

Element Goal

Promote use of alternative energy sources and energy conservation measures that benefit our communities.

Chapter 3.10: Energy Element

3.10.1: OVERVIEW

The Energy Element includes information about energy use, available energy sources, and recommendations to help Charleston County become more energy independent. Energy independence is vitally important for national security and economic stability because it minimizes reliance on imported fuel and sources of energy that have become increasingly scarce and costly to obtain. Ways to achieve energy independence include:

- Conservation;
- Efficiency;
- Utilizing Renewable and Alternative Energy Sources; and
- Utilizing Local Resources.

Energy plays an important role in the development of civilization. For centuries, the primary sources of energy came from human labor, domesticated animals, and biomass (wood related products). However, the primary source of energy over the past 150 years has increasingly shifted to fossil fuels. This shift has brought unprecedented growth and prosperity, changing every facet of human endeavor including transportation, medicine, agriculture, etc. In all levels of government, especially at a local level, energy consumption and conservation continues as a valid concern despite fossil fuels remaining relatively inexpensive over the last several years. Integration of sustainable development into the comprehensive planning process at the local level is vital to achieving sensible growth in South Carolina.

When energy expenses are reduced, there is more disposable income to spend on other priorities. Reducing energy use and investing in efficiency measures keeps more dollars circulating in the local economy, as well. Energy efficiency, demand-side management, and conservation need to be promoted, publicized, and encour-

aged. By improving our energy efficiency, we reduce the size and cost of renewable and alternative energy systems needed to power our homes and businesses. Conservation saves energy by changing attitudes and behavior to stop wasteful activities. The Energy Element underscores the significance of energy through an analysis of energy use and its sources and presents a series of strategies to promote alternative sources and conservation measures that can benefit our communities. The Energy Element is vital in this Plan as it both “sets the stage” and “reinforces” the concepts of most other Elements in the Plan.

Purpose and Intent

The purpose and intent of the Energy Element is to promote conservation and renewable energy. Additionally, Charleston County intends to lead by example. The strategies for energy conservation and renewability will aid in maintaining the character of scenic Charleston County without hindering business and employment growth of future generations.

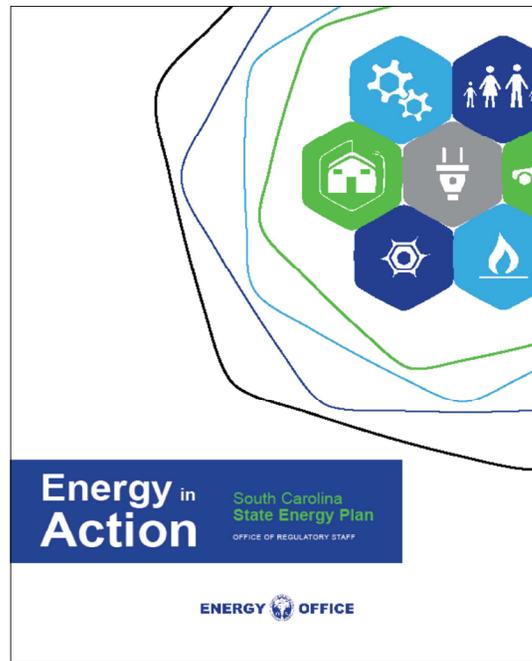
3.10.2: BACKGROUND AND INVENTORY OF EXISTING CONDITIONS

In order to understand the significance of energy at the local level, it is important to understand energy consumption and available sources at all levels. This section provides information about global, national, state, and county energy consumption. This will help guide the County to be more energy independent in the future.

Energy is the vital force powering business, manufacturing, and the transportation of goods and services. Energy supply and demand plays a vital role in our national security and the economy. In 2010, the U.S. Energy Information Administration (EIA) reported that the U.S. spends over \$1.2 trillion annually on energy, which was 8.3 percent of Gross Domestic Product (nominal GDP). Additionally, in 2014, the EIA reported that the U.S. consumes 98.0 quadrillion British Thermal Units (BTUs) annually.

According to the United Nations Population Division, the world population reached 7 billion people in October of 2011 and is expected to exceed 9 billion people before 2050. As seen in *Figure 3.10.1*, in 2016 approximately 82 percent of the U.S. energy consumption came from fossil fuels (petroleum, natural gas, and coal). Of that, about 37 percent was provided by petroleum, 29 percent from natural gas and 16 percent came from coal. Nuclear-derived electric power provided about nine percent, and the remaining 10 percent was provided by renewable resources, including biomass, hydroelectric, wind, solar and geothermal.

In 2016, the South Carolina Office of Regulatory Staff Energy Office collaborated with over 130 professionals representing over 60 organizations to prepare the South Carolina State Energy Plan. The “State Energy Plan” is a comprehensive blueprint for a reliable, resilient, clean, and affordable energy system for

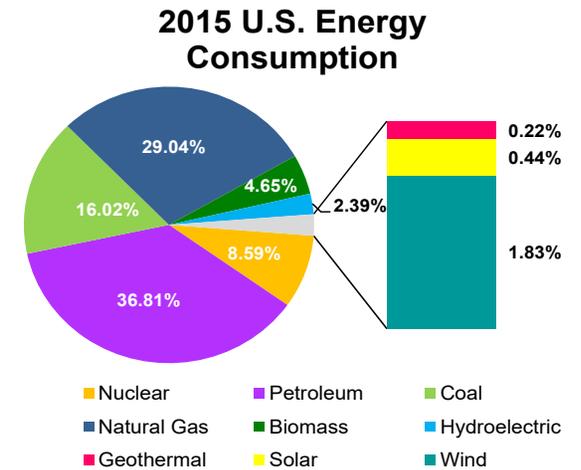


Energy in Action: South Carolina State Energy Plan, prepared by the South Carolina Office of Regulatory Staff, Energy Office, 2016.

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. The State Energy Plan includes top tier policy recommendations that the Energy Office will dedicate its resources to implementing, and a list of additional policy recommendations are included in Appendix C of the document providing sufficient detail to encourage other entities and stakeholders to champion each individually or in collaboration.

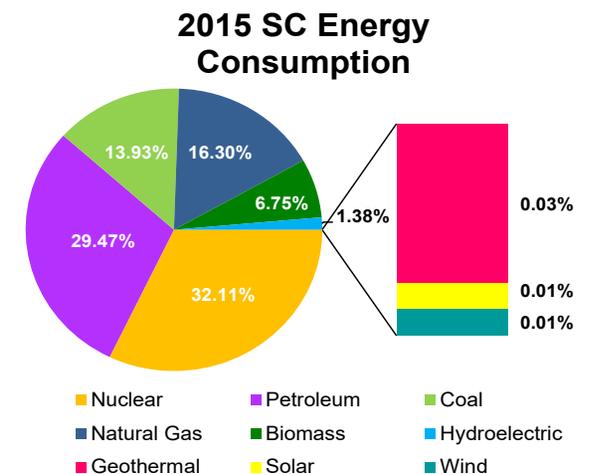
According to 2010 U.S. Census data, South Carolina had a population of approximately 4.6 million people. Between 2000 and 2030, South Carolina’s population is projected by the Census Bureau to increase 28.3 per-

FIGURE 3.10.1: U.S. ENERGY CONSUMPTION BY SOURCE



Sources: U.S. Energy Information Administration (EIA) and Department of Energy (DOE), 2015.

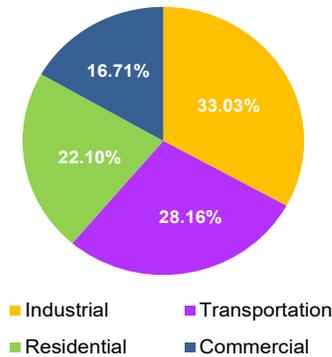
FIGURE 3.10.2: SC ENERGY CONSUMPTION BY SOURCE



Sources: U.S. Energy Information Administration (EIA) and Department of Energy (DOE), 2015.

FIGURE 3.10.3: SC ENERGY DEMAND BY SECTOR

2015 SC Energy Use by Demand Sector



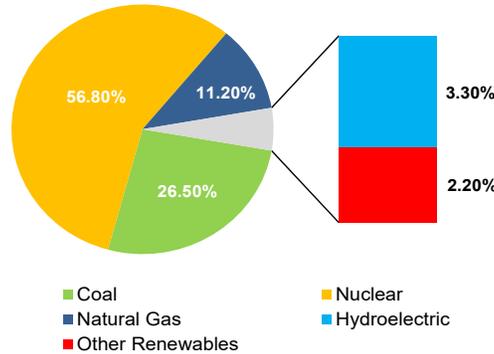
Sources: U.S. Energy Information Administration (EIA) and Department of Energy (DOE), 2015.

cent, adding over one million people to the state. As seen in *Figure 3.10.2*, in 2015, approximately 59 percent of South Carolina’s energy consumption came from fossil fuels (petroleum, natural gas, and coal). Of that, 29 percent was provided by petroleum, 14 percent was provided by coal (although there are no coal mines in South Carolina) and 16 percent was provided by natural gas. Nuclear power provided 32 percent of South Carolina’s energy. Renewable energy sources (biomass, conventional hydroelectric power, geothermal, solar, and wind power) accounted for eight percent of the state’s energy consumption.

In 2015, the industrial sector in South Carolina accounted for the largest portion of the state’s energy consumption by demand, at approximately 33 percent (*Figure 3.10.3*). This was followed by transportation at 28 percent, residential at 22 percent, and commercial at 17 percent.

FIGURE 3.10.4: SC ELECTRICITY GENERATION BY SOURCE

2014 SC Electric Generation by Source



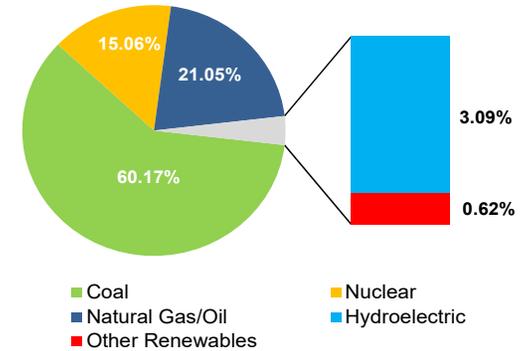
Note: ‘Other’ includes wind, solar, biomass, and petroleum. Sources: U.S. Energy Information Administration (EIA) and Department of Energy (DOE), 2014.

In 2014, South Carolina was ranked nineteenth highest in energy use per capita in the nation with a consumption of 338 million BTU per capita, according to data from the U.S. Energy Information Administration. According to the EIA, South Carolina ranked 26th highest in the nation in total net electricity generation in 2014. Sixty-one percent (61%) of South Carolina residents use electricity as their primary energy source, compared to 32.5 percent national use. As seen in *Figure 3.10.4*, as of March 2014, South Carolina electricity generation came from nuclear (57 percent), coal (27 percent), natural gas (11 percent), hydroelectric (three percent), and other miscellaneous sources and technologies including wind, solar, biomass and petroleum (two percent).

As seen in *Figure 3.10.5*, in 2013, coal and nuclear power provided over 75 percent of the County’s electric energy. Proportionally, the County uses approxi-

FIGURE 3.10.5: CHARLESTON COUNTY ELECTRICITY CONSUMPTION BY SOURCE

2013 Charleston County Electricity Consumption by Source



Note: ‘Other’ includes wind, solar, biomass, and petroleum. Sources: South Carolina Electric and Gas (SCE&G), Berkeley Electric Cooperative (BEC) and Santee Cooper, 2013.

mately twice the coal and a third of the nuclear power as compared to electricity generation energy sources for other areas of the state. This can be attributed to the location of coal burning and nuclear power plants statewide and the method of electricity transmission. Natural gas/oil provided approximately 21 percent and hydroelectric power provided three percent of the County’s electric energy consumption. Approximately one percent came from other sources such as wind, solar, biomass, and petroleum.

A. Alternative Energy

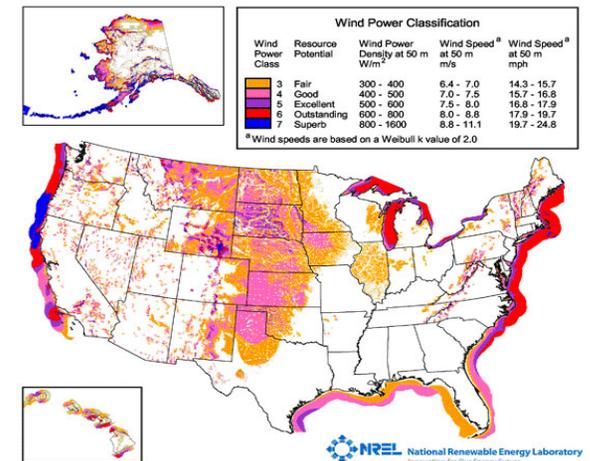
The following is a discussion of alternative energy sources and their current and/or potential use in Charleston County and South Carolina:

- Nuclear energy** is America's largest source of clean-air and carbon-free electricity, producing no greenhouse gases or air pollutants. Nuclear energy contributes 30 percent of the total energy consumption in the state. South Carolina is among the top nuclear power producers in the United States with four active reactors, which accounted for 57 percent of South Carolina's electricity generation as of March 2014. With seven nuclear plants, South Carolina is ranked third in the nation for installed nuclear power.
- Solar energy** requires no additional fuel to run and is pollution-free. There are three types of proven solar thermal power systems on the market, but they have limited use: the central receiver solar collector (a.k.a. power tower), the parabolic reflector, and parabolic trough system. Recent improvements in manufacturing and technology have dramatically reduced the costs and improved the efficiency of photovoltaic (PV) solar panels. According to the Solar Energy Industries Association (SEIA), as of 2016 there is about 144 MW of installed solar energy capacity in South Carolina. This includes over 16,000 homes powered by solar energy and over \$284M invested in solar energy statewide. SEIA projects that South Carolina will have over 1,800 MW of installed solar energy capacity in the next five years and will rank 15th nationally in solar power generation. In 2014, South Carolina enacted a renewable portfolio standard that requires two percent of energy provided by investor-owned utilities to be from a renewable source. The same legislation also increased the cap on solar power for businesses and universities, and allowed South Carolina residents to use third party leasing to lower the initial cost of rooftop solar installations.
- Wind power** has emerged as the world's fastest growing renewable energy market. The Department of Energy estimates that 20 percent of our national energy demand can be met with wind power by 2030. An estimated 1-5 GW of electricity from offshore wind can be produced in South Carolina alone, according to the Department of Energy. A 2009 study by Clemson University, Santee Cooper, Coastal Carolina University, and the South Carolina Energy Office determined that offshore wind resources in South Carolina could generate enough electricity to power one million homes more cost-effectively, due to the presence of sustained wind speeds of 12.5 miles per hour or more. In 2013, SCE&G and Clemson University partnered to dedicate a state-of-the-art wind turbine drivetrain test facility, named SCE&G Energy Innovation Center, in Charleston. The test facility is capable of full-scale highly accelerated mechanical and electrical testing of advanced drivetrain systems for wind turbines in the 7.5 to 15 megawatt range. South Carolina meets three important cost drivers for developing offshore wind farms: strong winds in shallow waters, access to commercial port facilities, and a large coastal demand. Building upon the offshore wind industry in South Carolina would offer economic development, as the manufacturing of wind turbines and associated components could generate up to 20,000 jobs in the state.
- Biomass energy** and biofuels are energy sources from organic matter. They involve releasing the chemical energy stored in organic matter including trees, farm crops, manure, plants, and landfill gas. These materials are either burned directly to produce heat or refined to create fuels like ethanol and biodiesel. There are currently several facilities in South Carolina that manufacture biofuel, with one facility operating in North Charleston. According to the 2016 South Carolina State Energy Plan, hydroelectric and biomass are the largest renewable electricity generation resources in the state.

BOEING'S ROOFTOP SOLAR ENERGY FARM, NORTH CHARLESTON, SC



MAP 3.10.1: WIND ENERGY RESOURCE MAP



Sources: U.S. Department of Energy (DOE) and National Renewable Energy Laboratory (NREL), 2010.



- **Hydroelectricity** is created when water from a river or stream flows through a turbine, which operates an electric generator. These plants have been in use in the U.S. since the late 1800s. In 1900, hydroelectricity comprised 57 percent of the electricity generated in the U.S; currently, hydroelectricity comprises six percent of the electricity generated in the nation and three percent of the electricity generated in South Carolina. In Charleston County, three percent of all electricity consumed comes from a hydroelectric source.
- **Geothermal energy** is heat energy generated and stored in the earth. While South Carolina does not have traditional sources of geothermal energy typically associated with the western United States, residential and commercial geothermal heat pumps (GHPs) are used throughout the state to enhance the energy efficiency of traditional heating and cooling systems.

B. Land Use

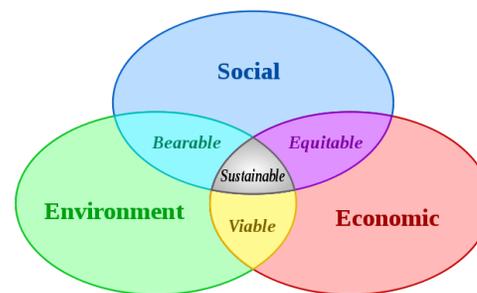
Preservation of the County's natural resources and rural areas is one of the main goals of this Plan. One way the County protects these resources is through the Greenbelt Program, which aims to preserve 30 percent of the land in the County. Of the 669,440 acres of land within the County, 161,348 acres were under some sort of public private sector protection before the Greenbelt Plan started in 2006. In order to achieve 30 percent open space, the County set a target of acquiring 40,000 additional acres through the Greenbelt Program. As of July 2017, 21,170 acres of land have been protected through the Greenbelt Program. Another effective tool the County uses to protect open space is its Urban Growth Boundary (UGB). The area included within the UGB is considered urban/suburban and is designated for higher intensity infill development with homes, businesses, and industries that are contiguous to or near existing development to prevent premature and costly over extension of public services, such as water and sewer. Everything outside of the UGB is considered rural, designated for less intense purposes such as agriculture, forestry, open space and preservation.

In 1987, the World Commission on Environment and Development (the Brundtland Commission) defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This is achieved by

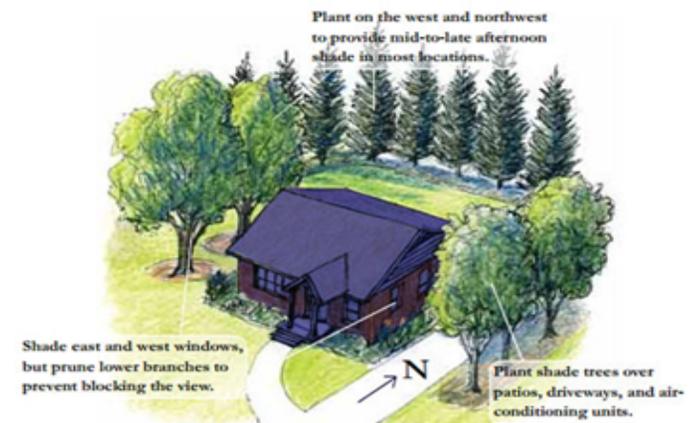
balancing social, economic, and environmental objectives or needs (Figure 3.10.7). More recently, and as a response to challenges such as extreme weather and costly energy, there has been a call for more resilient communities. Resilient Communities for America defines a resilient community as one that is "able to bounce back from disruptions in a sustainable way and maintain a good quality of life for all".

By promoting mixed use development within the Urban/Suburban Area and preserving land outside the Urban Growth Boundary for other activities such as agriculture, recreation, and open space, we begin to achieve sustainable development and resilience. Compact mixed use development within the Urban/Suburban Area requires less infrastructure (roads, water, sewer, etc.) because most of the required services already exist or are located nearby. This type of development generally uses less energy to install, maintain, and use while promoting alternative forms of transportation such as walking, biking, and mass transportation. Less intense modes of transportation are conducive to lowering energy and infrastructure costs and preserving the rural landscape. Planning and Zoning techniques such as an Urban Growth Boundary, Infill Development, and Transit Oriented Development can all be used to help promote sustainable development and resilience.

FIGURE 3.10.7: SUSTAINABLE DEVELOPMENT



Source: World Conservation Union, 2006.



C. Transportation

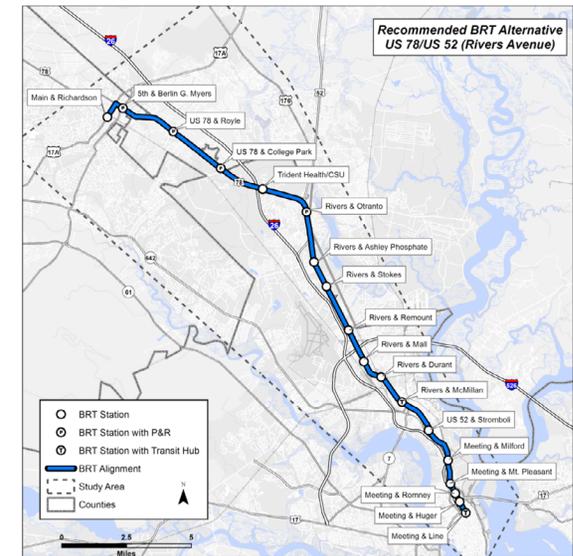
Driving habits are a direct result of development patterns. The national transportation sector accounted for 29 percent of total energy use in 2016. According to the American Community Survey, 2011-2015 Five Year Estimates, the average travel time to work in Charleston County was 23 minutes with nearly 78 percent of the population commuting alone by car, truck, or van. To assist in reducing vehicle miles traveled (VMT) by single occupancy vehicles in the Charleston area, the Berkeley Charleston Dorchester Council of Governments (BCDCOG) maintains a Trident Smart Ride program that provides information, resources, and tools to help residents, employees, and students make good transportation choices. Through a separate program called Trident Rideshare, the BCDCOG offers a coordinated menu of tools, encouragement, information, and activities to promote walking, biking, transit use and carpooling.

The BCDCOG also administers the Charleston Area Regional Transportation Authority (CARTA), the primary public transportation entity for the Charleston region. CARTA offers Fixed-route, Flex Service, Express commute service, and Paratransit service throughout the Charleston Metropolitan area, including The Trolley (DASH) service in the Historic Peninsula area of Charleston. In addition, the BCDCOG is managing the I-26Alt Bus Rapid Transit project (BRT). This transportation alternative would be a first for the Charleston area, with construction proposed to begin in 2023 on this high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. BRT operates much like light rail and can have a range of features, including limited stops, faster travel times, prepayment, and improved boarding access. In addition to supporting the use of public transit as a means to minimize VMT, Charleston County promotes livable communities with Complete Streets Policies that

accommodate all modes of transportation, including pedestrians and bicyclists. Besides reducing costs, the advantages of these latter modes of transportation include improved public health and environmental benefits from reduced air and noise pollution and improved water quality from fewer parking lots.

Over the next 25 years, the most growth in Charleston County is projected to occur within the Urban Growth Boundary (UGB). Future neighborhoods in these areas should be planned in close proximity to transit facilities with options that encourage future development of a mixed use land use pattern. In some areas of Charleston County, roadway capacity improvements on major thoroughfares help to relieve the congestion on existing roadway corridors. Moving forward, it is important to more efficiently utilize existing transportation corridors for all modes of transportation. For example, the proposed route for the I-26 Alt BRT is contained entirely within existing corridors. Additional transportation options that should be considered for the regional transportation network include the following:

- **Commuter Rail Service**, which refers to passenger trains operated on main line railroad tracks to carry riders to and from city centers. Commuter rail in the Charleston region would improve overall capacity along the congested transportation network adjacent to the rail corridors, particularly during peak travel hours.
- **Light Rail Service**, which provides more frequent service than commuter rail with a shorter space between stops (approximately one mile apart in suburban areas and one-half mile within urbanized areas). Light rail service in the Charleston region would improve capacity along the congested transportation network adjacent to the rail corridors, particularly during peak travel hours.



Source: Berkeley-Charleston-Dorchester Council of Governments (BCDCOG), 2017.

- **Electric and Partially-Electric Vehicles**, which provide an emerging alternative source of powering vehicles. These cleaner, domestically-fueled vehicles offer environmental, economic, and national security benefits to our county and nation. According to the U.S. Environmental Protection Agency (EPA), electric vehicles can reduce emissions between 30 percent and 60 percent over traditionally-fueled vehicles depending on the source of generation.

D. Landfill/Recycling

Landfill gas has the potential to power homes if captured and converted into pure methane gas. Statewide, landfill gas is used to generate electricity at 20 facilities in South Carolina. The Charleston County Bees Ferry Landfill, which was opened in 1977 in the St. Andrews area of Charleston County, provides a local opportunity to convert landfill gas to power. A portion of the site was formerly an unlined municipal solid waste landfill that closed in 2006. This closed portion of the landfill and the landfill's current 80-acre lined municipal solid waste (MSW) site are recognized as potential methane capture projects. In Fiscal Year 2016, Charleston County disposed of 313,382 tons of MSW. At the current disposal rate, the Bees Ferry Landfill has approximately 25 years of remaining capacity.

The recycling of household and commercial waste is much more energy efficient than disposing solid waste and producing new materials. The process of supplying recycled materials uses less energy than supplying virgin materials to industry. Additional savings are gained in the manufacturing process itself, which recyclables have already undergone. In addition to recycling white goods, scrap metal, and tires that are collected at Bees Ferry Landfill, Charleston County has nine staffed convenience centers and operates a number of dropsites within the county. The Bees Ferry Landfill also houses a 28 acre Compost Facility, where



100 percent of the yard waste that is accepted at the facility is composted. The landfill also has a paint remix program which offers customers the opportunity to buy paint.

Currently, Charleston County's Romney Street Materials Recovery Facility (MRF) serves as a recyclables transfer station while the County constructs its new MRF. In the near future, the Romney Street MRF transfer station will be repurposed to process and ship electronics and household hazardous waste. The new MRF will be a 57,000 square foot facility located on a 12-acre site on Palmetto Commerce Parkway and is planned for completion by July 2018. The MRF has been designed to meet future regional recycling needs operating at 25 tons per hour, 52,000 tons per year on a single 8-hour shift.

E. Building Codes

Currently, Charleston County enforces the *International Building Code (IBC)* and the *International Residential Code (IRC)* of 2015 as adopted by the State of South Carolina. The exception to the IBC is that the State does not adhere to the Energy Element within the IBC, but rather a second document known as the *International Energy Conservation Code (IECC)* of 2009. Charleston County encourages developers and homeowners alike to build based upon Leadership in Energy and Environmental Design (LEED), which is the most well known green building rating system.

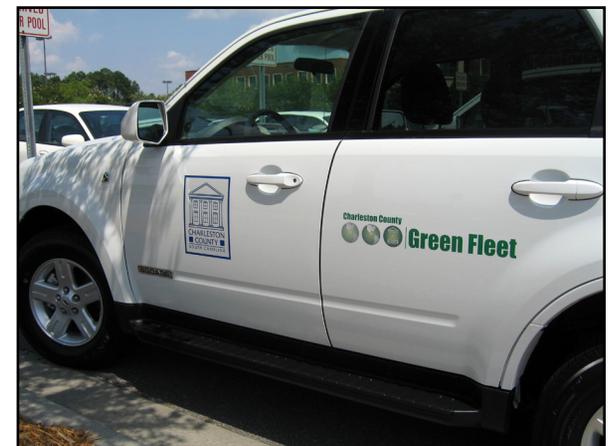
F. County Facilities & Fleet

The County currently has 797 active vehicles in its fleet with an average age of 4.62 years. The County has 124 vehicles that fall into the class of truck with an average age of 5.87 years, 31 ambulances with an average of 2.32 years, 6 hybrid vehicles with an average of 6.94 years, 275 vehicles in the car class with an average age of 3.99 years, 161 vehicles of the pickup truck type with an average age of 5.25 years, 164 vehicles in the sport utility class with

an average age of 3.29 years, and 50 vehicles of the van class with an average age of 5.44 years. As a whole, the County's fleet of vehicles has an average age of 4.62 years.

Charleston County is providing leadership in the production of sustainable energy in the region. In 2011, the County installed a solar power system on the roof of the Sheriff Al Cannon Detention Center. Power generated by the system is fed directly into the building power system and used as it is produced to offset energy from the power company. In addition, the County's Consolidated 9-1-1 Center and Emergency Operations Center was designed to achieve the LEED silver certification by collecting rainwater, planting water efficient landscaping and using recycled materials.

Charleston County has 142 facilities encompassing approximately 2.8 million square feet. The Charleston County Facilities Department has adopted the Charleston County Energy Conservation Program, which has resulted in reduced electrical consumption through conservation measures such as installing programmable thermostats, automatic switches, and energy efficient fixtures.



G. Workforce/Affordable Housing

Housing is affordable when no more than 30 percent of monthly income is spent on housing costs (mortgage, rent, insurance, HOA fees, etc.) according to the United States Department of Housing and Urban Development. As illustrated in the Housing Element, housing costs in Charleston County are very high and wages have not kept pace with national averages. Many of the more affordable homes are often not very energy efficient, meaning residents have higher utility costs. Additionally, many of the more affordable homes are located far from employment centers, requiring residents to drive long distances to and from their jobs. This results in increased vehicle miles traveled (VMTs) and higher energy costs for both residents and local governments.

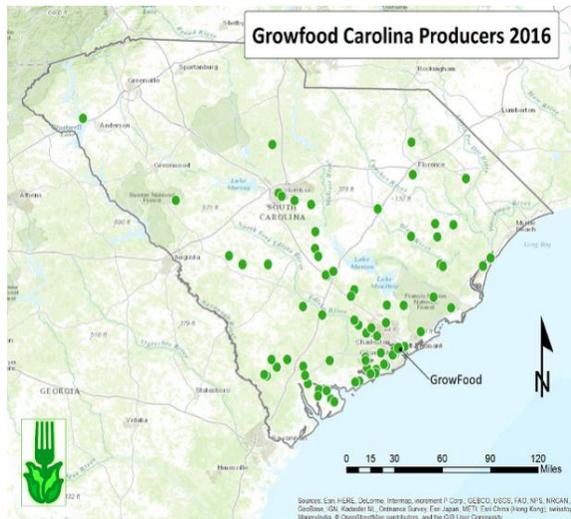
H. Food

In the United States, the average unit of food is transported almost 1,500 miles before it is consumed. In addition, one calorie of food produced requires ten calories of fossil fuels. This not only makes food more expensive for consumers, but also consumes an enormous amount of energy resources.

In February 2015, the South Carolina Department of Agriculture reported that the South Carolina Agriculture and Forestry Industries have grown 23 percent since 2006 to have an annual economic impact of \$41.7 billion and support 212,000 jobs. The availability of locally grown products affords our state and county the ability to provide food that is more fresh, costs less to transport, and reduces energy costs.

The County encourages agricultural uses through the goals and strategies of this Plan, the requirements of the *Zoning & Land Development Regulations Ordinance*, and through the Greenbelt Program, which has protected approximately 7,000 acres of farmland to date.

Other efforts to promote local living include the Lowcountry Local First and Buy Local campaigns, and the local food hub Growfood Carolina. Lowcountry Local First promotes local, independent businesses and farmers who reflect the unique character, flavor, and culture of the Lowcountry and Buy Local is a grassroots campaign that focuses on the need to recirculate more money in our community to promote a strong local economy and support and strengthen locally-owned, independent businesses and local jobs. Officially launched in 2011, GrowFood Carolina set the goal of providing small- to mid-size growers assistance with marketing, warehousing, and distribution. Since GrowFood was founded, it has continued to expand across the state, currently supporting more than 80 farms.



3.10.3: ENERGY ELEMENT GOAL

Promote use of alternative energy sources and energy conservation measures that benefit our communities.

Energy Element Needs

Energy Element needs include, but are not limited to, the following:

- Promoting conservation of resources;
- Investing in renewable energies;
- Educating the public on alternative energy sources and energy conservation; and
- Encouraging public and private partnerships to facilitate alternative energy sources and energy conservation.

3.10.4: ENERGY ELEMENT STRATEGIES AND TIME FRAMES

The following strategic actions should be undertaken by Charleston County and cooperating agencies in support of the Energy Element Goal. These implementation strategies will be reviewed a minimum of every five years and updated every ten years from the date of adoption of this Plan.

ES 1. Promote energy efficiency and use of alternative energy sources by:

- a) Education outreach, training and technical assistance;
- b) Utilizing existing state, federal and non-profit resources such as Carolina Energy Office, ENERGY STAR, public utility energy efficiency programs, and Commercial Property Assessed Clean Energy (PACE) financing;
- c) Conducting an energy audit for all County facilities (existing, undergoing renovation, and under design) and implement the recommended cost effective improvements.
- d) Monitoring state and federal legislation that promotes energy efficiency and renewable or alternative energy resources such as net metering legislation.

ES 2. Evaluate the impact on vehicle miles traveled (VMTs) for both County residents and employees through providing County services at satellite facilities, expanding online services and allowing telecommuting when it is a viable management work option.

ES 3. Promote green building code standards and sustainable landscaping that aids in energy conservation.

ES 4. Support weatherization programs, such as the Weatherization Plus program implemented by the Sustainability Institute in Charleston, SC, and the Weatherization Assistance Program offered throughout the U.S. Department of Energy.

ES 5. Amend the *Zoning and Land Development Regulations Ordinance* to encourage local renewable energy generation and green building design, and provide standards for solar collectors and wind generators as accessory uses.

ES 6. Support those involved with local food production as a means to reduce energy by minimizing food transportation costs.

ES 7. Adopt land use regulations that allow the establishment of electric vehicle charging stations where feasible.

ES 8. Support tax incentives for properties that install/utilize alternative energy sources.

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