State Regulation of Public Utilities Review Committee

Energy Policy Report

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Executive Summary

Senator Glenn F. McConnell, Chairman of the Senate Judiciary Committee, sent a letter to Senator Thomas C. Alexander, Chairman of this Committee, on September 10, 2008, outlining the high stakes facing South Carolina's energy future. In particular, these stakes involve proposed federal legislation addressing the issues of energy production and use and reductions in greenhouse gas (GHG) – mainly carbon dioxide (CO_2) – emissions. As proposed by Senator McConnell, this Committee conducted a formal inquiry into how these pending federal energy policies might affect our State.

To coordinate this initiative, the Committee charged the South Carolina Office of Regulatory Staff (ORS) to elicit, gather, and aggregate information from South Carolina's electric generators and suppliers and other pertinent demographic data. The Committee charged ORS to prepare a written report based on this information for this Committee. Additionally, public comments were solicited and two public hearings held on this matter on December 11, 2008 and January 8, 2009. This report reflects the information received by this Committee from the ORS as well as the other governmental entities, electric suppliers, businesses, environmental organizations, and private citizens. It is a report based on well-supported facts and reasoned opinion, and it supports a course of action that is realistic, balanced and feasible for South Carolina. It is the sincere hope of this Committee that, in undertaking this fact-finding venture, we have put our State in a much stronger position from which we can advocate effectively for energy and environmental policies that will benefit current and future generations of South Carolinians.

It appears inevitable that the United States Congress will act to adopt some form of tax, cap, or allowance on CO_2 emissions in the near future. While the contours of a federal cap-and-trade program remain undefined, the impact of a program that applies tariffs to CO_2 emissions without the benefit of any baseline allowances would undoubtedly be costly. The average monthly usage of electricity by South Carolina households combined with the current level of reliance on CO_2-emitting fuels (coal and natural gas) by the State's electric power generating companies would result in significant costs to be borne by South Carolinians. At a $12 per ton tariff, the average South Carolina household, which consumes approximately 1,200 kWh per month, would pay annually an additional $102 for coal and $4.50 for natural gas consumed in generating their electricity. At a $150 per ton tariff, these figures rise to additional annual costs of $1,270 for coal consumed and $67 for natural gas consumed.

Even if Congress fails to pass such restrictions, President-elect Obama has made it clear that his administration, if necessary, may act through the federal Environmental Protection Agency to impose restrictions on CO_2 emissions. President-elect Obama has spoken in favor of a national, economy-wide, market-based cap-and-trade system to impose a mandatory reduction in U.S. CO_2 emissions to 80% below 1990 levels by 2050. Specifically, he has called for auctioning rights to emit CO_2 in order to create an

estimated $250 billion in annual revenues for the federal government to reinvest in clean energy technologies.

What type of restriction will be adopted, and how will the allowances, caps, or taxes be imposed? What should the utilities and citizens of South Carolina be prepared for, and what is the best "option" among the plans and proposals currently being debated in Congress? While these questions remain open for debate, it is clear that South Carolina must act now to prepare for living and competing in a "carbon-constrained" economy. Unless properly planned and implemented, federal mandates restricting CO_2 emissions will carry a very heavy price tag – of which South Carolinians may be asked to shoulder an unfair burden.

After a thorough review of the electric generation and demographic data provided to this Committee, it is evident that South Carolina cannot conserve its way out of this situation. Our State currently relies on coal for the generation of 61% of its electricity. An additional 31% of this State's electricity comes from nuclear generation facilities with the remainder coming from a mix of natural gas and hydro, and a very small amount from renewable resources. These coal and natural gas generation facilities emitted approximately 60 million tons of CO_2 and generated approximately 90 million MWh of electricity in 2007 that was used by citizens, businesses, and industries in our State. South Carolina's moderate winters and long hot summers have created a dependence on electricity for both heating and cooling our homes and a corresponding usage rate that well exceeds the national average.

Furthermore, South Carolina residents rank 5th in the country in annual electric consumption, but rank 40th in the country in median household income. These two converse rankings demonstrate the potentially devastating economic impact that a carbon cap-and-trade system or tax on this State's electric utilities might have on South Carolina's economy and its citizens. Any federal legislation or regulatory mandate dictating either the immediate closure of this State's coal generation facilities – which have an average remaining depreciable book life of twenty-seven years – or the imposition of a tax or cap without allocations based on current generation could lead to electricity becoming unaffordable to many South Carolinians.

All South Carolinians must become more "energy conscious" and strive to reduce their use of electricity through conservation efforts and utility-sponsored energy efficiency (EE) and demand side management (DSM) programs; however, these efforts alone will not be enough. Based on a projected increase in population of over a million citizens by 2030, it is clear that we cannot maintain the level of reliability and affordability in our electric supply through these programs alone. We must aggressively pursue the addition of new electrical generation facilities to meet this State's growing demand. In doing so, we must pursue additional generation with the realization that the GHG-emitting generation facilities upon which we have relied in the past may no longer be permissible or affordable in the carbon-constrained world of the future.

South Carolina does not possess a wealth of renewable energy sources such as the solar energy available to states in the Desert Southwest, the wind turbine generation available to states located in the Great Plains, or the hydro generation in the Pacific Northwest. We must, therefore, seek to encourage the growth of research and development in the use of renewable resources that are available and economically viable in South Carolina to provide for our future needs. For at least the immediate future, we must rely on the growth of the nuclear energy industry in this State to ensure that reliable, affordable electricity is available to all of our citizens. To attempt to resist change or merely stand on the sidelines hoping for a delay in the inevitable is no longer an option.

To reduce our current reliance on CO_2-emitting fossil fuels for electricity, South Carolina should adopt a comprehensive and pragmatic vision of our future energy needs that avoids ideological positions and evaluates options objectively and rigorously. There is no "silver bullet" nor is there a one-size-fits-all solution. No single technology or policy can, on its own, successfully address the competing environmental and energy challenges faced within the unique context of each state. As a result, South Carolina and its energy providers should, at a minimum, evaluate the roles that energy efficiency, renewable energy, nuclear energy, and low-GHG fossil fuel technologies – including natural gas – can play in reducing this State's GHG emissions. In evaluating such resources, the ultimate goal should be to minimize adverse health and environmental impacts of energy generation, promote reliable and affordable energy services, and develop new industries and employment opportunities. The issue is not which of these approaches will solve our energy problems. Instead, the question we must address is this: What is the proper mix that will best serve South Carolinians' needs at the least cost economically, socially, and environmentally, while providing the greatest opportunities for our State in the future?

Introduction

Changes are coming; action is needed

At the writing of this report, we know most of President-elect Obama's choices for cabinet-level positions, and we know that Rep. Henry Waxman of California has replaced Rep. John Dingell of Michigan for the chairmanship of the House Energy and Commerce Committee. In the coming weeks and months, the key individuals involved in the federal climate change debate will certainly grow and change. Even now, it is clear that the White House, the Senate, and the House will take far-reaching action intended to reduce this country's greenhouse gas (GHG) emissions. As with any major change to the status quo, there will be winners and losers as a result of these pending actions by the federal government. We view our task as the State Regulation of Public Utilities Review Committee (PURC) to begin identifying measures that can be taken to ensure that this State and its citizens will not be harmed in the fast-approaching GHG-constrained economy. It is our fear that if the State fails to act, South Carolina will suffer both economically and environmentally.

The nature of this report

On September 10, 2008, President Pro Tempore Glenn F. McConnell of the South Carolina Senate sent a letter to colleague Senator Thomas C. Alexander, Chairman of PURC, requesting that PURC conduct a formal inquiry into how current and future energy and climate change policies might affect South Carolina. The goal of this inquiry, as proposed by Senator McConnell, is to provide the South Carolina General Assembly with an analysis of the State's electric energy systems' capabilities to comply with expanding federal policies and the effect these policies could potentially have on the citizens of South Carolina. With a comprehensive picture of South Carolina's current energy status and future energy needs, the General Assembly will be in a better position to develop a cogent message for the State's Congressional delegation regarding the challenges South Carolina will face if certain federal energy policies are adopted.

To this end, Chairman Alexander requested the South Carolina Office of Regulatory Staff (ORS) to assist PURC with this important venture. In this role, ORS has gathered and aggregated information from the State's electric suppliers, supplementing this information with pertinent demographic data for South Carolina. A public hearing was held on December 11, 2008. During this hearing, ORS Executive Director Dukes Scott submitted ORS's report, *An Analysis of South Carolina's Current Electric Usage Conditions with Recommendations for a Responsible Future.* Also at this hearing, members of the public were invited to speak and provide written comments. After reviewing and considering the report from ORS and the comments and supporting documents from the public, PURC adopts the following findings and recommendations.[1]

[1] Additional information on the methods by which this report was created can be found in Appendix C.

The Federal Climate Change Debate

The matter at hand

It is expected that the new Presidential administration and Congress will begin to take action in 2009 to address climate change. We do not debate whether such action is needed, but note that South Carolina, like the rest of the country, could be detrimentally affected by some of the dangers that could result from certain proposed models of climate change. For instance, with a large percentage of the State's population living near the coast and with a large portion of the State's economy dependent on tourism and agriculture, a change in climate patterns, an increase of hurricane frequency and intensity, or a rise in sea level could prove disastrous for South Carolina. Therefore, it is in the best interest of all South Carolinians that our State be a part of the solution to any dangers posed by climate change.

The underlying principle of every plan to address climate change is to make the emitting of GHG more expensive and thus create a market force to promote GHG-neutral energy generation; however, we must be careful that we do not subscribe to a course of action that provides no practical, reasonable, and affordable opportunity to adjust to a carbon-constrained economy. Without a carefully crafted plan, increased expenses to constrain carbon could wreak havoc on our country's already weakened economy.

In light of this consideration, our first recommendation is that South Carolina's Congressional delegation attempt to ensure that Congress address climate change proactively through federal legislation rather than by default through regulation by the Environmental Protection Agency (EPA). In the latter scenario, President Obama could direct the EPA to begin regulating carbon dioxide as a pollutant under the Clean Air Act (CAA). The United States Supreme Court, in the case of *Massachusetts v. EPA*, 549 U.S. 497 (2007), has already decided that the EPA has the authority to regulate GHG as pollutants. Such a course of action would eliminate South Carolina's influence on how the federal government addresses climate change.

What might federal climate change legislation look like?

It is expected that federal climate change legislation will make the emissions of GHG more expensive. Most electricity in this country is created by burning fossil fuels, such as coal, to turn energy-generating turbines. The plants at which these fuels are burned, in particular coal-fired plants, are heavy GHG emitters. The cost of these emissions will be increased either through a direct tax on GHG emissions imposed on electric generation facilities or through a permit/cap-and-trade system. Under a cap-and-trade system, it is presumed that a limited number of allowances to emit GHG would be issued to electric utilities. Additional allowances may be available through an auction/bidding process. As the demand for electricity grows over time, these utilities would be required either to purchase more allowances, which could increase the cost of allowances, or build new non-GHG emitting generation facilities. Although there is a benefit from the production of

lower emissions, such a system of buying and selling allowances may eventually have the effect of driving the cost of electricity generation to a level that makes electricity unaffordable to the average South Carolinian. All efforts in reviewing and commenting on changes in federal law must be focused on achieving a desired reduction in GHG emissions without hampering the reliability or affecting the affordability of electricity in this State.

Under many of the proposed climate change bills currently pending in Congress, the impact of the cost of reducing CO_2 will be felt unevenly across the nation, depending upon income level, region, provider of electricity, and housing. South Carolina has a greater dependence on electricity due to its climate, has a lower median income, and has less renewable energy potential than other areas of the country; therefore, South Carolinians will feel a greater economic impact from climate change legislation than residents of other states.

Beyond a cap-and-trade system of carbon allowances or a carbon tax, federal climate change action is likely to include mandates for the use of renewable energy sources (renewables) such as solar, wind, and biomass. Some members of Congress have advocated mandates for generation from renewable energy sources in the range of 20 to 25 percent of total electricity generation in this country. It should also be noted that some schemes of federal renewables mandates do not allow for the inclusion of existing hydroelectric generation or energy efficiency and exclude some biomass, which would make the meeting of mandates extremely difficult.

An outline of this report

It is within the context of two likely mandates — reducing GHG emissions and increasing generation from renewables — that South Carolina's current generation mix and electricity usage patterns must be evaluated. In such an evaluation, we must determine how to set a course of action that will meet these mandates and protect the affordable and reliable electricity supply that South Carolina needs to power its economy and provide for a prosperous future. To understand South Carolina's readiness to meet federal climate change mandates, this report will discuss the following topics:

- macro-scale energy demands in South Carolina, both as they exist now and as they will exist in the future. For instance, we will need to consider whether our State's energy usage is growing, and if so, by how much;
- current electricity generation portrait of South Carolina, taking care to note each method of generation and its corresponding fuel source in current use;

- an analysis of typical residential electricity usage in South Carolina, taking into account both the energy use constraints that exist and the usage patterns that can be modified to encourage greater efficiency;
- South Carolina's potential renewable energy sources;
- possible electricity usage reductions offered by conservation and energy efficiency; and
- the costs of taking no action in the face of pending federal action.

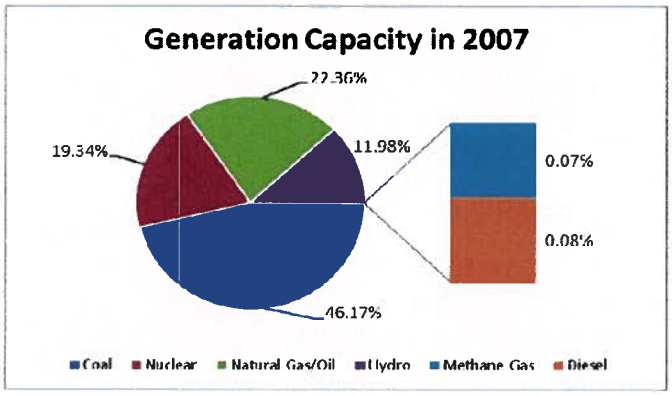
CO_2 is often cited, sometimes exclusively, as a GHG in climate change discussions. CO_2 is certainly the most prominent GHG in terms of amounts of gas emitted from man-made sources globally; however, other GHG, such as methane, have a far stronger heat-trapping effect. Accordingly, this report will discuss all GHG, not solely CO_2, where appropriate.

The Current State of Energy Usage

Macro-Scale Energy Demands in South Carolina

Current capacity

The concept of generation capacity includes a system's entire generating fleet, regardless of the plants' use. Certain plants, typically those fueled by natural gas, are used primarily during peak demand. However, baseload plants are normally fueled by coal or nuclear power and tend to run continuously in order to provide constant electric needs. In 2007, electric generating facilities serving South Carolina had 18,437 MW of installed capacity; of that, more than 68% was coal and nuclear. The following numbers are the statewide aggregate and include allocations from multi-state companies.

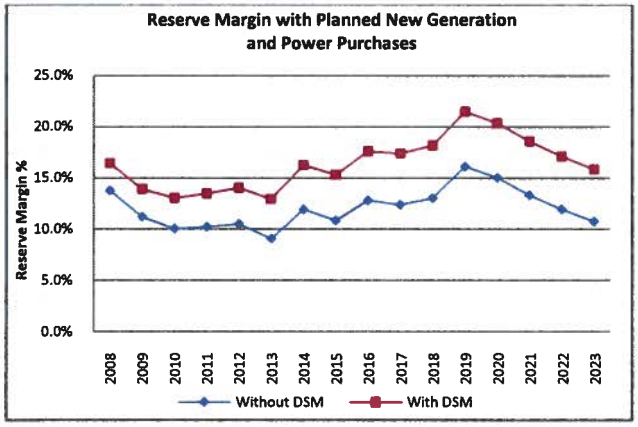


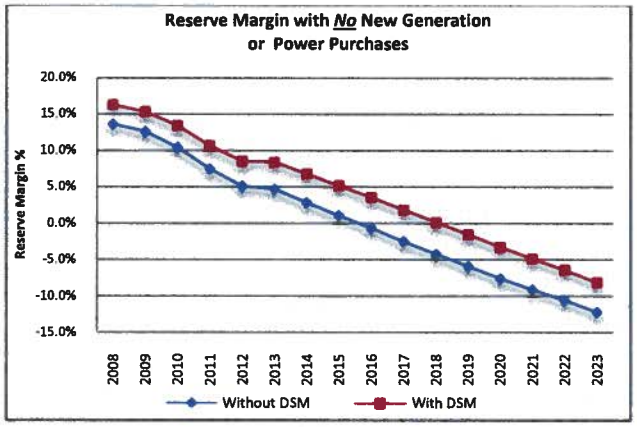
Future needs forecast

Electric generating companies anticipate higher electric demands due to a growing population and increased energy usage. Mr. Alexander Kline spoke on electrification of railroad lines and the increasing use of electric vehicles. This emphasizes the potential growth in demand based upon emerging technologies.

Currently, South Carolina electric utilities are close to falling below industry-standard reserve margins, which are generally between 12–18%. Reserve margins are designed to protect the reliability of electric systems and allow for unforeseen situations, such as an increase in demand or unscheduled maintenance. Information supplied by the electric generating companies serving South Carolina indicates that by 2023, there will be almost 5,000 MW of planned additional generation resources. Almost 1,000 MW of demand side management (DSM) resources are expected by 2023. Including both DSM and additional generation, South Carolina will have a reserve margin of 15.9% in 2023. Without DSM, the reserve margin drops to 10.8% in 2023.

According to ORS, without additional generation, South Carolina's aggregate reserve margin may fall below 12% in 2011 and may fall below zero in 2019, at which time the State could face blackouts. Without added generation and successful DSM, South Carolina may have a reserve margin below 12% in 2010, and may face power shortages and blackouts by 2016, if not sooner. Because these are statewide aggregates, some companies could face shortages sooner, depending on growth and current reserve margins.



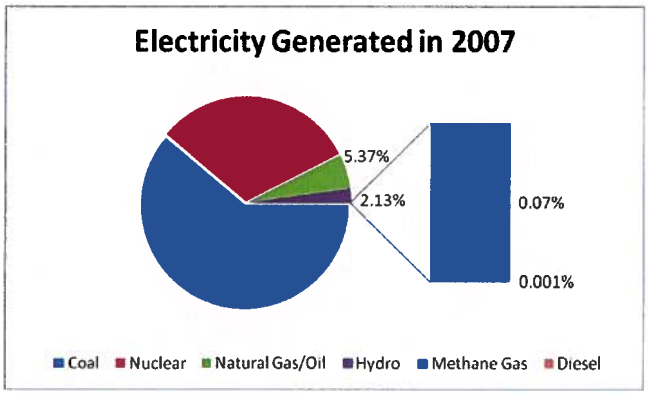


The historical reserve margin for South Carolina beginning with the year 2000 is available in Appendix E.

Current Generation Portrait

Generation mix

The following generation mix is calculated based on the electricity generated for South Carolina customers in 2007 and includes South Carolina's allocation from multi-state companies.



Coal

More than 61% of South Carolina's electricity comes from coal-fired plants. While these plants emit GHG, technology exists that has been and will continue to be installed to reduce these emissions. The consensus among stakeholders is that carbon sequestration is not yet a viable option in South Carolina due to the lack of suitable geological formations for storing the carbon in and around this State.

Nuclear

Nuclear power generates 31% of the electricity used in South Carolina and is a subject of debate. Currently, South Carolina has the third highest installed nuclear capacity in the nation and is home to seven nuclear units. There are ongoing plans to build additional nuclear facilities to meet South Carolina's growing electric needs. Although some parties oppose nuclear power generation, we believe that, in order to meet the electric needs of South Carolina with limited GHG emissions, nuclear must be considered a viable option.

Renewables

Landfill gas accounts for most of South Carolina's small percentage (0.07%) of renewable generation. ORS's report stated that the electric generating companies in South Carolina anticipate 4% of the State's generation will come from renewables by 2027. We agree with testimony that there must be additional research and development to meet or surpass this goal.

Emission Levels and Potential Costs

CO_2 emissions

Coal was the single greatest contributor to the approximately 60 million tons of CO_2 emitted by South Carolina electric generating companies in 2007. This number is a statewide aggregate and includes allocations from multi-state companies. Electric generators continue to try to reduce the environmental impact of coal through the use of technology such as sulfur dioxide (SO_2) and nitrogen oxides (NOx) scrubbers. According to state aggregates, the total capital investment in environmental impact reduction through 2013 is estimated to be almost $3.6 billion, with more than half of that already spent. In addition, nearly $56 million is spent annually on variable costs, such as reagents like lime or limestone, to reduce emissions. According to ORS, for residential customers with average electricity usage, these expenditures will likely add more than $120 per year to their bills. This amount may be higher depending on the reliance on coal by the customers' specific utility.

Potential costs

While the contours of a federal cap-and-trade program remain undefined, it is instructive to consider the impact of a program that would apply tariffs to CO_2 emissions without any baseline allowances (i.e. a scenario in which utilities would pay for all tons of CO_2 emitted without the benefit of any un-purchased allowances).

Estimates vary depending on which potential legislation is being considered; however, it is clear that the resulting cost to our State's residential customers would be significant. For a residential customer using an average of almost 1,200 kWh of electricity monthly in South Carolina, there could be an additional annual cost ranging from $33 to $600 per year.

These numbers are similar to those presented by the Electric Cooperatives of South Carolina (ECSC) who testified that, because of their increased dependence upon coal generation, their customers could face annual cost increases ranging from $250 to $3,200, which would remove $1.9 billion of wealth from cooperative homes.

Energy Use on a Residential Customer Level

Climate

The annual consumption of electricity by residential customers in South Carolina is the 5th highest in the nation. Though our State's climate is often celebrated by residents and tourists alike, it is partially responsible for this high usage of electricity. Our State differs from many parts of the country because electricity is used year-round, rather than just in the summer for cooling.

South Carolina's climate is ideal for the use of electric-powered heat pumps, and 62% of our residents use electricity as their primary fuel source compared with 32.5% nationally. Heat pumps are not efficient in colder climates, so residents in many other states, such as those in the Northeast, use electricity only for cooling and lighting; they heat their homes with natural gas, fuel oil, wood stoves, or propane.

According to ECSC, a recent study published on www.energy.sc.gov suggests that South Carolina's electric energy use per household is even higher – ranking third nationally when compared with all other states and the District of Columbia. That high personal consumption results, in part, from very low use of other traditional sources of energy such as natural gas (44th in the nation) and home heating oil.

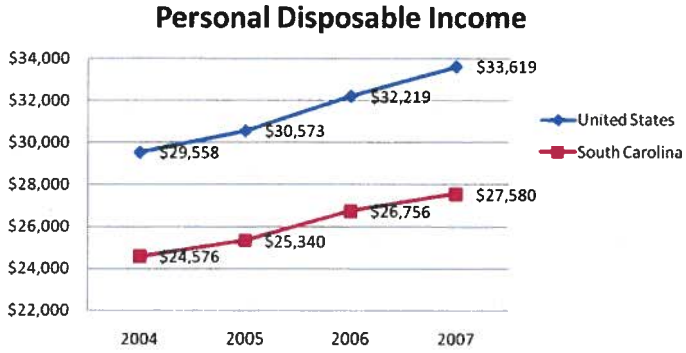
In addition to heating, electricity is used in South Carolina for air conditioning. There are many hot days in South Carolina, as suggested by the number of this State's "cooling degree days," a determination of energy demands for air conditioning. South Carolina had an average of 1,877 cooling degree days, while Ohio averaged 794 during a comparable time period. A higher number of cooling degree days typically leads to higher energy demands. High temperatures and humidity in summer months create a serious need for high levels of cooling, which drives our State's peak demand.

Some states enjoy year-round mild weather. For example, California is 45th nationally in "heating degree days" and 24th nationally in cooling degree days. That mild climate provides greater flexibility in the conservation and energy efficiency measures that California can implement because energy use there is a matter of choice and convenience that rarely impacts citizens' health and safety.

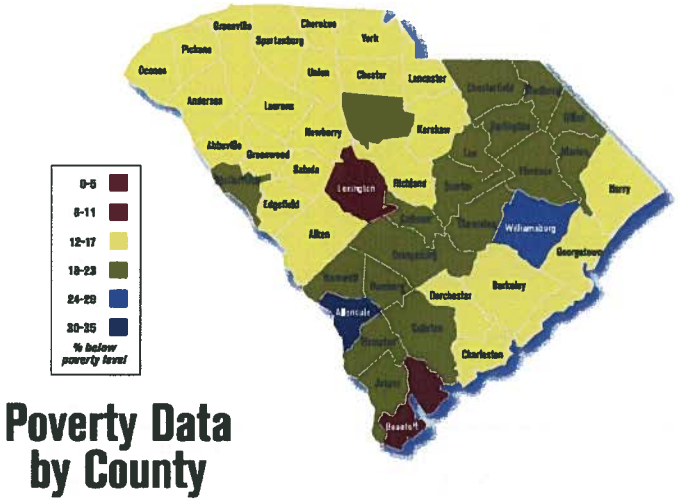
Wealth

Coupled with our State's higher usage of electricity is our relative disadvantage in paying for it. As a point of discussion, we note that South Carolina:

- ranks 40th among the 50 states in median income;
- ranks 44th in disposable income (or 18% less than the average American); and
- has, on average, 15% of households falling below the poverty level, with this figure reaching as high as 32% in some counties.

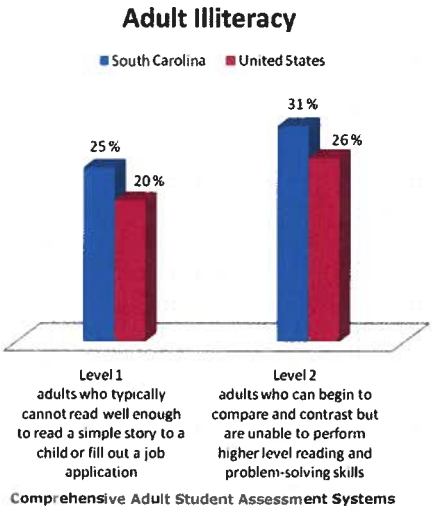


Because of lower income levels in our State, residents would be disproportionately affected by increases in electric rates. Also, since South Carolinians have higher electric usage and less disposable income than other parts of the United States, a larger portion of household income is spent on electricity. The "higher-use versus lower-income" problem is exacerbated by the fact that those with less disposable income are also less likely to be able to purchase new, energy-efficient appliances or make improvements to their homes, both of which would increase energy efficiency and lower their electric bill.

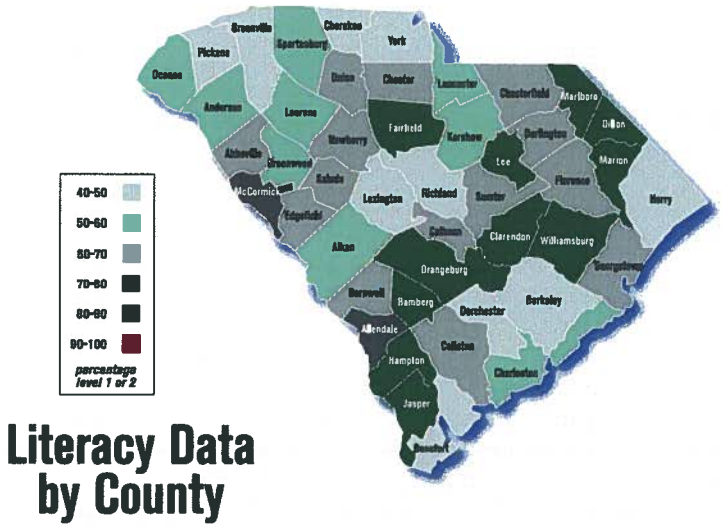


Education

Statistics indicate that South Carolina has high student dropout rates and, based on information provided by ORS, the majority of residents have some degree of illiteracy. As illustrated in the graph below, more than half (56%) of our state's residents fall within severe (Level 1) to moderate (Level 2) ranges of illiteracy. In fact, South Carolina has the 4th highest percentage of adults at Level 1 or 2 in the country. The illiteracy of residents compounds the serious challenges to our State because, if residents cannot read or write, they will have a difficult time comprehending information about energy efficiency and conservation.



When examining illiteracy on a county-by-county basis, some of the numbers are staggering and demonstrate the obstacles we as a State face when attempting to convey information to consumers about conservation and energy efficiency.



Housing stock

South Carolina has a very high proportion of residents who reside in energy-inefficient housing. Decades ago, energy efficiency was not a priority in building standards, and there was little incentive for builders to invest in more costly methods and materials that improved efficiency. While newer standards have addressed these issues, there are still many in our State living in older homes. Similarly, newer manufactured houses have improved energy efficiency, but many residents live in older manufactured homes that typically are not easily modified. These older manufactured houses — even if smaller in square footage compared to other homes — use proportionately more electricity per square foot. We lead the nation with 18.2% of our population residing in manufactured homes compared with the national average of 6.7%.

Like most other Southern states, South Carolina has a high electric appliance usage rate, particularly for heavy-use appliances such as dryers and water heaters. Many residents cannot afford to purchase new, more expensive energy-efficient appliances or make improvements to homes that would increase efficiency. It is our opinion that energy efficiency for homeowners could be significantly enhanced if consumers were able to obtain very low-interest loans for energy improvements such as efficient appliances and HVAC systems.

Ways to Meet Federal Mandates

Renewables

Developing renewable resources in South Carolina

South Carolina is pursuing the development of renewable resources through programs such as Palmetto Clean Energy (PaCE) and through Santee Cooper and the electric cooperatives' Green Power Program. These programs provide consumers with a voluntary method to invest in "green" energy.

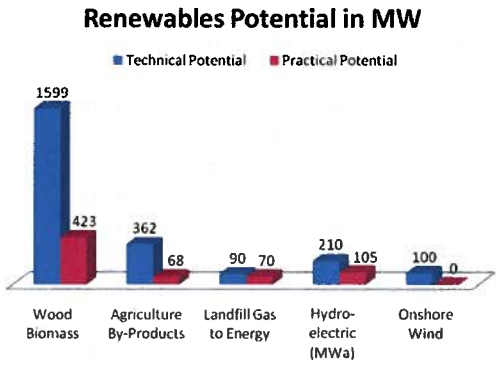
Several tax credits and programs already exist in South Carolina. Most of those are intended to promote the use of renewable resources by individual consumers and do little to aid or encourage the development or use of renewable energy by businesses, industry or utilities in our State. These consumer-incentive programs include, but are not limited to, the following:

- Consumer tax credits for those who purchase alternative or flex-fuel vehicles (S.C. Code Ann. § 12-63-10).
- Consumer tax credits to install residential solar energy systems (S.C. Code Ann. §§12-6-3587 and 12-36-10, et. seq.).

Only the "South Carolina Renewable Energy Revolving Loan Program" (codified at S.C. Code Ann. §46-3-260) provides for investment in renewable energy production. Section 46-3-260 is limited to providing matching grant loans of up to $200,000 for no more than 50% of a project cost for the research and development or construction of facilities dedicated to the development of solar, wind, or biomass energy production.

Availability of renewable resources in South Carolina

According to the La Capra study, South Carolina has the *technical* potential of new in-state renewable resources totaling about 2,360 MW. However, within the next decade, the *practical* potential – the amount reasonably expected to be implemented – is approximately 665 MW. While other studies were referenced in this fact-finding process, the La Capra study should be the benchmark for South Carolina, primarily because the data provided is specific to the renewable resources available in this State. Below is the estimated technical and practical potential of renewable resources available in South Carolina within the next 10 years.



*Hydroelectric potential is measured in average MW based on annual mean flow rates or estimated annual production.

The future of renewables in South Carolina

Landfill gas-to-energy and biomass resources are currently part of the generation mix in South Carolina. Given the limits of current technology, costs, and availability, solar and wind are not practical for utility-scale electric generation in this State. With extensive research and development, advances in technology could change this landscape. According to Duke Energy Carolinas, generating companies do foresee renewable energy in their future generation mix; however, due to current levels of technology, renewables are not viewed as being dependable generating resources at this time.

We believe that the existence of incentive programs in other states and the active recruitment of "green" technology firms by other states threaten to leave South Carolina behind. It is imperative that we take action to provide a competitive environment in South Carolina for the growth and development of renewables and their related industries.

Carbon Neutral Generation

Currently, more than 33% of South Carolina's electricity is generated from GHG-free sources, which include nuclear and hydroelectric. The electric generating companies estimate this percentage will increase to almost 52% within the next 20 years. This increase will be attributed to new nuclear and renewable generation and will allow more than half of our electricity to be generated from GHG-free sources, which will help South Carolina meet federal mandates.

In the meantime, any proposed legislation should factor in South Carolina's current generation mix to prevent an economic burden on South Carolina residents, businesses, and industry. Currently, and for at least the next two decades, this State will rely on coal to generate the majority of the electricity South Carolinians consume.

Nuclear

Nuclear power generation has played a significant role in keeping this State's electric rates affordable and reliable. There are plans to add additional nuclear generation to meet South Carolina's growing baseload electric needs and, while there is opposition, comments provided to us suggest that nuclear power must be a viable option for this State. Furthermore, ORS recommends – and we concur – that since the generation of electricity with nuclear fuel is GHG-free, any potential legislation should allocate credits or allowances to South Carolina and other states generating electricity with nuclear power.

As noted earlier, we heard from parties on both sides of the nuclear energy issue. Some opposed nuclear energy in general while others opposed the reprocessing of nuclear fuel. There was also testimony in favor of nuclear energy stating that, if South Carolina is to realistically prepare for a GHG constrained economy, increased nuclear capacity must be seriously considered.

According to several surveys conducted in 2008, whose results are summarized below, the majority of South Carolinians are in favor of nuclear energy. This trend mirrors national polling results that indicate that 74% of Americans either strongly or somewhat favor the use of nuclear energy as one of the ways to provide electricity in the United States (September 2008).

- **University of South Carolina poll.** Almost 70% of residents in four Midlands counties polled either strongly or somewhat favored expanding a nuclear power plant in the Midlands (November 2008).
- **Duke Energy Carolinas customer telephone interviews.** Sixty-nine percent of the company's South Carolina customers interviewed supported building the Gaffney nuclear power plant. Only 19% said they opposed this plant (August and September 2008).
- **SCE&G customer survey.** Two thirds (66%) of customers polled indicated they were either extremely or somewhat favorable toward new nuclear generation (August 2008).

Given this strong public support for additional nuclear capacity, and South Carolina's history and success as a leader in satisfying a substantial portion of energy demand through nuclear power, we recommend that new nuclear capacity be an integral priority in satisfying future demand while reducing GHG levels in South Carolina.

Carbon sinks

ORS also recommended that potential legislation include credits for carbon sinks, which are reservoirs that accumulate and store carbon for an indefinite period. The main natural sinks are the world's oceans and forests, which use plant photosynthesis to absorb CO_2. Forests and other land areas with dense plant populations qualify as carbon sinks under the Kyoto Protocol. Because South Carolina has extensive forests, we believe such a credit would help mitigate the financial impact of federal carbon legislation.

Energy Efficiency

There is no one solution to meet the increasing energy demands in South Carolina. Our State needs to do more to promote and encourage adoption of energy efficiency and conservation measures, which are the fastest and most economical means to reduce demand for electricity. In addition to looking for ways to increase electricity production, South Carolina must make serious efforts to promote conservation and energy efficiency.

Some expressed concern that without state action, utilities will not have an incentive to promote energy efficiency. For example, Mr. Tom Clements of Friends of the Earth expressed concerns that certain electric utilities are not engaged in DSM and that if they are permitted to pursue nuclear generation, they will not be incented to put programs in place that promote conservation and DSM.

While conservation and energy efficiency are excellent tools to lower South Carolina's electric demand, we recognize, as did many who participated in this process, that conservation alone will not mitigate the need for additional generation. A section from the comments filed by Duke Energy Carolinas is instructive:

> *Many reports indicate that it should be cost-effective for consumers to aggressively pursue energy efficiency on their own, but it often does not happen. Duke Energy Carolinas conducted customer research to determine why our customers were not taking advantage of opportunities to become more energy efficient. Our research suggests that:*
>
> - *Most customers do not have the expertise, data, time or desire to evaluate efficiency options.*
> - *Energy generally is perceived by customers to be an abundant, low-cost, readily available commodity – much more so in the Southeast than in other parts of the country. The cost of energy is a small portion of most household or business budgets.*
> - *Many customers believe they already have adopted simple, responsible behaviors and they perceive energy efficiency alternatives as higher-priced, complicated, or interfering with their lifestyle and/or business.*

- *Most residential customers lack the capital to invest in energy efficiency. This leads to decisions based on a lower initial capital cost or prolonging an equipment replacement decision as long as possible.*
- *Research shows most customers are minimally motivated solely by altruistic issues such as climate change or national energy independence. There are signs of an emerging social consciousness with regard to energy, but few customers are willing to pay more to participate.*

Cost of No Action

The Lieberman-Warner Bill

The most analyzed climate change bill that has been discussed in Congress is the Lieberman-Warner bill, S. 2191 (previously the "Climate Security Act of 2007" and subsequently the "Lieberman-Warner Climate Security Act of 2008"). On June 6, 2008, the bill, which had bipartisan support, fell a dozen votes short of the 60-vote threshold it needed to overcome a GOP filibuster and move to final Senate consideration. Although Congress failed to enact Lieberman-Warner, it is the single piece of proposed federal legislation that has been subject to extensive economic and environmental analysis, most notably an extensive EPA study. As Lieberman-Warner contains measures similar to those contained in many of the other GHG reduction bills currently pending in Congress, these analyses are worth noting. An in-depth discussion of the specifics of the Lieberman-Warner bill can be found in Appendix D.

If enacted, the Lieberman-Warner plan would create a cap on CO_2 emissions by large industries – most notably the electricity generation industry – resulting in a cap-and-trade program. Under the cap-and-trade scheme, businesses with unused CO_2 emissions allowances may sell those allowances to businesses with excess emissions. Because much of South Carolina's electricity is generated by coal-fired plants, many of South Carolina's generators need additional allowances, resulting in the increased cost of electricity to buy allowances. In its report to this Committee, ORS states that if allowances were sold for $30 a ton, South Carolina generators, as allocated, could be charged approximately an additional $1.8 billion a year based on 2007 CO_2 emissions. Based upon the generation mix of the producer supplying the state's electric cooperatives, ECSC reported that its customers could face additional costs of $432 million (presumed $12 per ton tariff) to $5.4 billion per year (presumed $150 per ton tariff).

Many of South Carolina's characteristics, including certain economic, demographic, geographic, and energy usage patterns, would amplify the negative effect of the aforementioned carbon-control measures for this State's citizens and electric suppliers. More of South Carolina's population falls below the poverty line than does the population nationally; furthermore, its population has less disposable personal income. This hampers consumers' ability to take energy-saving measures, such as insulating homes or buying more expensive, yet more efficient, electric appliances. South Carolinians would bear a disproportionate cost of

carbon control while being unable to pay for offsetting or beneficial measures. Simply put, increased electricity costs could put some South Carolinians in the desperate position of having to choose between paying for food and medicine or paying their electric bill.

Age of facilities (remaining book value)

South Carolina's coal-fired plants have an average remaining depreciable book life of 27 years, which provides 27 additional years (on average) to pay for these plants. If any coal plant is taken out of service prior to the anticipated date, this depreciation schedule will be accelerated, thus causing these costs to be passed along to the consumer faster than originally planned and resulting in increased rates.

Cost to prematurely retire coal plants

According to an example provided by ORS, if a single 600 MW coal-fired plant were taken out of service in 2012 instead of its planned retirement at 2036, the depreciated life would be reduced from 27 years to 3 years. This premature retirement would require the company to recoup additional depreciation expenses of $160 million in each of the remaining three years. Consequently, a residential customer using the 2007 monthly average of 1,195 kWh would be charged an estimated additional $3.16 per month, approximately $37.92 a year. The cost would be higher for customers of Santee Cooper and the electric cooperatives because the average remaining depreciable book life for Santee Cooper's coal plants is almost 38 years.

This cost would increase exponentially if all of South Carolina's coal plants were retired prior to their depreciated book life. These costs would come in addition to any further costs expended to build the new plants necessary to offset the losses in capacity brought about by the premature retirement of the fleet of coal plants.

Our Recommendations

This Committee received a number of excellent recommendations from those offering public comment. Written comments submitted can be viewed at the South Carolina Statehouse Web site (http://www.scstatehouse.gov/citizensinterestpage/energyissuesandpolicies/energyissues.html). In many cases, the suggestions were directed towards the Committee's efforts to advise our Congressional delegation as to the possible impact of various climate change proposals. Others address programs that our State may wish to create or expand in order to successfully meet challenges presented by federal climate change initiatives. Finally, several recommendations center on providing sufficient state government infrastructure to manage our State's successful transition into a carbon-constrained economy.

Recommendations as to Federal Climate Change Efforts

The most comprehensive set of recommendations received were those developed by the Office of Regulatory Staff. Underpinned by its December 11, 2008 report, *An Analysis of South Carolina's Current Energy and Usage Conditions with Recommendations for a Responsible Future,* ORS's ten core suggestions are thoughtful commentary on how federal climate change legislation could best be shaped to achieve the intended environmental benefits without causing undue harm to our State's economy and to our State's electricity ratepayers. We adopt the following of their recommendations (modified to incorporate other testimony received) as part of a broader statement offered by the Committee to our federal lawmakers:

1. Any federal initiatives should not endanger our State's ability to ensure that there is reliable, reasonably priced electricity for its citizens. South Carolina has enjoyed relatively low electricity prices, due in large part to the prudent reliance on lower-cost nuclear and coal generation.

2. Any federal initiative should acknowledge that all resource options must be preserved to meet resource needs. While coal will need to continue to play a role in meeting consumer electricity needs, investment in cost-effective energy efficiency and renewable resources should be encouraged.

3. As the federal government chooses to take action to address the issue of global climate change, its actions should protect the environmental and economic interests of the citizens of South Carolina. In particular, this legislation should:
    - be economy-wide and address all greenhouse gas (GHG) emissions from all sectors, including transportation and electric generation; and
    - utilize a properly designed cap-and-trade methodology as opposed to a tax.

4. To ensure a practical cap on the level of emissions:
    - any caps on the level of emissions should constrain emissions gradually over time, thus allowing for the development of technologies to reduce emissions. If the emission levels are reduced too rapidly, it may be difficult to achieve the emission reductions and the cost to achieve the levels could be harmful economically;
    - any federal initiative based on a cap-and-trade system should include a safety valve for allowance prices both to protect against unacceptable detrimental economic impacts and to address the special needs of lower-income citizens.

5. Any federal initiative should provide for funds to be distributed to those investing in research and development of cost-effective renewable resources and the reduction of emissions.

6. Any federal initiative should provide for funds to be distributed to lower-income households to assist with the purchase of weatherization and energy-efficient appliances as well as to assist with their monthly electric bills.

7. Any federal initiative should consider nuclear power generation a "GHG-emission neutral" source of electricity and electric utilities, states, or regions utilizing nuclear power generation should be allocated corresponding credits or allowances.

8. Any federal initiative should include credit for carbon "sinks," such as forests.

9. Any federal initiative should provide for the development of technologies, which can be employed to reduce national GHG levels. Specifically, federal legislation should encourage the development of new nuclear generation through the expansion of federal loan guarantees and production tax credits. These incentives should be available as a matter of energy policy and, therefore, accessible to non-profit generators as well.

10. Any federal initiative should provide, at least initially, that allowances associated with a cap-and-trade system be allocated as opposed to auctioned. These allocations should be based on a percentage of an historical baseline emission level over several years. The allocation of allowances can be ratcheted down over time as the emissions cap is gradually lowered. However, allocation of allowances should recognize changes in use of energy by various sectors of the economy (i.e., change of use from petroleum-powered motor vehicles to plug-in hybrid electric motor vehicles). Full auction of allowances raises the same issue as a tax related to the revenues that are raised. Full auction also unfairly penalizes utilities for past prudent decisions such as the decision to build coal plants.

We believe that ORS's recommendations are directed toward a practical and economically and politically sustainable implementation of climate change reforms. Many of the agency's suggestions were affirmed by groups as diverse as the Electric Cooperatives, investor-owned utilities, Conservation Voters of South Carolina, and the Coastal Conservation League. In particular, we note a common theme running through these groups' comments: For climate change reforms to work, they must be practically designed in order to maintain the affordability and reliability of electricity while also achieving environmental responsibility.

Our State Energy Office recommends the retention of existing federal tax credit, loan, grant, and incentive programs, including the Clean Renewable Energy Bonds (CREBS) program. Again, there appears to be a solid consensus that these programs are desirable. We encourage our Congressional delegation to continue to support these programs and to allow for states to exercise maximum discretion in their application, so long as cost-effectiveness in reducing the states' aggregate carbon footprint can be demonstrated. A continuing theme throughout our hearing was "one size will not fit all." We concur and believe that many programs, at their current level of technological development, may be less successful in our state than other states.

Very specific recommendations for federal legislation were submitted by Waste Management, Inc. We generally support its efforts to expand the success of waste-to-energy (WTE) and landfill gas-to-energy (LFGTE). South Carolina's utilities have been industry leaders in the use of biomass and landfill gas. The La Capra study of renewable energy sources currently available in South Carolina acknowledges the key role these technologies will play if our State is to utilize renewables. With a similar level of specificity, Mr. Andrew Kline recommends the conversion of our nation's rail fleet to be powered by electricity as opposed to diesel fuel. We can see the value of energy independence which would grow out of such a conversion, but would note that this change would increase the need for more electric generation capacity. Mr. Kline admitted as much and saw nuclear generation as the likely source. Congress will likely confront a similar challenge with the increasing popularity of Plug-In Hybrid Electric Vehicles (PHEV).

Several persons, Andrew Streit, Brett Parks, and Ron Sebeczek, promote implementation of a Renewable Portfolio Standard (RPS). Strong support for renewables came from a number of other individuals and groups. We urge Congress to support renewables, but to carefully craft any RPS mandate to be practically achievable on a state-by-state basis. Based upon research made available to the Committee through the La Capra study, we conclude that "best efforts" in developing renewables in our State may produce results much lower than those practically achievable in other states. We wish to emphasize that the aim of federal climate change legislation should not be to transfer wealth from one region of our nation to another through enforced purchase of Renewable Energy Credits (RECs).

Recommendations as to State Policy

As with suggestions for federal climate change legislation, our Committee received a number of thoughtful and excellent suggestions in regard to state policy. Within the context of this report, we choose to list these suggestions (See Appendix A) and note that our Committee, the Senate, and the House of Representatives will begin to draw upon these suggestions as we engage in our respective responsibilities. As for PURC, we will consider and incorporate this commentary in our Public Service Commission (PSC) and ORS oversight role and PSC Commissioner and Santee Cooper Board screening role.

While we are hesitant to commit to any of these suggestions for state policy without evaluating and determining our comfort with the remainder of the suggestions, we do accept the challenge of the Coastal Conservation League that our "state should adopt a vision and policy that evaluates all energy options objectively and vigorously." We are convinced that the new paradigm emerging for the electric utility industry demands nothing less than a willingness for policymakers to consider the viability of all options so long as the practical constraints of affordability, reliability, and environmental sustainability are satisfied.

Recommendations as to State Infrastructure

As we sift through recommendations for changes in state infrastructure, we note recurring themes:

> *"South Carolina needs an Energy Director who can incorporate the mandates of many agencies (ORS, Energy Office, DHEC, and PSC)." (Andrew Streit)*
>
> *"The General Assembly… should prioritize the implementation of CECAC's recommendations." (Coastal Conservation League)*
>
> *"In the face of the challenges ahead, authority and responsibility must be clearly assigned." (Electric Cooperatives of South Carolina)*
>
> *"South Carolina should have a vibrant Energy Office to study, plan and act upon new energy policies." (S.C. Wildlife Federation)*

While there may be disagreement as to who should accept the mantle of responsibility, it is apparent that the status quo is insufficient to meet the needs of our State.

With the sheer size of the challenges facing our State as federal climate change reform evolves, we agree with the assessments offered by the South Carolina Wildlife Federation and the Coastal Conservation League that the General Assembly needs to engage in a systematic and informed development of the infrastructure to support any number of programs that might grow out of federal action. Our baseline assessment is that, to date, we have a regulatory/judicial system governing electric utilities that is disconnected from the grant programs that are key to the effective implementation of energy efficiency, conservation, and the growth of "homegrown" renewable energy resources. From published reports,

including *The New York Times*, January 11, 2009, we are aware that the Obama Administration intends to include substantial federal grant dollars focusing on renewable, weatherization, and energy efficiency as a part of its economic stimulus package. We agree with the Electric Cooperatives that these programs can only be effective if they are incorporated into a model where the state "transitions to a carbon-constrained economy with minimal negative impact upon the population of the state."

It is essential that these grant programs support alternatives to traditional generation. Whether through renewables, conservation, or energy efficiency, each grant program must be reliable and affordable. Cost effectiveness and environmental worthiness must be considered in the evaluation of any alternative proposals. We believe that the ORS should be the receiving and granting agency for all grant dollars impacting electric energy use or generation. ORS should develop criteria for awarding grants. These criteria should reflect an appropriate balance between achieving immediate results through conservation and energy efficiency and long-term development of "homegrown" renewable resources. Within the separate classes of renewable options and energy efficiency options, ORS should place a premium on obtaining "bang for the buck" for grant dollars. Emphasis should be placed on the amount of GHG emissions avoided. Included within such calculations should be a determination of the relative reliability/dispatchability of each renewable option. Similarly, energy efficiency options should be tested as to their relative reliability/permanence. We believe that there are tremendous opportunities for partnerships between the ORS and our research universities as to the immediate and long-term goals.

We believe that the PSC should examine its existing authority under the South Carolina Energy Conservation and Efficiency Act of 1992 and determine whether it can implement procedures or regulations that will encourage utilities to implement more extensive conservation and efficiency measures. It appears that the integrated resources planning process could be revised to require utilities within the jurisdiction of the PSC to place a greater emphasis on meeting future energy needs with conservation and efficiency measures, and there may be other steps the PSC can take under the Act.

PURC was created as part of public utility oversight reform in 2004 and was expanded by Santee Cooper reform in 2005. We believe that PURC should provide the General Assembly with ongoing critical assessment as to the effectiveness of any programs that grow out of our emerging national energy policy as it relates to electricity. Our role, specifically, and the General Assembly's, generally, is to deal with this dilemma as soon as possible. Every day that we wait, our State forfeits opportunities. Every day that we wait, decisions are made by default. Every day that we wait, South Carolina's ability to provide electricity in an affordable, reliable, and environmentally responsible manner is imperiled.

Appendices

Appendix A: *Proposed Recommendations of Interested Parties*

— Use of Nuclear Generation —

Office of Regulatory Staff
Consider nuclear power generation a "GHG-emission neutral" source of electricity and electric utilities, states, or regions utilizing nuclear power generation should be allocated corresponding credits or allowances.

Investor-Owned Electric Utilities (Duke Energy Carolinas, Progress Energy Carolinas and SCE&G)
Plans for the future should include new nuclear generation.

Coastal Conservation League
The State should adopt a vision and policy that evaluates all energy options objectively and rigorously.

Conservation Voters of South Carolina
Promote clean energy.

Sierra Club
Invest in making significant improvements in energy efficiency and renewable energy alternatives instead of building nuclear power plants.

Raymond Dominick
There needs to be a repository for nuclear waste and, until this is available, there should be no new nuclear plants constructed.

— Use of Renewables —

Office of Regulatory Staff
South Carolina should act to implement economic incentives to attract private investment in the research and development of renewable energy and the construction of renewable energy generation facilities both for its current utilities and potential investors in South Carolina's economy.
Biomass should be considered as a renewable energy resource.
Economically feasible renewable generation should be encouraged by State policies.

South Carolina Energy Office
Advocates the retention of existing tax credits, loans, grants, incentive payments, and other programs at the State level and incentives at the federal level, including clean renewable energy bonds and tax incentives.

Recognizes a state energy policy was established in the South Carolina Energy Conservation and Efficiency Act of 1992.

Investor-Owned Electric Utilities
Develop alternative fuels and renewable resources.

Conservation Voters of South Carolina
Promote renewable generation.

Andrew Streit
South Carolina should invest in renewable energy, which will help guarantee future job growth. South Carolina should pass a robust, incentivized RPS.

Brett Parks
A renewable portfolio standard (RPS) should be implemented in South Carolina.

Ron Sebeczek
Offshore wind, solar and geothermal heat pumps should be used to reduce our dependency on coal.

A RPS should be implemented.

Tom Howell
South Carolina should start a web site clearinghouse for renewable energy information regarding the cost, performance and benefits of renewable energy for homeowners, businesses and government.

South Carolina should do more to develop and use more renewable resources including solar, offshore wind and geothermal energy.

CAREthanol, LLC
Implement new SC Energy Policy that incorporates energy transportation goals to replace 85% of transportation fuels (specifically gasoline) with bio-fuels via a sweet potato feedstock. Such a policy would make South Carolina energy independent for gasoline, improve South Carolina's energy security and advance the development of distributed, renewable electric power.

Amy Plummer
Because there are counties that are borderline non-compliant with regard to air emission standards, South Carolina should adopt a requirement that all petro-fuels (specifically gasoline) include 10% ethanol to reduce air emissions.

— Use of Conservation/Energy Efficiency —

Office of Regulatory Staff
The State and federal tax systems should encourage the purchase of more efficient appliances and lighting and the insulation of existing and newly begun residences, commercial buildings, and industrial structures. Low-interest loans could also support energy efficiency.

There should be special provisions for lower-income and less educated residential customers. Outreach programs should target these two groups for energy education and assistance with efficiency measures. Rates for lower use and energy efficiency should be expanded, and federal policy should be designed to encourage such rates.

Investor-Owned Electric Utilities
Plans must include robust energy efficiency and DSM.

Conservation Voters of South Carolina
Promote energy efficiency.

SC Small Business Chamber of Commerce – Frank Knapp
State government should be reducing its own carbon footprint.
Energy conservation must allow consumers to approve of the efforts and participate eagerly. If not, they will feel they are sacrificing and paying more only to benefit the energy producers.
State government should encourage energy conservation across the State, which would reduce demand for new power generation that increases energy costs to the consumer.

Leslie Coolidge
South Carolina needs to do a better job at conservation and energy efficiency.

Ron Sebeczek
An energy efficiency program should be created and should include a surcharge on all customers' utility bills, the proceeds of which would be placed into a fund to invest in energy conservation projects.
South Carolina residential building codes need to be revised to encourage energy efficiency.

Tom Trout
There needs to be a change in South Carolina's building codes to improve energy efficiency.

Tom Howell
The State should develop an energy efficiency initiative program.

South Carolina should develop a state energy efficiency web site to publicize efficiency methods for individuals and businesses.

Appendix B: *Glossary*

Baseload Generation
Generation that is used to meet the ongoing and steady energy needs of customers. This generation typically has a capacity factor of 60% and above and usually uses a fuel source such as coal or nuclear.

Capacity Factor
This is an important characteristic when considering types of generation. This is used to measure the productivity of power plants. It is determined by taking the amount of power produced and dividing it by the amount that would have been produced if the plant operated 100% of the time.

Carbon Dioxide (CO_2)
A colorless, odorless, tasteless gas that is about 1.5 times as heavy as air. Under normal conditions, it is stable, inert, and nontoxic. The decay of all organic materials produces CO_2. Fresh air contains approximately 0.033% CO_2 by volume. In the respiratory action (breathing) of all animals and humans, CO_2 is exhaled, and growing vegetation naturally absorbs CO_2.

Carbon Sequestration
The capture of carbon from a generating source and subsequent storage underground in deep geological formations.

Carbon Sink
A reservoir of carbon that accumulates and stores carbon for an indefinite period. The main natural sinks are the world's oceans and forests, which use plant photosynthesis to absorb CO_2. Forests and other land areas with dense plant populations qualify as carbon sinks under the Kyoto Protocol.

Conservation
Using less electricity through changes in working and living habits. Ideally this results in a constant reduction in the need for electricity. Examples include turning off lights, switching to CFLs, adjusting thermostats, or decreasing the temperature of water heaters.

Cooling Degree Days
A method used to determine the energy demands of air conditioning. The Cooling Degree Days are calculated by subtracting 65 from a day's average temperature above 65 degrees F.

Demand Side Management
The modification of energy usage to reduce peak load and get the most out of current generation resources.

Disposable Income
The amount of income left to an individual after taxes have been paid, available for spending and saving.

Emission Allowances
Typically administered by the EPA, allowances are given as permission to emit a certain quantity of particulates at a certain price. These allowances can be sold in a regulated market.

Energy Efficiency
Reducing energy consumption through adjustments such as increasing insulation, installing new windows, or utilizing appliances that use less electricity.

Greenhouse Effect
The increasing mean global surface temperature of the Earth caused by gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbon). The greenhouse effect allows solar radiation to penetrate but absorbs the infrared radiation returning to space.

Greenhouse Gases (GHG)
Components of the atmosphere that contribute to the greenhouse effect. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. The majority of greenhouse gases come from natural sources but are also created by human activity.

Intermediate Generation
Generation that is used to meet the demands that are higher than the ongoing, baseload demands. This generation typically has a capacity factor ranging from 20–60% and often uses a fuel source such as coal or natural gas.

Kilowatt (KW)
One thousand watts (See watt)

Kilowatt hour (kWh)
One thousand watt-hours. (See watt-hour) This is the unit of measurement for residential customers.

Landfill Gas
Gas that is generated by decomposition of organic material at landfills. The average composition of landfill gas is approximately half methane and half carbon dioxide. The methane in landfill gas is removed by, among other things, venting, flaring, or combustion to generate electricity.

Megawatt (MW)
One million watts or one thousand kilowatts (KW)

MWa
Average Megawatts used to reflect energy production rather than capacity. Hydroelectric potential is measured in average MW (MWa) based on the annual mean flow rates or estimated annual production.

Onshore Wind
Generating electricity by capturing the wind's power. Turbines are placed on land and, as the wind blows, the turbine blades spin and, in turn, generate electricity.

Offshore Wind
Generating electricity by capturing the wind's power. Turbines are placed in a body of water, such as the ocean or a lake. As the wind blows, the turbine blades spin and, in turn, generate electricity.

Peaking Generation
Generation that has a very quick start time and is used to meet the highest demands for electricity. This generation typically has a capacity factor of less than 20% and often uses a fuel source such as natural gas.

Renewable Resources
Any resource, such as wood or solar energy, that can or will be replenished naturally in the course of time.

Reserve Margin
The amount of available capacity of the power system above its anticipated peak load. Ideally, electric generating companies attempt to maintain a constant reserve margin of 12-18% of normal capacity as insurance against unforeseen maintenance, a breakdown in the system or for a sudden increase in energy demand.

Watt
The electrical unit of power or rate of doing work. The rate of energy transfer equivalent to 1 ampere flowing under a pressure of one volt.

Watt-Hour
An electrical energy unit of measure equal to 1 watt of power supplied to, or taken from, an electric circuit steadily for 1 hour.

Appendix C: *Methodology*

PURC developed a questionnaire designed to elicit information critical to analyzing how certain federal energy policies could affect our State. This questionnaire was sent to the four investor-owned electric utilities, the electric cooperatives, the Municipal Association of South Carolina, and Santee Cooper. Recognizing that some of the information requested may be considered proprietary by energy providers, PURC – in a cover letter dated October 6, 2008, which accompanied the questionnaire – requested that responses be sent directly to ORS. Deadline for submission of responses was October 20, 2008. PURC also posted on the South Carolina Statehouse web site* a request, dated October 17, 2008, for public comments on energy issues and policies. PURC noted in its request eight questions on which it was specifically interested in receiving public input; however, the public could comment on any issue related to energy and energy policies. Comments received by the deadline of November 17, 2008, were subsequently posted on the same web site.

To supplement the information that would be gained from the PURC questionnaire, ORS distributed an additional brief questionnaire on October 8, 2008, to the same energy suppliers. This questionnaire, with responses due October 13, 2008, focused on electric consumers' energy usage and appliance saturation. The aggregated responses from both sets of questionnaires were put in written report form by ORS and entitled *South Carolina Energy Policy Inquiry Aggregate Responses.* This report was presented to PURC on November 17, 2008, by ORS. Subsequent to this presentation, the report was posted on both the South Carolina Statehouse web site and the ORS web site.

A second request for public input was posted on November 19, 2008, by PURC on the South Carolina Statehouse web site. In this request, the public was invited to submit comments on the *South Carolina Energy Policy Inquiry Aggregate Responses* report or in reply to any issues contained in the comments submitted by interested parties. Comments received by the deadline of December 1, 2008, were subsequently posted on the same web site.

While the solicitation of information from stakeholders was proceeding, ORS was in the process of gathering pertinent demographic data for South Carolina. ORS used this information, along with the aggregated survey responses, to develop a comprehensive written report entitled *An Analysis of South Carolina's Current Electric Usage Conditions with Recommendations for a Responsible Future.* This report was submitted to PURC on December 11, 2008.

At a public hearing on energy issues and policies held by PURC on December 11, 2008, ORS Executive Director Dukes Scott gave an oral summary of the agency's findings. Those who had previously submitted written comments and were interested in providing oral remarks were invited to do so, and any other member of the public desiring to testify had the opportunity to provide oral comments at the hearing.

Another public hearing at which additional testimony and exhibits were presented was held by PURC on January 8, 2009.

PURC greatly appreciates the efforts of ORS, the cooperation of the electric suppliers, and the genuine interest and concern of all others who have taken the time and effort to provide input on this topic so critical to our State's future. This report reflects the united effort by these entities and individuals to capture the essence of what makes this State's energy needs unique. It is the sincere hope of this Committee that, in undertaking this fact-finding venture, we have put our State in a much stronger position from which we can advocate effectively for energy and environmental policies that will benefit current and future generations of South Carolinians.

The following organizations and individuals participated in this process by providing either written comments or oral remarks at the public hearings. Written comments submitted can be viewed at the South Carolina Statehouse web site.

- CAREthanol, LLC
- Coastal Conservation League
- Conservation Voters of South Carolina
- Coolidge, Leslie
- DiAsio, Leonard
- Dominick, Raymond
- Duke Energy Carolinas
- Electric Cooperatives of South Carolina
- Friends of the Earth
- Greenlaw, Pamela
- Howell, Tom
- Hutto, Allen
- Kline, Alexander
- Palmetto Electric Cooperative
- Parks, Brett
- Plummer, Amy
- Progress Energy Carolinas
- Rigas, Nicholas
- Santee Cooper
- South Carolina Wildlife Federation
- South Carolina Electric & Gas Company
- Sebeczek, Ron
- Sierra Club
- Small Business Chamber
- South Carolina Office of Regulatory Staff
- South Carolina State Energy Office
- Streit, Andrew M.
- Waste Management

http://www.scstatehouse.gov/citizensinterestpage/EnergyIssuesandPolicies/EnergyIssues.html

Appendix D: *The Specifics of the Lieberman-Warner Bill*

The Lieberman-Warner bill would have covered all sources that emit more than 10,000 tons of CO_2 equivalents per year in the electric power and industrial sector. The bill would have created a cap of 5,773 million metric tons of CO_2 in 2012, which would have been reduced annually (proportionally to the reductions specified in the bill) reaching 15% below the 2012 level by 2020 and 70% below the 2012 levels by 2050. The World Resources Institute estimated that the bill, as amended, would have covered 84% of U.S. emissions in 2004. This bill included incentives for states to adopt climate policies that were more stringent than the federal program and to adopt and enforce model building codes; decouple electric and gas utility revenue from sales; and to make energy efficiency investments as profitable as increasing energy supplies. The bill also would have set aside 5% of the total allowance pool to promote increased biological sequestration in domestic farms and forests and an additional 2.4% for similar international efforts.

The Lieberman-Warner bill additionally placed declining GHG emission caps upstream on petroleum, natural gas, and manufacturers of nitrous oxide and downstream on coal facilities. The bill would have established a market-driven system of tradable emission allowances and permitted the use of domestic offsets and international credits. It also included bonus allowances for carbon capture and storage and set-asides for agricultural and forestry sequestration and landfill and coal mine methane litigation. As suggested in an EPA study, there were many uncertainties that affect the economic impacts of the Lieberman-Warner bill, and ultimately it was these uncertainties that stopped the bill from being passed by the Senate. The most notable uncertainty was the availability of mitigation technologies and the level of international action on climate change. These same uncertainties exist with the other climate change bills currently pending in Congress.

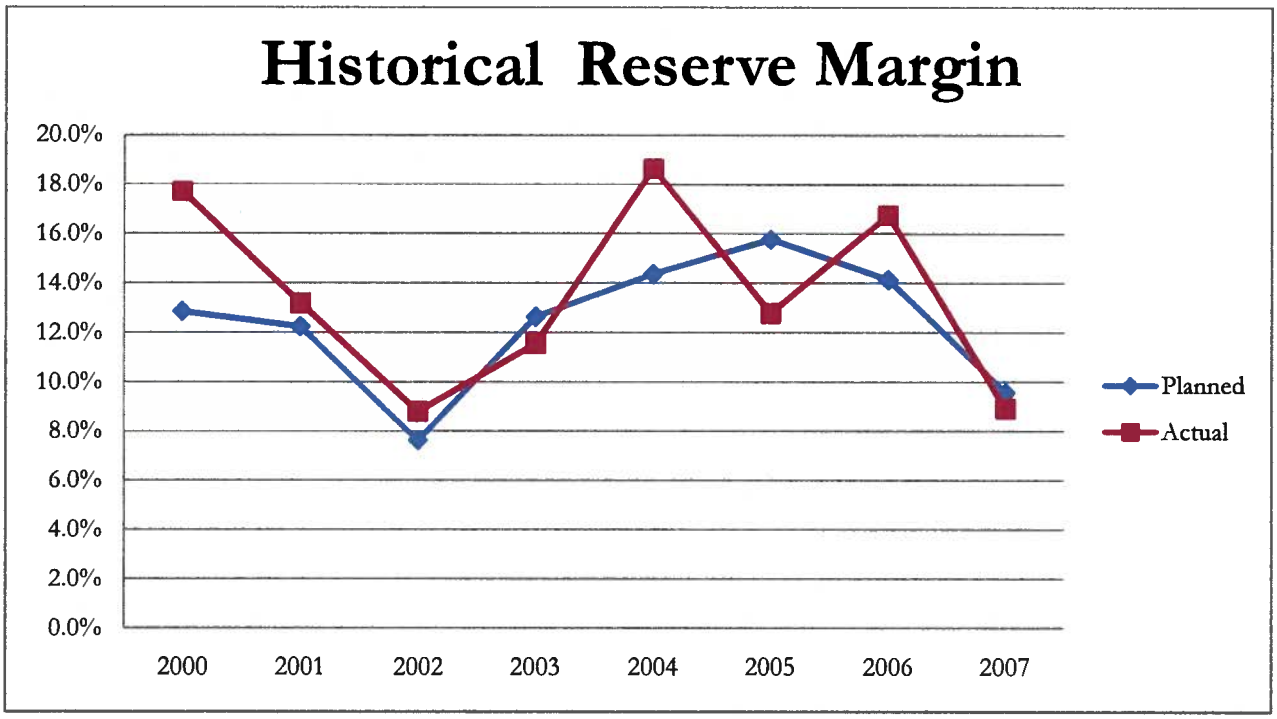
The EPA analyzed ten different scenarios in its March 2008 study of Lieberman-Warner in an attempt to evaluate a range of assumptions and key parameters. The use of ten different scenarios shows just how uncertain even the most educated environmentalists and economists are regarding the impact and results of such legislation.

Some of the inferences in the EPA scenarios used to evaluate Lieberman-Warner included very optimistic electricity sector modeling, including one model in which it is predicted that fossil fuel usage will peak in 2010 with a slow rate of decline to 2050 and that nuclear power would grow by 150% from 2005 levels by 2050. This optimistic scenario additionally relies on assumptions regarding the development of enabling technologies such as carbon capture and storage. Even operating under these assumptions, the EPA estimated that under the Lieberman-Warner bill the nation would face a dramatic reversal in its economy, thus causing between a 2.4% to 6.9% decrease in the projected 215% increase in GDP and consumption

from 2007 to 2050. This study was completed in March 2008, prior to the current economic recession; a similar study conducted today would almost certainly yield an even greater decline in productivity.

In an independent study of Lieberman-Warner, conducted by Dr. Anne E. Smith of CRA International, the annual redistribution of wealth caused by the Lieberman-Warner legislation would have been somewhere between $150 and $500 billion. This amount is on par with the total annual budget of the U.S. Defense Department, or about half of our total Social Security payout each year. Dr. Smith further asserts that under an ideal scenario of technological progression, natural gas prices, and available cap offsets, the increased costs per ton of carbon under the Lieberman-Warner plan would have been approximately $35 by 2015 and $150 by 2050. Under a less-than-ideal scenario, increased costs per ton of carbon dioxide could be as high as $50 in 2015 and $350 in 2050. These increased costs of emitting carbon dioxide would translate under the ideal scenario into a 35% increase of wholesale electricity prices nationwide by 2015 and an 85% increase by 2050. Under the less-than-ideal scenario, wholesale electricity prices could be 70% higher by 2015 and 125% higher by 2050. In states such as South Carolina where there is a greater consumption of coal in generation, these figures would be even higher. The Electric Power Research Institute (EPRI) estimates that under the ideal scenario of technological development, electricity costs could increase by 45% from current levels by 2050; under the less-than-ideal scenario, electricity could cost 260% more than what it costs today by 2050.

Appendix E: *Historical Reserve Margin*



These numbers are a statewide aggregate and represent information available from the electric generating companies serving South Carolina.

Appendix F: *South Carolina Governmental Programs, Agencies and/or Committees Currently Available to Coordinate or Guide South Carolina into Carbon-constrained Economy*

The ECSC indicated that several groups need to guide South Carolina into a carbon-constrained society. The South Carolina General Assembly will need to have effective oversight and support research for South Carolina-based solutions. The Public Service Commission needs to support conservation and renewables through cost recovery by regulated utilities. Finally, the regulatory and executive agencies will need to provide expertise as to reliability, affordability, and responsibility in regard to changes.

The Coastal Conservation League states that South Carolina "should adopt a comprehensive and pragmatic vision for South Carolina's energy future that avoids ideological positions and evaluates options objectively and rigorously."

Below is a list of programs, agencies, and committees in South Carolina that are currently available to coordinate/guide South Carolina into carbon-constrained economy.

Association of South Carolina Energy Managers (ASCEM)
ASCEM provides information to members to foster a common energy management program for South Carolina and consolidates experience, knowledge, and interest in the field of energy management. This association also disseminates information, shares strategies for financing, and implements energy efficiency projects.

Low-Income Home Energy Assistance Program (LIHEAP)
LIHEAP assists qualified households with utility bills. This program is administered by the Governor's Office of Economic Opportunity in coordination with the community action agencies.

Natural Gas Exploration Study Committee
This study committee was created to examine the feasibility of natural gas exploration in the Atlantic Ocean off the coast of South Carolina.

Palmetto Clean Energy (PaCE)
PaCE provides state-regulated electric utility customers the option to voluntarily support the development of renewable energy resources such as wind, solar, hydroelectric, and biomass. If a customer of a state-regulated electric utility chooses to participate in the program, the customer can subscribe with the utility and the utility will collect the customer's contribution. The utility will then remit all such funds to Palmetto Clean Energy, Inc., a 501(c)(3) organization. Customer contributions are tax deductible. PaCE's governing board is composed of the three major South Carolina investor-owned electric utilities, the South Carolina Office of Regulatory Staff, and the South Carolina State Energy Office.

Palmetto State Clean Fuels Coalition (PSCFC)
The PSCFC is part of the Clean Cities program and is one of 88 designated coalitions in the United States. Clean Cities is a grassroots, locally based, voluntary public/private partnership coordinated by the U.S. Department of Energy (DOE), which expands the use of alternatives to gasoline and diesel fuel. The goal of the Clean Cities program is to promote energy use in the transportation sector that is clean, safe, sustainable, and less dependent upon foreign sources.

Public Service Commission of South Carolina (PSC)
PSC's principal duty is to hear cases involving the State's regulated utilities. The PSC has broad jurisdiction over matters pertaining to investor-owned electric and gas utility companies, water/wastewater companies, telecommunications companies, motor carriers of household goods, hazardous waste disposal, and taxicabs. The South Carolina Office of Regulatory Staff is a party to all matters before the PSC.

South Carolina Energy Services Coalition (ESC)
The South Carolina Chapter of the ESC is a group of energy experts working together at the state and local levels to increase energy efficiency and building upgrades through energy savings performance contracting. Formed in August 2008 by the South Carolina Energy Office, the South Carolina Chapter of the ESC has members representing energy services companies, investor-owned utilities, state government, and energy consulting organizations.

South Carolina Environmental Excellence Program (SCEEP)
SCEEP is a voluntary program for companies committed to continuous environmental improvement to protect and preserve South Carolina's environment.

South Carolina Biomass Council
The South Carolina Biomass Council was created in April 2006 to develop and promote implementation of a long-term strategy for biomass energy in the State. The council has compiled a set of policy recommendations intended to enhance biomass-to-energy opportunities, demonstration projects, grants, and research. The South Carolina Biomass Council is a broad-based, diverse coalition of stakeholders ranging from government entities to private industry.

South Carolina Department of Health and Environmental Control (DHEC)
DHEC's Office of Environmental Quality Control (EQC) is the environmental regulatory division. EQC is responsible for the enforcement of federal and state environmental laws and regulations as well as issuing permits, licenses, and certifications for activities that may affect the environment. EQC is composed of four program areas:

Bureau of Water
Bureau of Air Quality
Bureau of Environmental Services
Bureau of Land and Waste Management

South Carolina Energy Office (SCEO)
The SCEO, designated as a unit within the State Budget and Control Board by the South Carolina Energy Conservation and Efficiency Act to promote implementation of state energy policy, performs a broad range of activities to help citizens, businesses, and public entities save energy and money through conservation and efficiency, greater diversity of energy resources, better information, and enhanced environmental quality. Since 1995, the SCEO has helped save State citizens more than $250 million through public and private energy-saving measures and new energy technologies. The SCEO also promotes the use of renewable energies and sustainable development practices throughout the State and educates residential builders, inspectors, home owners, and renters about building practices and behavioral changes leading to

greater energy efficiency, in addition to providing data and policy assistance to policy makers and the public. Among its activities are the staffing and coordination of affiliated organizations, several of which were created by the SCEO.

South Carolina Governor's Nuclear Advisory Council

The Governor's Nuclear Advisory Council is charged with advising the Governor on numerous issues pertaining to the nuclear industry in South Carolina, including the U.S. Department of Energy Savannah River Site, the Atlantic Interstate Low-Level Radioactive Waste Management Compact, the Barnwell commercial low-level radioactive waste disposal facility, and others.

South Carolina Institute for Energy Studies (SCIES)

SCIES is a state-chartered research and development organization established in 1981 and is housed at Clemson University. Its mission is to promote energy research and development in and for the State, transfer energy technology developed by others to South Carolina applications, contribute to national energy issues in areas of excellence, and promote statewide energy education activities. To accomplish its mission, SCIES interacts with all departments at all colleges in South Carolina, State and federal agencies, and private industry throughout the nation.

South Carolina Office of Regulatory Staff (ORS)

ORS is a state agency whose mission is to represent the public interest in utility regulation for the major utility industries – electric, natural gas, telecommunications, and water/wastewater – before the PSC of South Carolina, the court system, the South Carolina General Assembly, and federal regulatory bodies. ORS also has responsibility for oversight of transportation, railroad, and natural gas pipeline safety in South Carolina. In fulfilling its mission, ORS strives to balance the concerns of the using and consuming public, the financial integrity of public utilities and the economic development of South Carolina. For fiscal year 2007-2008, ORS generated a savings to customers of more than $118 million.

South Carolina Sea Grant Consortium

The South Carolina Sea Grant Consortium is a state agency that, through research, education, extension and training, enhances economic opportunities and conservation of coastal and marine resources for South Carolina citizens.

South Carolina Solar Council

The purpose of the South Carolina Solar Council is to promote wide utilization of solar energy through such means as providing solar energy education, promoting the application of solar energy technologies and acting as a solar energy technologies expert resource for the people of South Carolina, thereby increasing public awareness of solar technologies and ensuring their proper application. Additionally, the organization advocates for net metering and state policies that benefit solar technologies.

State Regulation of Public Utilities Review Committee (PURC)

PURC is responsible for nominating candidates for the Executive Director of ORS and each seat on the PSC. PURC also conducts an annual performance review of each member of the Commission and the actions of the Commission. Additionally, PURC conducts an annual performance review of the Executive Director of ORS and an evaluation of the performance of ORS. Among other duties, PURC assists in developing an annual workshop of at least six contact hours concerning ethics and the Administrative Procedures Act for the Commissioners and employees of PSC and the Executive Director and employees of ORS. PURC is also responsible for screening candidates for appointment to the South Carolina Public Service Authority Board of Directors.

U.S. Green Building Council, South Carolina Chapter (USGBC SC)
USGBC SC is the only statewide organization supporting energy, water, and other resource conservation through the design and construction of high performance buildings. It supports Leadership in Energy and Environmental Design (LEED) education and certification programs, which is significant because new or substantially renovated state buildings are now required to meet LEED or equivalent standards.

Weatherization Assistance Program (WAP)
This program provides home weatherization assistance for low-income families, particularly for the elderly, people with disabilities, and children, by improving the energy efficiency of their homes. WAP is coordinated through eight community action agencies responsible for each of the State's 46 counties.

Wind Energy Production Farms Study Committee
This study committee was created to determine the feasibility of establishing wind energy production farms in South Carolina. This study committee is to report its findings and recommendations to the General Assembly by January 2010.

Appendix G: *La Capra Study*

http://www.energy.sc.gov/publications/Renewables%20Potential%20Final%20Report%20-09-12-2007-B.ppt

Appendix H: *Executive Summary of the South Carolina Climate, Energy and Commerce Committee Report*

http://www.scclimatechange.us/ewebeditpro/items/O60F19041.pdf