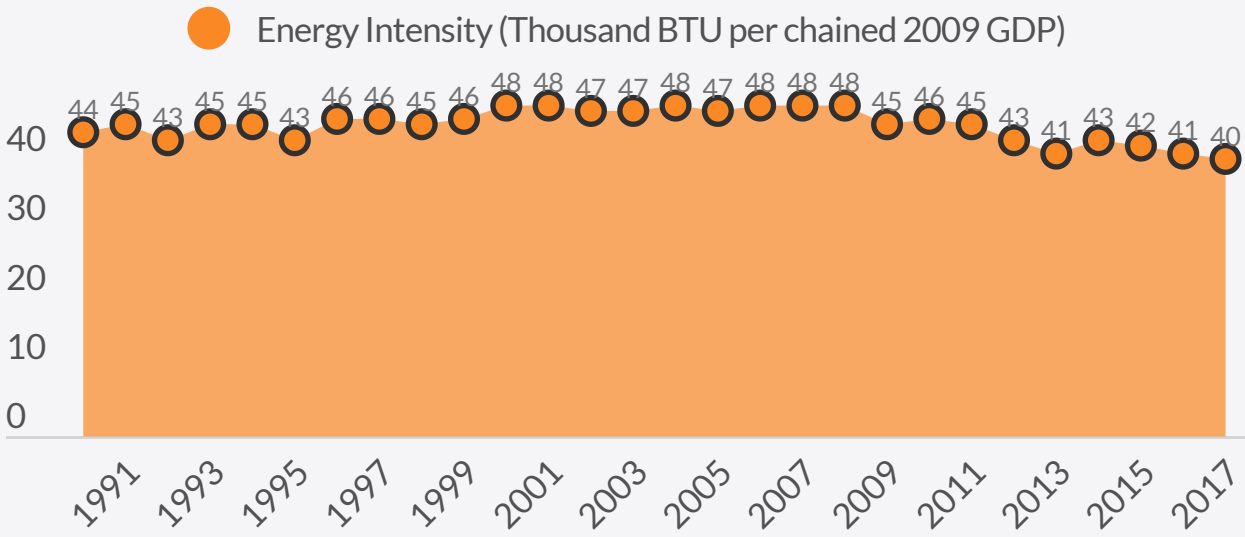
Carbon Dioxide emissions over time by energy generation source, according to the Energy Information Administration. Note: other includes non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and miscellaneous technologies; other Gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

ENERGY INTENSITY OVER TIME



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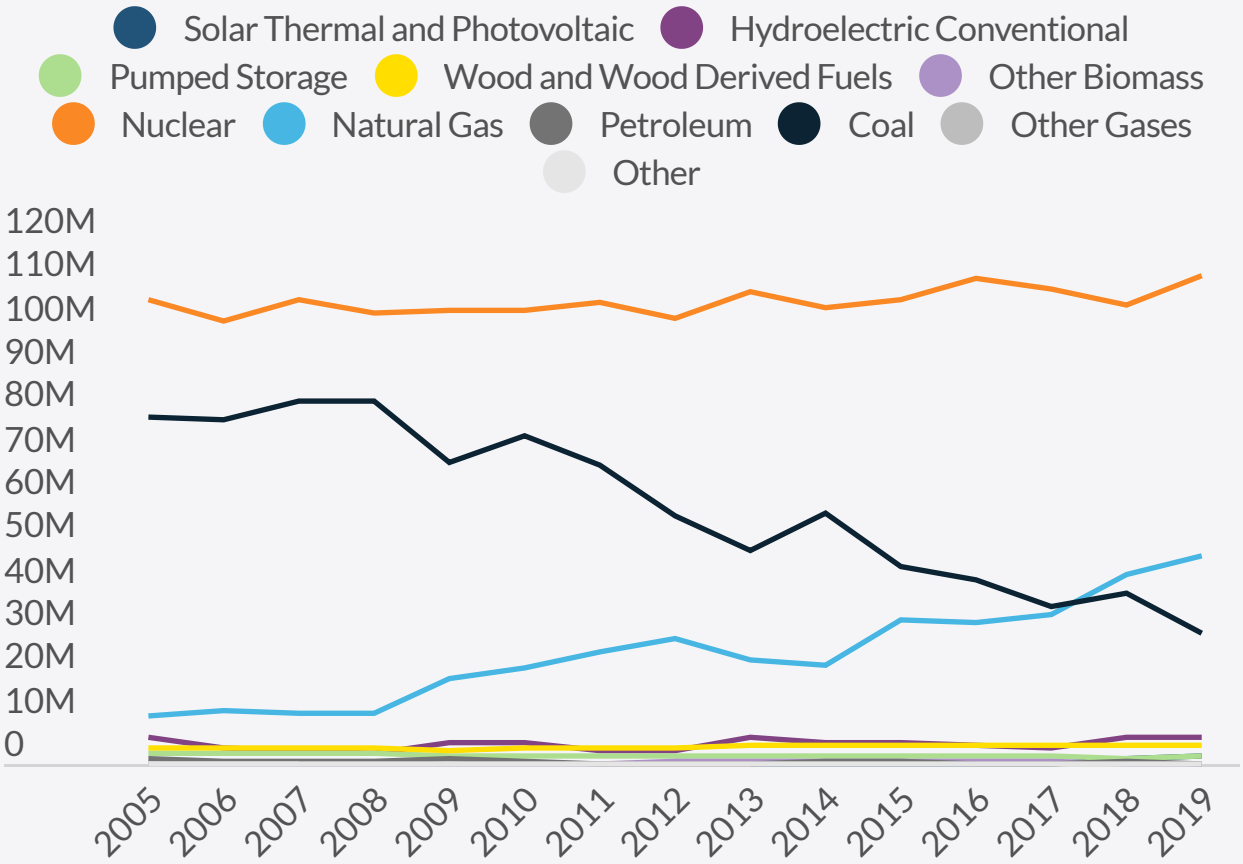
Source: Energy Information Administration

ELECTRICITY GENERATION BY SOURCE



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Generation over time, according to the Energy Information Administration. Note: other includes non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and miscellaneous technologies; other Gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

ENERGY FACTS AND FIGURES

ENERGY LOSSES	587,709	BBTU
ELECTRICITY PRICES	28.33	USD per MBTU
ENERGY PER GDP	8.06	Thousand BTU per 2012 USD
CONSUMPTION PER CAPITA	328.50	MBTU
NET-INTERSTATE FLOW	114,466	BBTU

Facts and figures, according to the Energy Information Administration. Note: negative net interstate flow of electricity and associated losses indicates flow out of state.

SOUTH CAROLINA'S LARGEST GENERATING PLANTS

Largest generation facilities by capacity, according to the Energy Information Administration

2,554 MW
Nuclear: Oconee

1,360 MW
Pumped storage: Bad Creek

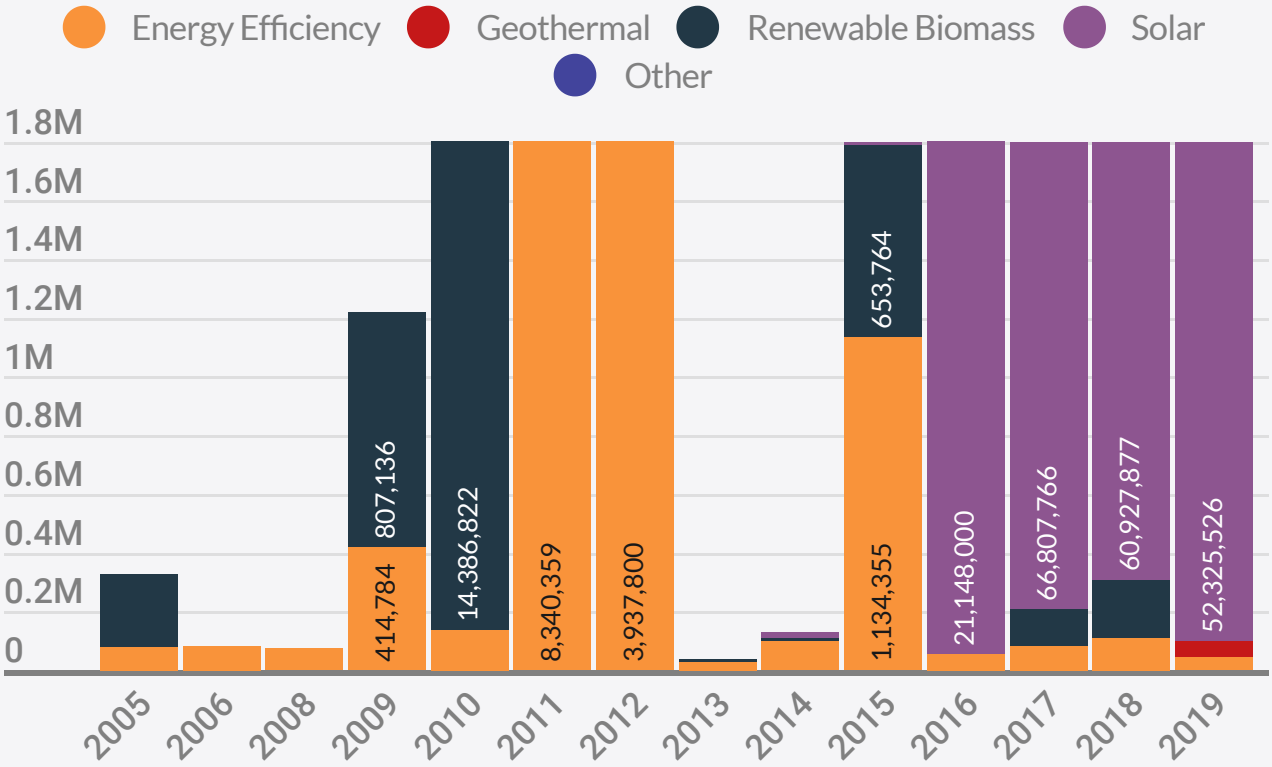
2,350 MW
Coal: Cross

1,130 MW
Coal: Winyah

2,310 MW
Nuclear: Catawba

1,040 MW
Natural gas: W S Lee

PUBLIC INVESTMENT BY GENERATION TYPE (DOA)



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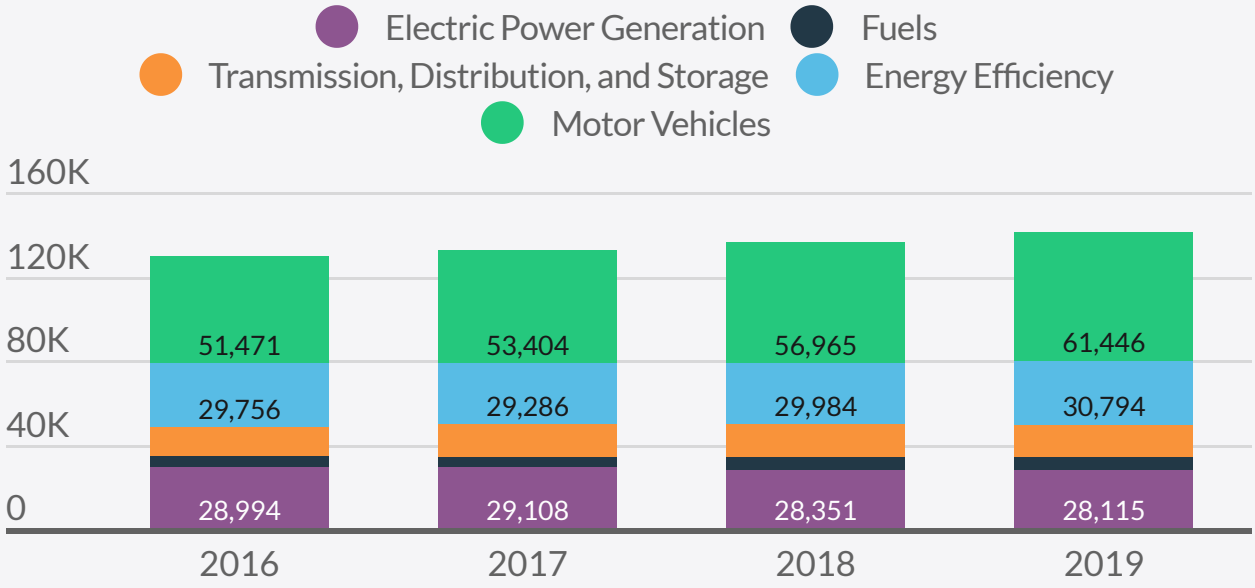
Public investment by energy type from 2002 to 2020, according to the United States Department of Agriculture. Data includes all investments made through Department of Agriculture programs.

TRADITIONAL ENERGY SECTOR JOBS



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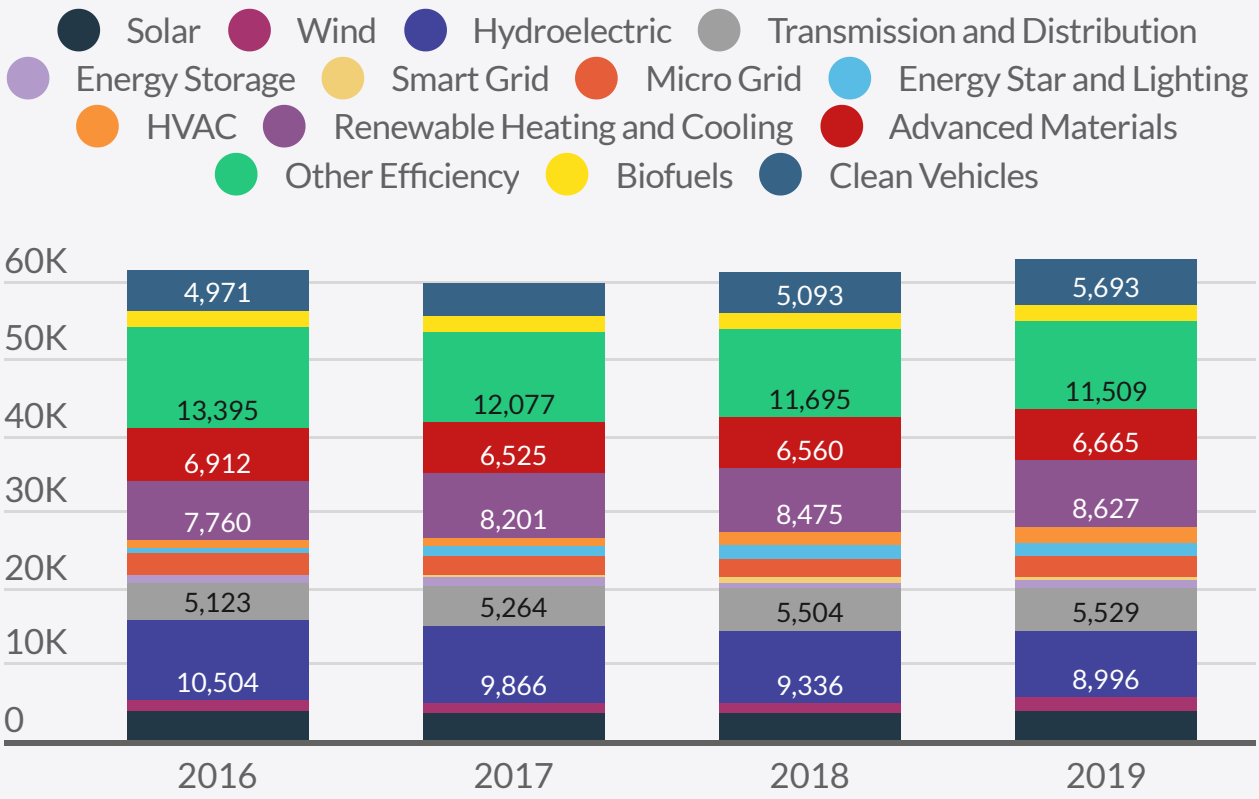
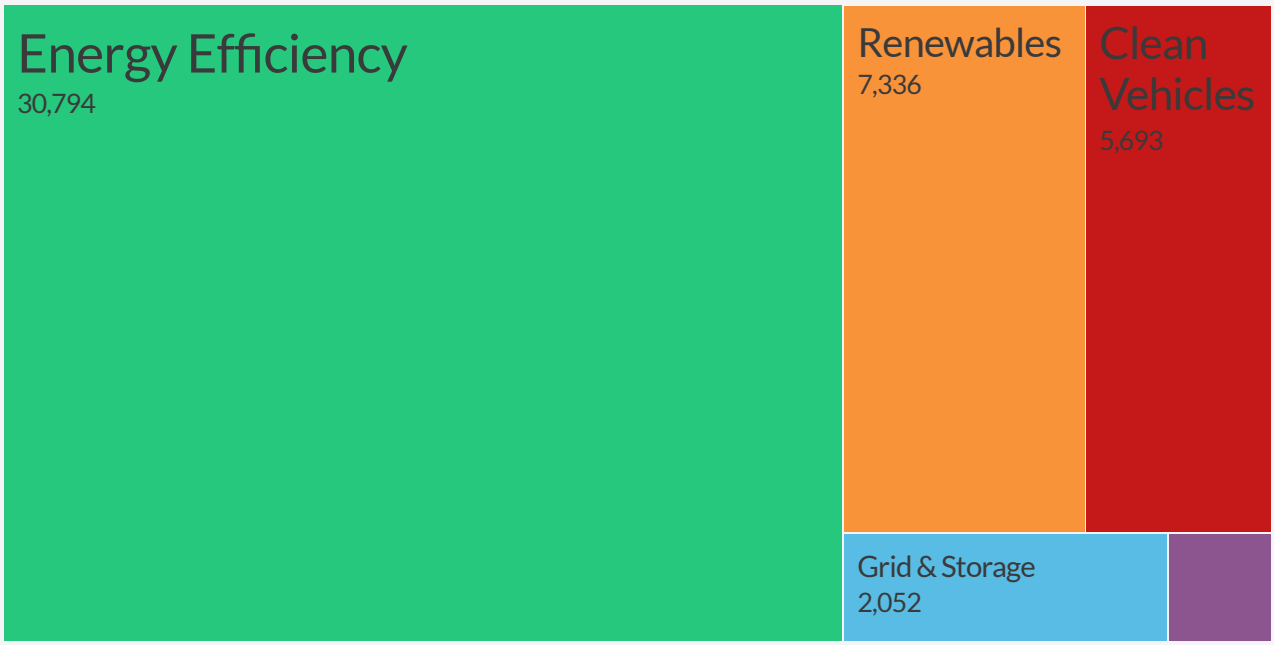
Traditional energy sector jobs over time, according the United States Energy and Employment Report (USEER).

CLEAN ENERGY JOBS BY TYPE



Clean energy jobs over time by type, according to the USEER. See Appendix for definitions and methodology.

OVERVIEW OF CLEAN ENERGY JOBS BY CATEGORY



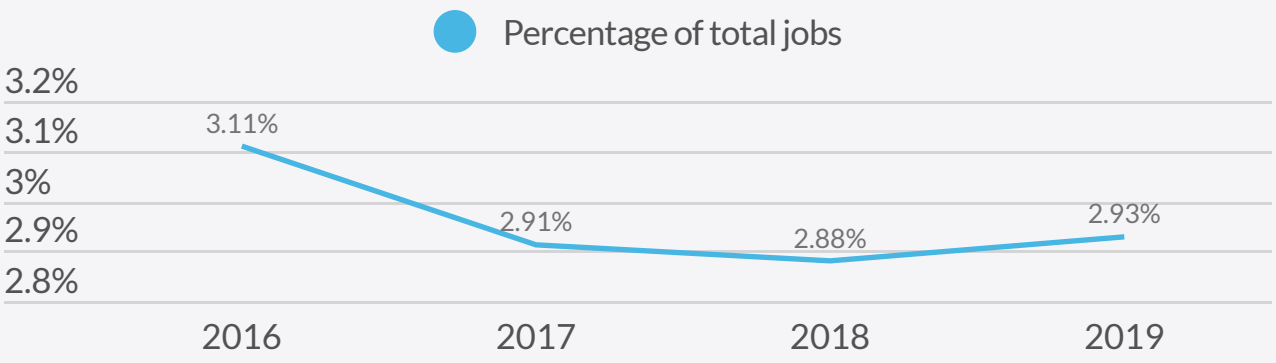
Clean energy jobs over time by technology, according to E2 Clean Jobs America.

CLEAN ENERGY COMPENSATION

Average state clean energy wage	$17.98
Percent above/below median state wage	7.8%
#1 most difficult to hire occupation	Electrician/construction workers
#2 most difficult to hire occupation	Technician or mechanical support

Clean energy jobs compensation and hiring, according to E2 Clean Jobs America and the USEER.

CLEAN ENERGY JOBS AS PERCENTAGE OF OVERALL JOBS



Clean energy jobs as a percentage of Bureau of Labor Statistics employment total numbers.

HYDROGEN

South Carolina has very few incentives for the purchase or lease of hydrogen-fuelled vehicles. Infrastructure for such vehicles is also lacking – there is only one hydrogen fuelling stations in the state. However, the state is a hub for research and production, for both hydrogen fuel cells and hydrogen as a source of alternative electric power. The Hydrogen and Fuel Cell Center at the University of South Carolina has a number of partnerships with private companies and national institutions at home and abroad to develop hydrogen technologies. Siemens, Duke Energy and Clemson University have received a $200,000 grant to study the use of hydrogen for energy storage and as a low- or no-carbon fuel source to produce energy on Clemson's campus. Arrival, a UK-based hydrogen vehicle company, has a "microfactory" in South Carolina. General Electric has developed turbines for natural gas power plants which can handle up to 50 percent hydrogen gas and will be produced at the company's factory in South Carolina. With a number of large-scale projects on the horizon, the future for hydrogen in South Carolina is positive.

Key players: Arrival, General Electric, South Carolina Hydrogen & Fuel Cell Alliance (SCHFCA), Siemens, Clemson University, University of South Carolina, Duke Energy

HYDROGEN PRODUCTION POTENTIAL NATIONAL RANKING

26th

Rank of hydrogen production potential in the wind sector

33rd

Rank of hydrogen production potential in the solar sector

26th

Hydrogen production potential in the biomass sector

33rd

Hydrogen production potential across renewable technologies

Hydrogen potential, according to the National Renewable Energy Laboratory's Hydrogen Demand and Resource Analysis Atlas.

HYDROGEN PRODUCTION COST AND RANK BY PROCESS

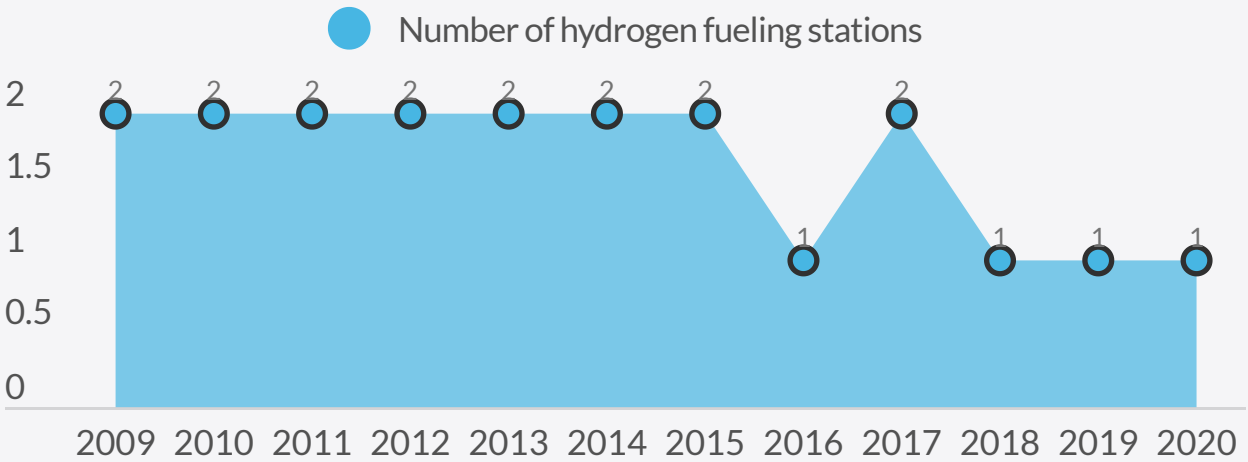
Hydrogen Electrolysis Costs	USD/kg	Rank (Low to High)
Commercial	346	22nd
Industrial	270	21st
Residential	365	22nd

Hydrogen Steam Methane Reforming Costs	USD/kg	Rank (Low to High)
Commercial	223	31st
Industrial	195	31st
Residential	238	30th

Hydrogen costs, according to the National Renewable Energy Laboratory's Hydrogen Demand and Resource Analysis Atlas.

HYDROGEN FUELING STATION POLICY AND INFRASTRUCTURE

	Strength	Number	Compared to National Average
Number of hydrogen fuel laws & incentives	High	8	44%



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Fueling stations over time and state laws and incentives, according to the United States Department of Energy's Alternative Fuels Data Center.

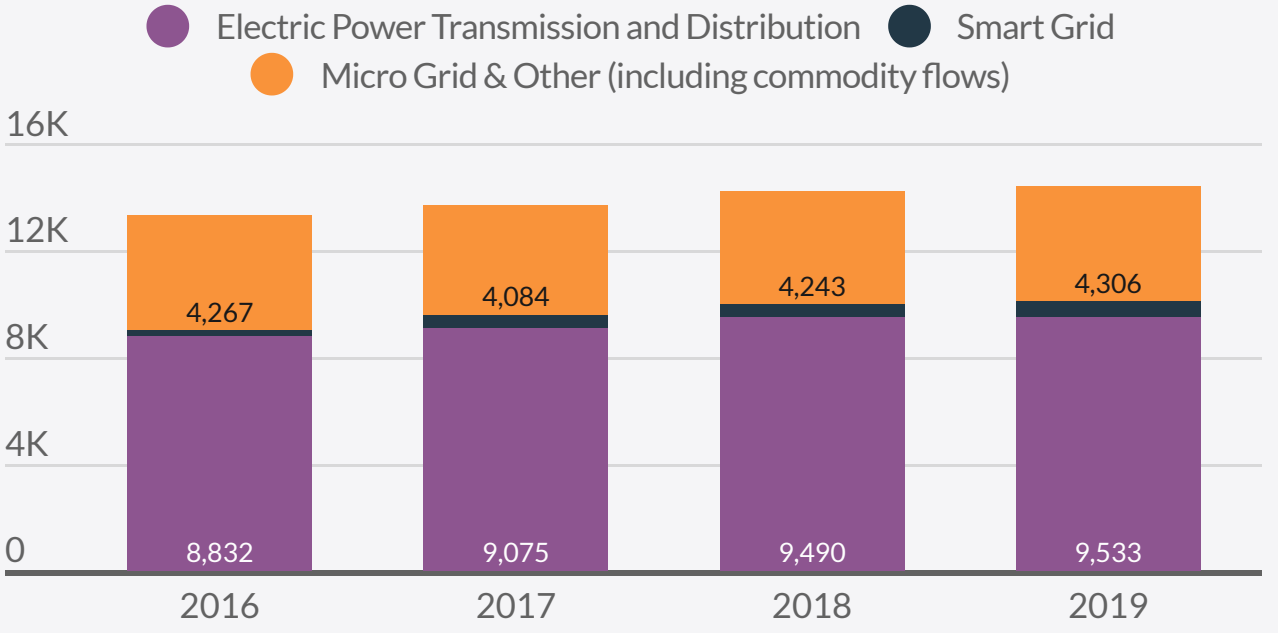
GRID MODERNISATION

South Carolina ranks joint-34th in the 2018 Grid Modernization Index, based on state policy support, customer engagement and degree of grid operations investment. The state focuses on grid modernisation in its energy plan but no formal policies to enable customer data access currently exist. Approximately 47 percent of customers use smart meters in South Carolina, primarily driven by state-wide policies to encourage their use. Duke Energy, which serves 28 percent of the state's residential consumers, plans to invest $454 million in grid improvements, but is awaiting a final decision from the state regulator.

Dominion Energy's latest Integrated Resource Plan has been rejected by regulators after failing to adequately model its resource mix and spending scenarios, bringing about uncertainty over its grid investments. In 2020, 36 bills relating to energy infrastructure and regulations were introduced, of which 3 were enacted. With regards to demand response, South Carolina enrols 157,677 customers, helping save 1,767 MWh. As it stands, Climate Advisers anticipates average growth in this sector due to mixed signals in the grid landscape in South Carolina.

Key Players: Duke Energy, Dominion Energy, SC Public Service Commission

GRID JOBS BY CATEGORY OVER TIME



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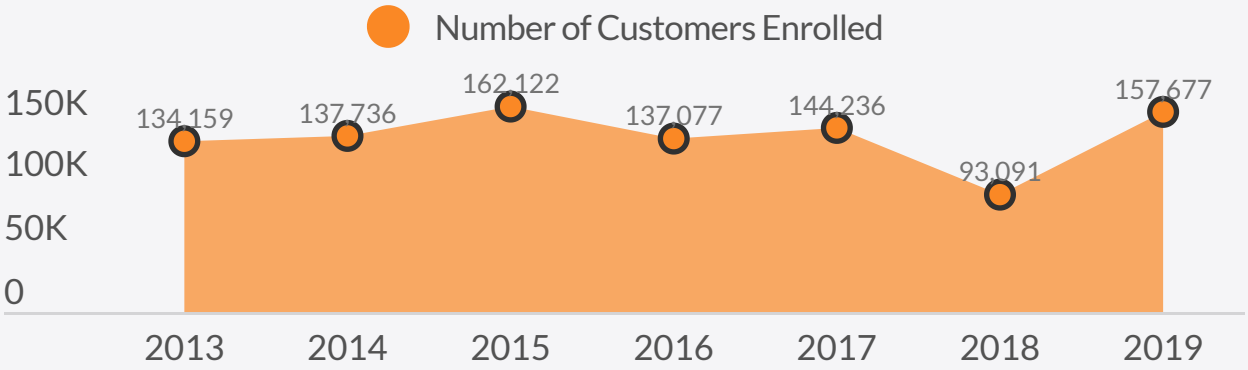
Categories of grid-related jobs, according to the United States Energy and Employment Report.

DEMAND RESPONSE ENROLLMENT AND INCENTIVES



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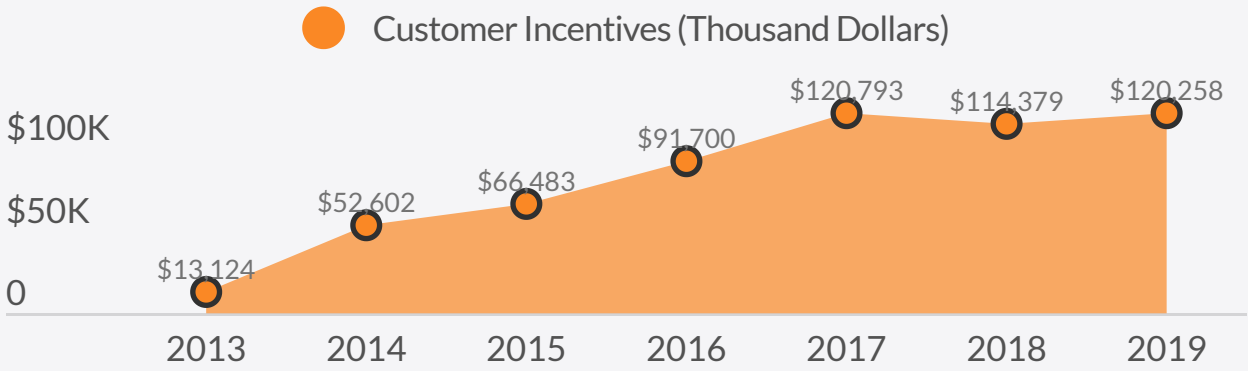

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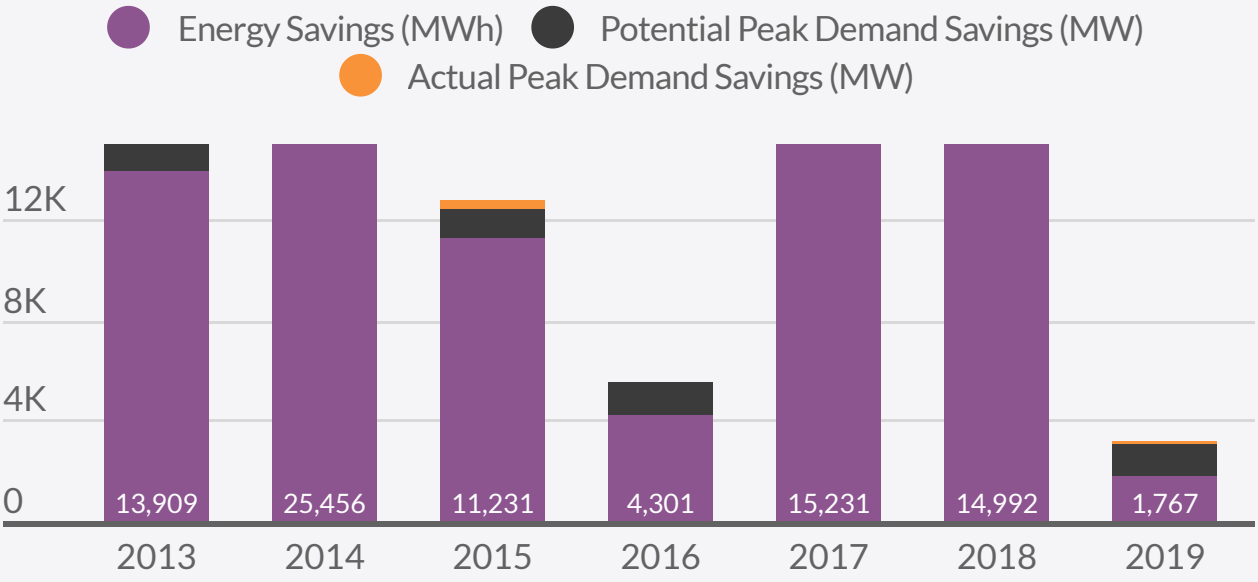
Enrollment and incentive data sourced from the Energy Information Administration.

DEMAND RESPONSE ENERGY SAVINGS OVER TIME



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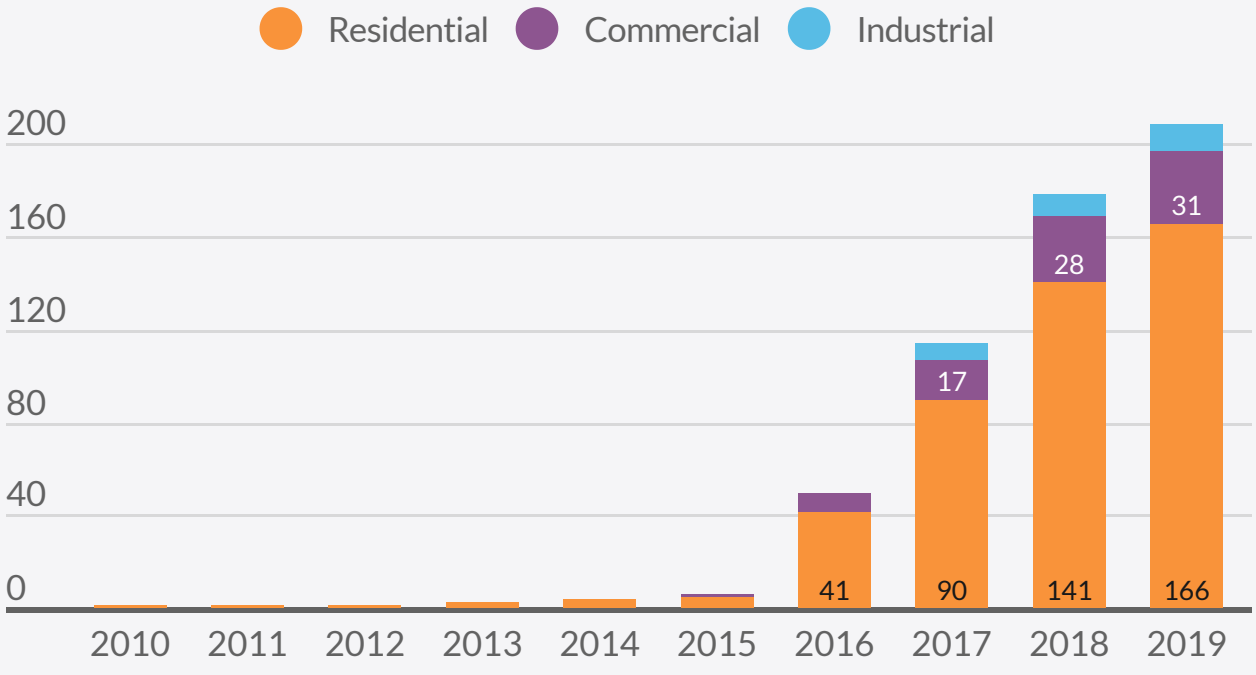
Demand response savings data sourced from the Energy Information Administration.

DISTRIBUTED GENERATION: NET METERING CAPACITY



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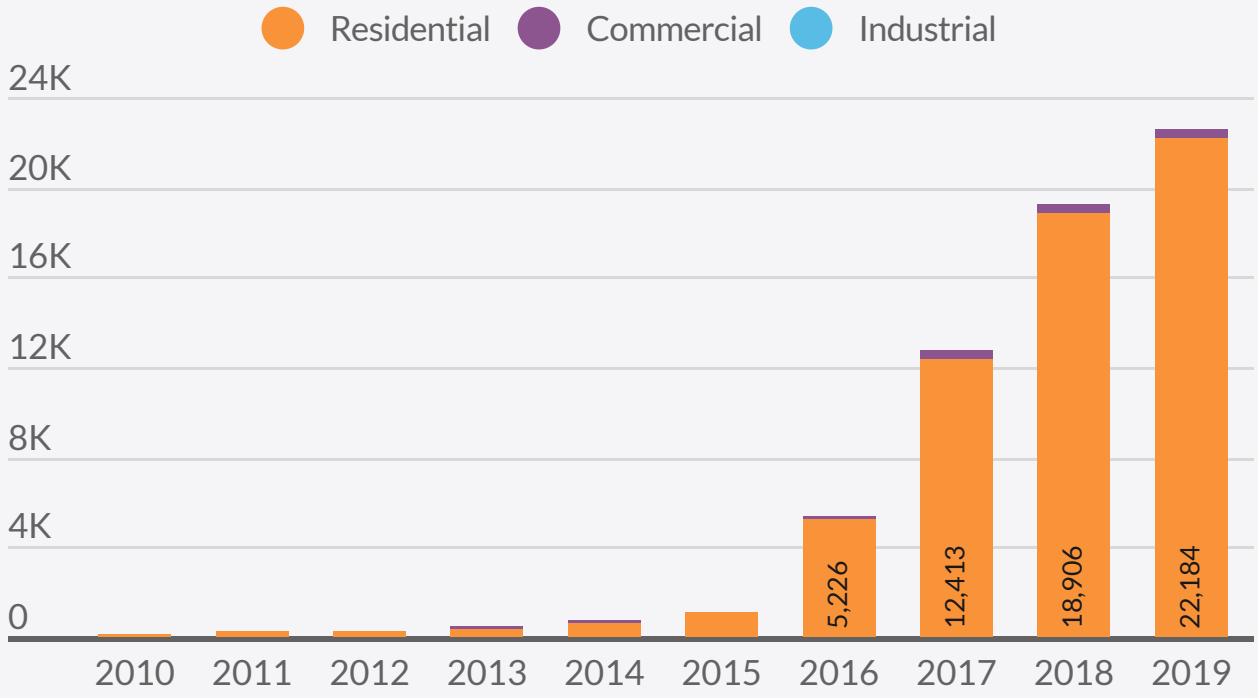
Net metering capacity over time sourced from the Energy Information Administration.

DISTRIBUTED GENERATION: NET METERING CUSTOMERS



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Number of net metering customers sourced from the Energy Information Administration.

WASTE TO ENERGY

Biogas: South Carolina is ranked 28th for biogas production potential with an estimated 14.27 billion cubic feet of renewable methane per year. The highest potential is in wastewater (94 systems), manure (54 systems), food waste (32 systems) and landfill (3 systems). These systems would result in a combined $548 million in capital investments, 4,571 construction jobs and 303 permanent jobs. Furthermore, estimated emissions reductions would be equivalent to having 1.41 million cars fewer cars on the road. South Carolina currently operates 19 landfill, 11 wastewater, 2 manure and 1 food waste biogas systems.

Transport: South Carolina requires all fuel at state-owned diesel fuelling stations to be at least 5 percent biodiesel. The state directs all state school bus fleets to use biodiesel when feasible, while all state agencies are required to give purchasing preference to alternative fuel and advanced vehicles. Stakeholders involved in the bulk transfer of gasoline and diesel must offer fuels that are suitable for biofuel blending. The state also provides low-interest loans to private and public entities for alternative fuel vehicle conversions, as well as grants for alternative fuel demonstration projects.

Biomass: Two percent of South Carolina's electricity is generated through biomass sources. Forests in the state support 9 utility-scale power plants that burn wood and wood waste as well as 2 wood pellet manufacturing facilities, which can produce a combined 611,000 tonnes annually. The state also uses landfill gas, anaerobic digesters and agricultural residue as part of its biomass generation projects.

Key Players: WestRock, International Paper

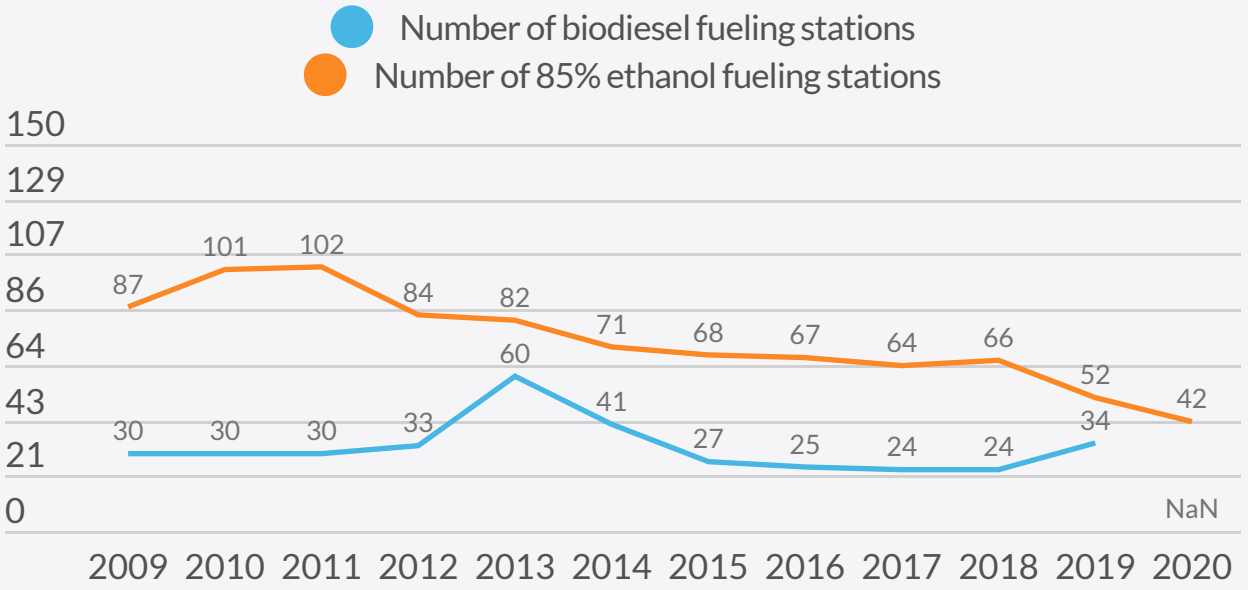
WASTE TO ENERGY: BIOMETHANE POTENTIAL

Biomethane Type	Output (Tonnes/Year)	National Rank
Methane Emissions from Landfills	39,508	17th
Biogas Generation Potential from Wastewater	32,913	23rd
Biogas Generation Potential from Industrial, Commercial and Institutional Organic Waste	17,056	23rd
Biogas Generation Potential from Animal Waste	14,999	27th

Biomethane generation potential and biomass feedstocks, according to the National Renewable Energy Laboratory's Biofuels Atlas..

WASTE TO ENERGY: BIOFUEL LAWS AND INFRASTRUCTURE

	Strength	Number	Compared to National Average
Number of biodiesel laws & incentives	Medium	7	20%
Number of ethanol laws & incentives	Medium	5	-8%



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Fueling stations and applicable laws and incentives, according to the United States Department of Energy's Alternative Fuels Data Center.

WASTE TO ENERGY: CAPACITY BY PLANT TYPE

Biopower Plant Type	Production Capacity (MW)	National rank
Landfill Gas	44	14th
Municipal Solid Waste	-	-
Wood/Wood Waste Biomass	383	7th
Other Waste Biomass	-	-
Co-Firing Biomass	-	-

Production capacities, according to the National Renewable Energy Laboratory's Biofuels Atlas.

OFFSHORE WIND

Offshore wind development has progressed at a slow pace in South Carolina. The Bureau of Ocean and Energy Management (BOEM) is still in the process of identifying wind energy areas on the Outer Continental Shelf (OCS) offshore South Carolina. BOEM has initiated planning efforts with South Carolina's Intergovernmental Renewable Energy Task Force, which includes representatives from federal, local and tribal governments. The Task Force meetings provide important information to stakeholders of BOEM's environmental review process and seek input on resources and alternatives BOEM should consider in the environmental assessments. To date, no lease has been awarded and no projects have been planned.

Key Players: Bureau of Ocean and Energy Management (BOEM), South Carolina's Intergovernmental Renewable Energy Task Force

64%

Of electricity generation potentially supplied by wind

19,200 MW

Of offshore wind economically recoverable

Offshore wind potential based on data from Oceana.

GREEN CONSULTANCY

In South Carolina, there are currently 330 environmental consultants employed, earning an average salary of $61,930. South Carolina's renewable energy consultancy sector is promised average growth as a result of the state's renewable energy potential of 3,720,276 GWh, ranking it 33rd in the nation. The state's potential is driven primarily by rural utility-scale PV and offshore wind.

Key proposed projects in the state include a number of solar PV facilities, of which the largest will be run by Cypress Creek Renewables. Solar PV facilities proposed by TWE Bowman Solar Project, Ross Solar, Gunsight Solar, Colleton Solar and Centerfield Cooper Solar are of approximately the same size. Given the state's moderate policies and modest technical potential, Climate Advisers expects South Carolina's green consulting sector to grow around the national average of 11 percent (from 2016-2026).

CARBON CAPTURE, UTILISATION AND STORAGE

South Carolina has no policies in place to stimulate the development of carbon capture projects. Three concrete companies operating in the state, the Van Smith Concrete Company, Thomas Concrete and Concrete Supply Company, have ongoing carbon utilisation projects that inject CO2 into concrete products. South Carolina also has a number of saline basins that have been identified as potential carbon sequestration locations. Overall, this sector has not been a priority in South Carolina, and with no major projects or policy changes on the horizon, the outlook will likely remain unchanged in the near term.

Key players: Thomas Concrete, Concrete Supply Company, Van Smith Concrete Company

ELECTRIC VEHICLES

South Carolina is unranked according to the ACEEE EV Scorecard, indicating the state's limited progress on EV policies, practices and investments. The state's headline initiatives include alternative fuel project grants which award for pilot projects grants of up to $10,000 to state and local government agencies, non-profits and some educational facilities, and two alternative fuel vehicle (AFV) loan programmes (one for the private sector, and one for the public sector) which provide loans to eligible businesses and industries, utilities, non-profit organizations, schools, colleges and universities for projects between $25,000 and $1 million. State agencies are required to give preference to hybrid, EVs and/or other AFVs during procurement.

The state requires that owners of EVs pay a biennial fee of $120 in addition to standard registration fees. Also, public electric utilities are allowed to seek recovery of costs associated with EV charging. EVs accounted for 0.53 percent of vehicles sales in South Carolina in 2018, and there are 1,950 EVs and 315 charging stations in the state. Looking forward, Duke Energy is implementing an EV infrastructure pilot project, which will include the installation of 60 fast chargers and up to $1,000 of grants for EV charging infrastructure. However, given the lack of current or planned state-level incentives for private consumers, the potential for EVs in South Carolina will likely remain limited in the short term.

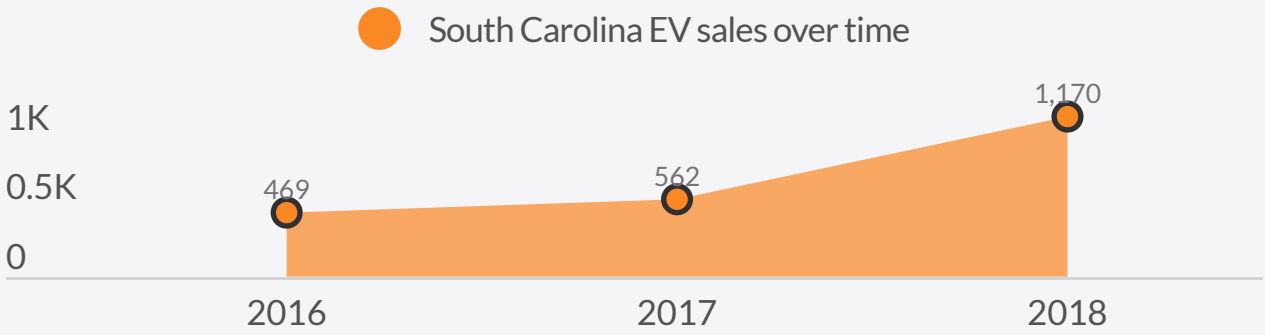
Key players: Duke Energy

ELECTRIC VEHICLE FACTS AND FIGURES

National rank based on EV sales	31
Percentage of national EV sales	0.3%
Market share within state	0.5%
Market share within state (year over year growth)	96%
EV sales as a percentage of motor vehicle sales	0.3%
Number of people per charging station	17,944
Number of people per charging station (rank)	34
EV Fuel Cost per eGallon (2018)	$1.17
EV Fuel Cost per eGallon (% above/below national average)	-8%
Fuel cost savings per gallon versus gasoline	$1.50
Most popular EV (search volume)	BMW i8

Electric vehicle quick facts based on data from EVAdoption.

ELECTRIC VEHICLE SALES OVER TIME



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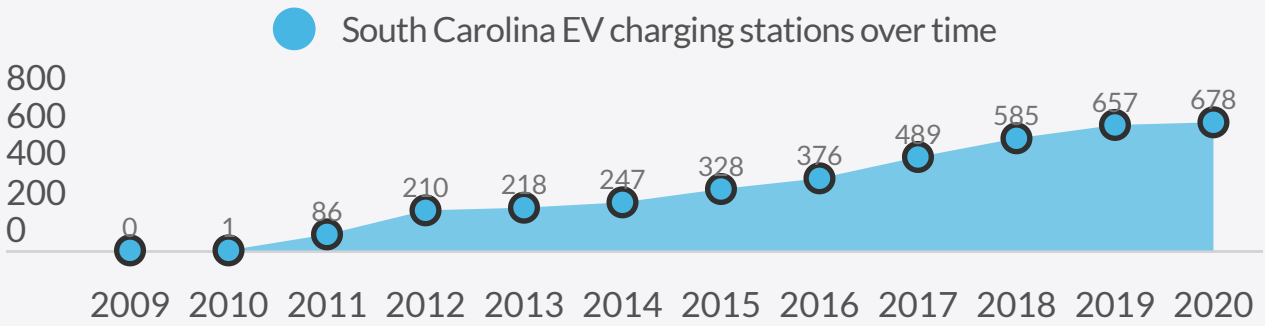
Electric vehicle sales over time, according to EVAdoption.

ELECTRIC VEHICLE CHARGING STATIONS OVER TIME



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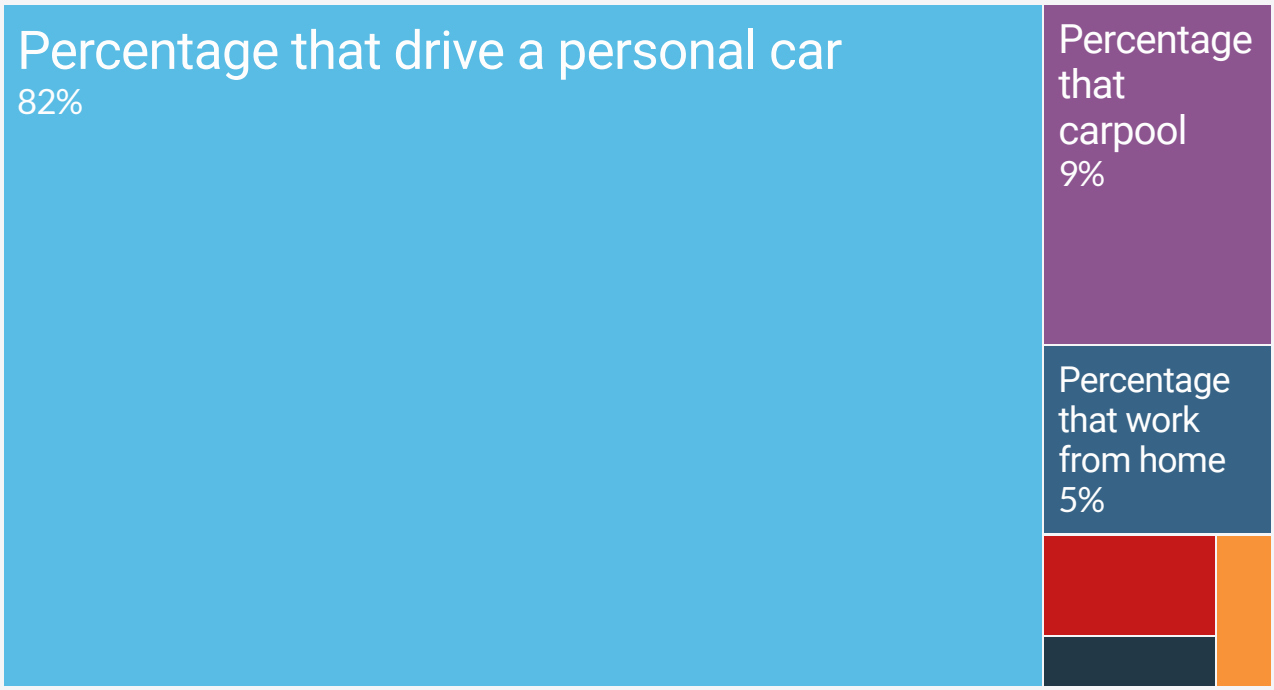
Charging stations over time, according to the United States Department of Energy's Alternative Fuels Data Center.

ELECTRIC VEHICLE LAWS AND INCENTIVES

	Strength	Number	Compared to National Average
Number of EV laws & incentives	Low	6	-59%
Number of HEV laws & incentives	High	5	143%
Number of PHEV laws & incentives	Medium	7	-47%
Number of NEV laws & incentives	Medium	1	-4%
Number of fuel economy/efficiency laws & incentives	Low	0	-100%

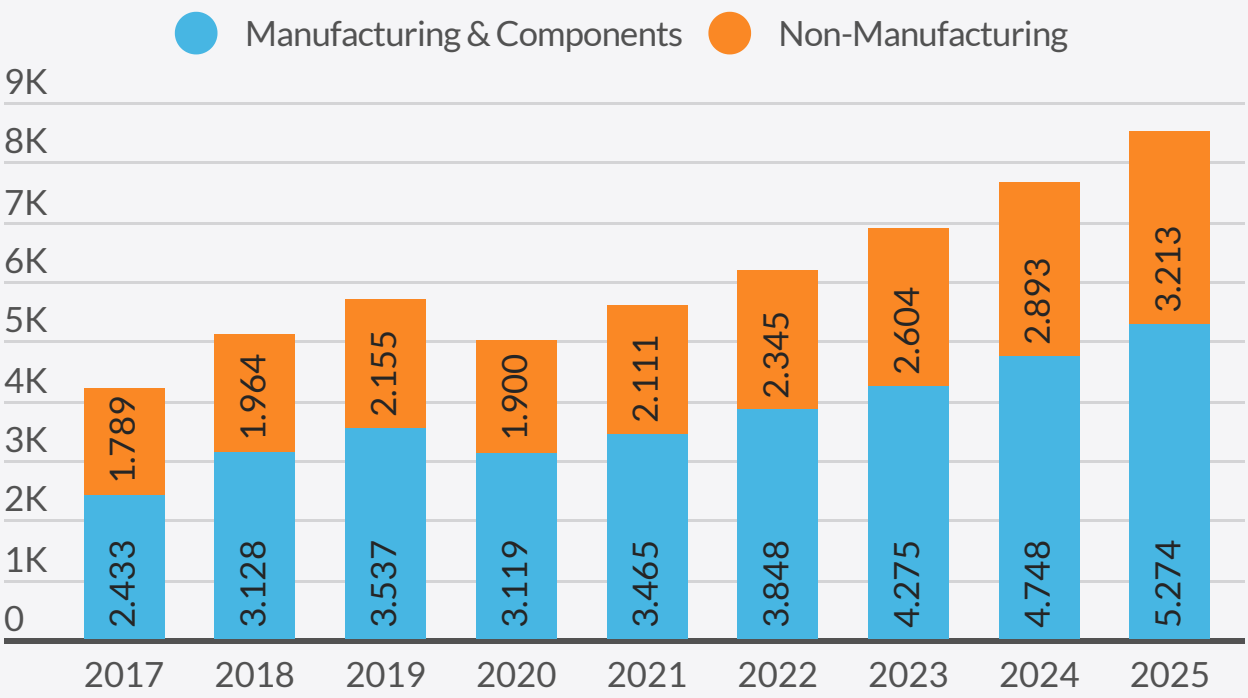
Quantity of state laws and incentives on electric vehicles, in comparison to national average, according to the Alternative Fuels Data Center.

PROFILE OF A SOUTH CAROLINA COMMUTER



State commuter dynamics, according to the United States Department of Commerce, Bureau of Census.

PROJECTED ELECTRIC VEHICLE JOBS OVER TIME



Methodology: Percentage of manufacturing jobs by state (NAICS codes 3361,3362,3363) of total motor vehicle jobs was applied to total clean vehicle jobs by state (E2) to determine the break down. Forecast based on projected clean vehicles miles travelled. More detail in the Appendix.

ENERGY EFFICIENCY

South Carolina is ranked 40th on ACEEE's 2020 State Energy Efficiency Scorecard, reflecting the state's limited efforts to improve energy efficiency. The state has 42 financial incentives for energy efficiency, including an energy efficiency revolving loan fund. South Carolina does not have any mandatory building energy disclosure policies for buildings that are not state-owned.

State-owned facilities are required to benchmark energy consumption and submit the data to the State Energy Office every year under H.B. 4766 of 2008. The bill also requires state agencies and public school districts to reduce 20 percent of energy consumption by 2020 from 2000 levels. Any new building construction projects or renovation projects must meet LEED Green Building standards, a Green Building Initiative Green Globe rating or an equivalent numeric rating. South Carolina has no research institutions focused on energy efficiency.

Key Players: Duke Energy, Duke Energy Progress, South Carolina Electric & Gas, Santee Cooper, Southeast Energy Efficiency Alliance, Southern Alliance for Clean Energy (SACE), Sierra Club, South Carolina Energy Users Committee, South Carolina Coastal Conservation League, Conservation Voters of South Carolina

ENERGY EFFICIENCY RANKINGS BY CATEGORY

40

Energy Efficiency Rank

35

Utilities Rank

19

Government Rank

37

Transportation Rank

46

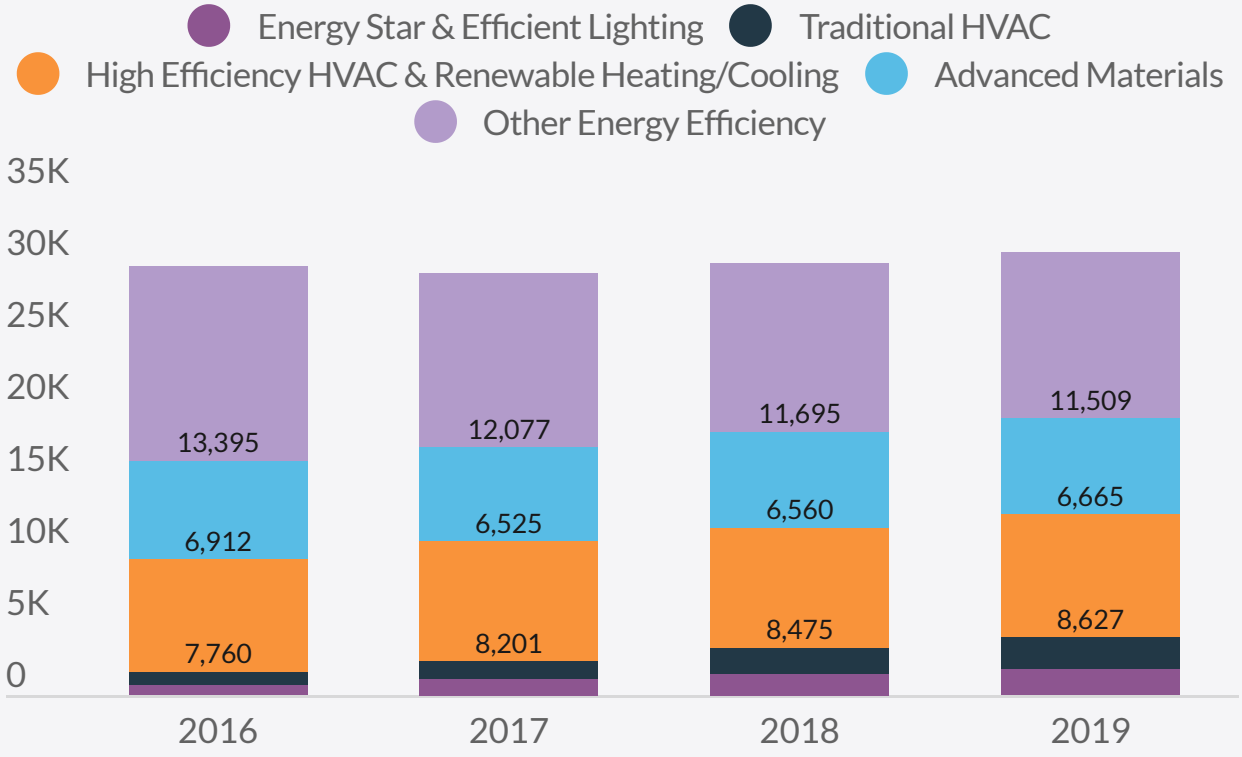
Buildings Rank

8

Appliances Rank

Each component of energy efficiency was evaluated by state by the American Council for an Energy-Efficient Economy, which is the basis for these national rankings. The ACEEE monitors state policies and programs, which feed into an assessment of 32 energy efficiency metrics.

ENERGY EFFICIENCY JOBS BY CATEGORY



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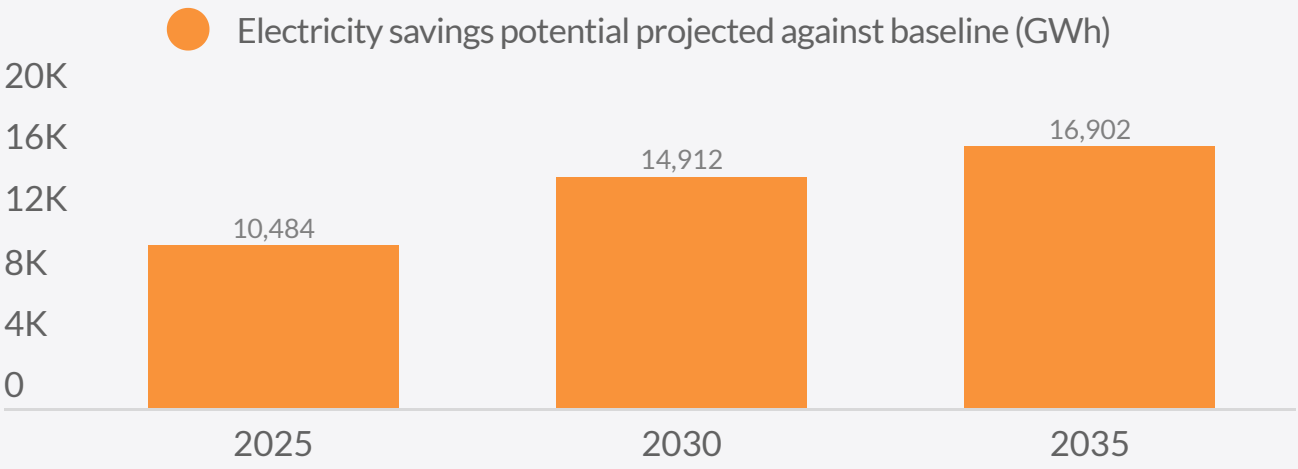
Categories of energy efficiency jobs, according to the United States Energy and Employment Report.

ENERGY EFFICIENCY ELECTRICITY SAVINGS POTENTIAL PROJECTED AGAINST BASELINE



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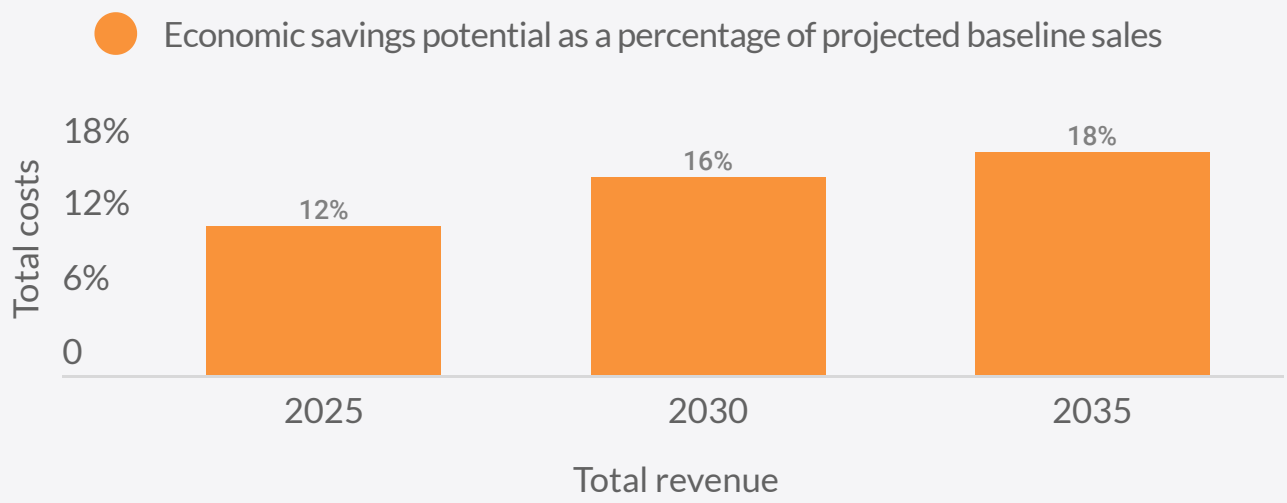
Electricity savings projected by the the United States Office of Energy Efficiency and Renewable Energy.

ENERGY EFFICIENCY ECONOMIC SAVINGS POTENTIAL AS A PERCENTAGE OF BASELINE SALES



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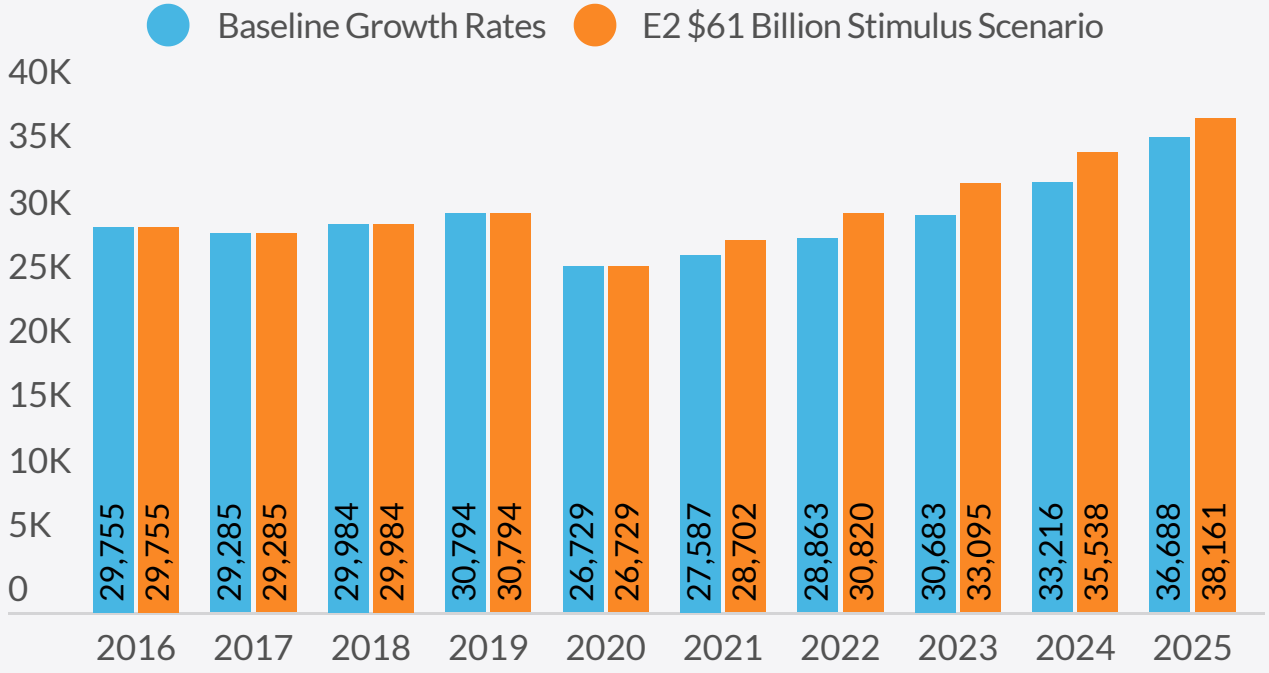
Electricity savings projected by the the United States Office of Energy Efficiency and Renewable Energy.

PROJECTED ENERGY EFFICIENCY EMPLOYMENT



Methodology: US Energy & Employment actuals for ENERGY STAR and efficient lighting, traditional HVAC, high efficiency HVAC and renewable heating and cooling, advanced materials and other energy efficiency. Current growth rates use historic compound annual growth rate, while the E2 $61 Billion stimulus scenario uses growth rates based on projected impacts of a federal stimulus bill. Both cases adjust for COVID-19 job loss actuals in 2020. Additional detail in the Appendix.

ENERGY STORAGE

Installed Capacity: South Carolina has 4 MW of battery storage and 2,716 MW of hydroelectric pumped storage, the largest of which include the 324-MW Bad Creek pumped storage project operated by Duke Energy Carolinas LLC and the 4-MW MCRD Parris Island PV Hybrid battery storage operated by Ameresco Federal Solutions. Of the installed capacity, 99 percent is operated by electric utilities and less than 1 percent by independent power producers (IPPs). There are currently 4 energy storage projects in the state.

Policies: South Carolina has demonstrated limited efforts to stimulate energy storage growth in the state. South Carolina does not have any procurement targets for energy storage. The state allows for projects with energy storage to net meter under HB 3659 of 2019.

Project Pipeline: South Carolina has no energy storage projects planned.

Key Players: Duke Energy Carolinas LLC, Dominion Energy South Carolina Inc., Ameresco Federal Solutions

ENERGY STORAGE: POLICIES AND CAPACITY INSTALLED

2,720 MW

Capacity installed

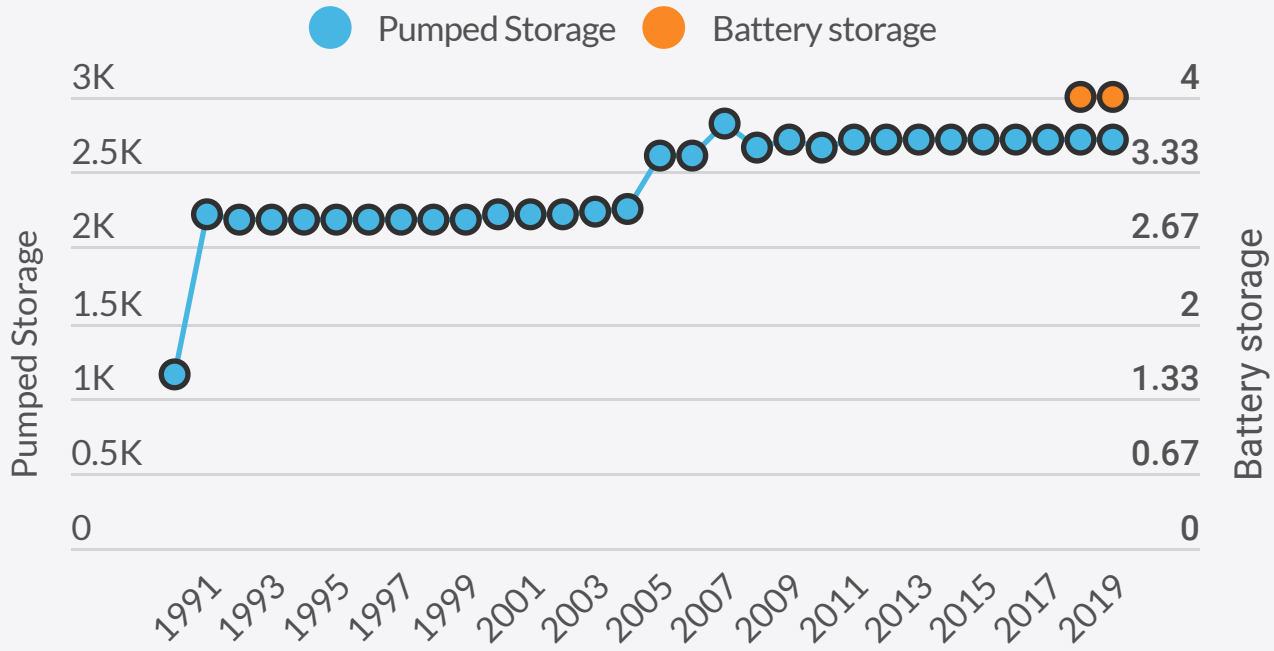
900

Energy storage jobs

	Yes/No
Procurement Targets	No
Regulatory Requirements	No
Demonstration Programs	No
Financial Incentives	Yes
Consumer Protection	No

Targets, policies and incentives maintained by the Pacific Northwest National Laboratory through the United States Department of Energy. Capacity installed sourced from EIA and jobs from USEER.

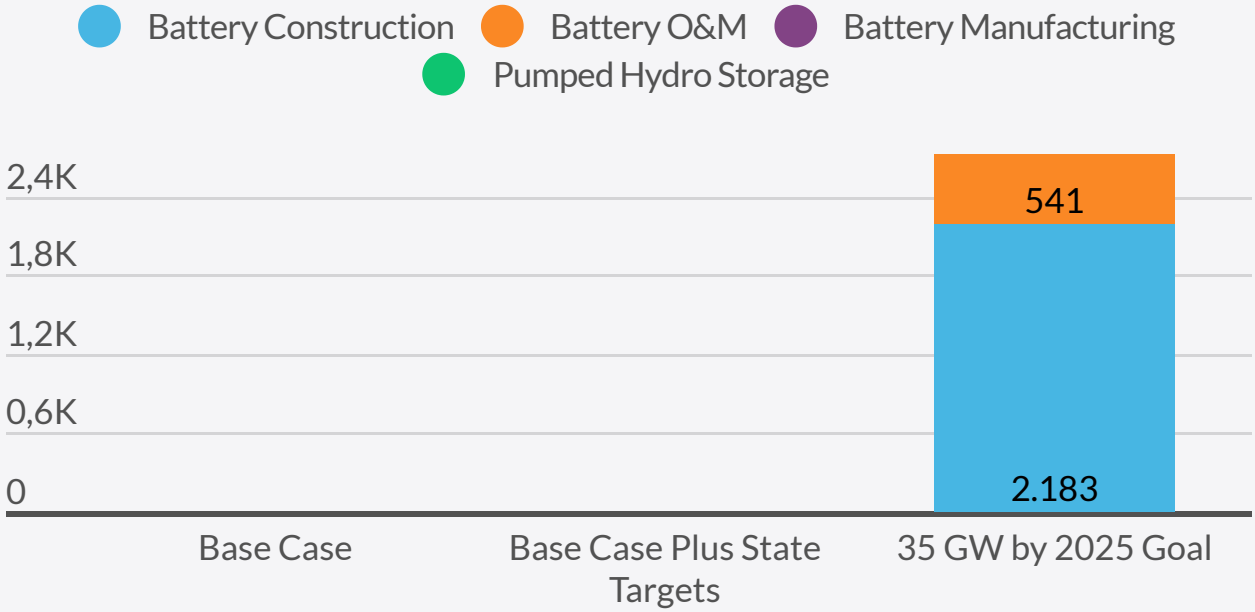
SOUTH CAROLINA CURRENT ENERGY STORAGE CAPACITY



Download data

Energy storage generation capacity over time available through the Energy Information Administration.

PROJECTED ENERGY STORAGE FTE ADDITIONS (2021-2025)



Methodology: Battery construction, battery O&M, and Pumped Hydro Storage jobs per MW rates based on historical data and Navigant estimates through 2025; manufacturing based on NAICS 335911 with manual adjustments. Base case capacity forecasts from the EIA pipeline; base case plus state targets includes announced state targets and the 35 GW by 2025 goal is based on an Energy Storage Association vision report. Additional information available in the Appendix.