Chapter 5
Energy Supply Sector

Overview of Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions from the energy supply (ES) sector in South Carolina include primarily emissions from electricity production and delivery, with a small contribution from the transmission and distribution of natural gas. Electricity consumption produces the largest source of GHG emissions in South Carolina, accounting for 35% of South Carolina's gross GHG emissions in 2005.

The GHG emissions associated with South Carolina's electricity sector increased by 15 million metric tons of carbon dioxide equivalent ($MMtCO_2e$) between 1990 and 2005, accounting for 55% of the state's growth in gross GHG emissions during this period. Looking forward, by 2020 ES emissions are expected to increase from 2005 levels by approximately 43% on a production basis, from roughly 38 $MMtCO_2e$ in 2005, to about 54 $MMtCO_2e$ in 2020. On a consumption basis, total GHG emissions to meet the state's electricity demand are expected to rise from about 33 $MMtCO_2e$ in 2005 to about 48 $MMtCO_2e$ in 2020. The higher emissions total under the production-based approach reflects South Carolina's role as a net exporter of electricity.[1] Projections for 2005 through 2020 indicate that South Carolina will remain a net exporter of electricity. Figure 5-1 shows the electricity generation resource mix upon which the emissions inventory and reference case projections are based.

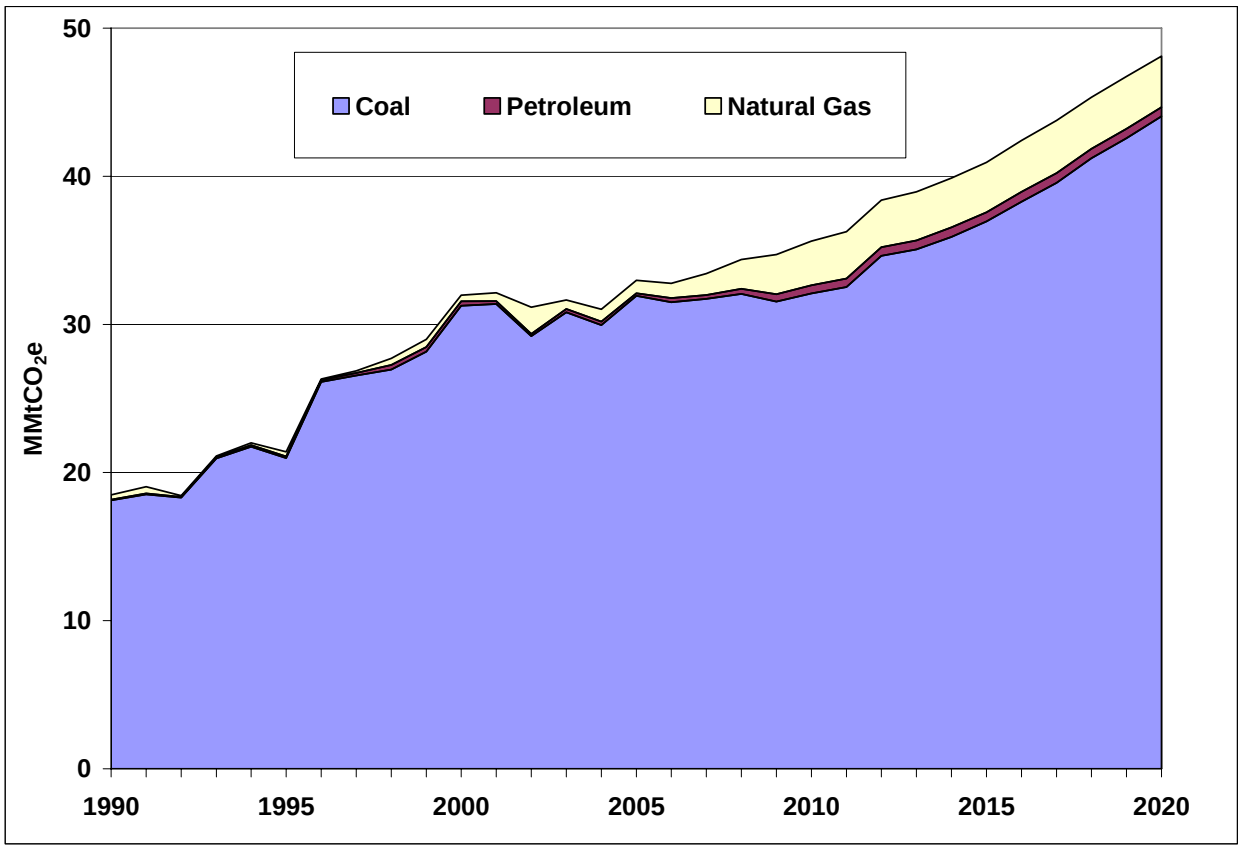
Key Challenges and Opportunities

There are significant opportunities to reduce GHG emissions growth associated with energy production and supply in South Carolina, such as promoting distributed renewable generation, investing in technology research and development in the state, and diminishing the carbon intensity of electrical generation through greater use of renewable energy and nuclear power.

There are also significant opportunities to reduce GHG emissions through policies addressing electricity consumption, and these can often provide cost savings as well as GHG mitigation benefits. The CECAC has identified two energy efficiency and conservation policies within Energy Supply: the energy efficiency component of the Efficiency and Renewable Portfolio Standard and Statement of Support for Nuclear Energy, and a regulatory model to equalize utility earnings on energy efficiency with earnings on traditional power supply. Several other opportunities to promote and develop energy efficiency and conservation measures are identified in the residential, commercial, and industrial (RCI) sector, discussed in Chapter 4.

[1] Accounting for electricity emissions on a production basis considers the GHG emissions produced by electricity generation facilities in South Carolina. This perspective is useful because the state may have policies it can use to influence electricity suppliers within the state different from those used to influence out-of-state suppliers. Emission estimates provided elsewhere in this report (including the inventory and forecast in Chapter 2) reflect the GHG emissions associated with the electricity sources used to meet South Carolina's demands, corresponding to a consumption-based approach. The consumption-based approach can better reflect the emissions (and emission reductions) associated with activities occurring in the state that affect energy use.

Figure 5-1. Historical and projected GHG emissions from South Carolina power plants: 2003–2020



South Carolina has substantial renewable energy resource potential in the form of biomass and both on-shore and off-shore wind energy. The CECAC recommends that South Carolina promote the development of these resources through a number of policies designed to address the various barriers to realizing the potential for renewable resources. Implementation of utility-scale renewable resources can be encouraged through feed-in tariffs, direct financial support for biomass and other resources, and an Energy Portfolio Standard, which mandates that a certain percentage of delivered energy in the state come from renewable resources and energy efficiency, and makes a statement of support for increasing the share of nuclear energy in the state. Smaller, distributed resources are specifically targeted through actions to reduce financial, permitting, and interconnection barriers. Green power marketing programs and state efforts to attract companies that specialize in this industry would likely boost adoption of all types of renewable resources. Technology research and development (R&D) can encourage market acceptance of a variety of technologies by lowering the cost or improving performance of renewable generation, and by encouraging collaboration between R&D, government, academic, and commercial sectors. R&D activities also produce employment and economic development benefits in the state.

Overview of Policy Recommendations and Estimated Impacts

The CECAC recommends a set of eight policies for the ES sector that offer the potential for significant GHG emission reductions in South Carolina. Four of these have been quantified to

estimate the potential for avoided GHG emissions. If implemented together with all of the policy recommendations from each of the sectors represented in the CECAC process, these four policy recommendations could lead to emissions reductions of:

- 3 $MMtCO_2e$ per year by 2020, and
- 22.5 $MMtCO_2e$ cumulative savings from 2008 through 2020.

The net cost of these four policies is estimated at $1.2 billion through the year 2020 on a net present value (NPV) basis.[2] The weighted-average cost of these policy recommendations is $53 per metric ton of CO_2e.

Six recommendations were accepted by unanimous consent of the CECAC, and two were accepted by super majority (5 or fewer objections). These recommendations and results are summarized in Table 5.1. The explanations of the objections are included in the detailed policy recommendations in Appendix H.

Recommended policies ES-1, ES-2, ES-3, ES-6, ES-7, and ES-8 are initiatives that would lead to increased reliance on renewable energy resources in the state. Policy ES-1 also requires utilities to increase the share of energy efficiency in their electricity resource portfolios, as well as providing a statement in support of increased investment in nuclear power in South Carolina. Policy ES-4 would address the financial disincentive utilities face towards investing in energy efficiency. Policy ES-5 concerns investigation into the technical, economic, and environmental feasibility of in-state nuclear fuel reprocessing, which may significantly reduce the volume of high-level radioactive waste created by new and existing nuclear resources.

The totals reported in Table 5-1 take into account overlaps in the expected emissions reduction and cost among some of the policies within the ES sector, as well as between policies in the ES, RCI, and agricultural, forestry, and waste management (AFW) sectors. Care was taken in the determination of benefits from each of the sectors to ensure that the combined calculated impact of the policies would not “double count” benefits that overlap.

In the case of the ES policies, the renewable energy component of the energy portfolio standard recommended under ES-1 overlaps with the incentives for utility-scale renewable energy projects under ES-3. The distributed energy incentives in ES-3 would overlap with promotion of distributed renewable energy in ES-8.

Figure 5-2 shows the breakdown of impacts of the recommended ES policies, taken together, in terms of avoided GHG emissions (2008–2020). The figure takes into account overlaps within the energy supply sector but not overlaps with policies from other sectors.

[2] The net cost savings are based on fuel expenditures, operations, maintenance, and administrative costs, and amortized, incremental equipment costs. All NPV analyses here use a 5% real discount rate.

Table 5-1. Summary list of energy supply policy recommendations

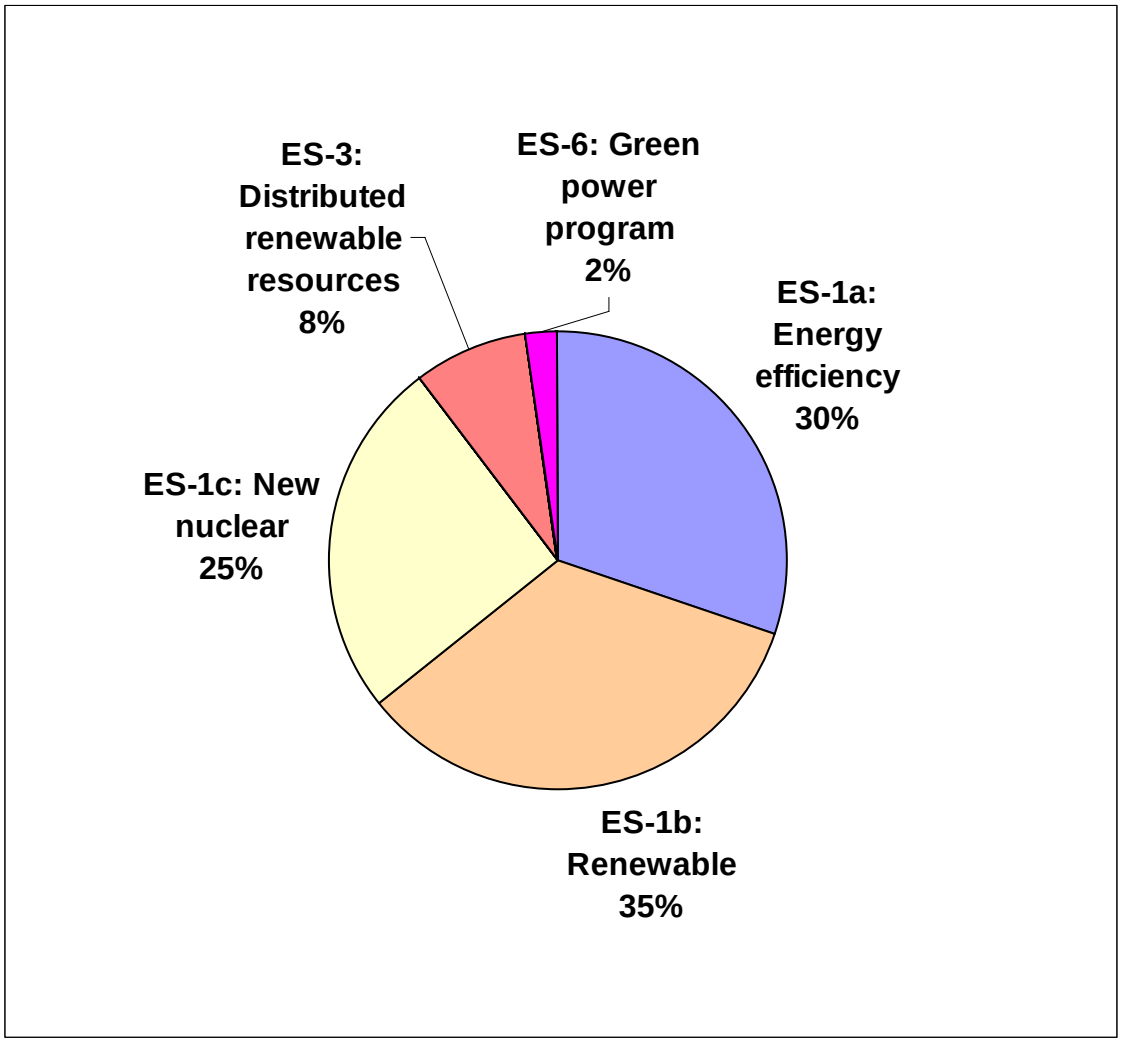
Policy No.*	Policy	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)[1]	Cost-Effectiveness ($/tCO_2e$)[1]	Level of Support
		2012	2020	Total 2008–2020			
ES-1	Efficiency and Renewable Portfolio Standard and Statement of Support for Nuclear Energy	1.9	12.6	66.5	$689	$10	Super-majority (Three objections)
ES-1a	Energy Efficiency: 5% of energy met with energy efficiency resources by 2020	0.8	4.2	22.4	–$586	–$26	
ES-1b	Renewables: 5% of energy served by new renewable resources by 2020	1.1	3.8	25.3	$489	$19	
ES-1c	Nuclear: 6% of energy served by new nuclear resources by 2020	0.0	4.6	18.9	$786	$42	
ES-2	Technology Research and Development, Including State Funding	*Not quantified*					Unanimous
ES-3	Renewable Energy Financing, Tax Incentives, Loans	0.4	0.9	7.1	$591	$84	Unanimous
ES-4	Regulatory Model To Equalize Utility Earnings on Energy Efficiency With Earnings on Traditional Power Supply	*Not quantified*					Super-majority (One objection)
ES-5	Nuclear Fuel Reprocessing	*Not quantified*					Unanimous
ES-6	Green Power Purchases and Marketing, 1% Participation by 2012	0.2	0.2	1.7	$46	$27	Unanimous
ES-7	Attract Renewable Energy Technology Businesses to South Carolina	*Not quantified*					Unanimous
ES-8	Distributed Renewable Energy Incentives and/or Barrier Removal (Including Interconnection Rules)	0.05	0.1	0.8	$42	$50	Unanimous
	Sector Total After Adjusting for Overlaps	**0.3**	**3.0**	**22.5**	**$1,201**	**$53**	
	Reductions From Recent Actions	**0.0**	**0.0**	**0.0**	**0**	**0**	
	Sector Total Plus Recent Actions	**0.3**	**3.0**	**22.5**	**$1,201**	**$53**	

Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings.

GHG = greenhouse gas; MMtCO2e = million metric tons of carbon dioxide equivalent; $/tCO2e = dollars per metric ton of carbon dioxide equivalent.

The numbering used to denote the above policies is for reference purposes only; it does not reflect prioritization among these policies.

Figure 5-2. Percentage of avoided greenhouse gas emissions by energy supply policy: 2008–2020



Two primary interactions between policies in the ES and RCI sectors concern the efficiency and renewable energy portfolio components in policy ES-1. First, ES-1 includes a requirement that some of the electricity demand in the state be met with energy efficiency measures and would overlap with the energy efficiency policy under RCI-1. In addition, a number of the RCI policies (RCI-1, RCI-3, RCI-5, RCI-6, and RCI-7) decrease overall electricity demand. As ES-1 sets a goal for meeting a fixed percentage of load with renewable energy, as well as a policy statement supporting new nuclear resources for a fixed percentage of load, the impact of this policy would be affected by reducing energy demand through these RCI policies. A smaller interaction involves green power purchasing under RCI-7 and renewable energy generation under ES-1. Finally, an additional feedback is that certain ES policies (including ES-1) will reduce the GHG emissions associated with energy production, so that RCI policies that target electricity use will have a reduced impact on overall emissions. This impact is small and has not been reflected in the analysis.

In addition, ES-1, ES-3, and ES-6 rely on a limited supply of biomass feedstock in the state to replace fossil-based electricity generation. These policies overlap with AFW-2, AFW-5, and AFW-9, which also rely on the use of biomass for both electricity production and other energy-related uses. See Appendix E, Methods of Quantification, for additional description of overlaps among sectors and of analyses of the cumulative GHG reductions from the combined effects of the CECAC policy recommendations that were quantified.

Energy Supply Sector Policy Descriptions

ES-1. Efficiency and Renewable Portfolio Standard and Statement of Support for New Nuclear Energy

Electricity demand is increasing each year in South Carolina, requiring the development of additional supply- or demand-side resources to meet that need. Certain resources can meet this demand without producing incremental GHG emissions, including energy efficiency resources, renewable energy, and nuclear power. (The construction and decommissioning of both nuclear and renewable resources produce GHG emissions, as do the production and transport of fuel. These have not been taken into account in this analysis.)

The CECAC recommends, by super majority, that the state develop energy portfolio standards, including renewable technologies and energy efficiency programs, and adopt a statement of policy supporting development of new nuclear power. The portfolio standards should be implemented such that the short-term and long-term demands for electricity in South Carolina are met without causing undue economic harm to its citizens, the quality of the environment in South Carolina is protected and enhanced, and the clean energy resources with the greatest economic potential in the state are developed.

The goals of this policy include a mandate on public and private utilities that energy efficiency programs and new renewable energy on the utility's retail distribution system each meets 5% of its South Carolina retail customers' electricity needs by 2020, for a total of 10% of electricity needs. Additionally, the policy provides a statement of support for new nuclear energy, with a goal that by 2020 at least 6% of the total electricity in South Carolina will be from new nuclear energy.

ES-2. Technology Research and Development, Including State Funding

Technology research and development (R&D) can encourage adoption of new, clean energy technologies by lowering their cost or improving their performance. R&D funding can be structured in various ways to move toward certain goals. For example, funding can be targeted toward a particular technology or group of technologies as part of a state initiative to build or expand an industry or core technical competency and to set the stage for adoption of the technology for use in the state; alternatively, it can focus on demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. A number of energy technology R&D programs are already underway at organizations and academic facilities throughout South Carolina, and the state is poised through its strength in hydrogen research to become a national leader in the hydrogen economy.

The CECAC unanimously recommends that the state establish an energy technology roadmap to focus its efforts on technologies that have the greatest potential for achieving reduced GHG emissions, economic development opportunities, national security, and energy independence for the state (including offshore wind energy, hydrogen infrastructure, and nuclear energy

resources). Furthermore, the state should provide additional funding of $20 million for clean energy initiatives that encourage collaborations among R&D, government, academic, and commercial sectors. The policy would also seek to showcase alternative energies in high-visibility R&D demonstrations and create a technology advisor position in the Governor's office. In addition to the Governor's office, academic institutions, and R&D firms, parties involved include the South Carolina Department of Commerce, economic development organizations, utilities, and state technology providers.

ES-3. Renewable Energy Financing, Tax Incentives, Loans

This recommendation concerns financial incentives to encourage investment in the full range of renewable energy resources and to help overcome barriers to their development. Institutional and market barriers include price distortions, inadequate information, institutional barriers to grid interconnection, high transaction costs for small projects, and high financing costs because of lender unfamiliarity and perceived risk. These can be overcome through a suite of financial and regulatory redresses, as well as through information and public education campaigns. Financial obstacles can also be addressed through property tax exemptions, exclusions, and credits; personal income tax credits or deductions to cover the expense of purchasing and installing renewable energy equipment; loan programs to aid in financing the purchase of renewable energy equipment; and grant programs designed for R&D or to help a project achieve commercialization.

The CECAC unanimously recommends a multilateral strategy of several different types of financial incentives to represent the range of opportunities. Available from 2009 through 2025, tax credits and subsidies would be provided as follows: removing legislative caps on current tax incentives for renewable fuel use; expanding the existing 25% income tax credit for solar and biomass equipment to include micro-hydro and small wind power projects and offering tax credits of $3,500/kilowatt (kW)-equivalent for small solar photovoltaic, micro-hydro, and small wind power projects up to 50 kW; and providing a subsidy to renewable energy generators of 1 cent/kilowatt-hour for electricity generated from a renewable resource, unless that electricity is used to meet a federal or state renewable energy standard. In addition, this policy would establish feed-in tariffs for large-scale, zero-pollution renewable generation projects, providing a guaranteed price for electricity or the market rate (if higher) for the lifetime of a project, up to 25 years, for projects brought on line between 2009 and 2015. Finally, this policy would include low-interest loans for feasible and desirable biomass generation brought on line between 2009 and 2015 that meets exemplary environmental performance standards.

ES-4. Regulatory Model To Equalize Utility Earnings on Energy Efficiency With Earnings on Traditional Power Supply

Utilities generate a predictable long-term earnings stream from investments in new supply resources that are needed to meet customer demand. Energy efficiency (EE) and distributed-generation (DG) renewable energy not only reduce sales, they also reduce the predictable earnings stream that Wall Street expects for the future earnings of the utility. This policy is designed to ensure that alternative methods of meeting customer demand provide the opportunity for an equivalent earnings stream to achieve investment parity.

Under traditional ratemaking, costs incurred by utilities, including a return on investment, are recovered through the sales of electricity. Because EE and DG renewable energy sources can decrease the volume of electricity sales, traditional cost-recovery mechanisms have created a financial disincentive to utility support for EE and DG renewable energy. In the short run (between rate cases), lost sales due to EE programs reduce revenue by the full tariffed rate, thereby undermining the utility's recovery of costs. When this net lost revenue is taken into account, utilities may be unable to recover costs and may face profit losses for EE and renewable DG measures.

The CECAC recommends, by super majority, implementing a regulatory model that equalizes the incentive for utilities to invest in cost-effective EE and renewable DG with the incentive to invest in new supply resources. The contemplated regulatory model would provide for timely recovery of all costs (including program costs, lost margins, and incentives) associated with the implementation of DSM and EE programs through an annual adjustment clause and rider; recovery of lost revenues experienced by the utility as a result of the implementation of DSM/EE programs; and provision of a financial incentive for the implementation of DSM/EE programs. Incentives may include sharing of savings achieved by the DSM/EE programs, or could be based on the capitalization of a percentage of avoided costs achieved by the programs. The CECAC has not endorsed any particular formula for sharing of avoided cost benefits between the utility and consumers.

ES-5. Nuclear Fuel Reprocessing

Nuclear power accounts for approximately 50% of the electricity produced in South Carolina. South Carolina currently has seven nuclear reactors, and new units are in the planning stages. Reprocessing spent nuclear fuel could significantly reduce the volume of high-level radioactive waste. Through reprocessing, the recovered uranium and plutonium can be recycled into new fuel for use in light-water-reactor fuel assemblies. This approach offers the benefits of significantly reducing the inventories of commercial spent nuclear fuel and plutonium, as well as reducing the total volume of waste requiring geologic disposal. However, a number of technical, economic, environmental, and other hurdles must be evaluated and overcome before nuclear waste reprocessing is a viable alternative for South Carolina.

Compared to most other states, South Carolina bears a burden for the environmental and health risks associated with the disposal of nuclear reprocessing waste. The state currently has a significant amount of nuclear waste for which there is no designated disposal site. South Carolina's support for in-state nuclear reprocessing should be contingent on the shipment of the waste out-of-state to an operating facility that is actively receiving nuclear waste for long-term disposal.

The CECAC unanimously recommends evaluation of the economic, environmental, waste reduction, national security, and other implications of nuclear waste reprocessing-recycling in South Carolina. If this evaluation shows that reprocessing and recycling of spent nuclear fuel are cost-effective and viable for South Carolina, this policy calls for expeditious implementation of applicable regulatory and legislative actions to support the construction of such facilities. South Carolina's support for in-state nuclear reprocessing should be contingent on a plan for the

shipment of the waste out of state to an operating facility that is actively receiving nuclear waste for long-term disposal.

ES-6. Green Power Purchases and Marketing, 1% Participation by 2012

The CECAC unanimously recommends establishing a voluntary program that offers a green power option to consumers throughout the state, supplementing the activities of existing voluntary green power programs in South Carolina (Palmetto Clean Energy and Santee Cooper Green Power). The green power purchases would be comprised of a variety of consumer-driven strategies to increase the production and delivery of low-GHG power sources. Participation in the program would provide support for marketing green power to consumers as well as financial incentives for the developers of renewable generation through state-funded green power initiatives coordinated by the South Carolina Energy Office.

The goals of this policy include educating consumers about the power (fuel) sources and emissions associated with the electricity they use; establishing a Voluntary Green Power Utility Program, to achieve 1%–5% participation of retail customers by 2012; and providing marketing and renewable resource development assistance through state-funded green power initiatives coordinated by the South Carolina Energy Office.

ES-7. Attract Renewable Energy Technology Businesses to South Carolina

Renewable energy has recently developed into an immediate and long-term growth industry. South Carolina can capitalize on this economic potential by working to attract companies that specialize in this industry. Incentives to attract renewable energy businesses should be designed to create South Carolina as a partner in the renewable energy market. Luring these types of businesses has become a primary economic target for many states, so competition will be tough.

The CECAC unanimously recommends that South Carolina develop a plan to attract businesses to the state, with the goal of creating an internationally respected renewable energy business cluster and becoming an obvious destination point for company facilities. Also, this policy seeks to create a strong local market for renewables, placing South Carolina in the top-five U.S. states for the number of new renewable energy installations per year per capita by 2012. Finally, this policy aims to place South Carolina as a leader in higher education and technical education for R&D and implementation of renewable technologies.

ES-8. Distributed Renewable Energy Incentives and/or Barrier Removal (Including Interconnection Rules)

Distributed renewable generation is energy generated at or near the sites of consumption by naturally replenishing resources, avoiding GHG emissions and the costs associated with conventional electricity supply and electricity losses during transmission and distribution. However, institutional and market barriers to distributed renewable energy are numerous, including inadequate information, institutional barriers to grid interconnection, high transaction and financing costs (e.g., due to lender unfamiliarity and perceived risk), interconnection rules

(e.g., standby fees, exit fees), pricing of net generation, and failure of the market to value the public benefits of renewable technologies and the social cost of fossil fuel technologies. While some of these barriers have been or are being addressed through recent or current financial and regulatory redresses and through information and public education campaigns, more remains to be done.

The CECAC unanimously recommends state action to identify all renewable energy sources that could lead to possible distributed generation options for residences and commercial and industrial facilities, as well as the uncertainties and risks associated with greater adoption of these resources. An additional goal of this policy is to identify and examine current and potential barriers impeding current and potential participants. Finally, this policy should provide specific incentives or policies that would eliminate or limit barriers and expand distributed generation in South Carolina.