2013
SUSTAINABLE ENERGY PLAN
FOR THE MIDLANDS REGION

Contents

Executive Summary

The Lexington County Administration Building was one of the County buildings retrofitted with EECBG Program funds. The projects included the instillation of an Energy Management System (EMS), replaced two HVAC units, and replaced parking lot lighting with energy efficient lamp fixtures. A summary performed September 30, 2011 estimated that since the completion of the upgrades, the Administration Building may save approximately 38, 212 KWh for an annual estimated savings of $13, 980.

The Richland County Administration Building was one of the buildings retrofitted with EECBG funds. Richland County switched T12s to T8 flourescent bulbs, installed motion sensors throughout building, installed LED exit signs, upgraded garage lighting from 250W high pressure sodium lights to 2 lamp 56W florescent lights, installed efficient lighting in parking lot from 400W high pressure sodium lights to 100W induction lights. In the last 9 months the county has seen a savings of 532,500kWh resulting in $38,000 in savings to date.

The City of Columbia changed the 175 watt metal halide fixtures in three of its smallest garages with high efficiency 64 watt 2-lamp fluorescent fixtures. In the 18 months since the last install, the lighting upgrades saved 600,945 kwh of electricity and $40,000. This amounts to a monthly savings of 3,338 kwh and $2,222.

Executive Summary

In 2009, the Department of Energy awarded Lexington and Richland Counties and the City of Columbia in the Central Midlands of South Carolina with Energy Efficiency and Conservation Block Grant (EECBG) funds. Lexington and Richland Counties discussed using these funds from their EECBG allocations to create a Regional Sustainability Plan that would be used as a guide in tackling sustainability issues that affect the Central Midlands Region. The Counties brought the City of Columbia into the discussions, but the City opted out financially, choosing to spend their EECBG funds on other projects.

A partnership was formed between the two Counties each of whom allocated $100,000 to launch a new sustainability effort for the entire Central Midlands Region. The Counties contracted with the Central Midlands Council of Governments to coordinate the project. Because more could be accomplished through a concerted effort, the City of Columbia was asked to assist with this process bringing with them valued experience in sustainability areas. The result was the Sustainable Energy Plan for the Central Midlands Region, South Carolina's first plan to focus on regional sustainability.

There were three motivators for the development of this plan: improving energy efficiency in the region, promoting energy independence, and protecting local air quality. First, energy efficiency is economic efficiency – getting the same amount of output from less energy input – with gains that permeate throughout the economy. Businesses are more profitable because their costs are lower, households have more money to spend on other priorities, and local governments can provide the same level of service without raising taxes to make up for projected budget shortfalls. Second, energy independence and security are additional motivators that resonate within the Central Midlands. Every dollar of fossil fuel consumption in the State necessarily includes a transfer of wealth out of the State to the owner of that resource stock, which may be an unfriendly foreign regime in the case of petroleum. Finally, local air quality is a motivator because it directly contributes to public health problems (e.g. cardiopulmonary problems like heart attacks, as well as respiratory conditions like asthma and bronchitis). According to EPA's local air quality monitors and regulations, much of the area can experience dangerously high concentrations of ground-level ozone. A nonattainment designation for failure to meet ground level ozone standards could have an unfavorable ripple effect on the Region's economy, with impacts on activities ranging from transportation planning to industrial recruitment and expansion. To address these motivating concerns the plan was broken into four areas: energy efficiency, decreasing demand through broader initiatives, alternative energy and green jobs.

The first area addressed in the plan provides local governments with specific policy recommendations and activities that could be implemented to improve energy efficiency. When looking for ways to conserve energy, the first place the local governments should look is in areas they have the greatest control, specifically their facilities and policies. South Carolina lacks a statewide energy efficiency resource standard, but even in the absence of a statewide standard, there are many actions available to the Central Midlands local governments to improve the energy efficiency of the built environment.

Regional policies such as actions on land use, transportation, procurement, waste management, and drinking/wastewater while still under local government control, require a level of regional cooperation to see significant energy efficiency. The plan focuses on reducing the region's energy footprint through areas over which local government possesses considerable control and expertise but looks at the cooperative nature of these activities. Unlike conventional energy efficiency, which is usually initiated by state-level policymakers and executed by utilities, issues such as transportation and land use, as well as drinking/wastewater, municipal solid waste, green purchasing, etc., are the traditional purview of local governments. Though proactive action on these issues may only affect energy use indirectly, these actions can be quite powerful and may require considerable political will.

Renewable energy can improve local air quality and energy security by offsetting the use of conventional energy sources and diversifying the energy portfolio. In addition, alternative energy development positively impacts the region's economic development by generating green collar jobs and keeping spending on energy within the region. The Central Midlands is blessed with a reasonably good endowment of renewable resources. Yet renewable energy projects are relatively rare. State-level energy policy has succeeded in keeping electricity prices relatively low, which presents a major challenge for competing renewable generation with slightly higher unit costs at current scales. However, state-level policy has also erected (perhaps inadvertently) other barriers to the success of alternative energy throughout South Carolina. Nonetheless, the state has succeeded in attracting some renewable energy technology manufacturers. A growing commitment to developing technical expertise within the State's higher education and other training institutions, relatively low property taxes, and a handful of tax incentives and other programs targeting alternative energy technologies have prompted some manufacturers of wind and solar energy system components to locate production facilities in the state. Yet, the State's generally favorable business climate could be improved for the alternative energy industry. Although local governments have limited influence over state-level policies aimed at creating demand for renewable energy development, there are many things they can do to improve the environment for small-scale, customer-sited renewable energy installations in the region. The region's local governments could take action like installing more

Energy Efficiency Recommendations Include:

- Implement city/county sustainability policy supported by volunteer Green Teams to promote energy efficient behavior among employees.
- Assess enforcement of the current energy building code.
- Launch an energy efficiency educational initiative.
- Conduct energy audits of county buildings.

Broader Initiative Recommendations Include:

- Facilitate the implementation of appropriate goals contained in COATS/COG plans.
- Pilot a new program economizing commute of government employees.
- Improve recycling rate by local governments, businesses, and residents.
- Evaluate "greenness" of land use with emphasis on public properties.

Renewable Energy Recommendations Include:

- Establish an Alternative Energy Task Force.
- Adopt favorable zoning and permitting requirements for alternative energy development.
- Launch alternative energy educational initiatives.
- Identify opportunities for Geothermal heat Pumps and industrial Combined Heat and Power.
- Support Reforms to State's Energy Policy

Green Job Recommendations Include:

- Develop a survey to better classify and enumerate the existing green and clean jobs to verify/quantify the number of jobs and identify what makes the region attractive for green business.
- Jointly prepare a Targeted Marketing Study focused on manufacturing facilities for renewable and alternative energy generators.
- Promote the technology/engineering design and planning industries for other alternative energy generation plants – advanced hydropower, biomass, solar, wind, geothermal, etc.

demonstration projects and improving local permitting requirements. By designing, developing, and launching a thoughtful, collaborative, regional effort, the three governments can achieve significant economies of scale and broaden their reach beyond what would be attainable on their own.

A key consideration of this plan is its potential effect on the local economy. Economic development, particularly at the local level, is often measured in terms of new jobs – a measure of economic opportunities created for individuals. If local governments are successful in their efforts to reduce the energy footprints of Richland and Lexington Counties, then some green jobs will surely be created, but other economic activity might get curtailed. Likewise, the alternative to implementing a sustainable energy plan may also cause some jobs to be created and others to be lost. On balance, pursuing energy sustainability produces greater net benefits for a local economy than the alternative.

1.0 Introduction

Introduction

Background

In 2009, the Department of Energy awarded Lexington and Richland Counties and the City of Columbia in the Central Midlands of South Carolina with Energy Efficiency and Conservation Block Grant (EECBG) funds. Lexington and Richland Counties discussed using these funds from their EECBG allocations to create a Regional Sustainability Plan that would be used as a guide in tackling sustainability issues that affect the Central Midlands Region. The Counties brought the City of Columbia into the discussions, but the City opted out financially, choosing to spend their EECBG funds on other projects.

A partnership was formed between the two Counties who each allocated $100,000 to launch a new sustainability effort for the entire Central Midlands Region. The Counties contracted with the Central Midlands Council of Governments to coordinate the project. Because more could be accomplished through a concerted effort, the City of Columbia was asked to assist with this process bringing with them valued experience in sustainability areas. The result was the Central Midlands Regional Sustainability Plan, South Carolina's first plan to focus on regional sustainability.

At the start of this process, Lexington and Richland Counties had limited sustainability efforts outside of the EECBG funded projects while the City of Columbia has maintained a sustainability program for ___years. It is the intention of each partner in this project to collectively grow sustainability efforts within the Central Midlands Region as well as individually within the operations of Lexington and Richland Counties and the City of Columbia.

The EECBG funds served as a catalyst for the Regional Sustainability Plan, but also kick-started sustainability programs for Lexington and Richland Counties and generated a boost to the City of Columbia's ongoing sustainability efforts.

Upon being award $2.2 million in from the Department of Energy, Lexington County formed a committee of County employees to identify options to best use EECBG program funds. The committee included staff from Building Services, Community Development, Public Works, Finance, and County Administration. They identified upgrades and retrofits for County facilities to improve energy efficiency. The upgrades included the replacement of antiquated HVAC's with new energy efficient systems, the installation of new windows, the replacement of old lighting (interior and exterior) with energy efficient fixtures, the installation of energy management systems and waste oil heaters, bay door replacements, insulation of ceilings, and the installation of infrared heaters. There were 15 physical projects in the County encompassing 42 buildings with the combined squared footage of 396,670 that received energy retrofits and upgrades.

Aside from the physical energy retrofits, the County allocated some of its EECBG dollars to partner with Richland County in an effort to increase awareness of energy efficiency and sustainability. Together the Counties participate in the annual Lawn Mower Exchange Program and have committed to the creation of a Regional Sustainability Plan.

County staff also met with representatives of Richland County and the City of Columbia to explore ongoing efforts toward regional energy efficiency and conservation initiatives.

Richland County chose to use their $2.1 million in EECBG funds for internal and external projects. Internally, the County upgraded two facilities with energy efficient lighting, purchased an energy efficient chiller, installed a hot water heater to reduce the use of a boiler in the summer months as well as purchased eight hybrid vehicles for the fleet. Externally, Richland awarded funds to four municipalities within the County for energy efficiency, sidewalk and recycling projects; the Regional Sustainability Plan; public awareness programs for energy efficient light bulbs and electric mowers; and a solar project for a local hospital.

Having already completed an energy audit of City facilities, the City of Columbia used the bulk of their $1,424,100 EECBG direct funding to implement recommended lighting system improvements. These improvements provided the City with a high quality visual environment that is energy efficient, low maintenance and cost effective. The improvements are estimated to save the City almost $200,000 a year in energy savings. The City also allocated $100,000 of the funding to pilot their Green Building Incentive Program, which incentives to those who construct buildings to green building program standards within the City limits.

Shortly after the CMCOG signed the contract with Richland and Lexington Counties, a Core Committee was formed with the following members:

- Synithia Williams (Lexington County)
- Ron Scott (Lexington County)
- Peatra Cruz (Lexington County)
- Anna Lange (Richland County)
- Mary Pat Baldauf (City of Columbia)

The Core Committee's main responsibility was to steer the development of the Plan, ensuring that it met the needs of each jurisdiction's EECBG requirements. With the participating of Richland County, Lexington County and the City of Columbia, the Core Committee decided for the sake of this document to describe the study are of the two counties as the "Central Midlands" region.

With the Core Committee's guidance and consent, CMCOG then selected a consulting team of technical experts: The Cadmus Group, Inc. (Cadmus) as prime contractor, with Genesis Consulting and ADCO as subcontractors. Once the Counties had reviewed and approved the scope of work, they signed a contract between Cadmus and the CMCOG. This report represents the culmination of that work.

Motivating Concerns

Economic: Efficiency and Development

Energy efficiency is economic efficiency – getting the same amount of output from less energy input – with gains that permeate throughout the economy:

businesses are more profitable because their costs are lower, households have more money to spend on other priorities, and local governments can provide the same level of service without raising taxes to make up for projected budget shortfalls. Hence, energy efficiency is a major focus that motivates this Sustainable Energy Plan.

Although economic development is indirectly affected by energy efficiency via cost-competitiveness, a Sustainable Energy Plan can also have direct effects on economic development. The green economy will be increasingly important in the future; even if it is not ushered in by national policies with or without environmental aims, consumers increasingly demand to devote resources to that sector. The region would be wise to angle for a niche at the forefront of that curve of innovation rather than lag behind it.

A Sustainable Energy Plan may directly advance local firms competing in the green sector (e.g., alternative energy generators). Broader economic development can also indirectly benefit from a Sustainable Energy Plan because firms are operated by individuals who want to locate in areas boasting amenities that provide a high quality of life, such as having cleaner air. With a sluggish recovery, including unemployment at levels close to those in early 2009, economic development is a chief consideration for this Sustainable Energy Plan.

Political: Energy Independence and Security

Energy independence and security are additional motivators that resonate within the local culture. South Carolina values its political independence as much as, if not more than, any other state. However, the State has not been endowed with a large number of traditional energy resources. Coal is imported from the mines of Appalachia and Wyoming, oil comes from even further abroad, and natural gas will increasingly come from the neighboring states with richer shale formations. Hence, every dollar of fossil fuel consumption in the State necessarily includes a transfer of wealth out of the State to the owner of that resource stock, which may be an unfriendly foreign regime in the case of petroleum.

With 51.1% of the State's electric power generated by nuclear power plants, it may appear that the State has achieved a greater degree of energy independence than most states. However, the uranium used by these nuclear power plants is imported. Moreover, even though many local residents tend to hold relatively accepting views of nuclear power, nuclear power plants remain a non-trivial risk to security and safety.

In contrast, renewable energy is far less threatening and entirely home-grown. Despite South Carolina's noteworthy renewable resources, only large-scale hydropower has been pursued to its full potential (i.e. hydroelectric projects account for most of the 4% of electric power generated statewide from renewable sources). Other renewable resources, such as solar and biofuels, are only now beginning to receive serious consideration. Further, potential gains in energy efficiency remain relatively untapped in the state. Tapping into that potential offers an additional significant upside for local economic and environmental sustainability. A Sustainable Energy Plan based on a comprehensive assessment of potential, constraints, and priorities could make a difference to the deployment of the area's alternative resources in a way that makes the most sense from a broad regional perspective.

Environmental Health: Local Air Quality

EPA regulates local air quality because it directly contributes to public health problems (e.g. cardiopulmonary problems like heart attacks, as well as respiratory conditions like asthma and bronchitis). According to the South Carolina Department of Health and Environmental Control local air quality monitors, much of the area can experience dangerously high concentrations of ground-level ozone based on EPA standards. Of the three air quality monitors in the area, displayed in Table 1, the Parklane and Sandhill monitors have a history of exceeding EPA's current standard of 0.075 ppm.[1] To date, both Richland and Lexington Counties have avoided being designated as nonattainment counties, but EPA is expected to tighten that standard in 2013 to a threshold closer to 0.06 ppm. The resulting nonattainment designation could have an unfavorable ripple effect on the Region's economy, with impacts on activities ranging from transportation planning to industrial recruitment and expansion.

Table 1. Summary of 2011 Air Quality Monitor Data for Area

Richland County	Monitoring Site		
	Congaree Bluff	Parklane	Sandhill
Total Hits *	0	6	8
1st 8-hour Average	0.066 ppm (June 15)	0.079 ppm (June 7)	0.085 ppm (June 7)
2nd 8-hour Average	0.062 ppm (June 30)	0.079 ppm (Sept. 2)	0.082 ppm (June 17)
3rd 8-hour Average	0.062 ppm (August 2)	0.078 ppm (June 4)	0.082 ppm (June 27)
4th 8-hour Average	0.062 ppm (August 4)	0.077 ppm (June 9	0.081 ppm (Sept. 2
5th 8-hour Average	0.061 ppm (Sept. 17 14)	0.077 ppm (June 15)	0.078 ppm (June 9)

*A hit is an occurence of an 8 hour average above the threshold of 0.075 ppm.

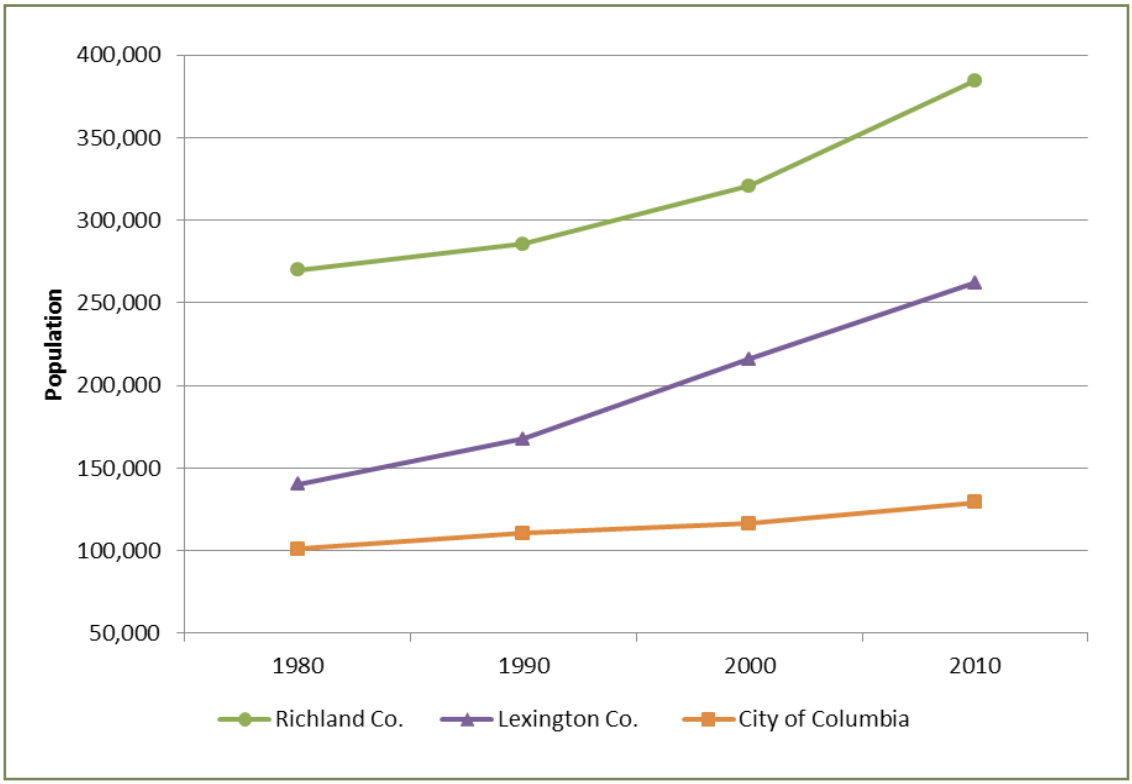
Growth and Development Trends

Population

From 1980 to 2010, the combined population of Richland County and Lexington County increased from 410,088 to 646,895, a change of 58% over the level in 1980 (see **Figure 1**). During that period, Lexington County grew by 87% while Richland County grew by 43%. By 2035, the combined population has been projected to grow to 878,597.[2] Population growth of the Metropolitan Statistical Area (MSA) from 1990 to 2000 resulted in the expansion from two counties to six counties.

1. EPA uses the most current three-year average to make a determination on a county's attainment designation.
2. Regional Population Projections, 2005-2035 Central Midlands COG, 2008.

Figure 1. 20 Growth of Area's Population over Decades



Employment

Unemployment remains a major concern in Richland and Lexington Counties, particularly since 2009. Even though recovery from the financial crisis remains sluggish, employment is more stable in these counties than much of the remainder of the state due to the strategic location of these counties. Richland and Lexington Counties benefit from their proximity to the state capital, the state's largest university, and multiple military installations.[3] In 2009, there were 21,088 State government jobs in Richland County, making it one of the largest employers in the County. By contrast, Lexington County only had 1,942 State government jobs in 2009; however, because Lexington is far less populous, State government is still one of the top employers in the County. However, these dominant employers are not in growth industries – government budget shortfalls (at all levels) do not bode well for job growth in the area.

The other top employers, as listed in **Table 2,** were in the Education and Health Care sectors. When grouped by NAICS Code as listed in **Table 3**, health care and social services was the top industry for the two Counties with 38,538 employees, followed closely by retail trade at 34,082 employees. Identifying the industries with the largest employee base is a first step towards developing opportunities to promote proactive changes in behavior.

3. Fort Jackson is an Army post in Richland County as is McEntire Joint Air National Guard Station. The McCrady Training Center is located on the Fort Jackson property; and Shaw Air Force Base is located in Sumter County, adjacent to Richland County.

Table 2. Major Employers 2008

Richland County	Lexington County
State Government	Lexington Medical Center
Palmetto Health	Lexington County School District 1
Richland County School District 1	Lexington County School District 5
Richland County School District 2	Michelin Tire Corp
Westinghouse	State Government
CSC Corporation	Solectron
Bose Corp	CallTech
International Paper	Cooper Tools
Square D	Union Switch & Signal
FN Manufacturing	
The State - Record Co	

Table 3. Major Industries in Richland and Lexington Counties

Industry Code	Industry Code Description	Combined # of Employees
62	Health care and social assistance	38,538
44	Retail trade	34,082
72	Accommodation and food services	28,813
31	Manufacturing	25,873
52	Finance and insurance	20,601
56	Waste management and remediation services	18,569
54	Professional, scientific, and technical services	15,483
81	Other services (except public administration)	13,539
42	Wholesale trade	13,369
23	Construction	13,115
48	Transportation and warehousing	7,381
51	Information	6,932
61	Educational services	4,783
53	Real estate and rental and leasing	4,582
55	Management of companies and enterprises	3,265
71	Arts, entertainment, and recreation	2,649
11	Forestry, fishing, hunting, and agriculture support	297
21	Mining, quarrying, and oil and gas extraction	242
Total for listed sectors		**252,113**

Approach

In order to proceed, CMCOG and the Cadmus team needed to engage the local jurisdictions: Lexington County, Richland County, and the City of Columbia. Their goals were solidified during a large kick-off meeting that included the Administrators of Richland and Lexington Counties and the City Manager for the City of Columbia, as well as many department heads from each of the three local jurisdictions. After some discussion, the group's consensus was that the Plan should serve two functions:

- The Plan should provide specific direction to participating local governments on policies and activities that each government could implement to help reduce their dependence on non-renewable energy sources. Particular consideration should be given to those policies and activities that could be achieved cooperatively at the regional level, since those would achieve the greatest economies of scale, while providing the best opportunity to improve the pressing issue of local air quality.
- The Plan should provide a variety of recommendations that businesses and residents could implement to save money on energy, while promoting green economic development. To facilitate private citizens making more sustainable energy choices at an individual level, and to support moving to a greener economy, the Plan should provide guidance on developing accessible education resources on the available alternatives and how to adopt them.

Given these functions that the Plan should serve, as well as the motivating issues and the constraints facing the Region's local governments, the following goals for the next 5 years have been proposed:

- Maintain current attainment status for ground level ozone and meet future air quality requirements.
- Increase the number of alternative energy demonstration projects by an average of 3 per year.
- Decrease the participating governments total energy usage by 10% relative to a baseline of the usage in 2011.
- Decrease the total energy usage of non-governmental entities by 1% relative to a baseline of the usage in 2011.
- Increase the number of green jobs by an average of 1,500 per year.

Public Participation Plan

The Core Committee asserted that involving the public was critical to the success of the Plan, both for collecting information on energy issues in the Region and for gathering an understanding of the desired outcomes of various stakeholders. These purposes were accomplished with stakeholder interviews, followed by a series of staff meetings with involving department heads from each of the jurisdictions. The Core Committee determined that it was important to engage as stakeholders those with knowledge about alternative energy, including representatives from the business sector, utilities, special interest groups, and elected officials who make policy, as well as staff from the jurisdictions responsible for implementation.

Stakeholder Interviews

The Core Committee, along with representatives from the Cadmus consulting team, brainstormed a lengthy initial list of stakeholders, which was expanded as additional stakeholders were identified during the course of the project. In an effort to prioritize project resources, some stakeholders were congregated into focus groups, while others were selected for one-on-one interviews conducted by a combination of Cadmus and ADCO staff.

To ensure that relevant information was collected, the Cadmus consulting team developed a general interview instrument and augmented it with specific data requests for particular stakeholders. The interview instrument followed the basic structure of the project tasks:

- Background Information
- Existing Conditions
- Approaches to Energy Conservation
- Regional Goals and Constraints
- Green Jobs
- Implementation and Monitoring

The first set of focus groups were held in early December. The groups comprised of department heads from Richland County, Lexington County, and the City of Columbia. The attendees were grouped based on areas of responsibility so that staff from the three jurisdictions with similar responsibilities met together. Prior to the group meetings, members of the Cadmus consulting team attended a staff meeting at each of the three jurisdictions to brief the department heads on the status of the Plan and prepare them for the group focus meetings that followed.

Continued Public Involvement

Several of the recommendations in the Plan have a public education component. The public should be educated in what sustainability is, including how it applies to energy, with some focus on the subject areas in the report (e.g. alternative energy sources and energy efficiency). When the public is uninformed about the benefits of sustainable practices and their opportunities for implementation, this lack of knowledge can become a major obstacle to the adoption of sustainable energy practices.

Overview of the Sustainable Energy Plan

The Plan presented in this document assesses some of the impacts fossil fuels have on the Region and identifies alternatives that can be sustainably and cost-effectively deployed to help reduce the negative impacts of fossil fuels while fostering local economic stability and growth.

The next chapters review existing conditions, goals and constraints, approaches used in other states and regions, and recommendations for implementation in three organizational areas of sustainable energy:

- ***Decreasing Demand through Energy Efficiency and Conservation:*** programs, policies, and activities aimed at reducing the use of fossil fuels through conservation or by using technologies that reduce the overall requirement for energy inputs but are able to produce the same output.
- ***Indirectly Decreasing Demand through Broader Initiatives***: programs, policies, and activities that that address fossil fuel use from a broader perspective, such as implementing development restrictions that better accommodate alternative modes of transportation.
- ***Increasing Supply through Renewable Energy Generation***: programs, policies, and development activities associated with energy generation using renewable resources, such as solar or wind, to reduce the use of fossil fuels, such as coal and natural gas, and to offset growing energy demand.
- The Plan is not intended to be an exhaustive overview or a step-by-step plan of action, but it does provide a snap-shot of current conditions to contextualize the sustainability landscape and provides a broad strategic direction with some specifics.

2.0 Decreasing Demand Through Energy Efficiency and Conservation

Decreasing Demand through Energy Efficiency and Conservation

As the introduction indicated, one focus of this plan is to provide the local governments with specific policies and activities that could be implemented to improve energy efficiency. When looking for ways to conserve energy, the first place the local governments should look is in areas they have the greatest control, specifically their facilities and policies. This chapter will look at some of the policies and facilities in each of the participating governments and make recommendations that could improve energy efficiency.

Existing Conditions

South Carolina has abundant cost-effective energy-efficiency opportunities that the State could capitalize on without harming the economy.[1] Energy efficiency has the potential to provide South Carolina's Central Midlands with multiple short- and long-term economic and environmental benefits, including:

- Creating new jobs and green economic development opportunities
- Lowering consumer utility bills
- Mitigating air quality issues
- Increasing energy security and diversity
- Shoring up future demand needs with the lowest impact on energy costs

Although it has been hard hit by the economic downturn, the Central Midlands area has made a number of good investments to reduce the energy consumption of government buildings. For example, the Office of Economic Opportunity administers a statewide low-income weatherization program, and the State legislature is considering needed updates to the building code. Over time, these activities can help revitalize the economy. Yet, at present, South Carolina is ranked 37th out of all 50 states in the American Council for an Energy Efficient Economy's annual Energy Efficiency Scorecard.2 The Scorecard assesses energy-efficiency performance by examining six policy areas: utility and public benefits policies and programs, transportation policies, building energy code, use of combined heat and power (CHP), state government initiatives, and appliance efficiency standards.

Among energy experts, there is a clear consensus that energy efficiency is the least-cost way to address future energy challenges: it is far cheaper than expanding supply with renewable, nuclear, or conventional generation resources. In fact, energy experts sometimes cast energy efficiency as a supply-side resource that can be used to meet future demand. Mike Couick from Electric Cooperatives of South Carolina described the State as "*the Saudi Arabia of energy efficiency potential*" and said he'd like to "*drill down into it*" with energy-efficiency programs.

1. For a thorough assessment of the state's cost-effective energy-efficiency potential, completed in 2009, see: http://www.aceee.org/sites/default/files/publications/researchreports/E099.pdf
2. http://www.aceee.org/sites/default/files/publications/researchreports/E097.pdf

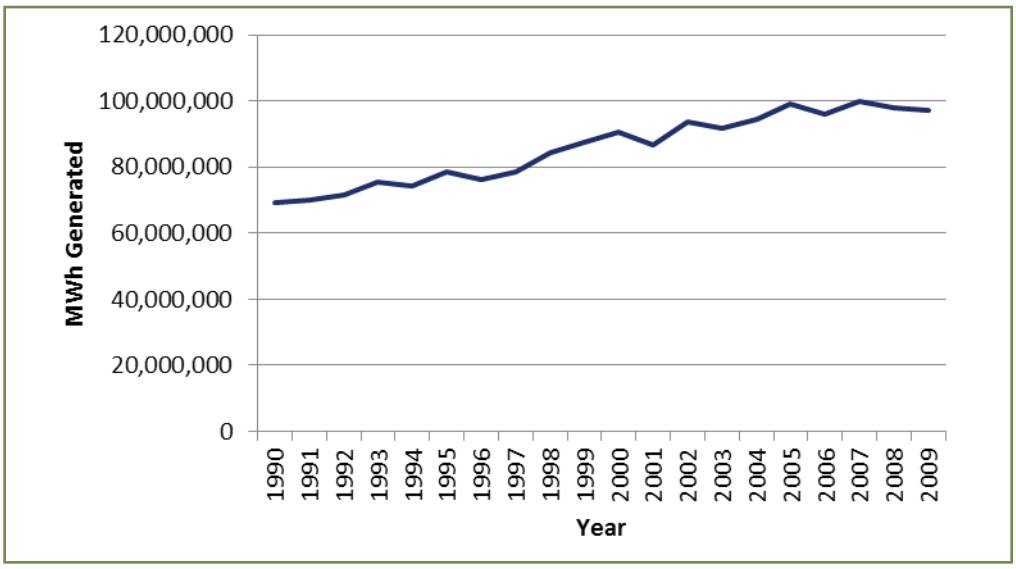
Every utility planner facing projected demand increases can choose to build a generation plant, requiring a significant capital investment and subsequent rate increases, or can offset demand growth by increasing energy efficiency, which requires only a modest rate increase to cover the investment in programs.

State policies that require utilities to undertake demand-side management (DSM) can be game-changers in the pursuit of energy efficiency. While the Central Midlands Region has very little control over statewide legislative activities, the Region can take some action to promote the energy efficiency of its building stock. The governments of the Central Midlands Region have already begun, and, in the absence of statewide policy, should continue to focus on local and regional initiatives to improve the efficiency of existing public and private buildings, as well as addressing new construction.

Supply Side Forecasts

Figure 2 shows the annual energy generated by all electric power utilities in South Carolina from 1990 through 2009. Electric power generation increased by an average of 2.1% per year until the financial crisis, which induced a flat line in energy consumption over the last several years.[3]

Figure 2. South Carolina Electric Utility Energy Generation 1990 Through 2009



The Central Midlands Region is served by multiple power utilities, including a large investor-owned utility SCE&G and several cooperative utilities: Mid Carolina Electric Cooperative, SCANA, Tri-County Electric Cooperative, Newberry Electric Cooperative, and Fairfield Electric Cooperative.4 The Central Electric Power Cooperative, Inc. (CEPCI) is a generation and transmission electric power cooperative that provides total wholesale electric service to all of South Carolina's 20 retail electric cooperatives.

SCE&G expects its energy sales to grow 1.5% per year over the next 15 years, which accounts for increases in efficiency as a result of its DSM programs and

3. Ibid.
4. SCE&G is the only gas utility in the Region.

federal codes.5 Because of the possibility that future federal regulations would make fossil fuel generation more expensive, they have mainly focused on adding more nuclear power plants for additional capacity. SCE&G and Santee Cooper together plan to construct two 1,117 MW nuclear power plants: the first will come online in 2016 and the second in 2019. Local utilities continue to consider other options as well, such as woody biomass, off-shore wind, and solar.6

The CEPCI purchases wholesale power from Santee Cooper and SCE&G, then sells it to the distribution cooperatives. CEPCI's energy sales grew at a faster pace than the State's as a whole—at 5% per year before 2007—but that growth flattened out with the recession.7 Had the recession not slowed the growth in demand, an additional 600 MW coal plant would have been needed by 2012. Instead, according to Mike Couick, this lull in demand has allowed utilities to "catch their breath" and re-examine their options. Energy-efficiency programs offer much promise. A study of energy-efficiency potential prepared for CEPCI estimated there could be 2,278 GWh of achievable, cost-effective savings potential by 2017 (11% of projected sales), assuming that 50% of CEPCI customers participate in energy-efficiency programs.8

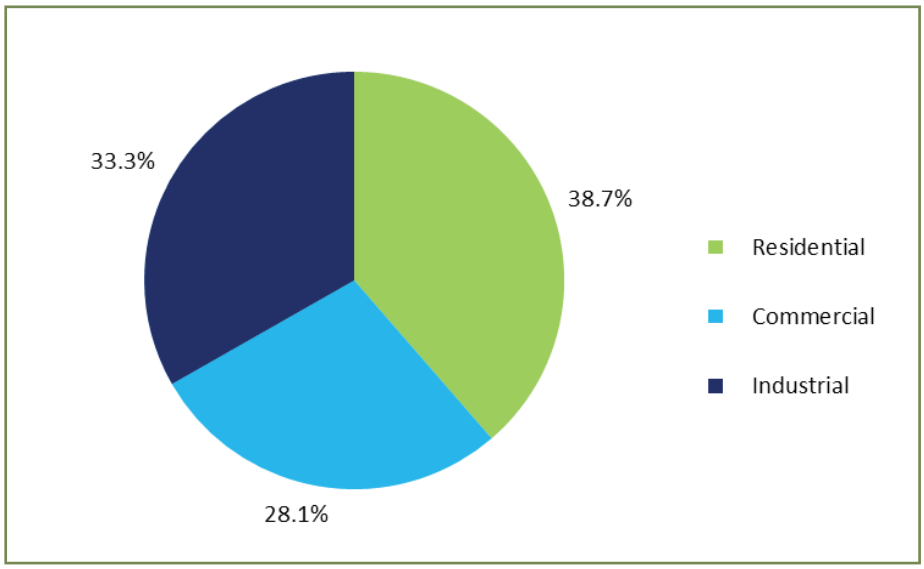
Inventory of Consumption Characteristics in the Midlands

In 2009, the total energy consumption in South Carolina was 76,417 GWh.[9] **Figure 3** shows the breakdown of consumption by sector. The residential sector consumed the largest share, at 38.7%. The industrial sector accounted for 33.3%, and the commercial sector consumed 28.1%.

SCE&G's 2011 consumption by sector is very similar to the statewide pattern in 2009: residential customers accounted for 35%, commercial customers accounted for 32%, industrial customers accounted for 26%, and other sectors (street lighting and other public uses) accounted for the remaining 7%.10 Although energy sales were roughly even across the major sectors, energy usage among customers in the different sectors varied considerably. Less than 1% of SCE&G's customers are industrial, but those industrial customers use much more energy than commercial customers. Likewise, the 14% of commercial sector customers tend to use more energy on average than the 86% of residential sector customers. In CEPCI's service area during 2006, residential customers accounted for 63% of sales, commercial customers accounted for 20%, and industrial customers accounted for 17%.[11]

5. SCE&G. 2011 Integrated Resource Plan. Accessed November 15, 2011. http://dms.psc.sc.gov/pdf/matters/8146F964-EB72-D70C-745E1E547F9E2612.pdf.
6. Ibid.
7. This information came from an interview with Mike Couick from Electric Cooperatives of South Carolina in November 2011.
8. GDS Associates, Inc. Electric Energy Efficiency Potential Study. Prepared for CEPCI. 2007.
9. U.S. Energy Information Administration. Table 8. Retail Sales, Revenue, and Average Retail Price by Sector, 1990-2009. Downloaded from http://www.eia.gov/cneaf/electricity/st_profiles/south_carolina.html.
10. SCE&G. 2011.
11. GDS Associates, 2007.

Figure 3. 2009 Energy Consumption in South Carolina by Sector



Residential Sector

Within SCE&G's territory, the residential sector is primarily comprised of single family homes (85%; see Table 4). The remaining 15% of customers live in manufactured homes (often referred to as mobile homes or trailers).[12] In the cooperatives' service territories, there is a greater prevalence of manufactured homes.

Table 4. SCE&G Residential Customers by Segm

Home Type	# of Customers	% of Customers
Single Family	464,769	85%
Manufactured	82,018	15%
Total	546,787	100%

Table 5 shows residential customer and appliance saturation data from a 2005 study of CEPCI customers in South Carolina. For any given appliance, customer saturation is the percentage of customers who had at least one, and appliance saturation is the total number of appliances divided by the total number of customers (thus accounting for customers who had more than one of that appliance). By knowing the appliance saturation rate, policies can be developed to help encourage more efficient models, particularly in categories with the highest saturation rate to have the biggest impact on energy efficiency. The majority of residential customers in the study had electric space heating (a category that includes heat pumps) and electric water heating. These findings are consistent with residential heating fuel saturation in SCE&G's territory, which was dominated by electric heat.

12. ICF International. DSM Potential Study. Prepared for SCE&G. September 30, 2009. http://www.psc.sc.gov/exparte/briefing2010aug18/Ex_Parte_Briefing_Materials_08-18-2010_13SCEG%20DSM%20Potential%20Study.pdf. Note that this report did not include the number of multifamily customers.

Table 5. 2005 CEPCI Residential Customer and Appliance Saturation Data

Equipment	Customer Saturation (%)	Appliance Saturation (%)
Space Heating and Cooling		
Space Heating Electric	71.5%	N/A
Space Heating Gas	17.3%	N/A
Room Air Conditioning	24.8%	35.3%
Central Air Conditioning Electric	86.5%	N/A
Central Air Conditioning Gas	8.7%	N/A
Water Heating		
Water Heating Electric	84.8%	91.5%
Water Heating Gas	15.2%	N/A
Household Appliances		
Clothes Dryer	91.9%	92.5%
Clothes Washer	96.9%	97.8%
Refrigerator	99%	123.6%
Freezer	58.2%	69.2%
Dehumidifier	7.7%	8.8%
Dishwasher	64.3%	65.0%
Pool Pump or Heater	37.7%	N/A

Source: GDS Associates, 2007

Commercial Sector

Within SCE&G's territory, the retail, office, education, and food service sectors, which account for 93% of commercial customers (see Table 6), account for 67.8% of commercial energy consumption. The end-uses with the highest energy consumption are lighting, cooling, and office equipment, which together account for 61% of commercial consumption.

Industrial Sector

The industries with the largest classifiable energy consumption in SCE&G's territory are chemicals and allied products, at 23%, and metals, machinery, and equipment, at 12%. (SCE&G's largest consumption category is classified as "Other" (defined by SIC Code 99: Nonclassifiable Establishments),[13] at 26%. The end-use that consumes the most energy is machine drives, estimated at 10% of the total consumption, followed by HVAC equipment at 6% and lighting at 5%.[14]

13. Nonclassifiable Establishments are facilities that cannot be classified in any other industry.

14. ICF International, 2009.

Table 6. SCE&G Commercial Customers and Energy Consumption by Segment

Segment	# of Customers	% of Customers	% of total MWh
Assembly	3,012	3.4%	5.1%
Big Box Retail/Warehouse	2,390	2.7%	5.9%
Food Service	29,238	32.1%	7.2%
Grocery	401	0.5%	4.4%
Large Office	295	0.3%	10%
Primary School/Education	4,583	5.2%	16.2%
Small Office	9,397	10.6%	6.6%
Small Retail	38,982	44.1%	27.8%
Total	88,298	100.0%	83.2%*

* Sectors not represented include: health care (5.0%), lodging (6.2%), and other (5.5%)

Source: ICF International, 2009

Condition of Public Building Stock

While Lexington and Richland Counties and the City of Columbia have begun to address energy waste in many of their buildings, county and city-owned buildings in the Central Midlands Region still offer significant potential to improve efficiency through upgrading equipment to higher efficiency levels. Cadmus conducted a desk-review of the energy usage of several buildings to provide an overview of opportunities. It should be noted, however, that the buildings represented in this study comprise a very small proportion of city and county-owned buildings.

Methodology

Lexington County, Richland County, and the City of Columbia submitted public building data to Cadmus on at least five representative buildings. Cadmus evaluated the completed and proposed capital improvements and considered possible future energy-efficiency upgrades. The data submitted included building characteristics, completed projects over the past five years, proposed projects, and billing data.

Using the billing data, Cadmus calculated the energy intensity of each of the buildings (kWh/sq.ft. for electricity and kBtu/sq.ft. for gas). Energy intensity gives a snapshot of a building's energy consumption and can be useful when considering the energy efficiency of a building benchmarked against other buildings with similar uses. However, energy intensity alone should not be used to evaluate a building, because it does not include important factors such as building type, occupancy, operating hours, and age.

Lexington County

Figure 4 shows the calculated electric energy intensities for five county buildings and Figure 5 shows the natural gas energy intensity for selected buildings that use gas. These energy intensity values are for November 2010 through October 2011.

Figure 4. Electric Energy Intensity for Selected Lexington County Facilities

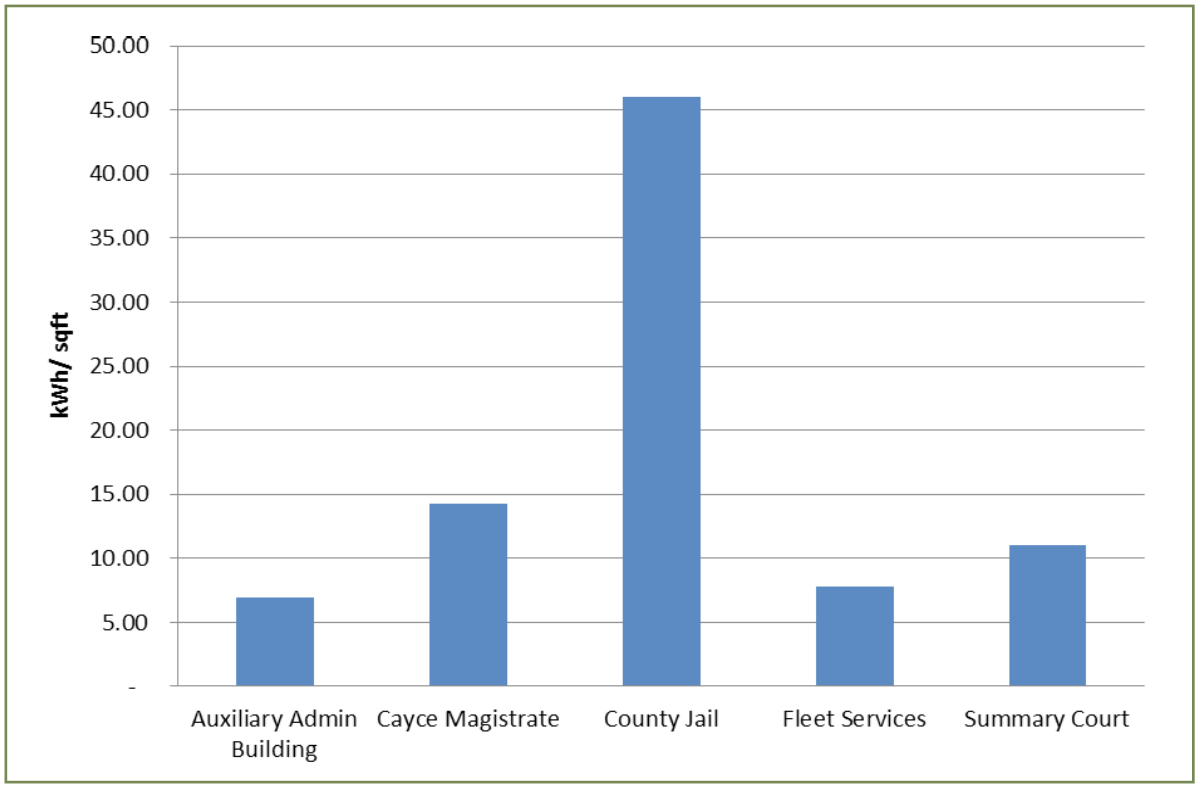
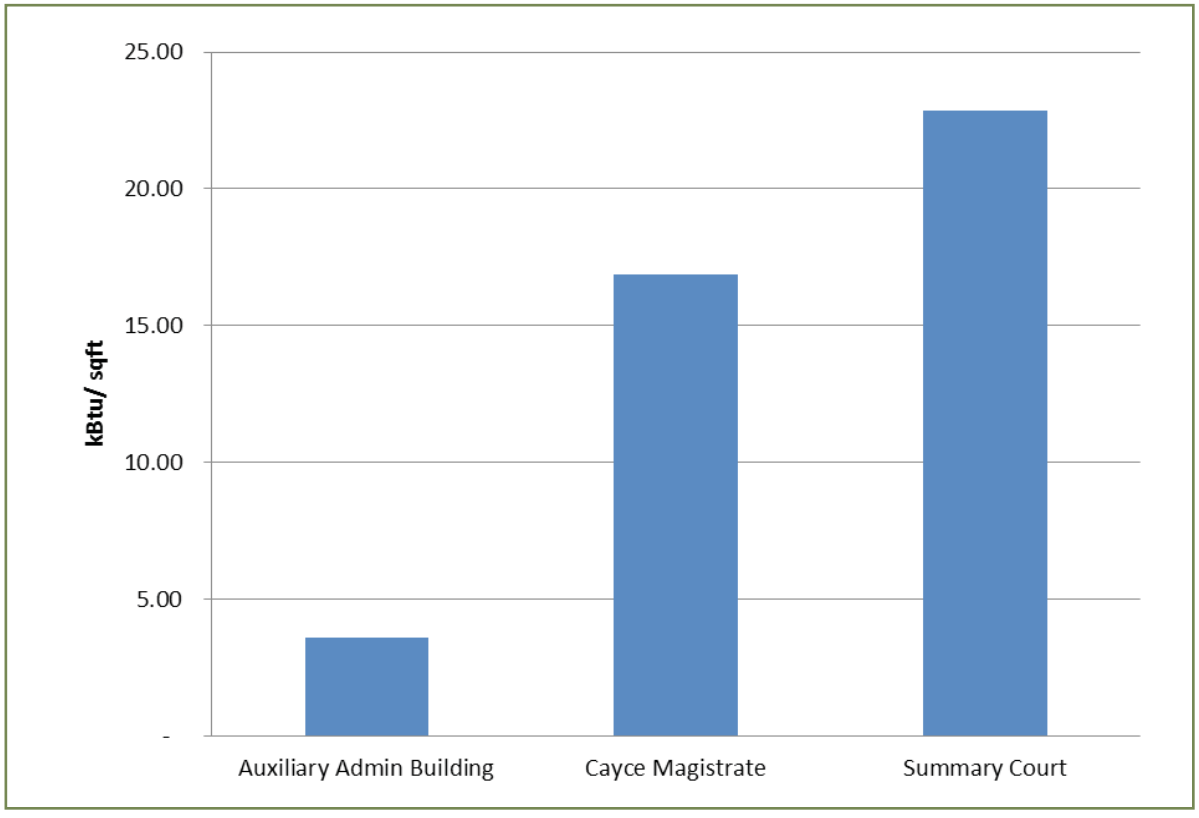


Figure 5. Natural Gas Intensity for Selected Lexington County Facilities



Administration Building

The Administration Building consists of six floors with 79,246 square feet of office space. It sits on approximately three acres of parking lot. The retrofit activity for the Administration Building which was completed the end of 2011 included the installation of an HVAC system on the 3rd floor, the replacement of old perimeter parking lot lamp fixtures, the connection of the entire perimeter parking lot lighting to the Energy Management System, and the replacement of old lamp fixtures in the underground parking area.

Auxiliary Administration Building

The Auxiliary Administration Building is a 25 year old, 50,327 square foot office building. Cadmus' analysis found that the electric energy intensity of the building was 6.9 kWh/sq.ft. and that the natural gas energy intensity was 3.57 kBtu/sq.ft. This facility underwent several energy-efficiency upgrades, including a parking lot lighting retrofit, an HVAC retrofit, and the installation of an energy management system. As illustrated in Figure 4 and Figure 5, it has the lowest electric and natural gas energy intensities of the five buildings analyzed. However, there are several additional measures that could further increase the efficiency of the Auxiliary Administration Building, including interior lighting upgrades, domestic water saving upgrades, and computer power management.

Cayce Magistrate Office

The Cayce Magistrate Office is a 36 year old, 5,930 square foot facility. The building's electric energy intensity was 14.3 kWh/sq.ft., which is 207% of the Auxiliary Administration Building's energy intensity and its natural gas energy intensity was 16.9 kBtu/sq.ft., which is 473% of the Auxiliary Administration Building. The Cayce Magistrate Office received an HVAC system retrofit with a new variable refrigerant system including fan coil units and piping and condensing units, while replacing the existing outdoor air system with a new dedicated air unit. The retrofit was completed in early 2012. No natural gas savings upgrades are scheduled at this time. There are strong potential natural gas savings opportunities for this facility that include space heating and domestic water heating upgrades. Additional potential measures that could increase the efficiency of the Cayce Magistrate Office include an interior lighting retrofit, domestic water saving upgrades, and computer power management.

Fleet Services

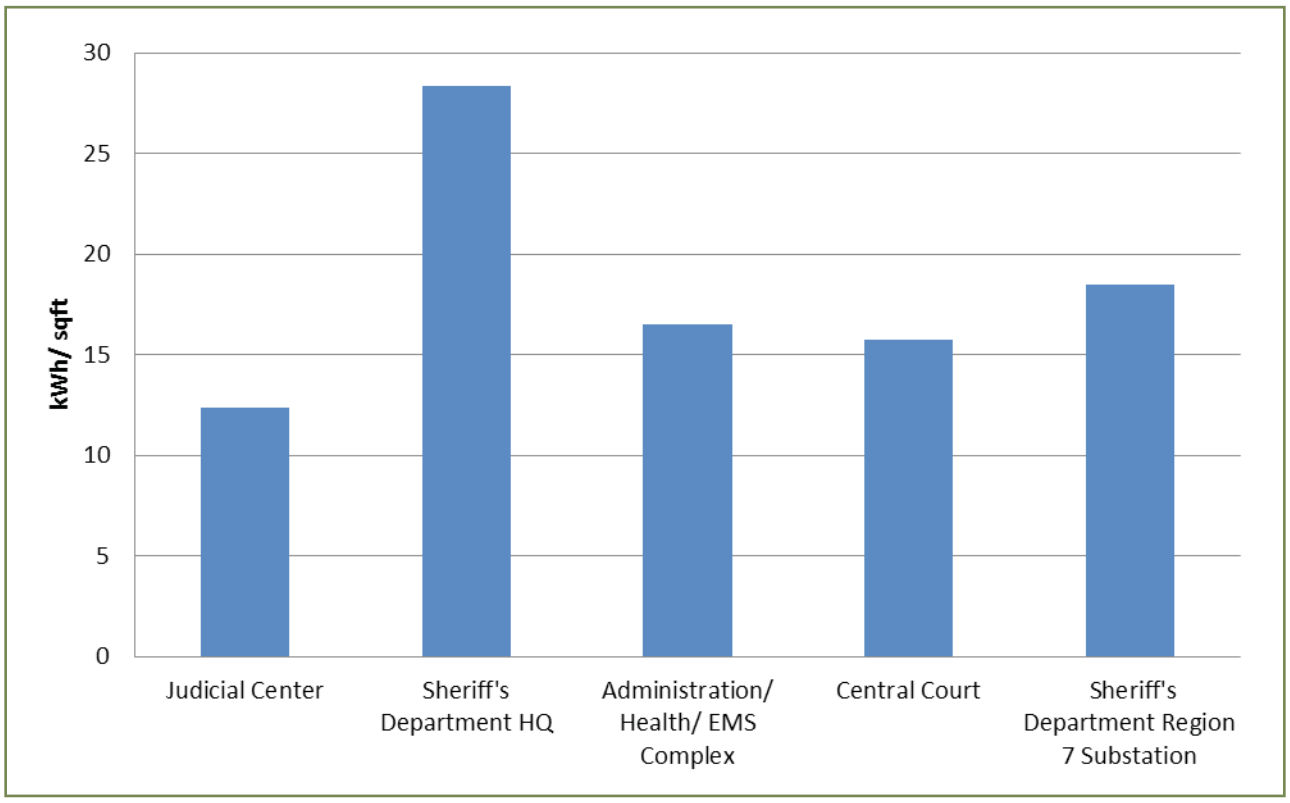
Fleet Services consists of 1,600 square feet of office space and a 7,570 square-foot bay area used to service county vehicles. This facility's primary electric end uses are lighting and cooling, and its electric energy intensity was 7.8 kWh/sq.ft. The retrofit conducted at Fleet Services included the installation of new energy efficient windows for the bay area, insulated bay doors and the filling of the ceiling with blown insulations providing an updated R-value. Additionally space conditioning measures were installed in the facility, including two furnaces that use waste oil from the fleet to heat the bay area.

Summary Court Center

The Summary Court Center is a 34,788 square-foot building containing courtrooms and offices. Its electric energy intensity was 11.0 kWh/sq.ft. and its

natural gas energy intensity was 22.9 kBtu/sq.ft. The Summary Court Center received several saving retrofits. The scope of work completed in early 2012 included lighting retrofit to replace T12 fixtures with T8 fixtures estimated to have an energy savings of 17,500 kWH and a GHG reduction of 6.6MtCO2e. New chiller water lines and insulated piping were installed as well as a new HVAC system estimated to have a combined energy savings of 30,165 kWH and GHG reduction of 11.4 MtCO2e. Additionally, 93 windows were replaced with Energy Star windows with an energy savings of $2,511 a year and a GG reduction of 3.46 MtCO2e.. The Summary Court Center has the highest natural gas intensity of the profiled buildings. There are natural gas savings opportunities available for this facility that may want to be considered as a future project.

Figure 6. Electric Energy Intensity of Selected Richland County Facilities



Richland County

Figure 6 shows the energy intensity from December 2010 through November 2011 for five Richland County facilities. The following subsections outline each of the facilities' building characteristics, completed efficiency upgrades, proposed efficiency upgrades, and possible energy savings opportunities.

Judicial Center

The Judicial Center is a 30 year old, 369,000 square-foot office building. The electric energy intensity was 12.4 kWh/sq.ft. This facility has had two lighting retrofits. In 2007, the lighting retrofit replaced high bay, metal halide fixtures with fluorescent fixtures. In 2010, the lighting retrofit replaced metal halide flood lights with fluorescent fixtures. In addition, funds left over from the 2007 and

2010 projects are currently being used to replace T12 fixtures with T8 fixtures. The County installed a boiler control system and upgraded the Judicial Center's domestic hot water system and public elevator controls. An additional lighting upgrade and air handler fan replacement have been proposed. The air handler fan replacement project is currently moving forward and is expected to be completed in 2012. Richland County is determining how to fund the proposed lighting project before it moves forward. The measures that have been installed and proposed for this building are the types of measures that Richland County should explore for other County buildings.

Sheriff's Headquarters

The Sheriff's Headquarters is a 25 year old, 41,000 square-foot building that is occupied continuously. It has the largest energy intensity of the profiled buildings for Richland County, due in part to its constant operation. Upgrades to this facility to date include the installation of a localized HVAC unit in the lobby, primary chiller replacement, and an ongoing lighting upgrade from T12 fixtures to T8 fixtures. Additional efficiency measures could further increase the efficiency of the Sheriff's Headquarters, such as lighting occupancy sensors, domestic water saving upgrades, and computer power management.

Richland County Administration/ Health/ EMS Complex

The Richland County Administration/Health/EMS Complex is 21 years old and contains 243,000 square feet of conditioned space. It is primarily used as office space that maintains standard operating hours from 8:00 a.m. to 5:00 p.m., five days a week. This facility has undergone several efficiency upgrades in the past few years. Completed HVAC upgrades include a new control system, variable frequency controls on air handlers, and unit upgrades. Automatic exit and entry doors were installed in 2011. The County is currently installing a lighting update to retrofit T12 fixtures to T8 fixtures. An envelope efficiency measure to reseal and caulk all windows and joints has been proposed. Additional efficiency measures, such domestic water saving upgrades, and computer power management could further increase the efficiency of the building.

In addition to the work inside the building, the county also made improvements to the adjacent parking garage, exterior lighting, surface lot lighting and ground lighting. These changes included: switching T12 to T8 fluorescent bulbs, installed motions sensors throughout the building, installed LED Exit signs, upgraded garage lighting from 250W high pressure sodium lights to 2 lamp, 56 watt florescent lights, installed efficient lighting in the parking lot from 400W high pressure sodium lights to 100W induction lights.

The projects listed above were completed under the county's energy grant with no direct cost to the county. In 2007 Richland County looked into Performance Contracting from an RFQ, but it was concluded most opportunities that were identified for energy savings were already underway or planned through the County's normal budgeting process.

Central Court

The 40 year-old Central Court building is 22,000 square feet and contains office and courtrooms. Richland County implemented a rooftop HVAC unit replacement and a chiller replacement and is currently implementing an ongoing

lighting retrofit from T12 to T8 fixtures. Additional efficiency measures, such as lighting occupancy sensors, domestic water saving upgrades, and computer power management could increase the efficiency of the Central Court building.

Richland County Sheriff's Department Region 7 Substation

The Richland County Sheriff's Department Region 7 Substation is a newly constructed 4,500 square-foot building that operates continuously. The building's design and construction included efficiency considerations: it contains T8 lighting fixtures with occupancy sensors, high-efficiency HVAC units, and a high-efficiency electric domestic hot water heater. As a result, this building is not considered a high priority for additional energy-efficiency retrofits. The Substation's high-efficiency features and measures should be integrated into all new County buildings.

City of Columbia

Figure 7 shows the energy intensity of six City of Columbia facilities from October 2010 through September 2011 based on the evaluation done by Cadmus for this plan.

In 2008, the City of Columbia authorized Ameresco, Inc. to perform an energy and utility audit encompassing all City facilities and operational plants. Ameresco identified a number of infrastructure improvement projects that would result in significant energy and utility savings for the City. These city-wide projects addressed multiple objectives, including:

- Reduction in annual energy and utility consumption, resulting in lower emissions
- Decrease in levels of deferred maintenance
- Improved environmental conditions and occupant comfort
- Reduced ongoing operations and maintenance costs

The audit summary proposed ten energy conservation measures and recommended that the City implement the projects under a performance contracting project for financing. The City chose not to use performance contracting to finance the projects, but is using the preliminary audit report to guide energy improvements as finances allow.

In 2010-11, the City of Columbia used $1.4 million American Recovery and Reinvestment Act of 2009 formula funding to install new lighting systems in 45 City facilities. It provides a high quality visual environment that is energy efficient, low maintenance and cost effective. This project was the first of Ameresco's recommendations and it was estimated to provide the quickest payback with annual projected energy savings of over $150,000.

Table 7 profiles six of the 45 upgraded facilities and includes other significant recommendations that have not yet been implemented.

Figure 7. Electric Energy Intensity of Selected City of Columbia Facilities

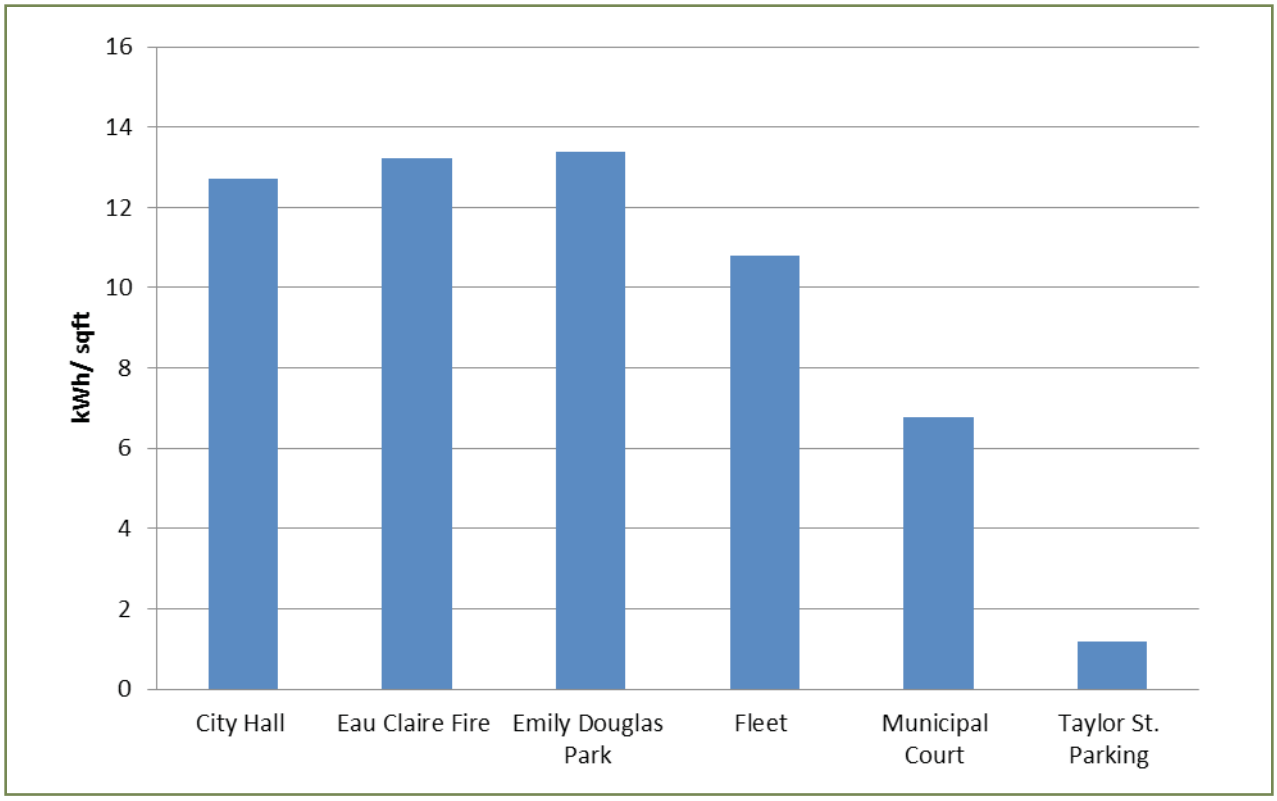


Table 7. Efficiency Upgrades and Recommendations for the City of Columbia

Building	Completed Upgrades	Reported Savings (kWh)*	Additional Ameresco-Recommended Efficiency Upgrades
City Hall	Lighting System Upgrade	94,881	New HVAC System Domestic Water Conservation
Eau Claire Fire	Lighting System Upgrade	14,697	Domestic Water Conservation
Emily Douglas Park	Lighting System Upgrade	6,984	Domestic Water Conservation
Fleet	Lighting System Upgrade	196,050	Domestic Water Conservation
Municipal Court	Lighting System Upgrade	26,525	New HVAC Equipment Domestic Water Conservation
Taylor St. Parking	Lighting System Upgrade	27,919	Domestic Water Conservation

*Annual reported electricity savings resulting from lighting upgrades.

Regional Initiatives and Accomplishments

Utility Programs

While South Carolina currently does not have a mandated energy-efficiency standard in place, utilities in the State have implemented voluntary DSM activities. DSM programs are designed to help utility customers reduce their demand for energy.

In 2010, the South Carolina Energy Office published *Saving Energy, Saving Money: Overview of Demand-Side Management by South Carolina Electric and Natural Gas Utilities.* According to the report, 33 of the 46 electricity distribution utilities in South Carolina conducted DSM activities in 2010. These activities covered three categories:

- **Energy Efficiency.** Five electric utilities offered financial incentives (such as rebates or low-interest financing) for the purchase of energy-efficient appliances, equipment, and/or lighting.
- **Load Management.** Twenty-three electric utilities offered financial incentives (such as bill credits) to customers that allowed the utilities to curtail the operation of certain appliances or process (such as climate control) during periods of peak demand.
- **Public Information.** Five electric utilities maintained Websites that offered energy efficiency and conservation tips and/or Web-based systems for viewing and analyzing monthly electricity usage and cost.

In the Central Midlands region, only SCE&G and Tri-County Electric Cooperative currently incorporate DSM into their integrated resource plans (see **Table 8**).

DSM programs can have a significant impact on energy consumption and peak demand. Some states have set, and achieved, energy and demand savings of 1% or more per year, offsetting the need for new generation. In SCE&G territory, DSM programs are projected to save approximately 72 GWh in 2011 (0.3% of sales); and to increase to 1,285 GWh by 2025 (4.2% of sales). However the potential for savings is much higher. Demand response programs that are already in place are projected to result in 225 MW of consistent, annual peak load demand reduction through 2025, representing 4.5% of peak demand in 2011 and 3.6% of peak demand in 2025. Table 9 shows the state-wide estimated energy savings resulting from DSM programs in 2010.

Several utilities in the area do not currently offer DSM programs, including Mid-Carolina Electric Cooperative, Newberry Electric Cooperative, and Fairfield Electric Cooperative. However, most of the utilities servicing the region promote energy efficiency through education and outreach efforts, as described in Table 10.

Table 8. Utility DSM Programs Offered in the Central Midlands Region

Utility/Program	Program Type	Description
SCE&G		
ENERGY STAR® Lighting Discounts	Upstream Buy-down	Discounts on energy-efficient compact fluorescent lamps (CFLs).
Heating, Cooling and Water Heating Program	Residential Incentive	Rebates for purchasing and installing ENERGY STAR® qualified central air conditioning systems and heat pumps (air source, dual fuel, and ground source) in either new or existing residences. Rebates are also available for installing non-electric resistance water heaters.
Home Performance with ENERGY STAR® Program	Residential Incentive	Rebates for the implementation of energy-efficiency improvements following a comprehensive energy audit of the customer home.
Convert to Natural Gas and Earn Bill Credit	Residential Bill Credit	Credits on customer gas bills for converting to a natural gas furnace, water heater, cook top, or logs.
EnergyWise for Your Business	Commercial Incentive	Financial incentives for commercial customers who install high-efficiency equipment in existing buildings or new construction. Eligible upgrades include: lighting, HVAC, food service, and custom high-efficiency equipment.
Residential Contractors	Education and Support	Education and support provided to residential contractors who encourage customers to make energy-efficient home improvements leveraging SCE&G rebates.
Tri-County Electric Cooperative		
Energy Efficiency Rebate Program	Residential Incentive	Rebates for home energy audits and for the purchase of CFLs, low-flow water fixtures, water heater blankets, pipe wrap, HVAC tune-up, ceiling insulation, high-efficiency electric heat pumps, ENERGY STAR® room air conditioners, ENERGY STAR® dishwashers, and heat pumps.
ENERGY STAR® Rated New Home Construction	Residential Incentive	Rebates available for ENERGY STAR® certified new homes.
Commercial Lighting Rebate	Commercial Incentive	Rebates for upgrading commercial lighting fixtures to reduce the wattage. Rebate is based on watts saved per fixture.

Table 9. Estimated Energy Savings from DSM Activities in South Carolina, 2010

Utility	Electricity Consumption Reduced	Peak Demand Reduced
South Carolina Electric Cooperatives	N/A	100 MW
Duke Energy Carolina's	120,000- 140,000 MWh	800-880 MW
Progress Energy Carolina's	182,380 MWh	162 MW
South Carolina Electric & Gas	103,000 MWh	220 MW
Santee Cooper	16,483 MWh	542 MW
City of Rock Hill	N/A	6.1%

Source: South Carolina Energy Office. Saving Energy Saving Money, p. 3.

Table 10. Utility Education and Outreach Efforts

Utility/Market Served	Program	Description
Tri-County Electric Cooperative		
Residential and Commercial	Energy Savings Tips	A list of energy saving ideas ranging from no cost to high cost on the utility Website.
Residential	Home Audits	Free home energy audits.
SCANA/SCE&G		
Residential and Commercial	EnergyWise	Online tools, information about rebates and incentives, "how-tos" and tips, information on the ENERGY STAR program, and information on how to support renewable energy available on the utility website.
Newberry Electric Cooperative		
Residential and Commercial	Energy Calculators	Links on the utility website to calculators for analyzing the energy efficiency of homes and businesses.
Fairfield Electric Cooperative		
Residential and Commercial	Energy Experts	Energy experts are available to answer questions about energy efficiency and general energy and services-related items.
Residential and Commercial	Energy Expert "Walk Through Audit"	Energy experts perform a basic "walk-through audit" to assess home or business energy efficiency and recommend improvements.
Residential and Commercial	Touchstone Energy Cooperative Materials	Energy saving information and links to resources offered by Touchstone Energy Cooperative (outlined in this table).
Central Electric Power Cooperative		
Residential and Commercial	Take Control and Save Programs and Resources	Link to the Take Control and Save Website.

Table 10. Utility Education and Outreach Efforts (Cont.)

Utility/Market Served	Program	Description
Mid-Carolina Electric Cooperative		
Residential and Commercial	Energy Savings Information	”How-to” tips and information on appliances, CFLs, and consumer behavior available on the utility Website.
Residential and Commercial	Energy Expert	Energy experts are available to answer questions about energy efficiency and general energy- and services-related issues.
Residential and Commercial	Touchstone Energy Cooperative Materials	Energy saving information and links to resources offered by Touchstone Energy Cooperative (outlined later in this table).
Touchstone Energy Cooperative (available to South Carolina Cooperatives under the Touchstone umbrella)		
Commercial	Business Energy Advisor	Extensive information on energy saving strategies for businesses, including check lists, information on LEED, saving tips.
Residential	Home Energy Library	A comprehensive resource for homeowners to understand their homes’ energy use, as well as information on building systems, and how-to videos for energy savings.
Education	Children’s Education	A web page offering educational tools for children to learn about energy efficiency.
Residential	Touchstone Energy Home Program	A set of standards that apply to both new and existing homes to make them more energy efficient.

Government Programs

The South Carolina Office of Economic Opportunity administers the following programs focused on energy efficiency:

- The Weatherization Assistance Program provides home weatherization assistance for low-income families in each of the State’s 46 counties, coordinated through eight community action agencies. The program is funded through a formula grant by the DOE.
- ConserFund is a $10 million revolving loan fund administered by the State Energy Office. Loans are made at favorable interest rates and repayments are used to fund future loans. The loan fund targets energy-efficiency retrofits in existing public-sector buildings (e.g., buildings belonging to state agencies, local governments, public universities, public school districts, and non-profits). The Energy Office also considers renewable energy systems in new construction.

The South Carolina Energy Office has sometimes struggled to find projects to fund.[15] In an attempt to seed project ideas, the Energy Office provides the following suggestions on its Website:[16]

- Lighting retrofits
- Heating, ventilation, and air conditioning system upgrades
- Building envelope modifications (doors, windows, insulation, roofs, etc.)
- Automated or computerized energy-control systems
- Cogeneration systems that produce electricity and process steam heat for use within a building or complex of buildings
- Energy recovery systems
- Ground source heat pumps
- Biomass, solar, and other alternative/renewable energy systems

Although funding is primarily limited to upgrades of existing buildings, the last three improvements may be applied to new construction as well.

Additionally, there are several collaborative programs sponsored by the Central Midlands local governments that promote sustainability through energy efficiency including for example the Richland County Light bulb Exchange (see Figure 8), the regional lawn mower exchange, the City of Columbia's Climate Protection Action Campaign (CPAC), and joint regional programs like the EnergyExpo.

Table 11 summarizes local and regional government programs and resources designed to encourage energy efficiency and decrease energy demand.

15. This information is based on an October 2011 interview with Trish Jerman, manager of energy efficiency, conservation, and outreach at the Energy Office.

16. For more information visit http://www.energy.sc.gov/index.aspx?m=7&t=48&h=180.

Figure 8. Richland County Light Bulb Exchange Campaign

Table 11. Local Energy Efficiency Activities

Activity	Description
City of Columbia	
Climate Protection Action Campaign (CPAC)	A campaign providing the citizens of Columbia with information and tools to save energy, conserve water, improve air quality, and reduce waste.
Lexington County	
County Green Business Certification Program	A framework for workplaces and organizations to address resource conservation, including energy efficiency. Participating organizations must set goals, form a green team, and earn 10 green points. Members receive a window decal and additional recognition through the county.
Richland County	
Light Bulb Exchange	A County-sponsored effort that offers residents the opportunity to exchange incandescent bulbs for energy-efficient CFLs.
Joint Efforts between the Local Governments	
Energy Expo and Fair Housing Event sponsored by the County of Lexington, Richland County and the Irmo Chapin Recreation Commission	An event to educate citizens on how to make their homes and lifestyles more energy efficient through speakers, demonstrations, and information on incentives and rebates available.
Central Midlands Lawnmower Exchange	An annual event (now in its sixth year), during which residents can turn in their gasoline-powered lawn mowers to receive a deep discount on the purchase of an environmentally friendly, cordless electric mower.

Policy Context

National Level Policy and Programs

National energy policy can be a contentious political issue, particularly in crisis situations such as the recent Middle East uprisings or the 2010 oil leak in the Gulf of Mexico. It is beyond the scope of this plan to debate the merits of national energy policy over which, regional governments have little control. Nonetheless, national energy policy can greatly affect the reality on the ground in South Carolina; hence this section briefly describes current, significant national energy policy that relates to energy efficiency.

The most significant federal legislative actions in recent history are:

- **The Energy Policy Act of 2005.** Signed into law by George W. Bush, the Energy Policy Act of 2005 includes a broad range of provisions related to energy conservation and clean energy

development. The Act authorized loan guarantees, tax incentives, subsidies, and research and development funding for innovative technologies that reduce and avoid greenhouse gas emissions, through energy conservation and alternative energy generation, among other provisions.

- **The 2007 Energy Independence and Security Act (EISA).** The stated purpose of the 2007 EISA Act is "to move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government."[17] It was signed into law on December 19, 2007.

While EISA contains a number of provisions, many of which set standards for the energy footprint of federal buildings, vehicle fleets, and other procurement, the Act's most significant provision establishes minimum efficiency and lifetime performance standards for consumer lighting products. EISA began to take effect starting on January 1, 2012, when standard 100 watt incandescent bulbs were phased out. This was the first of three waves in which certain bulb wattages will be restricted: 75 watt bulbs will be phased out in 2013, and both 60 watt and 40 watt bulbs will be phased out in 2014. EISA stipulates that performance, as measured by lumen ranges (i.e., the amount of light that a bulb emits) and lifetime ratings, cannot be compromised in order to attain efficiency.

EISA has broad implications for consumers across the country, including in the Central Midlands region. The consumer lighting market is changing at a rapid pace, and the direction of the industry with these new standards is still evolving. The products that will replace the standard incandescent bulb are expected to be wide-ranging and more expensive. Consumers will have more choices (e.g., CFL, halogen, LED) and will need to consider a range of factors in their light bulb selection (e.g., lighting quality, lumens, color rendering, energy efficiency, lifetime, and environmental and health concerns, in addition to cost and application).

Beyond these legislative activities, federally sponsored initiatives and public-private partnerships aimed at promoting and providing technical support to voluntary energy-efficiency efforts have made significant progress in increasing the energy efficiency of buildings and consumer products. Several examples are described below.

Building Efficiency

While there are several voluntary efforts to establish energy efficiency and green building standards for new construction, the most commonly used are Leadership in Energy and Environmental Design® (LEED), ENERGY STAR New Homes, the International Energy Conservation Code (IECC), and the International Green Construction Code (IGCC).

LEED: LEED was developed by the US Green Building Council (USGBC). According to the USGBC Website: "*LEED is an internationally recognized green*

17. Rahall, Nick (2007-01-12) http://www.thepoliticalguide.com/Legislation/house/110/H%20R%206/.

building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts." [18]

LEED uses rating systems to distinguish high performance buildings in multiple categories. Categories include new commercial construction, existing buildings, commercial interiors, core and shell, schools, retail, healthcare, homes, and neighborhood development.

ENERGY STAR New Homes: The U.S. Environmental Protection Agency (EPA) set strict energy-efficiency guidelines to meet the ENERGY STAR standard for new homes. The EPA Website states: "*These homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30% more efficient than standard homes*."[19]

IECC: The International Code Council created the first IECC in 2000 and has released multiple updates. The code establishes minimum energy-efficiency standards for the design and construction of new residential and commercial buildings. The IECC has been adopted by many state and municipal governments in the United States.

IGCC: In 2009, the International Code Council launched the development of an international green construction code for new and existing commercial buildings. Development of the code was completed in late 2011, and will become available in the spring of 2012.[20]

Efficient Products

ENERGY STAR is a joint EPA and DOE program. ENERGY STAR certifies household products that achieve strict DOE and EPA energy-efficiency standards, as well as offering tools and resources to help consumers plan for and undertake energy-efficiency projects. ENERGY STAR also supports businesses with programs that help them measure their energy performance, set goals, track savings, and reward improvements. The ENERGY STAR Website claims that "*Americans, with the help of ENERGY STAR, saved enough energy in 2010 to avoid greenhouse gas emissions equivalent to those from 34 million cars — all while saving nearly $18 billion on their utility bills.*"[21]

State-Level Policy

Most energy-efficiency legislative action in the U.S. occurs at a state level. The two most common types of legislation are energy-efficiency resource standards (EERS), which primarily address energy efficiency in existing buildings, and building code and standards, which address energy efficiency in new construction. To date, 24 states have adopted EERS, setting long-term energy savings targets and requiring utilities to invest in energy-efficiency programs.

18. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988
19. http://www.energystar.gov/index.cfm?c=new_homes.hm_index.
20. http://www.iccsafe.org/cs/IGCC/Pages/default.aspx
21. http://www.energystar.gov/index.cfm?c=about.ab_index.

A total of 38 states have adopted some form of statewide commercial and residential building standards.

One concern about EERS is the fiscal impact they can have on utility providers, who bear the cost of developing, delivering, and evaluating DSM programs and lose revenue with reduced energy demand. To address these impacts, most state EERS include provisions that allow utilities rate recovery, lost margin or lost revenue recovery, and incentives, penalties, or both for meeting or failing to meet the targets set in the standard.

The economic impacts of building codes are less of a concern since the cost associated with building to higher energy performance standards is largely distributed across multiple building owners and developers, and the upfront investment in energy efficiency is recovered by the energy savings over the lifetime of the building. Still, developers tend to oppose stricter code, which drives up the cost of buildings and removes some discretionary power from builders.

Most of the legislative activity in the South Carolina to date has focused on building codes and actions to make State buildings more energy and resource efficient. The first significant legislative action on energy efficiency was House Bill 2863 (Act 156), which introduced mandatory statewide building codes in 1979.

Current Status of DSM Policy in South Carolina

South Carolina has no state-wide EERS. However, the South Carolina Public Service Commission (PSC) is considering procedures to encourage electric utilities to invest in cost-effective energy-efficient technologies and conservation programs (SC Statute: Title 58, Chapter 37). The State has also developed some incentives for utilities to help recover lost revenue.[22]

Other important legislation in South Carolina has included: [23]

- In 2007, the Energy Independence and Sustainable Construction Act of 2007 promoted energy and environmental standards for buildings with a long-term goal of increasing capacity for high performance building in the State, creating jobs, and increasing the State's energy independence.
- In 2008, House Bill 4766 required state agencies and public school districts to develop plans to reduce their energy use by 20% by 2020, and to implement all cost-effective, energy saving improvements.
- In 2009, Senate Bill 268 established energy standards for public buildings and set energy use reduction targets of 1% annually for five years beginning July 1, 2008, and 20% energy use reduction relative to 2000 by July 1, 2020. Additionally, new construction or substantial renovation projects must be designed to minimize energy and water use. Public buildings are required to prepare

22. The Edison Foundation. State Electric Efficiency Regulatory Frameworks. July 2010. http://www.edisonfoundation.net/iee/issuebriefs/IEE_StateRegulatory Frame_0710.pdf

23. For more information on these and other energy related legislation see the Tax Incentives, Legislation and Publications page on the South Carolina Energy Office Web site: http://www.energy.sc.gov/index.aspx?m=1&t=67.

energy plans designating how energy use reductions will be achieved and report energy use annually. New construction or substantial renovation projects must be designed to achieve LEED Silver or to receive two globes under the Green Globe rating system. Other paths to compliance are available based on a 30-year lifecycle cost analysis.[24]

Additionally, the State has introduced incentives, shown in **Table 12**, supporting the adoption of specific energy-efficient strategies (current as of May 3, 2011).

Table 12. Current State DSM Incentives

Incentive	Target Market	Description
Energy Efficient Manufactured Homes Incentive Tax Credit	Residential	$750 tax credit for the purchase of either 1) a manufactured home that meets or exceeds EPA and DOE energy-saving efficiency requirements; or 2) a manufactured home that meets or exceeds energy efficiency requirements under the ENERGY STAR program.
Sales Tax Incentives for Energy-Efficient Manufactured Homes	Residential	Full sales tax exemption for manufactured homes purchased between July 1, 2009, and July 1, 2019, that have been designated by the EPA and the DOE as meeting or exceeding each agency's energy saving efficiency requirements or has been designated as meeting or exceeding such requirements under the federal ENERGY STAR program.

Codes and Standards

In 1997, the General Assembly passed the first mandatory statewide building code that incorporated the Council of American Building Officials' Model Energy Code as the official state energy code.[25] Then, in 2009, the South Carolina Building Codes Council adopted the 2006 edition of the IECC. The current building codes that specifically govern energy efficiency include:

- 2006 International Residential Code
- 2006 International Building Code
- 2006 IECC

The IECC was updated in 2009 to account for evolving technologies and design techniques, and several states have adopted this version as their statewide code. The Building Code Council formally adopted the 2009 International Code Series on May 10, 2010; however, implementation has not yet occurred. Meanwhile, the 2012 International Code Series has been released. The 2012 code will achieve a 30% increase in energy savings in both residential and commercial buildings compared to its 2006 predecessor.

Codes in South Carolina are reviewed and adopted by the Building Code Council, and local jurisdictions can apply to the Council for variances. Once a code is adopted by the Council, the Council identifies an implementation date for local jurisdiction adoption. Local jurisdictions may apply to the Council to set a more stringent building code than those adopted by the State.

24. http://www.energy.sc.gov/index.aspx?m=7&t=115
25. http://www.energy.sc.gov/index.aspx?m=3&t=23&h=96

Regional-Level Policy

While a statewide EERS or improvement in code and standards are easy ways to advance energy efficiency, local jurisdictions are not entirely powerless. South Carolina regulations allow local jurisdictions to apply for and set a more stringent building code than the adopted state code. Additionally, enforcement of building code occurs at the local level; it is important that the Region maintain strong code enforcement in order to continue improving its building stock over the longer term.

It is difficult at a local or regional level to mandate higher efficiency in existing buildings. Residential Energy Conservation Ordinances (RECOs) and Commercial Energy Conservation Ordinances (CECOs) are policy tools for upgrading the energy efficiency and water usage of existing housing and commercial buildings. RECOs and CECOs require targeted building owners to implement specific energy and water-efficiency measures if their property doesn't meet a minimum standard. However, for the few jurisdictions that have passed a RECO or CECO, the process has been controversial, politically difficult, and prolonged. Other options to affect energy efficiency at a local level are mostly voluntary.

As state-level, energy-efficiency standards and other supporting policies move through the legislature, the region can continue to implement local efficiency initiatives to advance voluntary efficiency and behavior change, as well as lead by example by implementing efficiency upgrades in public buildings and begin to look at more significant local policy action.

Alternative Approaches

Marketing, Outreach, and Awareness

- Collaborative marketing and outreach programs involving multiple jurisdictions can have a dramatically higher reach and impact than disconnected activities implemented by multiple entities. Collaborative programs also benefit from economies of scale; individual jurisdictions, by virtue of sharing costs, can achieve greater savings for the same costs. For example, Flex Your Power (http://www.fypower.org/) is California's statewide energy-efficiency marketing and outreach campaign. Initiated in 2001, Flex Your Power is a partnership between California utilities, residents, businesses, institutions, government agencies, and nonprofit organizations working to save energy. The campaign includes a comprehensive Website, an electronic newsletter and blog, and educational materials.
- Green Energy DC, a Sustainable Energy Utility (SEU), is a single resource for information on energy efficiency and renewable energy programs, products, and services in the District of Columbia. The Clean and Affordable Energy Act of 2008 (CAEA) required the District to conduct sustainable energy programs and authorized the creation of an SEU to be the one-stop resource for energy efficiency and renewable energy services for District residents and businesses.

- Green teams are grassroots, multifunctional groups of citizens, neighborhood groups, or co-workers who voluntarily work together to educate, inspire, and empower others toward sustainability. They identify and implement specific solutions to increase environmental sustainability at a neighborhood, organizational, or city level. Green teams may focus on green operations at their school or workplace, addressing such issues as recycling, composting food waste, reducing the use of disposable take-out containers, and eliminating plastic water bottles. Resources are available at: http://www.greenteamproject.org/.
- In 2010, Buncombe County in North Carolina launched the Buncombe green community-based sustainability programs. The initiative helps raise awareness of the need for local sustainability with its slogan, "*growing greener together*." The program promotes recycling, reuse, and the installation of energy efficiency and renewable energy measures, such as CFLs and solar panels. To help raise awareness and support, residents submit pictures of what they do to go green, and they share tips on green practices. The County also recognizes businesses that made significant steps toward organizational sustainability.[26]

Technical Guidance, Incentives, and Grant Programs

- The City and County of Boulder, Colorado collaborated on the design, development, and implementation of its EnergySmart program (www.energysmartYES.com). The program offers local residential and commercial customers subsidized energy audits that include advice from a personal EnergySmart advisor, installation of free energy-saving measures, customized efficiency recommendations, help with contractor selection and bid evaluation, and assistance securing utility rebates and financing. The program is paid for through a small tax that voters approved in 2006, and is levied through customer's utility bills.
- Nebraska's ReEnergize Program (www.reEnergizeProgram.org) provides incentives up to $1,000 to homeowners and businesses for energy-efficient upgrades. The program is a collaborative effort of the Cities of Lincoln and Omaha, and is funded through a $10 million grant from DOE. Incentives are available to help cover the costs of insulation, energy-efficient heating and cooling, improved lighting, and other efficiency upgrades.
- Residents of the City of Gillette, Wyoming are eligible for a $125 rebate when they get an energy audit through the City's Home Energy Audit Rebate Program. A certified energy auditor conducts a walk-through assessment and diagnostic analyses to determine the energy efficiency of participant homes. The auditor provides customers with a comprehensive report that details specific actions they can take to improve their home energy efficiency.

26. http://www.businessofgovernment.org/sites/default/files/Promoting%20Environmental%20and%20Energy %20Programs%20in%20Local%20Government.pdf.

- King County, Washington provides Green Building Grants for commercial and residential building projects that meet the County's resource conservation criteria. Grants are funded by the Department of Natural Resources and Parks. Eligible projects include:
  - Commercial, institutional, multifamily, and single family projects that achieve LEED Gold or Platinum certification can earn awards up to $35,000 based on the project's performance level.
  - Residential, single family homes are eligible for up to $5,000 and multifamily and community development projects may receive grants up to $20,000 when they achieve Built Green 4 or 5-star certification.

Local Policy and Ordinances

- Six U.S. cities currently have RECOs in place. RECOs can be one of the only avenues available to local jurisdictions to address the efficiency of existing housing. Typically, RECOs take effect either when the property changes hands (point of sale) or during the rental licensing and inspection process. RECOs are often implemented to address the split incentive barrier in rental properties (property owners have little incentive to invest in energy-efficiency upgrades since they do not pay the energy bills, and tenants lack the incentive to invest in property they do not own). All of the existing RECO programs include rental housing, and some, including those in Burlington, Vermont, Ann Arbor, Michigan, and the State of Wisconsin, apply exclusively to rental housing.
- Cities with CECOs in place include Berkeley, California, New York City, Washington, D.C., and Seattle, Washington. CECOs require upgrades in commercial properties at the time of sale or when permitting for large renovations.
- The City of Austin's Energy Conservation Audit and Disclosure Ordinance (#20081106-047), approved on November 6, 2008, requires the owners of nonresidential facilities to benchmark and disclose the property's energy performance. Building owners must calculate energy ratings each year subsequent to initial compliance. Nonresidential buildings over 10,000 square feet must be benchmarked using Austin Energy's Business Energy Analysis tool or the EPA's Portfolio Manager. Building owners must disclose the facility's rating to prospective buyers prior to signing a sales contract and to Austin Energy within 30 days of the transaction. Compliance deadlines will be phased in according to facility size:
  - June 1, 2012 for buildings 75,000 square feet and larger;
  - June 1, 2013 for buildings between 30,000 and 69,999 square feet; and
  - June 1, 2014 for buildings between 10,000 and 29,999 square feet.

- Industrial and manufacturing properties are exempt.

Benchmarking

- With a goal of reducing energy costs district-wide, the Poudre School District in Fort Collins, Colorado launched an energy management program in 1994. As of 2007, the District had implemented nearly 150 energy-efficiency upgrades, producing annual energy cost savings of nearly $440,000 and earning the ENERGY STAR label in 17 schools and two administrative offices. The District is using ENERGY STAR tools to benchmark and track each school's energy performance. Design features in the District's new operations building include daylighting, automated lighting systems with dimmers, on-site solar electricity generating panels, and a geo-exchange heating system.

Green Buildings

- In 2005, Sarasota County, Florida adopted a green building resolution, requiring that new County-owned buildings and major renovations meet either U.S. Green Building Council or Florida Green Building Coalition standards. In lieu of formal residential or commercial green building new construction standards, Sarasota offers incentives for building green, including expedited permit application processing for green buildings. As a result of the initiative, more than 1,300 green-built residential units and 500,000 square feet of new commercial space have received expedited permits. The County also sponsors a Green Business Partnership to advise and recognize local businesses that adopt green practices.[27]

- In 2006, the State of Hawaii passed the Hawaii Lead by Example Initiative, an executive order directing State agencies to improve energy, water, and resource efficiency in their facilities and requiring that all State-funded new construction and building renovation projects meet LEED certification, targeting LEED Silver certification where possible. The State adopted a strategic energy management approach, conducting whole-building energy audits, benchmarking, and recommissioning to ensure buildings achieve superior energy performance. In addition, the State is working to achieve ENERGY STAR certification for energy performance in several State buildings.

- In 1999, Arlington County, Virginia launched a Green Building Incentive Program, which provides higher density allowances for commercial projects and private developments earning LEED Silver certification. Commercial project developers must submit a LEED Scorecard and have a LEED Accredited Professional on the project team to be eligible for the density allowance. Additionally, each project is required to contribute to a fund for county-wide sustainability education and outreach activities. If the project earns LEED certification, the contribution is refunded.

27. Ibid.

- Through an ordinance passed in 2006, Chatham County, Georgia offers full State and County property tax abatement for commercial buildings that achieve LEED Gold certification. Tax abatement is available for the first five years following the building's completion, and then tapers off by 20% each year for another five years. To qualify, projects must be a new or expanded business that increases employment opportunities in an enterprise zone.
- The City of Grand Rapids, Michigan has no green building requirements for residential or commercial properties. Instead, the City leads by example. All new municipal buildings and major renovations of more than 10,000 square feet must meet LEED certification standards. The City promotes green building and energy efficiency as fiscal responsibilities and offers incentives for developers who build green. The City's educational and promotional efforts have fostered a culture of green building, and Grand Rapids now has more LEED-certified buildings per capita than any other mid-size city in the country, and has the fifth highest overall.[28]

Facility Upgrades

Municipal and county governments around the country have upgraded the energy systems in their own buildings to energy-efficient alternatives. There are hundreds of examples of cities and counties that have undertaken building energy upgrades and retrofits, paying for upgrades through multiple approaches such as municipal bonds; state, federal, or other grants; and performance contracting. Many energy-efficiency upgrades offer paybacks of two years or less and cities and counties are sometimes able to offset their investment with utility DSM incentives.

The following subsections outline several examples of building efficiency upgrades that can be cost-effectively installed in typical municipal and county facilities (office-type rather than process-type facilities). While the cost and savings of each measure depend on the specific facility, the measures highlighted here either require little to no investment or may save enough energy to pay for themselves within a few years of implementation.

Lighting Upgrades and Controls

Many existing buildings can realize significant electricity savings by upgrading to new high-efficiency lighting. Common measures include:

- Replace linear fluorescent T12 lighting (bulbs with a 1.5 inch diameter) with linear fluorescent T8 lighting.
- Replace high-bay metal halide dome fixtures (commonly used in areas such as garages, gyms and warehouses) with linear fluorescent T5 fixtures.
- Replace incandescent light bulbs with CFLs.
- Replace incandescent exit signs with LED exit signs.
- Install occupancy sensors to automatically turn lights on and off when people enter and exit an area.

28. Ibid.

In addition, many types of high-efficiency lighting provide non-energy benefits such as longer lamp life, which can reduce maintenance costs, and better light color and quality, which can positively impact building occupants.

HVAC Controls

Programmable thermostats can reduce heating and cooling energy by limiting equipment operation when buildings are not occupied. Setting the thermostat back by 10 degrees (i.e., turning the set-point up 10 degrees in the summer and down 10 degrees in the winter) can reduce annual heating, ventilation and air conditioning (HVAC) energy use by approximately 10-25%, depending on the building use and occupancy, with minimal initial investment.

Computer Power Management

Many computers in offices and government facilities are left on overnight and at other times when not in use. To save electricity, power management features can be activated. Power management automatically puts monitors and computers into a low-power sleep mode after a set period of inactivity, then return to active mode when the user touches the mouse or keyboard.

The EPA ENERGY STAR program offers free information and support (provided by Cadmus as a contractor to ENERGY STAR) on power management at www.energystar.gov/powermanagement.

Efficient Purchasing

Government agencies can save energy by choosing ENERGY STAR or high-efficiency models when purchasing new equipment, such as:

- Appliances
- Commercial kitchen equipment
- Electronics
- HVAC equipment
- Lighting
- Office equipment
- Water heaters

A range of efficiency options are available for most products in these groups. Some efficient models cost no more than standard-efficiency alternatives. While the highest-efficiency products may cost slightly more, the initial investment is more than recovered through energy savings over the product life.

The ENERGY STAR website offers energy savings calculators and guidance on purchasing efficient equipment (www.energystar.gov/purchasing).

Recommendations for Implementation

As demonstrated above, even in the absence of a statewide energy efficiency resource standard, there are many actions available to Central Midlands local governments to improve the energy efficiency of the built environment. **Table 13** presents these action items by timeframe, and the remainder of this section outlines these recommendations in more detail.

Near-Term Recommendations and Action Items

Implement City/County Sustainability Policies Supported by Green Teams

The Central Midlands governments should develop a formal policy around energy-efficient behavior in city and county office buildings. To ensure long-term results, best practice energy management uses a structured approach by establishing policies and procedures and committing staff and resources to support its goals. The City and Counties should coordinate efforts to develop consistency across the region and enlist volunteers for green teams. Forming volunteer green teams can help create awareness around the policy and promote additional behavioral activities that employees should adopt to save energy in the workplace. Effective communication is critical to ensuring effective implementation. Additionally, the City and Counties should look for opportunities to leverage and collaborate with efforts for an alternative energy task force, described in Chapter 4 of this report.

City/County Action items include:

- Research and identify energy-efficiency behaviors and protocols to adopt as the formal Central Midlands policy. Include a timeline with milestones to implement new activities over time. Establish metrics for tracking results. Examples of energy-saving best practices for consideration include:

  Lighting

  - Turn off the lights when you leave a room, especially at the end of the day.
  - Replace incandescent light bulbs in your desk lamp with a more efficient bulb (at this time ENERGY STAR qualifies CFL as more efficient. They last 10 times longer and use approximately 75% less energy.)
  - Clean all light bulbs, fixtures, lamps and reflective surfaces regularly. This will increase the lighting output.
  - Maximize natural light and avoid unnecessary decorative lighting, especially in unoccupied areas.
  - Install motion-sensors in restrooms, meeting rooms, copy rooms, storage rooms and other rarely-used areas.

  Office Equipment

  - Use a power strip to completely disconnect the power supply to office equipment at night and on weekends. Even though equipment may be off, it still uses electricity when plugged in.
  - Turn off all copiers, fax machines and other equipment when not in use. If available, use ENERGY STAR savings software to automatically shut down these devices.
  - If possible, use laptops instead of desktop computers and use inkjet printers instead of laser printers. Both use 90% less energy than the alternatives.

Kitchen / Break Room

- Turn off and unplug appliances that are not used at night (e.g. coffeemakers).
- Start a recycling program that includes various types of containers in addition to paper products.

Table 13. Energy Efficiency Action Items for Local Governments

Timeframe	Action
Near-term (0-12 months)	• Implement city/county sustainability policy supported by volunteer Green Teams to promote energy efficient behavior among employees. • Assess enforcement of the current energy building code. • Launch an energy efficiency educational initiative. • Conduct energy audits of municipal/county buildings.
Medium-term (1-5 years)	• Adopt a green building resolution for all municipal/county buildings. • Implement incentives for green building practices. • Support reforms to State Energy Policy. • Improve the efficiency of municipal/county building stock.
Long-term (beyond 5 years)	• Enact a more efficient local building energy code. • Assess options for local incentive or loan programs.

General

- Make sure all air vents are kept clear of paper and office supplies (it can take 25% more energy to pump air when vents are blocked).
- Use the two-sided settings on office printers. Re-use single-sided prints for taking notes and as scrap paper.
- Communicate with building maintenance staff. Comfort issues could be related to a larger problem. Letting maintenance staff know about these issues early can help them solve problems more quickly.
- Close windows and doors in the warmer months while air conditioning and open windows at night to allow the building to cool when the temperature drops. Close the window shades during the day, especially on windows exposed to direct sunlight.
- In the cooler months, open window shades during the day, allowing the sun to warm the building naturally and close them in the evening to prevent heat loss. Always close windows when leaving for the night. Overnight the temperatures drop and an open window can cause the heating system to run non-stop, wasting energy.

- Identify and recruit green team members from diverse organizations and relevant city/county departments (e.g., energy, planning, public works, transportation, community and economic development) to help promote that policy.
- Establish a schedule of regular meetings for green teams. Work with green team members to develop a promotional strategy and vision for ongoing improvements to the policy.
- Develop a plan and identify resources to promote sustainability through events, contests, internal newsletters, public relations, information on the intranet, videos, posters, calendars, brown-bag lunch seminars, etc.
- Access ENERGY STAR resources to support the policy's goals, including:
    - Bring Your Green to Work with ENERGY STAR (http://www.energystar.gov/index.cfm?fuseaction=bygtw.showSplash)
    - Energy IQ test (http://www.energystar.gov/index.cfm?c=bygtw.view_showQuiz)
    - Tip cards and posters to share with co-workers, distribute at events, and hang in the employee break room (http://www.energystar.gov/index.cfm?fuseaction=bygtw.showSpreadWord)
    - Creating a green team (http://www.energystar.gov/ia/business/challenge/bygtw/Green_team_checklist_FINAL_4.pdf)
    - Change the World, Start with ENERGY STAR Challenge (http://www.energystar.gov/index.cfm?fuseaction=challenge.showChallengeForm)

Assess Enforcement of the Current Energy

Building Codes

The State has an established minimum building efficiency code, and it is important that local jurisdictions ensure compliance with the code. The Building Code Council formally adopted the 2009 International Code Series on May 10, 2010; however, implementation has not yet occurred. It is important for all stakeholders to know that a new code has passed and understand what is required. The Central Midlands governments should prepare building officials to enforce the new energy code and the construction community to comply with it by launching an education and outreach effort several months in before adoption is required. The more local governments promote and train the building community on the new code, the more it will be accepted and used.

Once the new code is implemented, creating protocols to enforce the code will be critical to ensuring the region benefits from the new code through lower energy costs, reduced environmental impacts, and a more robust economy. City and county staff should evaluate their permitting and inspection protocols to assess whether they will be sufficient to comply with and enforce the new building code once it is implemented.

City/County Action items include:

- Increase emphasis on building codes related to energy efficiency. Enhance training programs to inform all stakeholders in the building community about the code, what it entails, and how it will be enforced. To be effective, training should cater to the needs of building officials, architects, designers, engineers, manufacturers, builders and contractors, and building owners. The Building Energy Codes Program, ICC, ASHRAE and other organizations can supply tools and materials to help local jurisdictions implement and conduct training on new codes.
- Develop educational materials with guidelines and requirements that builders, architects and others in the construction community to comply with the new code. Provide tips and information on energy-efficiency design strategies and technology specifications to help with code compliance.
- Review enforcement strategies at the local level to ensure they facilitate compliance with the code. Enforcement strategies can include:
    - Review of plans
    - Review of products, materials, and equipment specifications
    - Review of tests, certification reports, and product listings
    - Review of supporting calculations
    - Inspection of the building and its systems during construction
    - Evaluation of materials substituted in the field
    - Inspection immediately prior to occupancy
- Evaluate compliance tools to demonstrate compliance with the new code. There are several common ways to document compliance: prescriptive forms, software generated forms, and modeling runs. A simple prescriptive form, particularly for residential construction might list the minimum requirements, show the appropriate details on the submitted plans, and include fields for noting insulation levels, equipment efficiencies, etc. A software-supported compliance tool might include inputs for building component areas, equipment efficiencies, and other specification. Many compliance tools, such as RES*check* and COM*check* generate a compliance report.
- Conduct plan check inspections and onsite building evaluations using a random sampling approach to verify that builders and developers are following the code and buildings are in compliance. See http://www.energycodes.gov/arra/reaching_compliance.stm for DOE compliance tools and support.

Launch an Energy Efficiency Education Initiative

In order to raise awareness of energy-efficiency technologies and practices, the city and county governments should collaborate on a centralized education

and outreach effort. A collaborative approach between the City of Columbia and Lexington and Richland Counties can benefit from economies of scale and a broader approach to conservation awareness, and be more effective than stand-alone efforts. Education and outreach should focus on increasing awareness of the benefits of energy efficiency, promoting widespread behavior change, and facilitating longer-term market transformation.

City/County Action items include:

- Commit both human and financial resources to the initiative. Assign an initiative leader from each jurisdiction to collaboratively manage the initiative development and implementation. Allocate budgets sufficient to support staff time for planning and implementation, as well as to develop a marketing strategy, design a professional brand identity and media platform, and produce multimedia tactics and collateral materials.
- Identify creative ideas and funding sources for implementing the initiative. The best way to raise awareness is through a broad outreach campaign that leverages multiple tactics including mass media, events and presentations, grassroots community outreach and social mobilization, challenges and competitions, social media, a program Website, direct communications, and other creative ideas.
- Create a marketing and implementation plan. Depending on resources, the Central Midlands Region may want to identify a range of ideas for the initiative that can be implemented in phases over time, based on the availability of resources and interest in the community.
- Solicit involvement and sponsorship from private entities, state agencies, local utilities, non-profits, educational institutions, and other neighboring local governments. Dedicated city/county resources can be supplemented significantly through contributions from local organizations and private companies, and by enlisting local volunteers to help implement grassroots outreach tactics.

Conduct Energy Audits of Municipal/County Buildings

Data provided by Lexington County, Richland County, and the City of Columbia shows that several energy-efficiency upgrades are in progress or have been made recently, but also shows that each of these buildings still has additional opportunities for savings. Energy audits are a good first step to improving the efficiency of existing buildings. Comprehensive audits of the City and Counties' entire portfolio of facilities could identify additional opportunities and prioritize upgrades based on savings potential.

An audit should include an inspection of the building and current equipment; interviews with key staff about building use, maintenance practices, and any building changes or new equipment being considered; and identification of potential energy conservation measures. If 15-minute interval data is available from the electric utility, it should be used to examine electricity use patterns throughout the day, which can be used to identify opportunities, such as

equipment that is running unnecessarily outside of operating hours. Metering tools may also be used as part of an audit to measure current equipment use and energy consumption. An audit will evaluate whether energy-efficiency upgrades are appropriate in a given building, identify building-specific energy conservation measures, and help to prioritize the measures that will achieve the most cost-effective energy savings.

Cadmus conducted a desk evaluation of several city and county buildings to determine the best candidates for comprehensive energy audits. The Lexington County Auxiliary Administration Building is an example of how efficiency measures can lower the energy intensity of a building. This facility underwent several efficiency upgrades and has the lowest energy intensity of the profiled office buildings. Of all profiled facilities, the Lexington County Jail likely has the greatest opportunity for efficiency upgrades because of its continuous operation and lack of past efficiency upgrades.

City/County action items include:

- Conduct comprehensive, portfolio-wide energy audits every five years. The City of Columbia has already had energy audits for its municipal buildings, and should continue to use the audit report as a guide to prioritizing energy-efficiency investments. The two Counties should conduct a competitive bidding process to solicit and select a qualified firm to conduct energy audits of all of its facilities.

Medium-Term Recommendations and Action Items

Adopt a Green Building Resolution for current and future Municipal/County Buildings

The City of Columbia and Lexington and Richland Counties should lead by example by adopting a resolution that requires all new buildings and major renovations to meet either U.S. Green Building Council or another advanced building standard.

City/County action items include:

- Conduct research on green building resolutions adopted by other jurisdictions.
- Evaluate the applicability of the components of identified resolutions and weigh the pros and cons of each in the context of local conditions (e.g., the technical capacity of the local commercial building community, the availability and cost of advanced energy technologies).
- Research the process required to adopt resolutions by each jurisdiction. Develop a proposal for review by key stakeholders.
- Promote the benefits of the resolution and gather stakeholder support. Ensure supporters speak out publically in support of the resolution.
- Implement the required procedures and protocols to pass the resolution.

Implement Incentives for Green Building Practices

Create an incentive structure to promote green building of commercial and residential construction. Incentives may include expedited processing of building applications for green buildings, higher density allowances for commercial projects and private developments, and/or property tax abatement for buildings that achieve certification of an advanced building standard.

City/County action items include:

- Conduct research on green building incentives adopted by other jurisdictions.
- Evaluate the applicability of the various incentive programs and weigh the pros and cons of each in the context of local conditions, particularly considering new building codes adopted by the State and required enforcement activities.
- Establish metrics for evaluating green building permit applications. Develop protocols for verifying and approving green building permit applications.
- Identify funding sources for energy efficiency projects and incentives.
- Research the process required to adopt the selected incentives in each jurisdiction. Develop a proposal for review and approval by key stakeholders.
- Promote the incentives among members of the building community. Provide information and guidelines on eligibility and protocols to apply for incentives.

Support Reforms to State Energy Policy

South Carolina has had some legislative activity around adopting a statewide energy-efficiency resource standard. When well written, these policies have been very successful in stimulating the implementation of utility DSM programs, resulting in significant efficiency improvements in existing buildings. Without an EERS or other legislative advances that create the market drivers needed to accelerate energy-efficiency adoption, the State will continue to make small, incremental progress in capitalizing on its energy-efficiency potential. Local governments can advocate for the State government to develop an energy-efficiency policy that aligns the interests of utilities and ratepayers and results in productive energy efficiency. It is important for the City and Counties to develop a comprehensive approach, thus the Central Midlands governments should consider both energy efficiency and alternative energy development priorities in its efforts to lobby State officials.

City and county action items include:

- Identify local legislative priorities and proper protocols for submitting local priorities to State representatives.
- Submit a set of legislative priorities to relevant State representatives each year. Significant legislative action is a multi-year process so the City and Counties should develop its policy priorities and articulate consistent, continuing support for them each year.

Improve the Efficiency of Municipal/County Building Stock

Cadmus conducted a desk review of energy-efficiency opportunities in a limited number of the City and Counties buildings, using data provided by each local jurisdiction's facilities and maintenance staff. Based on this review, we identified upgrades in each building that offer potential for energy savings. This review included only 16 of hundreds of the City and Counties owned buildings. **Table 14** outlines estimated priorities for implementing energy-efficiency upgrades in the City and Counties' buildings.

City/County action items include:

- Develop selection criteria for recommended energy efficiency improvements. These may include financial, building performance, needed equipment or technology upgrade, or employee comfort/ health criteria.
- Develop a list of priority efficiency upgrades and building improvements based on the identified selection criteria. Create a timeline for implementing the selected upgrades.
- Set an efficiency goal for Btu/sqft.
- Investigate possible funding strategies to support implementing the upgrades. Possible strategies include:
    - Utility resources. Investigate available incentives through the utilities serving each building. Commercial DSM programs may be able to provide funds to help offset the capital cost of equipment upgrades. Some utilities may also support demonstration projects or offer custom solutions to larger customers implementing substantial energy efficiency upgrades.
    - Performance contracting. An energy performance contract generally entails a turnkey energy retrofit and financing package, at times requiring no upfront costs from the end user. The company providing the performance contract typically guarantees that the measures outlined within the contract will produce enough savings to finance projects. Applicable measures can include: energy efficiency, renewable energy, and water conservation. The benefits associated with engaging in a performance contract include: risk mitigation through the guarantee on how executed projects will perform and technical expertise that the client may not posses. The drawbacks with a performance contract include: longer payback periods, lengthy contract periods, and financial commitments.
    - Grants. The federal government issues grants for large projects; a full directory of available energy-efficiency grants is online at www.grants.gov. Available grants may have applicants compete for a limited pool of money, or may be formula grants, in which money is allocated according to a particular set of applicant requirements.
    - Loans. The South Carolina Energy Office offers the ConserFund Loan Program to fund energy efficiency improvements for local

governments, and in public buildings. The ConserFund has had some difficulty allocating all of its funding. Local utilities may also offer low-interest loan programs. Private sector lenders consider loans to government entities to be low risk.

Long-Term Recommendations and Action Items

Enact a More Efficient Local Building Energy Code

In South Carolina, local jurisdictions can appeal to the State to enact a local energy-efficient building code that is more stringent than the State code. Once the local building and construction community becomes familiar with the new State building code and understands the benefits associated with a higher performance energy code, the City and Counties should apply to the Building

Table 14. Prioritized Central Midlands Building Upgrades.

Government	Estimated Priority	Building	Potential Upgrade Opportunities
Lexington County	1	Lexington County Jail	• Interior and exterior lighting retrofits • HVAC upgrades and controls • Kitchen equipment upgrades • Laundry facility upgrades • Faucet aerators • Low-flow toilets • Waterless urinals
	2	Cayce Magistrate Office	• Space heating upgrades • Domestic water heating upgrades • Interior lighting upgrades • Domestic water savings upgrades • Computer power management
	3	Summary Court Center	• HVAC upgrades • Domestic water heating upgrades
	4	Auxiliary Administration Building	• Interior lighting upgrades • Domestic water saving upgrades • Computer power management
	5	Fleet Services	• Cooling system upgrades • Ventilation control recommissioning and upgrades.

Government	Estimated Priority	Building	Potential Upgrade Opportunities
Richland County	1	Sheriff's Headquarters	• Lighting occupancy sensors • Domestic water savings upgrades • Computer power management
	2	Richland County Administration/ Health/ EMS Complex	• Enhance computer power management to be more user friendly • Domestic water saving upgrades • Continue/Complete change to T8 lighting • Lighting occupancy sensors for common areas
	3	Central Court	• Lighting occupancy sensors • Computer power management • Domestic water saving upgrades
	4	Judicial Center	• Computer power management
	5	Richland County Sheriff's Department Region 7 Substation	• Computer power management

Government	Estimated Priority	Building	Potential Upgrade Opportunities
City of Columbia	1	City Hall	• HVAC system retrofit • Domestic water conservation
	2	Eau Claire Fire	• HVAC system retrofit • Domestic water conservation
	3	Municipal Court	• HVAC System retrofit • Domestic water conservation
	4	Fleet	• Ventilation control recommissioning and upgrades. • Domestic water conservation
	5	Emily Douglas Park	• HVAC system retrofit • Domestic water conservation
	6	Taylor St. Parking	• Domestic water conservation

Code Council to implement a local energy-efficient building code that exceeds the State standard.

City/County action items include:

- Refer to the DOE publication, *Going Beyond Code* for guidance (http://www.energycodes.gov/publications/resourceguides/packets/gbc_guide/GoingBeyondCode_LoRes.pdf). The guide helps state and local governments design and implement successful "beyond code" programs for new commercial and residential buildings. The guide addresses keys to successful adoption and implementation and discusses the primary areas that are typically included in beyond code or green building programs, including energy-efficiency materials and resource conservation, water efficiency, indoor environmental quality, and site development and land use.
- Research requirements to apply for a local code that differs from the State standard. Implement the application process.
- Follow the recommendations outlined above to prepare for and enforce the new building code.

Assess Options for Local Incentive or Loan Programs

In the absence of statewide mandates that result in utility DSM programs, the Central Midlands governments may consider offering its own incentive or loan programs to promote energy efficiency at the local level. While there are several examples of such programs around the country, they are not a small undertaking and it can be challenging for local governments to design, develop, fund, implement and evaluate. Thus, the City of Columbia, in collaboration with Lexington and Richland Counties, should embark on a thoughtful and deliberate evaluation process to determine whether their implementation is consistent with available resources and capabilities, and with regional goals.

City/County action items include:

- Assess potential funding options. Incentive or loan programs require sustainable, long term funding. City and County staff should research funding sources supporting incentive programs in other jurisdictions and evaluate the pros and cons of replicating attractive funding models in the context of local conditions.
- Identify potential programs. Local governments often implement residential energy audit programs as a platform for broader outreach, installing low-cost efficiency measures and to identify priorities for larger equipment upgrades. The City and Counties should evaluate various program options for their applicability to local conditions.
- Develop a budget. Based on the identified program, the City and Counties should develop an estimated annual program budget that includes staff resources, marketing and outreach, administration, incentives, quality control, tracking, and evaluation.

- Assess staff resources. The process to develop and implement incentive or loan programs can be a significant undertaking that requires considerable staff time and a high level of technical and organizational skill. If applicable skills do not exist in the local governments' organizations, they may want to hire or outsource that role.
- Solicit involvement and support from other stakeholder organizations.

Make a go/no-go decision. If, based on its assessment, the City and Counties decide to develop a local incentive program; they should seek support from a professional firm with experience in the design, development, and implementation of such programs.

3.0 Decreasing Demand Through Broader Initiatives

Decreasing Demand through Broader Initiatives

The material in Chapter 2 focused on the sort of energy footprint reduction initiatives that the local governments can pursue with changes to their internal policies in order to boost energy efficiency. Regional policies such as actions on land use, transportation, procurement, waste management, and drinking/ waste water while still under local government control, require a level of regional cooperation to see significant energy efficiency. Hence, this chapter focuses on reducing the region's energy footprint through areas over which local government possesses considerable control and expertise but looks at the cooperative nature of these activities.

Existing Conditions

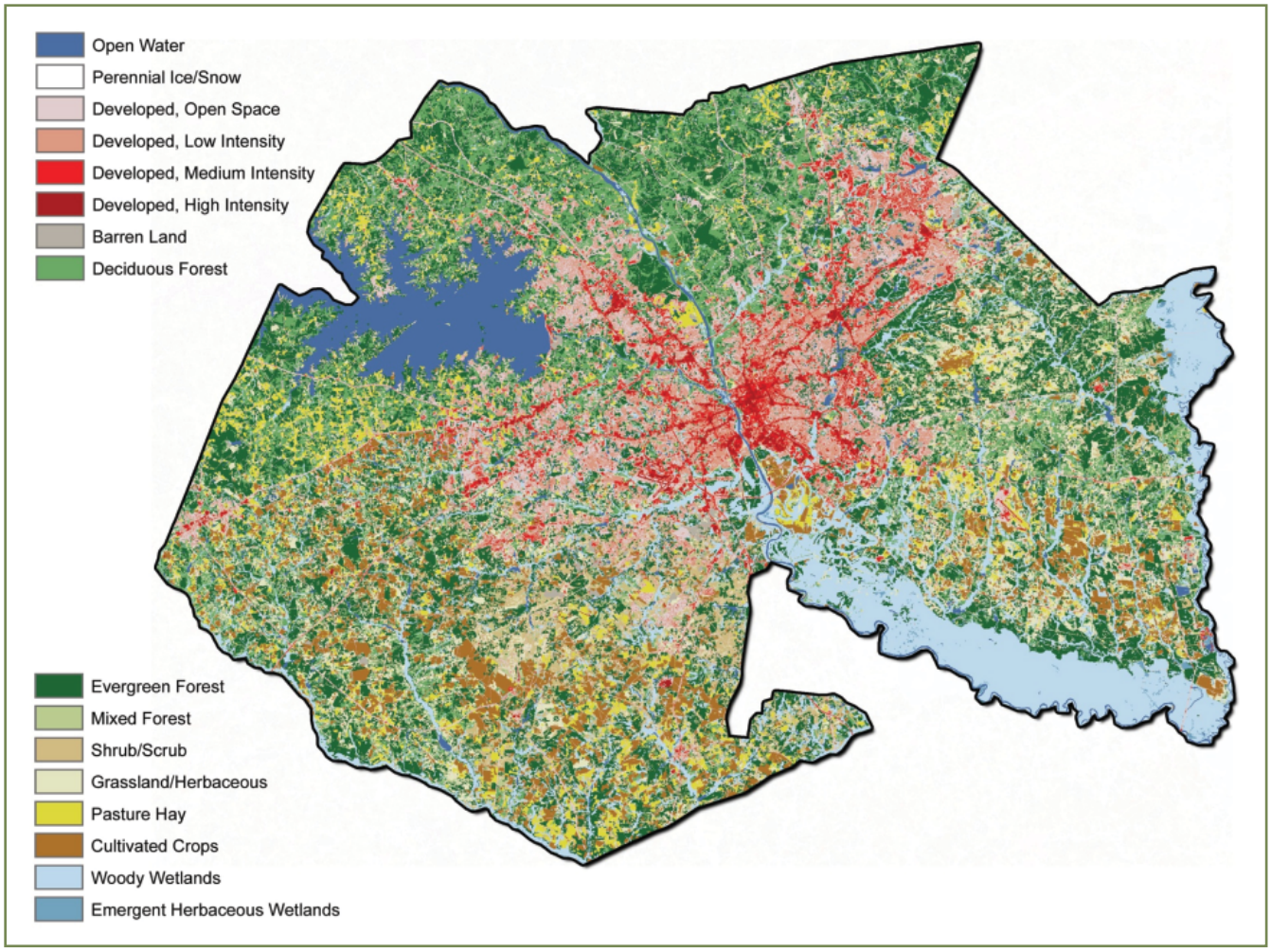
Over the last several decades, the central midlands area has developed in a very low density manner that has resulted in a high percentage of single occupant vehicle trips as measured by increasing vehicle miles travelled (VMT). Not only has amount of miles travelled increased, but the time spent in travel has also increased, i.e. vehicle hours travelled (VHT). This auto-centric development pattern has also resulted in virtually no real alternative transportation options for the central midlands residents because the population density is not high enough to support real alternative transportation systems. Such systems would be more viable IF there were areas of concentrated residential and workplace development.

Land Use

The core of "developed" land, as shown in **Figure 9**, is clearly centered in downtown City of Columbia. From there, development radiates out along the major corridors, which are also clearly visible. For example, development tracks US 1 between the Town of Lexington and the Town of Batesburg-Leesville, where scattered development is visible along the corridor within an otherwise rural area. While the map shows a distinctive "X" pattern of development, it also shows the encroachment of low-density development into rural areas of the counties.

Nineteen percent of Richland County and 16% of Lexington County are categorized as "developed." The category with the highest percentage in both counties is "Evergreen Forest," most of which is concentrated near the outskirts of the counties, at 22% and 21% in Richland County and Lexington County respectively. **Table 15** provides a break-down of the land use categories for the two counties.

Figure 9. Land Cover for Richland and Lexington Counties, 2006



Source USGS 2006 National Land Cover Database

Table 15. Development Categories in Richland and Lexington Counties

	Richland (Acres)	% Total Richland	Lexington (Acres)	% Total Lexington
Open Water	9,876.07	2.00%	37,719.13	7.78%
Developed Open Space	44,075.37	8.93%	42,933.60	8.86%
Developed Low Intensity	32,834.24	6.66%	24,996.64	5.16%
Developed Medium Intensity	12,571.26	2.55%	8,004.63	1.65%
Developed High Intensity	4,192.57	0.85%	2,850.42	0.59%
Barren Land	1,528.96	0.31%	2,469.68	0.51%
Deciduous Forest	74,675.00	15.14%	68,201.11	14.07%
Evergreen Forest	109,860.83	22.27%	102,672.84	21.18%
Mixed Forest	13,240.00	2.68%	14,577.03	3.01%
Shrub/Scrub	1,937.05	0.39%	3,399.74	0.70%
Herbaceous	58,744.70	11.91%	68,122.16	14.05%
Hay Pasture	22,896.35	4.64%	39,441.79	8.14%
Cultivated Crops	22,498.93	4.56%	44,551.74	9.19%
Woody Wetlands	82,952.50	16.82%	23,946.27	4.94%
Emergent Herbaceous Wetlands	1,427.99	0.29%	894.91	0.18%
Total Area	493,312.67	100.00%	484,781.91	100.00%

Source USGS 2006 National Land Cover Database

Sprawl and Its Impacts

The overall geographic distribution of the region's growth, as illustrated in **Figure 10** and **Figure 11**, can be characterized as an "X" pattern that runs outward from downtown Columbia, into the unincorporated sections of Richland and Lexington Counties with some spillover into Kershaw County along US 1 and Interstate 20.

Since the automobile allows people to travel relatively far distances in just a few minutes, an auto-oriented land use pattern is not concerned with the distances between activity centers. Policies such as generous parking standards and "big-box" retail abandoning store fronts along the inner suburban rings to move further into the rural areas encourage the dependence on the automobile.

A more sustainable land-use pattern can be found in the region. **Figure 12** shows a typical layout of an automobile-centric suburban neighborhood characteristic of suburban Richland and Lexington County compared to the "traditional neighborhood development like that found in the Shandon neighborhood in the City of Columbia or "The Avenues" in the City of Cayce.

Figure 10. Population Distribution

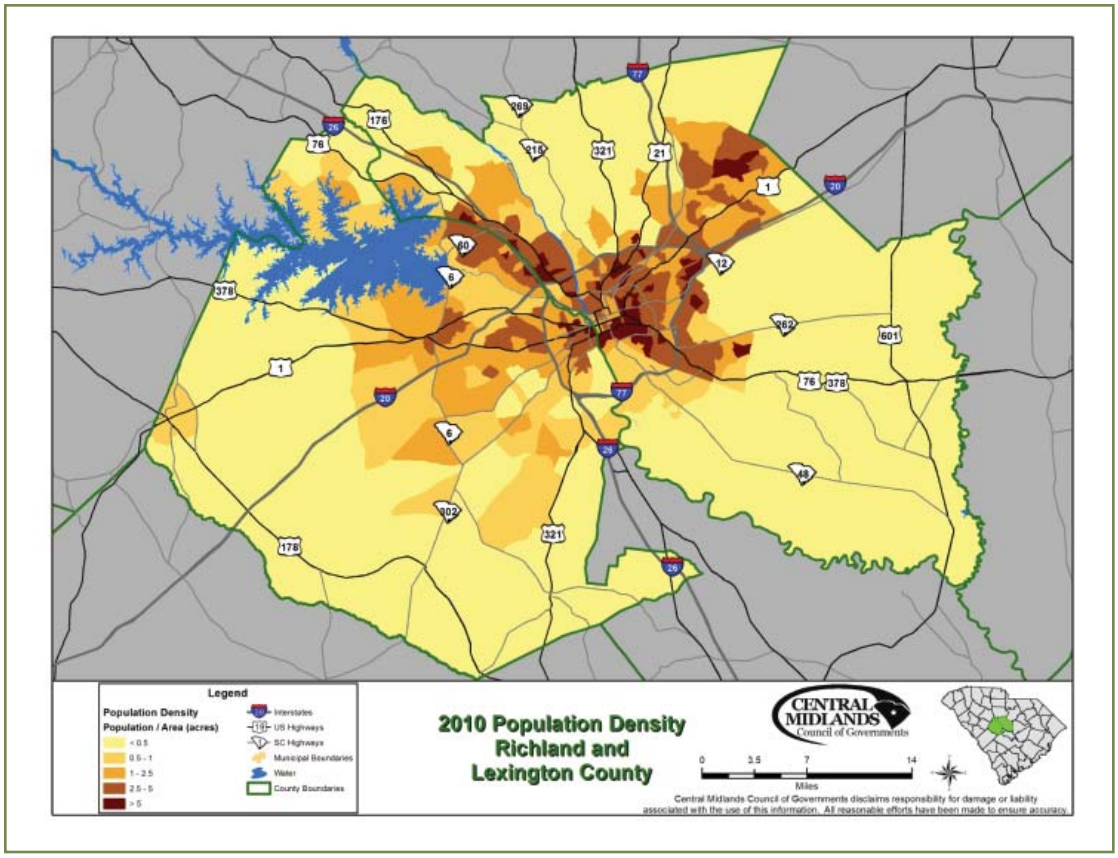


Figure 11. Growth and Development Trends

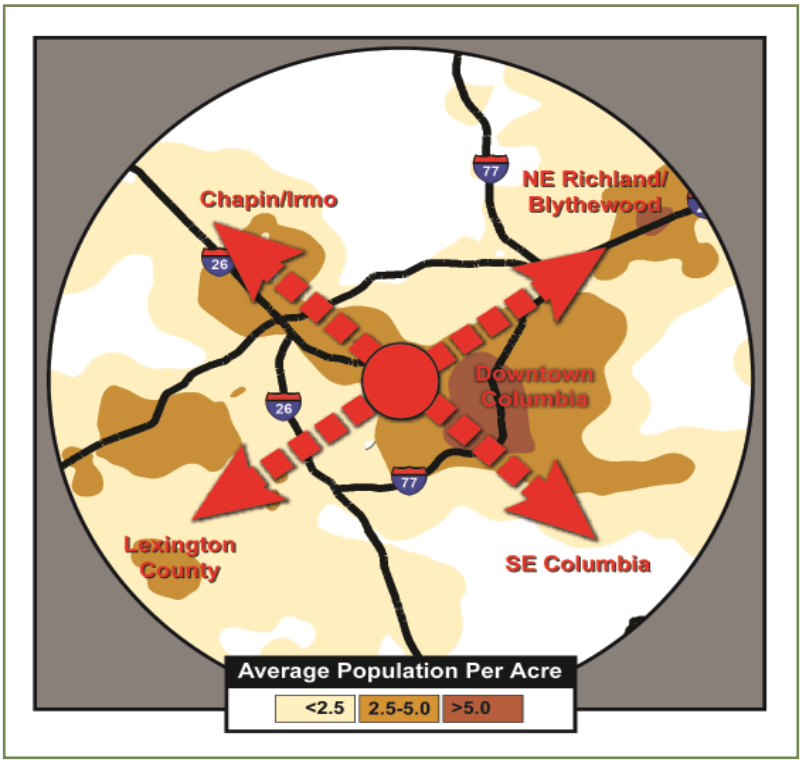
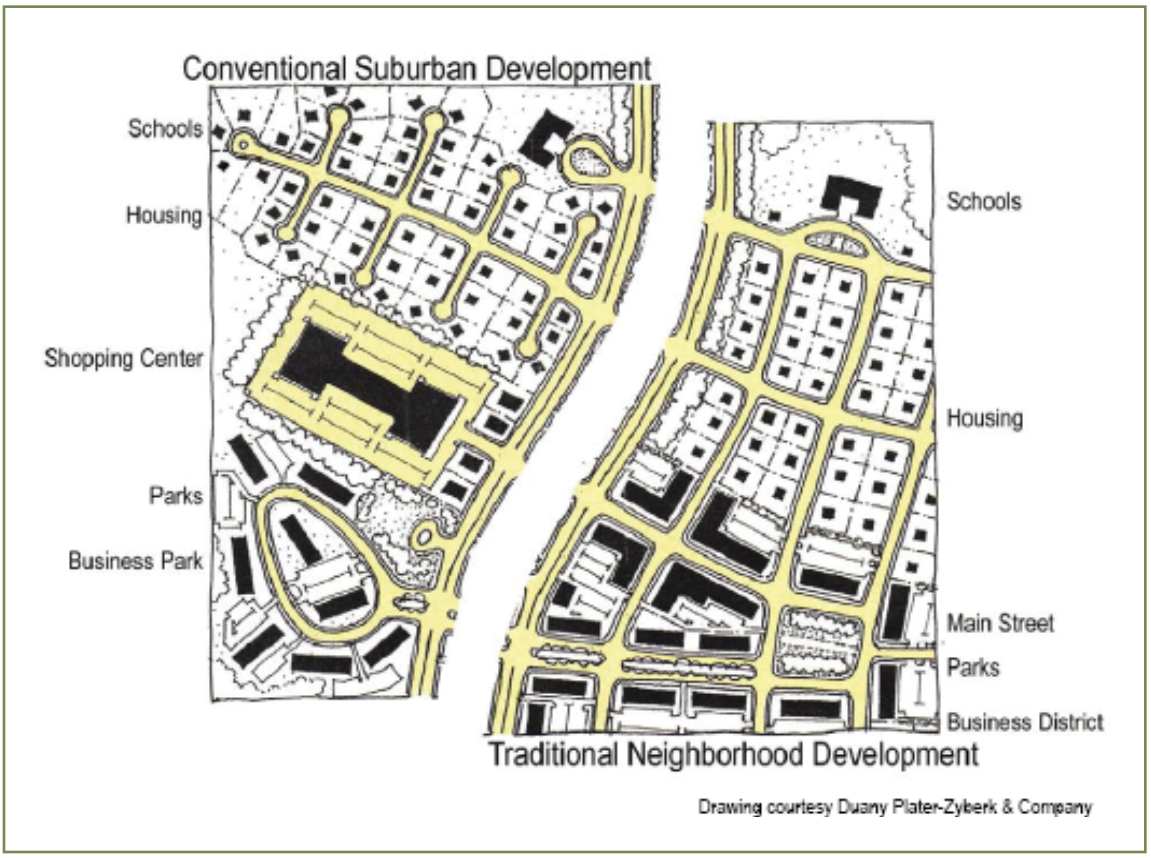


Figure 12. Comparing Neighborhood Development Alternatives



Among the effects of conventional suburban, or sprawl, development illustrated above is the decline of an "active lifestyle" typified by those who walk or bike to work or errands. In the TND illustration, it is much easier for a student to walk to school, a parent to walk or bike to work, and a family to walk to a restaurant or the movies. The loss in an active lifestyle has been linked to health concerns such as obesity and increased rates of diabetes as discussed by a recent article, *Study Links Sprawl, Obesity*, (http://www.nytimes.com/gwire/2010/09/09/09greenwire-study-links-sprawl-obesity-10432.html).

Linking Land Use and Transportation

The very low density development pattern in the midlands area directly affects "true" housing affordability. The Center for Neighborhood Technology (CNT) developed a system, known as the Housing + Transportation Affordability Index (H+T®) Affordability Index or Index, to combine housing costs and transportation costs to better measure true housing affordability. The research involved in the development of the Index found that the two primary independent variables in the model – residential density and household income – drive the three primary dependent variables, i.e., auto ownership, auto use and transit ridership.

It has been accepted housing industry practice that a home is considered affordable when the housing costs do not exceed 30 % of the household income. The Index asserts that the combined housing costs and transportation costs should not exceed 45% of the household income.

The yellow area in **Figure 13** shows that most of the Census block groups in the midlands have housing costs at, or below, 30% of the household income. The Lake Murray area, the Forest Acres area and the near Northeast area have housing costs above 30% of the household income.

The areas shown in blue on **Figure 14** have a combined H+T Index of 45%, or more, of their household income. A comparison of these two Figures dramatically depicts that one of the major benefits of higher density development is a lower H+T Index, i.e., inside the "Beltway". The Index is lower because the VMT and VHT, i.e., transportation costs are lower.

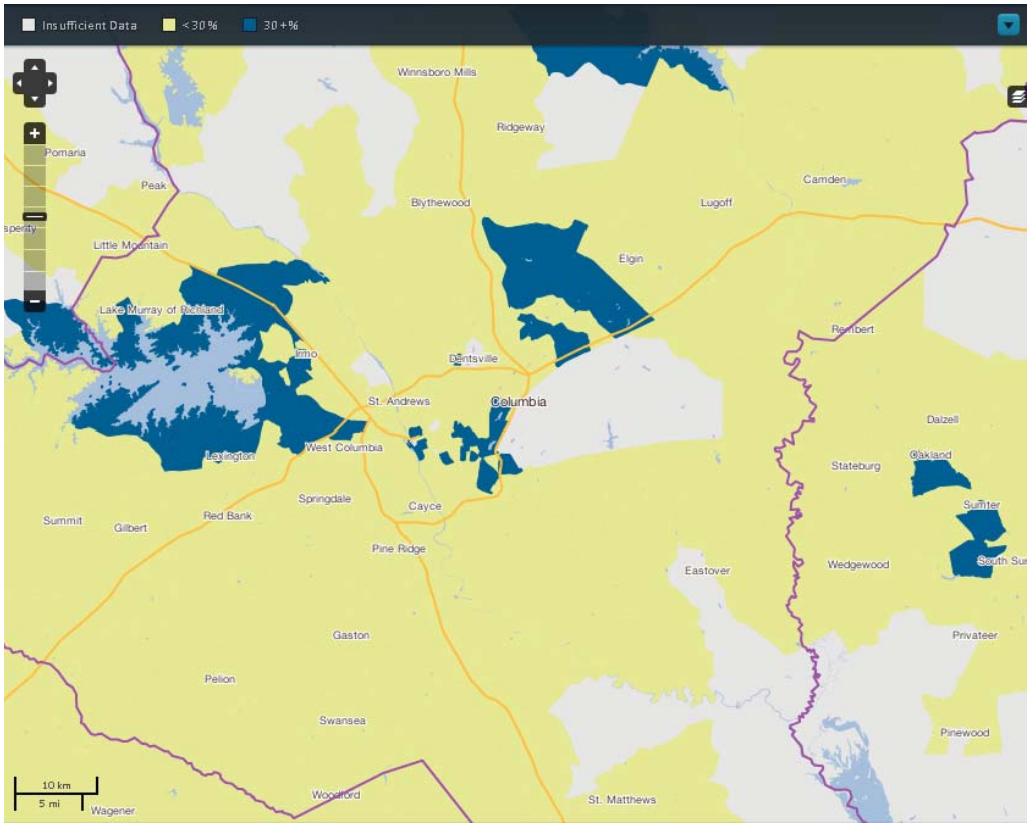


Figure 13 Housing Costs in the Central Midlands Region

Source: www.htaindex.org

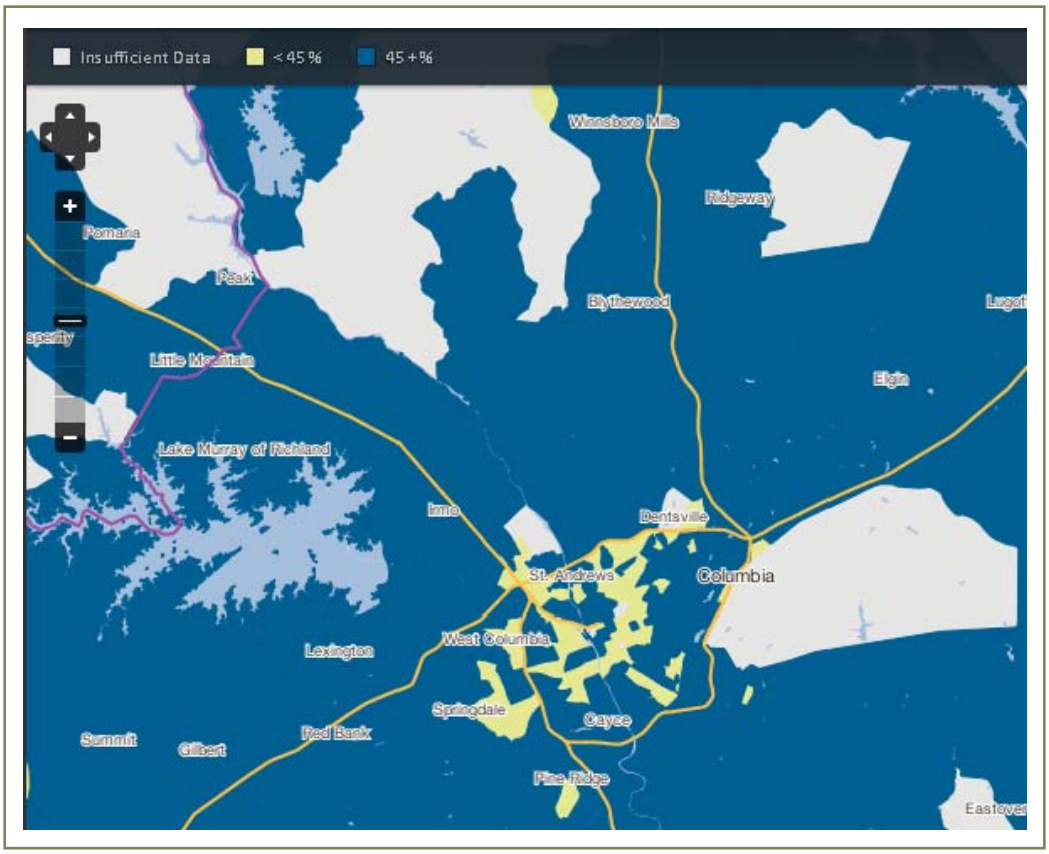
There is a direct correlation between the amount of VMT and the amount of greenhouse gas emissions (GHG). The Index also includes information regarding urban GHG emissions associated with household auto use.

The EPA has estimated that cars and trucks are responsible for 81 % of carbon monoxide emissions 49 % of nitrogen oxide emissions and 33% of carbon dioxide and other greenhouse gas emissions. In addition, cars and trucks burn millions of barrels of oil every day which accounts for half of the nation's fossil fuel consumption[1].

The direct relationship between GHG reduction and VMT reduction was documented in a presentation to the CCAP VMT & Climate Change Workshop in May 2008. The Cambridge Systematics group stated that greenhouse gas (GHG) emission reduction can be measured by miles per gallon of fuel efficiency; use of alternative fuels with lower carbon content; vehicle miles travelled; and traffic

1. Dangerous By Design, Michelle Ernst -Tri-State Transportation Campaign and Lilly Shoup – Transportation for America, undated, pg. 14 downloaded April 2010)

Figure 14 Housing and Transportation Costs in the Central Midlands Region



Source: www.htaindex.org

congestion. The amount of GHG emission is determined by travel activity (trips) times person miles per trip times vehicle miles per person miles times gallons per vehicle mile times GHG per gallon of gas.

The Cambridge Systematics staff had developed a model to estimate the relative effectiveness of various GHG reduction measures for a target year of 2030, about the same time period of the current COATS 2035 LRTP. The model showed that the percentage of reduction in GHG was virtually equal to the percentage reduction percentage reduction in VMT. While all the scenarios that were tested involved synergistic combinations of measures, the single most effective measure to reduce VMT, therefore reducing the GHG, was changes in land use development patterns to more dense more situations.[2]

Many of CMCOG's regional studies and sub-area plans draw the connection between land use policies and alternative transportation modes. The following are some observations and recommendations from plans developed by the Columbia Area Transportation Study (COATS), the Metropolitan Planning Organization (MP0) for the Central Midlands region that draws the connection between land use policy and transportation:

> A number of planning approaches offer alternatives to development patterns that cause almost total reliance on private automobiles. By strategically mixing land uses and providing and better alternatives to

2. How Much Can We Slow VMT Growth ?: The Potential Savings of Implementing Best practice Everywhere, CAAP VMT & Climate Change Workshop, Cambridge Systematics, May 2008)

> each person driving their own car, vehicle miles traveled by automobiles can be reduced and this, in turn, can begin to reverse the negative environmental and lifestyle trends associated with sprawl. [3]
>
> The presence of land development patterns that are supportive of transit services would help increase the ridership base for a potential commuter rail service. Even though research suggests that high densities are not as critical for the viability of commuter rail as compared to other high-capacity transit modes, it is important for jurisdictions in the region to recognize the connections between land use decisions and transportation system impacts.[4]

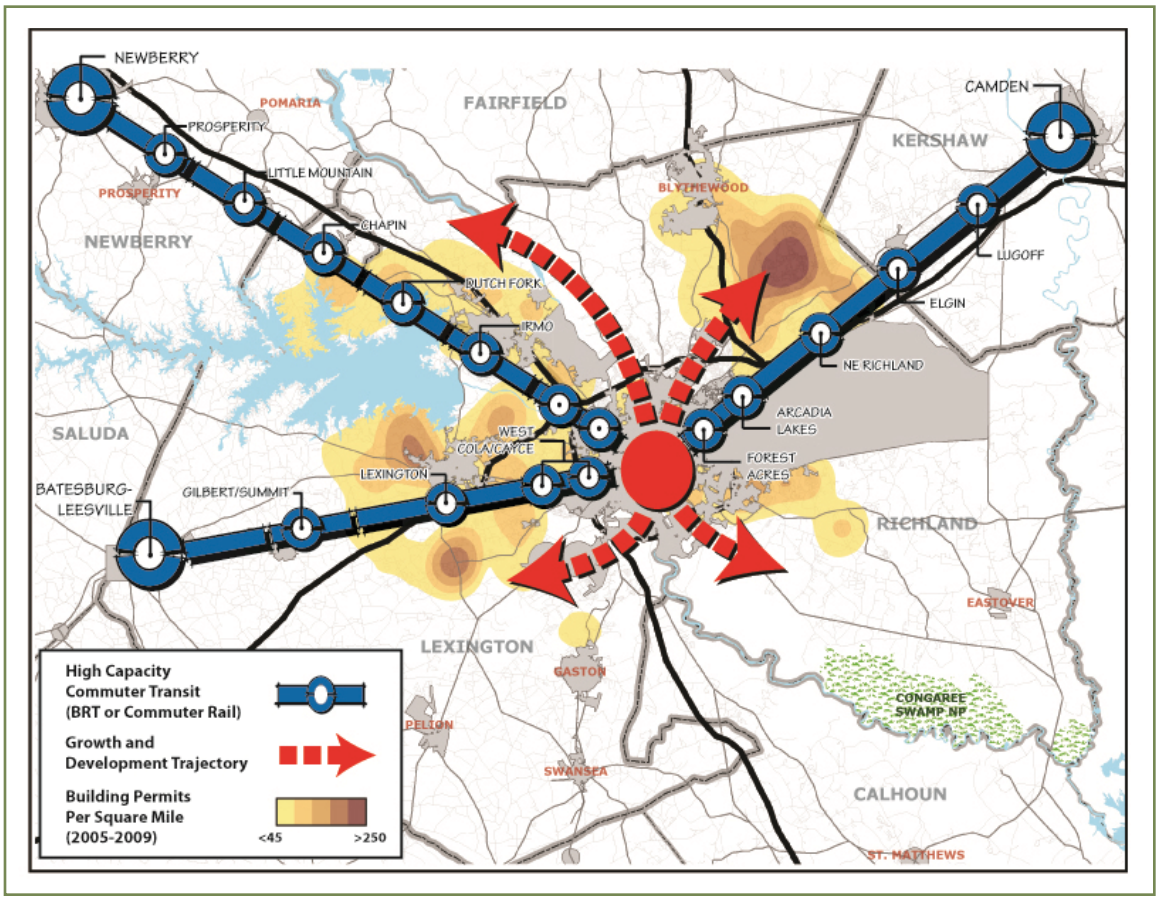
While the comments above address general policies, the comments below reflect how the recommendations can apply to a specific corridor; in this case Columbia Avenue (S-48) in the Town of Chapin:

> The relationship of future land use characteristics to the efficiency of the transportation network in and around the S-48 Columbia Avenue Corridor is of primary importance to encouraging a sustainable setting for reasonable growth. Seeking alternatives to the pattern of car-dependent development, identifying a rational connection between land use policy and transportation is being increasingly recognized as critical to reducing the need for costly future road construction and expansion projects. Other benefits include preserving natural resources, fostering more livable and socially interactive neighborhoods, and, through reduction of in car travel, assisting in the attainment of air quality standards for the metropolitan areas. Key to achieving such goals along the S-48 Columbia Avenue Corridor, and in the Town of Chapin as a whole, is the implementation of land use and access management measures.[5]

This link between land use and transportation policy is illustrate in **Figure 15** which shows the "X-pattern" development map with the recommended commuter rail routes identified in the 2006 commuter rail study. The study identified these three routes as the most likely in the region to support commuter transit, but acknowledges that there are many hurdles, including funding, that must be overcome to make commuter rail possible. In lieu of commuter rail, the study suggests interim modes of commuter transit including enhancing the express bus service and bus rapid transit.

3. Pg 56 Midlands Tomorrow 2035 LRTP
4. Pg. 8-5 Central Midlands Commuter Rail Feasibility Study, 2006
5. Pg. 53 S-48 Columbia Avenue Corridor Study

Figure 15. Development Pattern with Proposed Commuter Rail Routes



While land use regulations like zoning can facilitate the use of alternative transportation modes such as biking, walking and transit as discussed above, environmental planning can identify and protect sensitive and other areas that are not suitable for development. The result is a more compact development pattern that protects critical environmental resources, improves air quality, mitigates urban heat island impacts, and reduces demand for fossil fuels by accommodating alternative transportation. Policies to implement preservation/conservation standards can range from identifying sensitive areas on an individual development-approval basis, to adopting a regional urban growth boundary. The site-by-site approach may not consider regional connectivity between sensitive areas, while the urban growth boundary (see **Figure 16**) poses problems regarding where the boundary should be set and if the growth area is sufficient for future development.

The CMCOG has developed a green infrastructure plan which can be seen as a first step towards adopting regional sustainability goals. Green infrastructure is a term often applied to economical and environmentally friendly means for protecting and managing land and water resources. Over the past two decades separate but related conceptual definitions for Green Infrastructure have emerged, one centered on the protection of open space for its inherent natural value, and one centered on utilizing sustainable Low Impact Development (LID) strategies to address storm water runoff related issues.

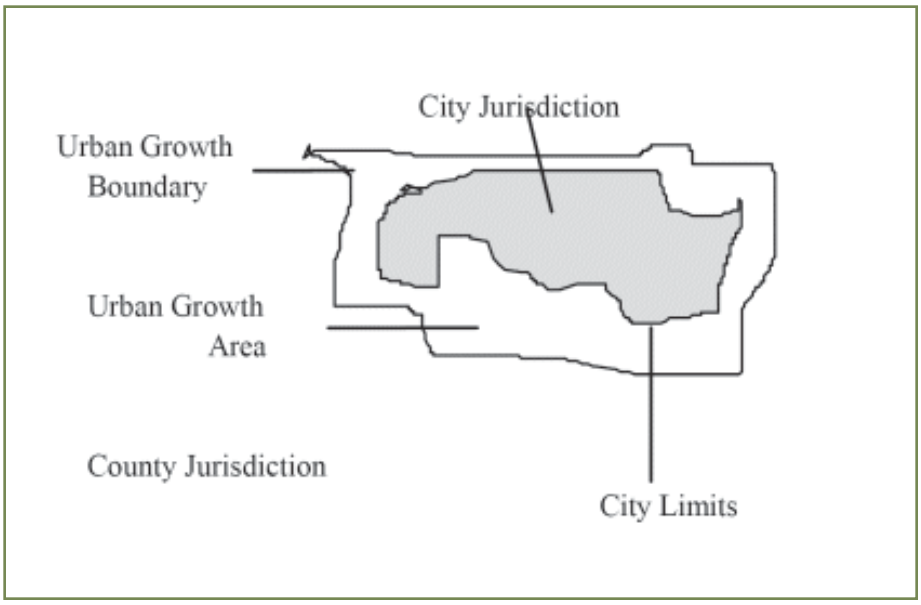


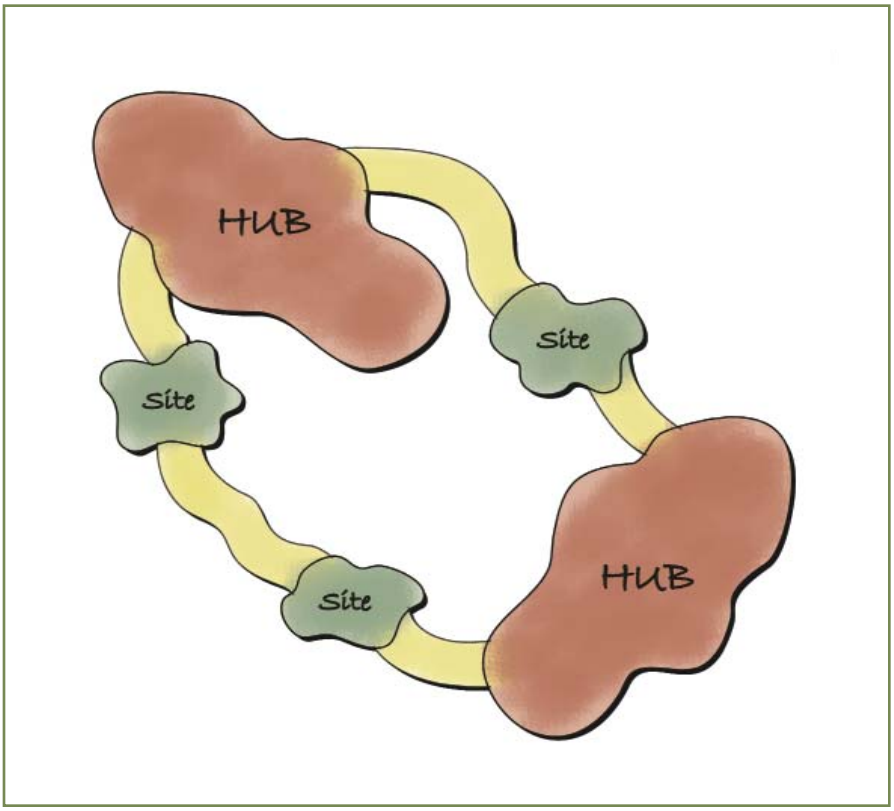
Figure 16. Illustration of an Urban Growth Boundary

Source: http://www.co.umatilla.or.us/planning/plan_per_process.htm

In the case of the open space definition, green infrastructure is commonly described as "an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations," (Benedict and McMahon, 2006). This definition typically describes a "hubs, links and sites" approach to open space preservation. Hubs anchor green infrastructure networks and provide an origin or destination for wildlife and ecological processes moving to or through it. Sites are smaller community parks and areas where natural features and ecological processes are protected and/or restored. Links are the connections that tie the system together and enable green infrastructure networks to work. They range in size, function and ownership. **Figure 17** illustrates the Hubs, Links, and Sites approach to green infrastructure planning.

The water resource definition of Green Infrastructure refers more specifically to a natural or engineered system that uses soil and vegetation to manage storm water runoff by retaining and treating it where it falls, allowing for fewer disruptions to the natural hydrologic cycle and contributing to improved health of the overall watershed. Low Impact Development (LID) concepts are often used interchangeably with this definition of Green Infrastructure because they also refer to a planning, design and development framework for using natural site features along with engineered facilities to better manage land and water resources. Examples of this type of site- specific project can include rain gardens, rainwater barrels, cisterns, bio-swales, green roofs and green walls. By decreasing impervious paved surfaces and increasing the amount of vegetation in urban environments, installing GI/LID techniques can impact energy consumption by decreasing ambient temperatures in the build environment**. Figure 18** and **Figure 19** illustrate how a government building can be retrofitted with a green roof and wall.

Figure 17. Sustainable Infrastructure Components



Source: Central Midlands COG

Figure 18. Green Roof Retrofit Opportunity

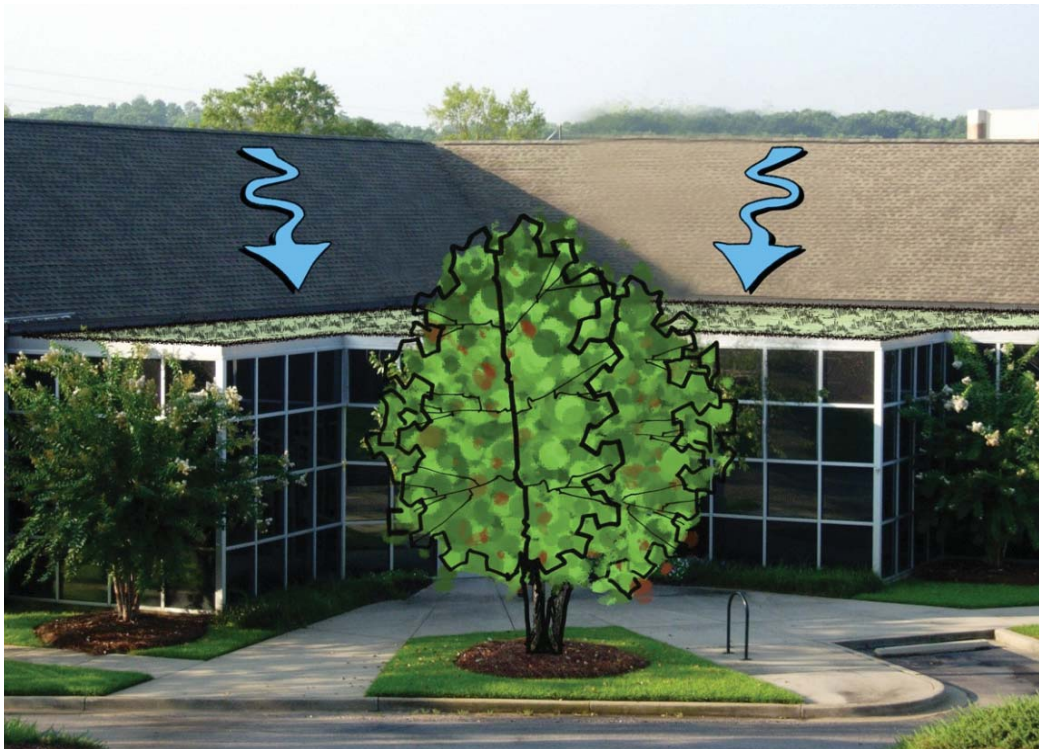


Figure 19. Green Wall Retrofit Opportunity

Transportation

As proposed by The Cambridge Systematics staff (see the discussion on page (55)), reducing the VMT results in a reduction in GHG emissions of approximately the same amount. While effectively reducing the GHG emissions requires various combinations of measures, one of the single most effective tools reducing the VMT by changing the land development pattern from a low density auto-centric orientation to a higher density less auto dependent pattern in nodes and corridors. The following is offered in support of this statement:

- The Urban Land Institute has estimated that carbon emissions from transportation will be 41% above today's levels by 2030, unless driving is reduced.
- The transportation system's contribution to the poor air quality is estimated to be between $ 40 billion and $64 billion per year to address health issues.
- The 2008 National Household Transportation Survey found that 50% of all trips are three miles or less and that 28% of all trips are one mile or less. Many of these short trip lengths can be more efficiently accommodated by walking, biking and/or riding a bus.
- If bicycling trips were increased from 1% per to 1.5% per year, 462 million gallons of fossil fuel would be saved each year which in turn would reduce the VMT and the annual GHG emissions.

- Transit use (bus and/or rail) currently saves 1.4 billion gallons of fossil fuel each year which in turn would reduce the VMT and the annual GHG emissions[6].

Long Range Transportation Plan

The Columbia Area Transportation Study (COATS) is responsible for developing a Long-Range Transportation Plan for the region which is used to identify transportation needs and prioritize projects for funding. The 2035 LRTP noted that vehicle miles traveled (VMT) has grown faster than the rate of population growth and is projected to increase another 70% by 2035. **Table 16** shows the projected increases in VMT and VHT respectively in Lexington and Richland Counties from 2005 through 2035.

The predicted increase in VMT is, in part, a result of the low density land use pattern associated with the sprawl development discussed earlier, creating a dependence on the automobile as a mode of travel. Additionally, higher VMT and VHT contribute towards two of the region's public health concerns: air quality and obesity.

Table 16. Projected Growth in VMT and VHT in Lexington and Richland Counties, 2005 to 2035

	2005	2035 Estimated
VMT	15,705,225	26,614,065
VHT	326,469	606,075

Source: COATS 2035 Long Range Transportation Plan

Commuting

Based on 2010 Census data, approximately 79% of the residents in Richland and Lexington Counties indicated that they drive to work alone (see **Table 17**). While this category of commuter increased over the nine-year period, so did those who work at home. Categories that reflect an alternate mode of transportation, (carpool, public transportation and walking), declined during that period. The high percentage of single occupant vehicles results in a higher demand for fossil fuels and contributes to local air pollution problems including ozone emissions. **Table 18** shows the commuting pattern for each county. In both cases, a plurality of the commuters stay within their county, but in Lexington County, almost as many out-commute as work and live in the county. Knowing where those out-commuters are going would help in the development of a commuter transit system.

6. " America Needs Complete Streets", Dan Burden & Todd Litman, Institute of Transportation Engineers (ITE), ITE Journal, April 2011, pg. 36 – 43

Table 17. Transportation Totals for Lexington and Richland Counties

	2000	2010	% Change
Car truck or van - drive alone	210,414	234,571	11.48%
Car truck or van - carpooled	31,627	29,592	-6.43%
Public transportation (excluding taxi cab)	3,492	3,045	-12.80%
Walked	10,802	4,812	-55.45%
Other means	3,383	6,473	91.34%
Worked at home	6,509	18,537	184.79%

Source: US Census Bureau

Table 18. Commuting Patterns Lexington and Richland Counties

Commuting Patterns	Workers (LC)	Workers (RC)
Work and Live in County	67,370	143,905
In-Commuters	33,694	71,205
Out-Commuters	51,224	32,009

Source: 2010 Census Transportation Planning Package (CTPP)

Road Network

The map in **Figure 20** shows the road network of the two counties based on the SCDOT functional class which divides the network into rural and urban categories. For the 1,794 miles of road, 52% is considered rural and 45% is considered urban. The remaining 3% is local, which could be in either a rural or urban area.

As discussed above, the 2035 Long Range Transportation Plan (LRTP) estimated the projected transportation needs to accommodate the estimated 2035 population. Three of the major portions of the LRTP are the Highway Element, the Congestion Management Element and the Transit Element

The Highway Element analyzed 62 proposed road widening projects based on eight criteria. Only 18 road widening projects were determined to be financially feasible, i.e., had enough projected revenue, approximately $ 350 million, to pay for the project between 2005 and 2035. The estimated cost of completing the proposed 66 projects is $ 1.6 billion.

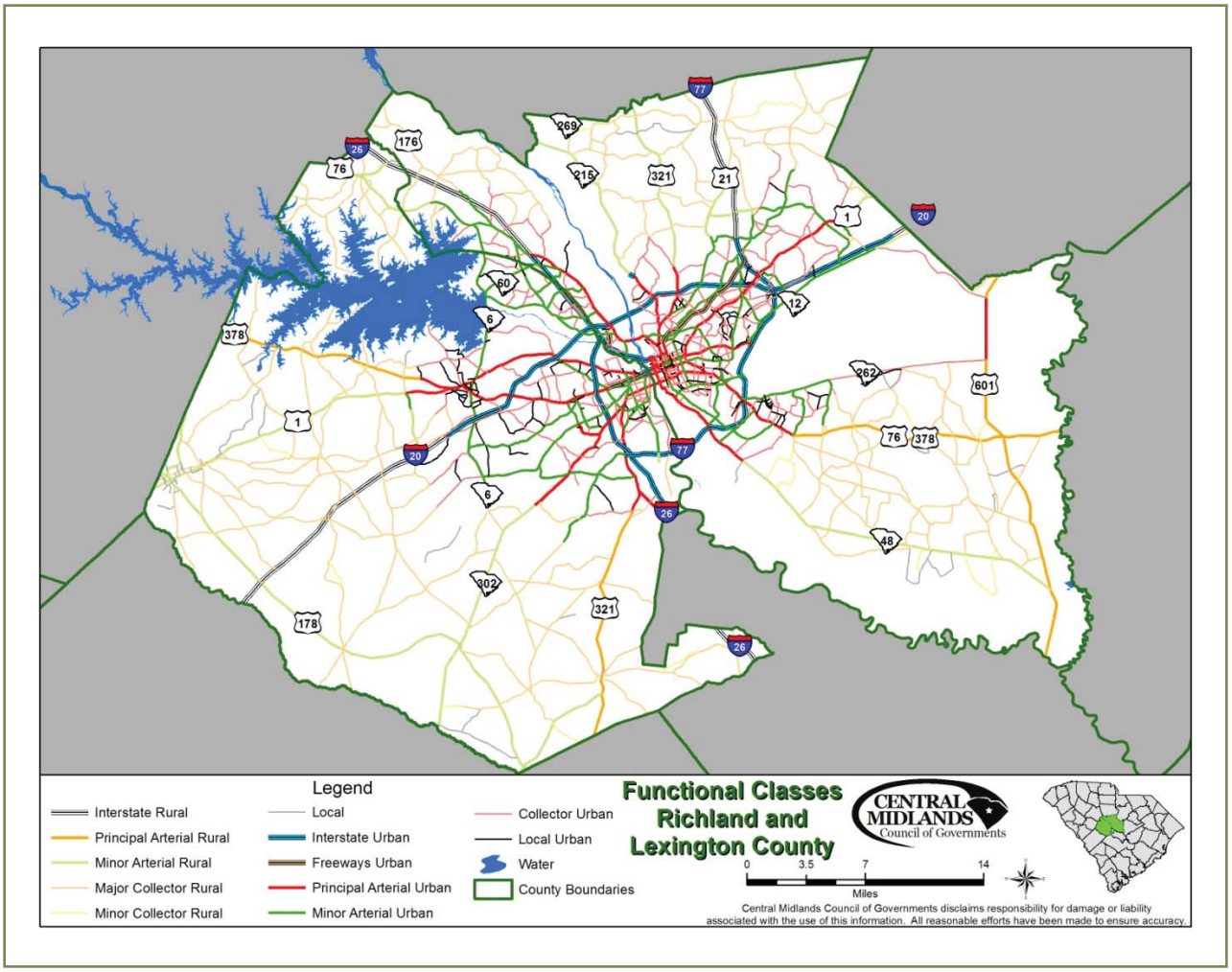
The analysis described above is a perfect example of the prevalent state of traffic analysis in which the underlying assumption is that the development pattern over the last three decades will continue indefinitely into the future. In other words, it implicitly assumes that 90 % of all trips will continue to be made by automobile.

Todd Litman, one of this country's most respected transportation experts, has published many studies regarding various aspects of transportation issues. He states that management experts always say that one cannot manage what one cannot measure. "…However, what is measured, how it is measured and how the data are presented can affect how problems are evaluated and solutions are selected…"

In transportation planning, automobile use is given higher priority consideration, mostly because it has been the accepted practice for the several decades. Litman states "…Most travel surveys count only the primary mode used between relatively large transportation analysis zones (TAZ)..As a result, they undercount shorter trips, non-motorized trips, non-work trips, travel by children and recreational travel…"

Therefore, one of the actions that can be taken is that the next version of LRTP should include some measures of non-motorized trips. The LRTP project evaluation criteria should be adjusted to give more weight for alternative modes of transportation and more weight to conformance local government comprehensive plans.

Figure 20. Richland and Lexington County Road Network



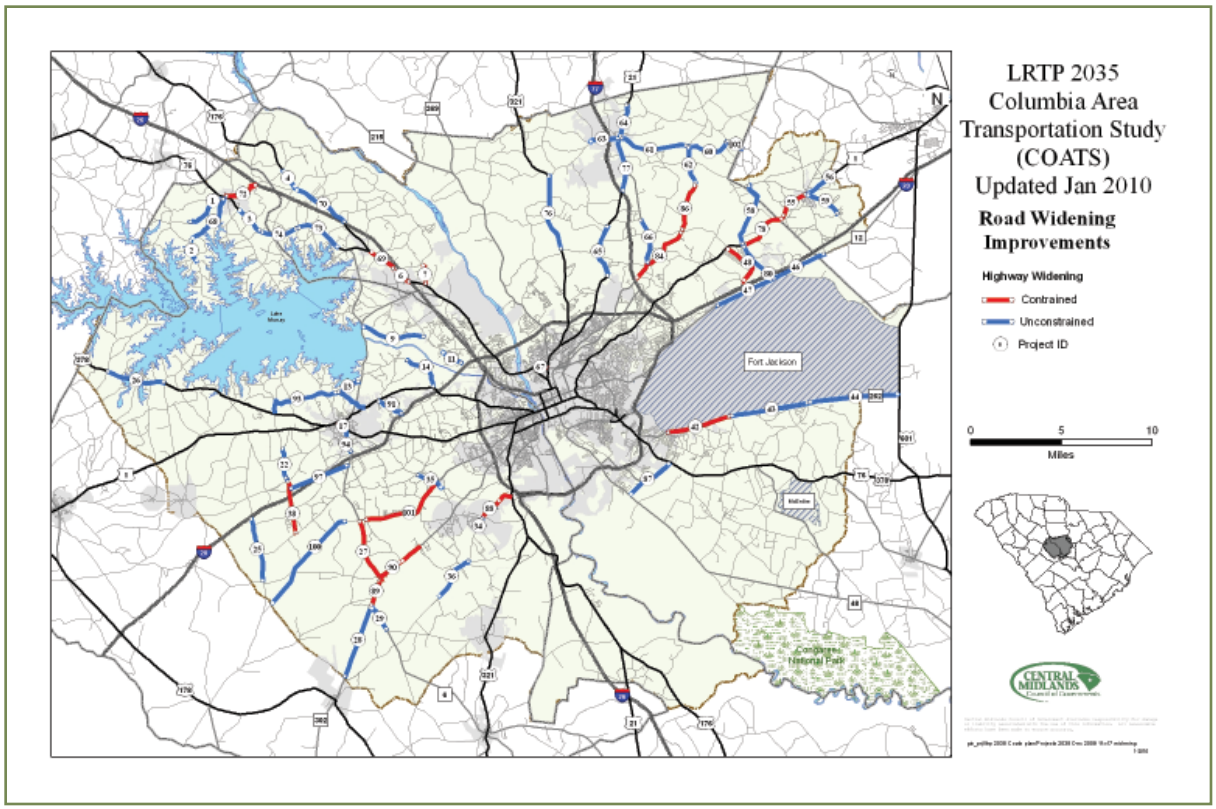


Figure 21. Prioritized Road Widening Projects

Congestion Management Element

The Congestion Management Plan (CMP) portion of the LRTP identifies congested areas and recommends various mitigation practices. Using accepted congestion measurement practices, 330 centerline miles of roadways were evaluated based on the 2005 traffic and the projected 2035 traffic.

The analysis showed that only 8% of the roadway corridors examined were congested or potentially congested. The analysis will be repeated as part of the next LRTP update.

A byproduct of the corridor analysis is a determination of congested intersections. The CMP network consists of 1170 intersections, of which 845 are signalized. This study found that 40 intersections were severely congested in the AM peak hour and 41 intersections were severely congested in the PM peak hour.

The significance of this information is that congestion mitigation begins with employing the most cost effective and efficient (least intrusive) and ends with the most cost-prohibitive and most intrusive strategies , i.e, road widening for capacity improvements. The former strategies include decreasing the need for trip making by changing land use policies and regulations to limit growth in areas with limited infrastructure and by changing land use policies and regulations to enhance the jobs to housing balance along corridors. Other non-intrusive measures are enhancing operations on existing roadways by intersection widening, better signal coordination and/or better signal and driveway spacing, frontage roads and more medians.

Congested intersections are a critical issue because they create air quality problems due to idling while waiting to get through the intersection. For example, a T intersection's congestion level can be significantly reduced by installation of a continuous flow right lane on the main roadway.

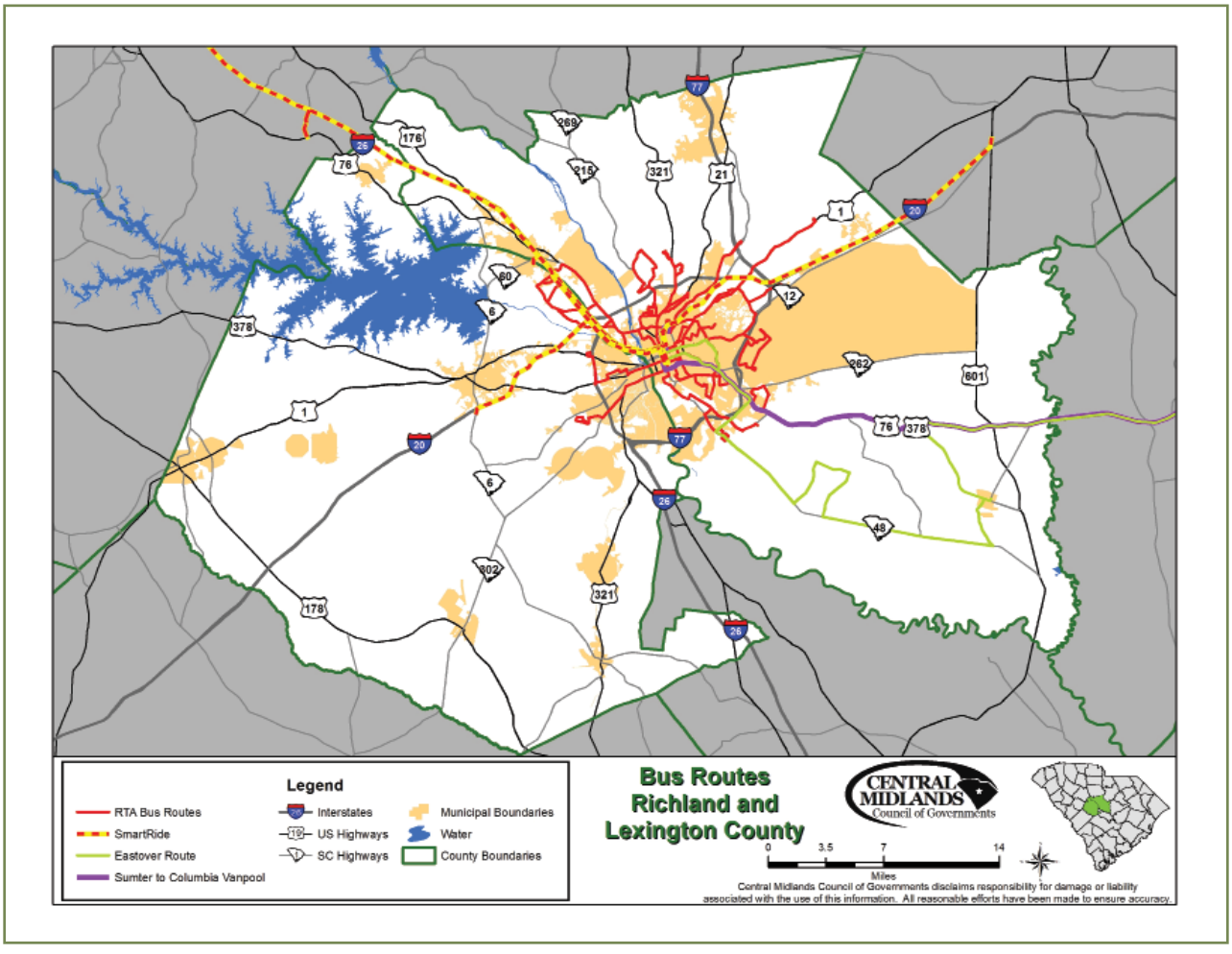
Transit Element

There are several pioneer programs that offer a commuting alternative to the single-occupant vehicle commute. For instance, the South Carolina Department of Transportation (SCDOT), in partnership with the Newberry County Council on Aging and the Santee-Wateree RTA, offers SmartRide – an express bus service to downtown Columbia from Newberry; SWRTA also provides a vanpool from Sumter to Columbia. Additionally, there is a park 'n ride lot located on US 378 near the I-20 interchange available for carpoolers..

The carpool option offered by Lexington Medical Center is particularly effective because any employee left stranded because work caused them to miss their ride is guaranteed a ride home in a taxicab.

The H&T Index discussed earlier in this document includes two measures of transit access, a Transit Connectivity Index and Transit Access Index. The information generated by these measures has been proven to be helpful in both transit planning and transit operations, Among the transit systems using this

Figure 22. Richland and Lexington County Bus Routes



system are the Pee Dee Regional Transit Authority and the Charleston Area Regional Transportation Authority

Public funds build most roads and most sewer systems. That public investment generates private investment and creates jobs. For example, the American Recovery and Reinvestment Act (Stimulus Act) investments in public transportation created almost twice as many jobs per billion dollars invested in highway projects. Since 1980, the City of Portland has invested $ 100 million in a transit system that has resulted in $ 3.5 billion of private investment. The City of Charlotte has experienced a similar return on its investment in their Blue Line Rail facility.

In summary, this Plan has demonstrated that a viable transit system is an important tool to reduce GHS emissions by reducing the VMT. Public investment in transit makes good economic sense because it generates significant private investment. The CMRTA needs a public investment commitment to become a positive part of the future development of the midlands

Bike/Pedestrian

The map in **Figure 23** shows bike lanes and bike/pedestrian routes in the two counties. The numbers of miles in each are:

- Bike Lane Under Construction – 5.12 miles (dotted red line)
- Existing Bike Lane – 32.16 miles (solid red line)
- Existing Trail – 11.76 miles (solid green line)

There are efforts to improve bicycle access in the region, for example, in March 2012, the University of South Carolina won the League of American Bicyclists Bike Friendly University Bronze Level; and in August 2011, the City of Columbia formed the Bike/Ped Appointed Committee (BPAC) to advise the City on walking and biking projects.

Similarly, sidewalks in the two counties are generally limited to the urban core (downtown Columbia and thinning out into first ring subdivisions). Beyond the urban core, sidewalk access is limited mostly to subdivisions where they are installed as a requirement of Land Development Regulations. **Figure 24** shows sidewalks in the two-county study area while **Figure 25** shows sidewalks in the urban core.

The SC Priority Investment Act was signed into law on May 23, 2007. It amended the Planning Act to require a new Transportation Element (TE) a new Priority Investment Element (PIE) and significantly amended the existing Housing Element requirements. The 2009 Richland County Comprehensive Plan contains both new Elements.

The TE must consider all transportation facilities (including roads, transit projects, pedestrian and bicycle projects) as part of a comprehensive transportation network. The Richland County TE includes Goals to expand the express bus service; Improve overall traffic conditions and Promote Traditional Neighborhood Developments. Some of the Implementing Strategies include; promote mixed land uses with walkable neighbor hoods; amend the Land Development Code to use traffic calming techniques; and promote mixed use developments with pedestrian, bicycle; public transit linkages; and amend the regulations and procedures to include complete streets concepts.

Figure 23. Bike and Pedestrian Routes in Richland and Lexington Counties

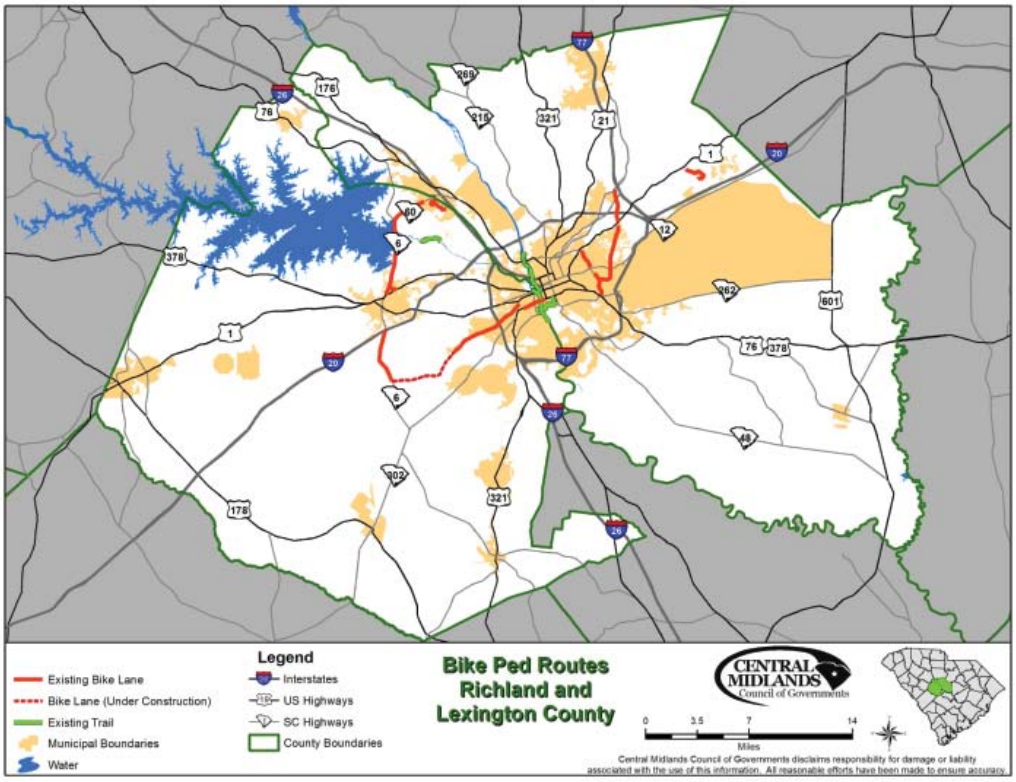
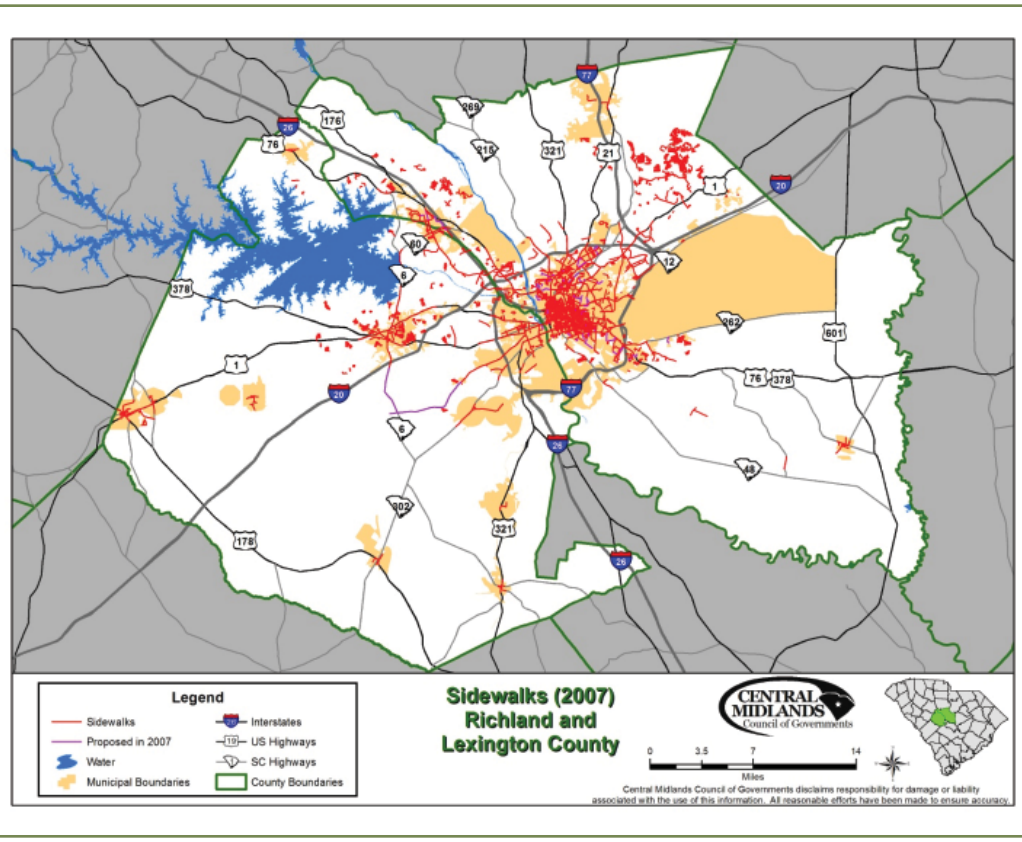


Figure 24. Sidewalks in Richland and Lexington Counties



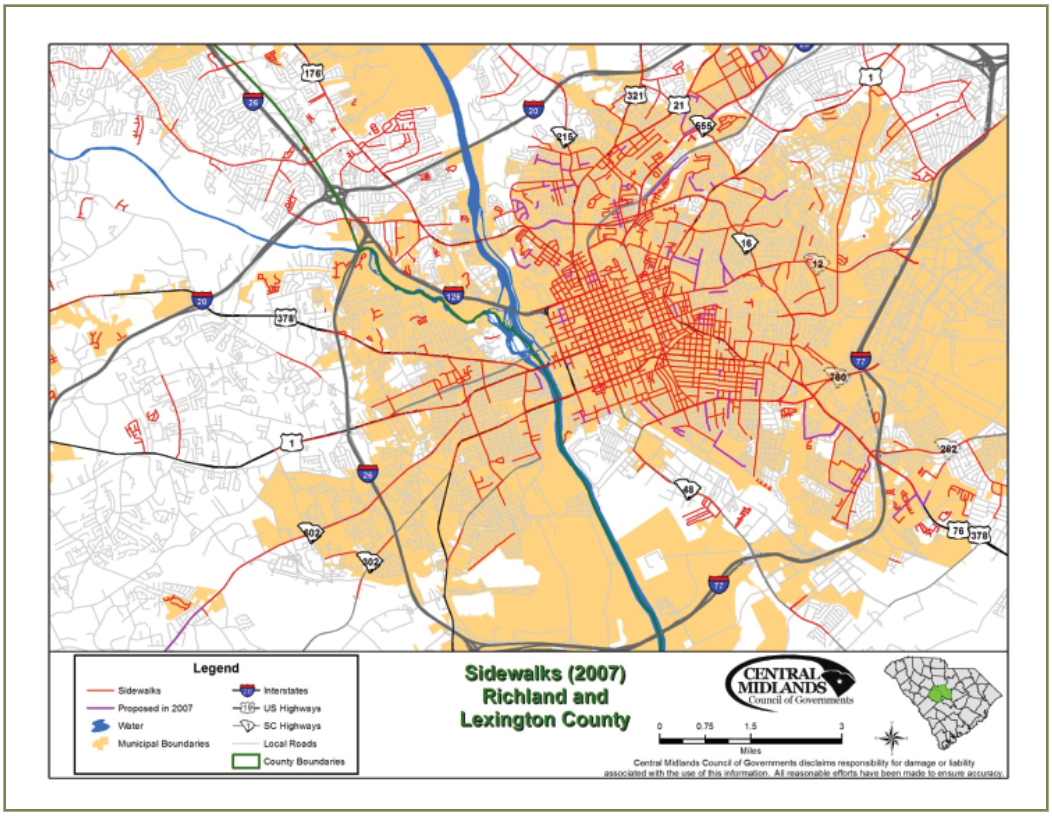


Figure 25 Sidewalks in the Urban Core

Effective implementation of these provisions will require close coordination with other state and local governments. It will also require the 2045 LRTP to include a project evaluation system that includes conformance with local government comprehensive plans to have greater weight in the project evaluation process. All of these actions will contribute to reduction of the VMT and the GHG emissions.

The statutory PIE requirements include provisions to improve the intergovernmental coordination process. It also contains specific provisions to encourage the use of density bonuses; traditional neighborhood design. Transfer of development rights; tax increment financing; and overlay zoning districts[7].

The Richland County Priority Investment Element includes a provision to "… concentrate county public facilities expenditures in all urban and suburban areas (including Priority Investment Areas) identified on the County's Future land Use Map…" The County's purchase of a strip mall on Decker Blvd, a County Priority Investment Area, is a positive action to implement the Transportation Element and Priority Investment Element provisions of the Comprehensive Plan[8].

Richland County, the City of Columbia and numerous communities throughout South Carolina have adopted complete streets resolutions. The term complete streets simply means that roadways should planned, designed and built to safely accommodate pedestrians, bicycles and vehicles

The goal of a complete streets program is to transition from an auto-centric development pattern to a more compact development pattern This transition

7. South Carolina Priority Investment Act: Implementation Guide for Local Governments. South Carolina Chapter of the American Planning Association, October 2008
8. Richland County Comprehensive Plan, adopted December 15, 2009

occurs by changing the procedures and practices used in roadway construction. One of the benefits of these changes will be a reduction in VMT and GHG emissions which in turn results in a more sustainable transportation system

Alternative Fuel Vehicles

New innovations in vehicles, such as electric vehicles, plug-in hybrids and hydrogen fuel-cells, may help reduce the areas energy footprint and air quality, even though these innovations have little no effect on VMT and VHT. One of the biggest hurdles to the adoption of alternative-energy technology is the infrastructure, particularly recharging/refueling stations, necessary to fully support these vehicles. According to the DOE Alternative Fuels and Advanced Vehicles Data Center, there are 10 locations within 25 miles of downtown Columbia that have public-access electric charging stations; five of those locations were City of Columbia parking garages. One way to raise the awareness of alternative fuel vehicles is through publicly operated fleets. Many of the local governments offer alternative fuel vehicles, and the CMRTA operated six compressed-natural gas buses before they were removed from the fleet due to budget constraints.

Water

Over two hundred drinking water systems serve the communities in the Central Midlands region. The vast majority of these systems are very small, private operations that draw their water from groundwater wells and distribute it to only a small number of people in a neighborhood. However, even though most systems are very small, the overwhelming majority of the region's population is served by a handful of large systems that are owned and operated by local governments (except for Fort Jackson, which is run by the Department of Defense). **Table 19** characterizes the drinking water systems serving the Central Midlands region:[9]

The City of Columbia's water system serves many customers in Lexington and Richland County who are beyond the City's jurisdiction. The City's water is treated by two plants, one on the Columbia Canal and one on Lake Murray. The two plants primarily serve those residents in closest proximity, but each can serve the entire distribution area if necessary. Water is carried across the service area through a network of distribution mains that has over 2,000 miles of pipe.

Besides providing drinking water services, the City of Columbia is also the major provider of wastewater services. The City has over 900 miles of sewer lines linking the area to its Metropolitan Wastewater Treatment Plant located at the intersection of I-77 and the Congaree River. The system has a capacity of 60 million gallons per day (MGD), with an average flow of 35 MGD.[10] **Figure 26** shows the coverage of water and sewer lines in Richland and Lexington Counties.

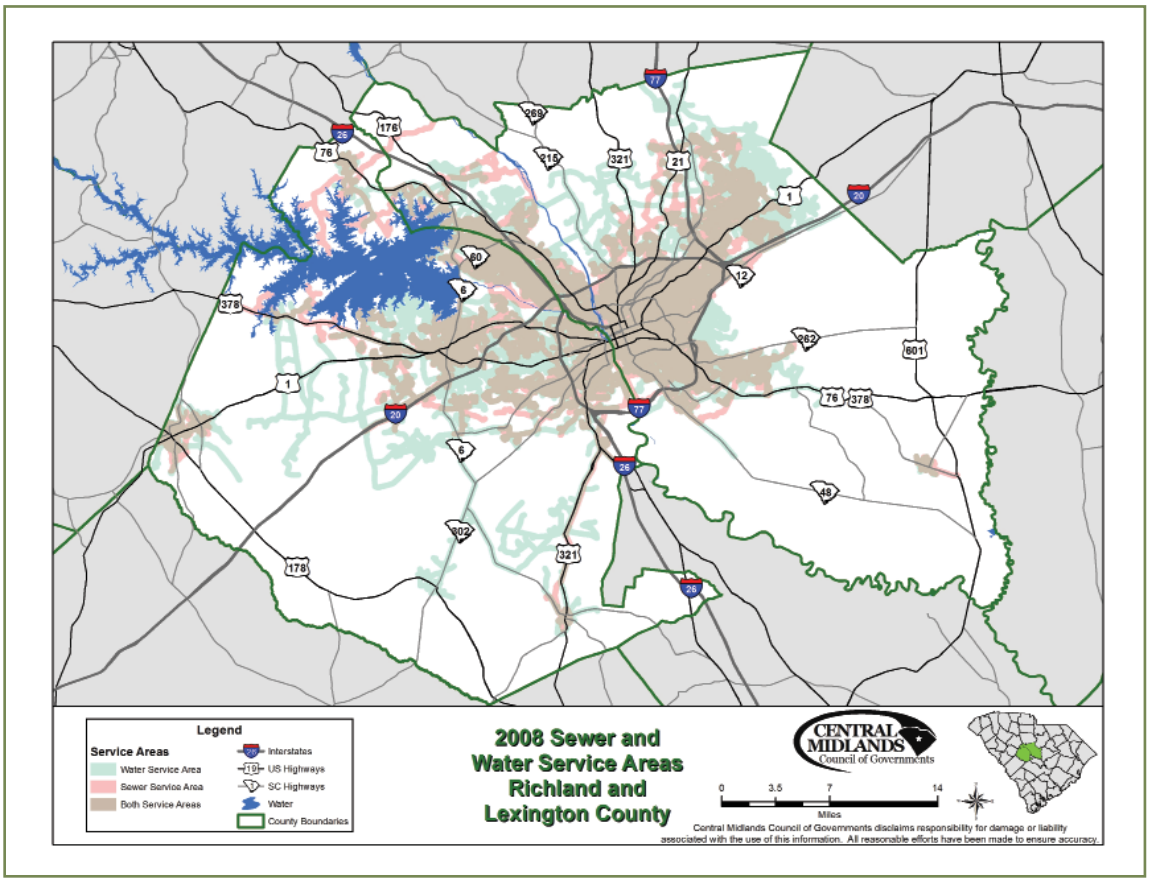
Across the country, between 30% and 40% of the energy consumed by local governments is used for drinking water and wastewater services.[11] For drinking water, pumping accounts for approximately 80% of energy consumption and

9. US Environmental Protection Agency. Safe Drinking Water Information System/ Federal (SDWIS/Fed). January 2011.
10. City of Columbia. http://www.columbiasc.net/economicdevelopment/415
11. Water Research Foundation. 2011. Energy Efficiency Best Practices for North American Drinking Water Utilities. http://www.waterrf.org/ProjectsReports/PublicReportLibrary/4223.pdf

Table 19 Drinking Water Systems Serving the Central Midlands

Water System	Sector	County	Source Water	Number of Service Connections
City of Columbia	Municipal	Both	Surface Water	133,422
City of West Columbia	Municipal	Lexington	Surface Water	12,767
Lexington County Joint Municipal Water & Sewer Commission (Pelion, Swansea, Gaston, etc...)	Municipal	Lexington	Surface Water	10,894
City of Cayce	Municipal	Lexington	Surface Water	8,300
City of Lexington	Municipal	Lexington	Surface Water	7,426
Fort Jackson	Federal	Richland	Surface Water	1,828
121 Smaller Systems	92% Private	74% Lexington	86% Ground Water	22,974

Figure 26 Sewer and Water Service Area in Richland and Lexington Counties

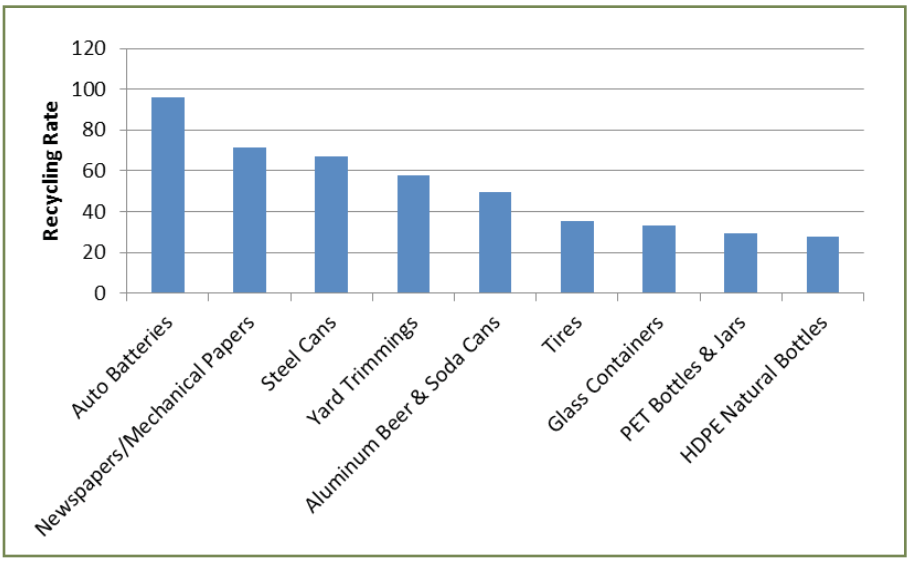


the remaining portion is associated with treatment.[12] Given the energy usage involved in pumping water, pumps and motors are obvious components of energy efficiency. Rehabilitating and optimizing pumps are important, as is correctly sizing pumps and using variable frequency drives. Working to reduce water loss and encouraging consumers to conserve water is also important, since these things will reduce the amount of water that needs to be pumped. Because water is a capital-intensive industry with increasing returns to scale, the simplest way to increase efficiency (i.e. not just energy efficiency and water efficiency but also economic efficiency.) Water utilities can also adopt the same best practices applicable to all local government departments, such as ensuring that buildings are as energy efficient as possible by installing low-wattage lighting.[13] The United States Environmental Protection Agency estimates that energy efficiency improvements of around 10% are readily attainable for water systems.[14]

Solid Waste

Like water, handling solid waste is a capital-intensive industry with increasing returns to scale (implying that it is more economically efficient when conducted on a larger scale). Like water, hauling/processing solid waste requires a non-trivial amount of energy. Unlike for water, many communities have increased the amount of solid waste that they recycle, with 34% of municipal solid waste recycled in 2010 in comparison to less than 10% in 1980. The growth of recycling has proceeded unevenly, resulting in different recycling rates across materials:[15]

Figure 27 National Recycling Rates by Product



12. EPRI (Electric Power Research Institute). 2002. *Water and Sustainability (Volume 4): U.S. Electricity Consumption for Water Supply and Treatment—The Next Half Century*. Technical Report 1006787. Palo Alto, Calif.: EPRI.

13. Water Research Foundation. 2011. *Energy Efficiency Best Practices for North American Drinking Water Utilities*. http://www.waterrf.org/ProjectsReports/PublicReportLibrary/4223.pdf

14. US Environmental Protection Agency. 2008. *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities*. Contract No. GS-10F-0337M. Washington, D.C.: USEPA. http://www.epa.gov/owm/water-infrastructure/pdfs/guidebook_si_energymanagement.pdf

15. US Environmental Protection Agency, 2010. *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010*.

In terms of the narrowest interests of local government, recycling may appear to be both more energy-intensive and labor-intensive (making it more expensive) than dumping solid waste in an existing landfill. However, once one broadens the examination to the full life cycle of a material, from the cradle of harvesting virgin raw materials to a landfill grave, recycling is far less energy-intensive than the alternative:[16]

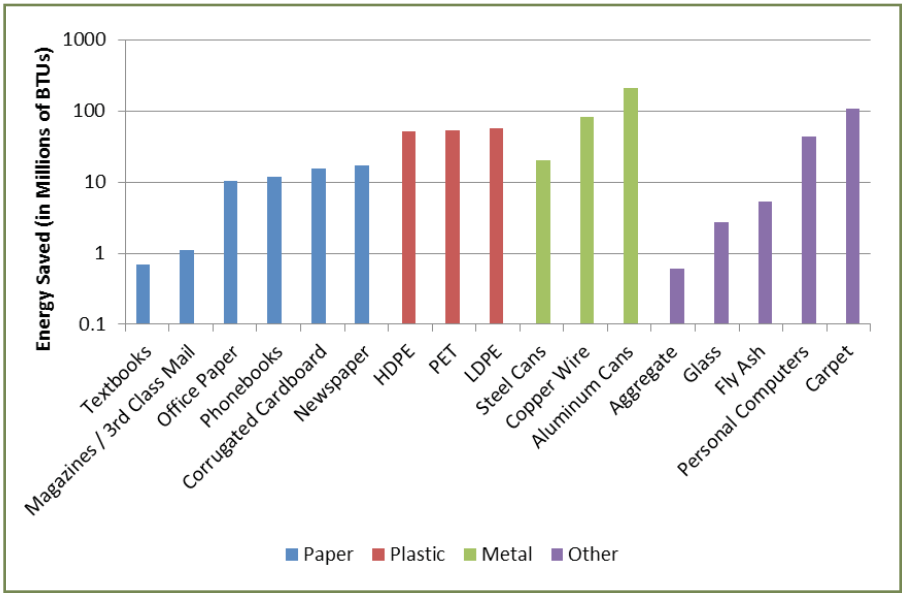


Figure 28 Energy Saved Through Recycling

Moreover, landfills can be quite costly and the labor-intensity of recycling makes it a primary source for green collar jobs. The recycling industry employs 5 times as many people as disposing waste into landfills.[17] On average, each additional 500 tons of material recycled creating an additional job. Within South Carolina, recycling accounted for more than 37,000 jobs as early as 2006 (which projected that recycling's economic impact would continue to grow at the rate of 12% per year).[18] Yet, the scale of the recycling in South Carolina lags behind the rest of the nation, which implies a ripe opportunity for growth. Within South Carolina, only 26% of municipal solid waste was recycled in 2010.[19] In contrast, nationally in that same year, 34% of municipal solid waste was recycled and an additional 12% was used to generate energy (the remaining 54% of waste was discarded into landfills).

Even if materials are not recycled, disposal techniques can still increase energy efficiency. Methane gas released at landfills may be captured and used as fuel, rather than being allowed to enter the atmosphere. Alternatively, the hydrocarbons in waste can be combusted or gasified, allowing for the recovery of energy. These latter processes reduce the original waste down to ash, consisting primarily of minerals rich in metals, which can then be disposed of in a landfill (at a much lower space requirement) or even recycled.

16. In addition to reducing the energy consumed due to processing raw materials, recycling also reduces the amount of pollution during that processing. (EPA MSW doc)
17. *U.S. Recycling Economic Information Study*, 2006, Prepared by R.W. Beck for USEPA.
18. Frank Hefner and Calvin Blackwell, 2006. *The Economic Impact of the Recycling Industry in South Carolina*. College of Charleston, Department of Finance.
19. SCDHEC Recycling 102 doc

The City of Columbia provides curbside recycling service to nearly 30,000 residential and commercial locations. Lexington and Richland counties each run landfills and provide curbside pick-up, but also receive waste at a number of collection centers around the counties.

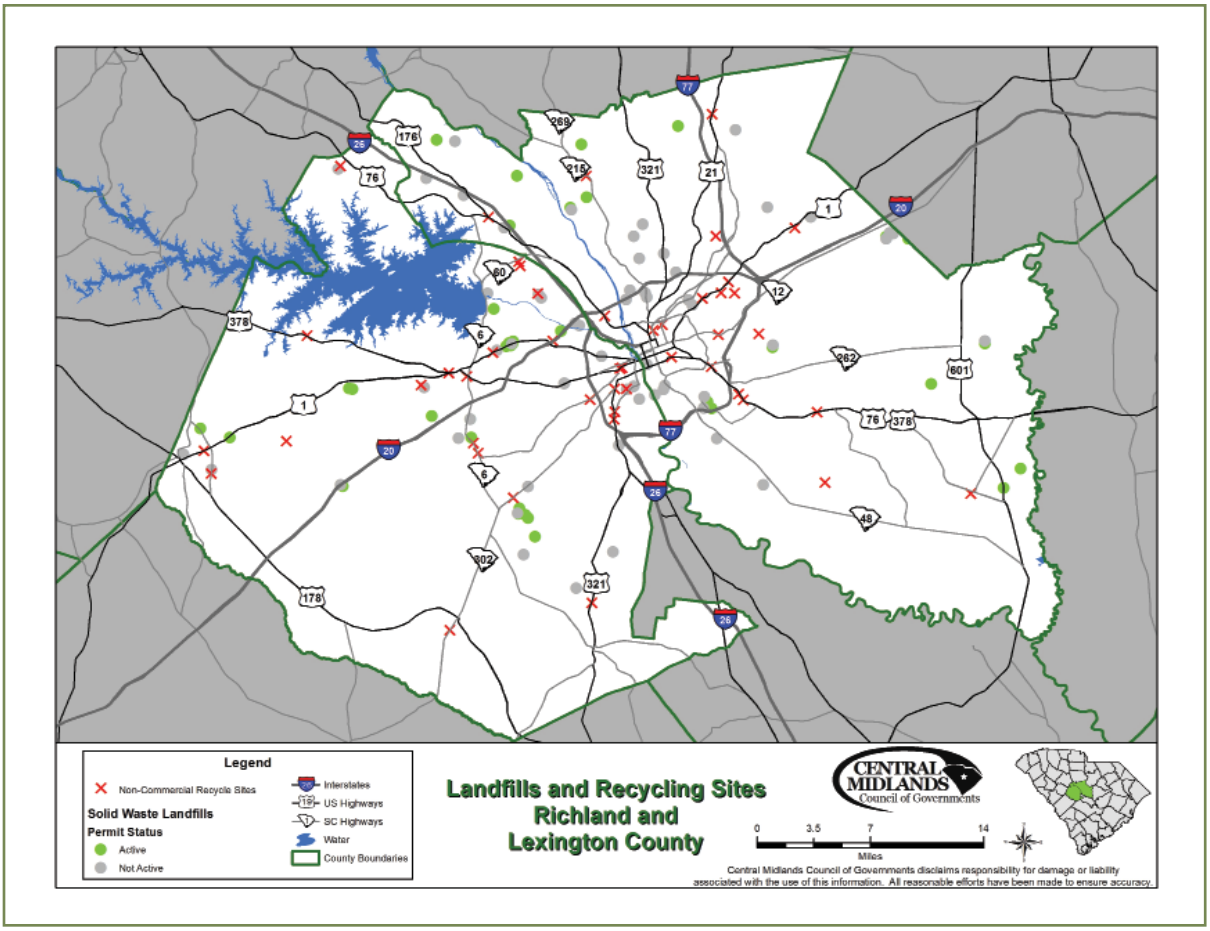


Figure 29 Landfills and Recycling Sites in Richland and Lexington County

Each of these three jurisdictions has made a notable effort to increase the amount of materials recycled. One example of recent local government-led initiatives that promote increased recycling activity (and subsequent economic advantages through the recycling/re-use industry) is the City of Columbia's enhanced curbside recycling program. Based on private-sector capacity upgrades (such as a recent $4M dollar upgrade to a Sonoco recycling plant located in Richland County), additional and larger amounts of recyclable materials can be accepted from local governments that collect such recyclables (primarily from individual households). Due to the upgrades, the City of Columbia's curbside collection of recyclables now includes cardboard, corrugated cardboard, lightweight chipboard (i.e., cereal boxes and other similar packaging), and junk mail in addition to previously collected materials such as aluminum and steel cans/lids, clean aluminum foil, glass, newspaper, magazines, office paper, empty aerosol cans, and bottle-shaped (necks smaller than bases) plastic items. A regional public/private initiative associated with the addition of these materials to the acceptable waste stream is a "Recycle and Win" promotion sponsored by Bi-Lo and Coca-Cola whereby grocery gift cards are awarded to select households that participate in the curbside pick-up program.

Procurement

A substantial amount of goods and services are purchased by the local governments in the Central Midlands. The general [operating] funds for Lexington County, Richland County, and The City of Columbia sum to a total of about $350 million per year.[20] Around 70% of this expenditure is on personnel (i.e. the employees of these local governments); most of the remaining budget is expended on purchasing goods in the form of capital outlays (which tend to take the form of large ticket items, like fleet vehicles) and operating costs (which tend to take the form of small ticket items, like office paper).[21] Hence, millions of dollars of goods are procured every year by these local governments, from their general [operating] funds alone. Moreover, these local governments also purchase goods (and services) from additional funds under their control; for instance, the City of Columbia operates 3 different enterprise funds with a total annual budget of around $125 million to provide water and sewer services, storm water services, and parking.[22] Accounting for these additional funds brings local government expenditure in the Central Midlands to more than $1 billion every year, implying an estimate of goods procurement that must exceed $100 million per year.[23]

Despite their large economic footprint and the potential to support the green economy with hundreds of millions of dollars worth of purchases of goods from the green economy, none of these 3 jurisdictions currently have a green procurement policy. The basic idea behind green procurement is to use the government's large economic footprint to promote the green economy. For example, the three jurisdictions could purchase bio-diesel instead of diesel fuel. While bio-diesel currently is slightly more expensive per gallon, it supports a local green industry (such as Midlands Biofuels). Given the social good accomplished by the Green Economy's advancement of sustainability, governments are a logical patron for the green economy. Hence, Executive Order 13514 states that "the Federal Government must lead by example" by using its $350 billion in procurement to purchase "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose."[24] Although these products can be more expensive, they may still be affordable if the purchases of multiple local governments are pooled so as to increase the scale of their market power when negotiating a bulk buy. The overhead of deciphering greener products has been greatly reduced by the EPA's Environmentally Preferable Purchasing Program, which has developed tools and guidance documents to facilitate green procurement.[25]

20. This figure is based on recent budgets, taken from the 2010-2 011 fiscal year (which is not the same across these 3 local governments), available on the website of each local government.
21. Richland County directly provides the exact number of 74% for its budget; see its budget at http://www.richlandonline.com/departments/budget/Bud getFY2011/FY11BudgetBook.pdf. In the same ballpark, Lexington spends $71 million of their $102 budget on personnel; see Lexington's budget at http:// www.lex-co.com/Departments/Finance/Documents/FY10-11%20Ap proved%20Budgets.pdf.
22. See the City of Columbia's budget at http://www.columbiasc.net/depts/budget/ downloads/FY%2010-11%20Approved%20Budget1.pdf.
23. Ibid. The figure of $1 billion can be attained by adding Richland County's $650 million total to the City Columbia's $250 million total and Lexington's $100 general fund.
24. See http://www.whitehouse.gov/assets/documents/2009fedleader_eo_rel.pdf.
25. See http://www.epa.gov/epp/pubs/about/about.htm.

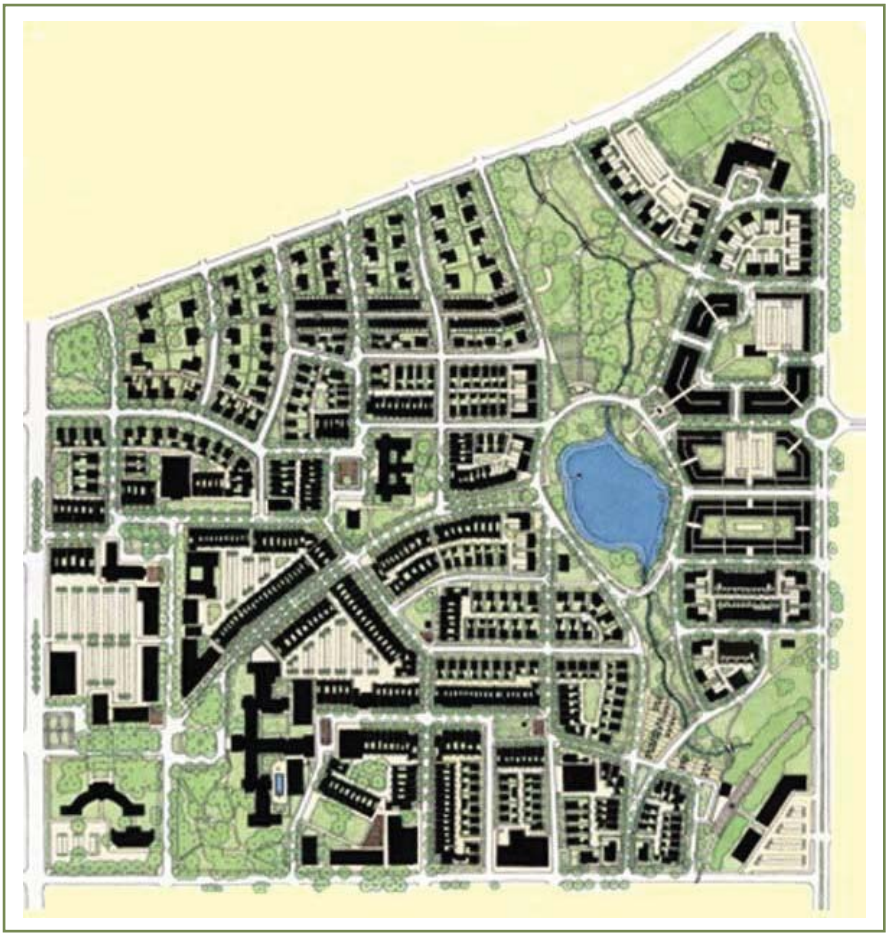
Alternative Approaches

Local and Regional Initiatives and Accomplishments

Many jurisdictions in the Central Midlands Region have already adopted comprehensive plans that incorporate sustainable principals. Two examples include the Town of Springdale and the Town of Blythewood; both plans were drafted by Central Midlands Council of Governments. The Town of Springdale's plan is based on "pedestrian sheds" to encourage compact development that is accessible by multiple modes of transportation. The Town of Blythewood's comprehensive plan weaved sustainability principals of throughout its policies. Blythewood also created a master plan based on sustainability principals of and have offered seminars on the topic.

In 2006, the City of Columbia hired Duany Plater-Zyberk and Company to develop a plan for the 181 acre "Bull Street" site. **Figure 30** shows the concept resulting from the planning process. The property has been purchased by a developer who presented a revised plan in January, 2012, but indicated development would be consistent with the Duany plan which "called for a walkable, urban neighborhood of offices, stores and homes." The project is significant not only for its design, but as Mayor Benjamin indicated, it is "the single largest neighborhood project in our city's history." [26]

Figure 30. Proposed Sustainable Redevelopment of Bull Street Property



26. The State, 01/12/2012

COATS has provided a series of regional plans and sub-area plans with the understanding that funding for road expansion projects is becoming scarce. The plans were intended to look at alternative approaches to relieve congestion.

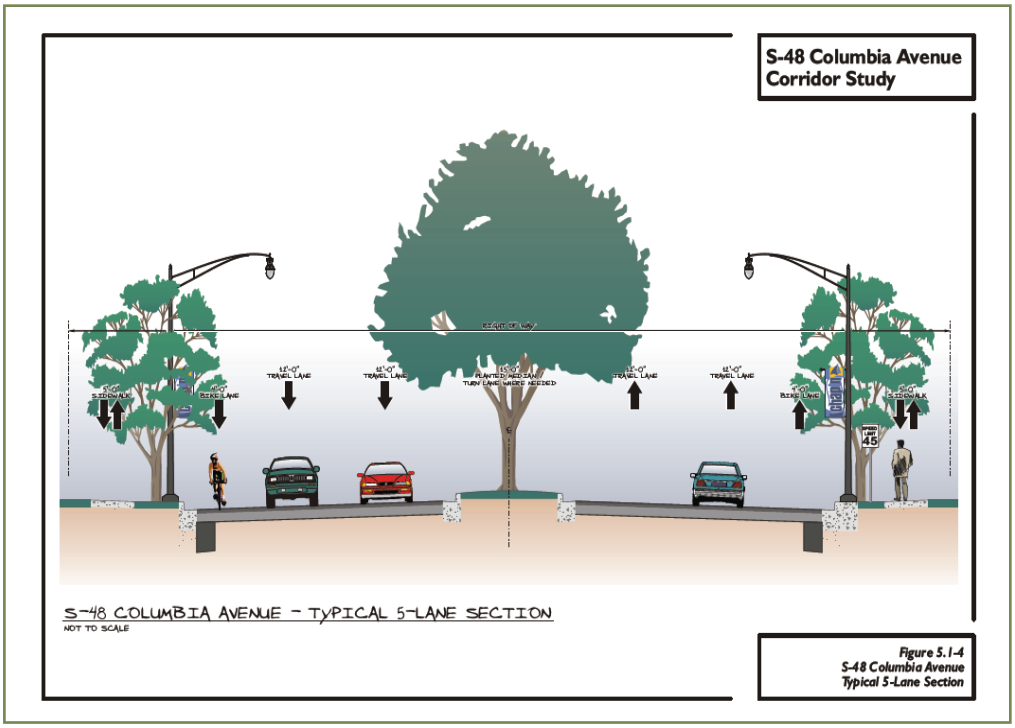
- Regional Congestion Management Plan
- Regional Motor Freight Transportation Plan
- Human Services Transportation Coordination Plan
- Regional Bicycle & Pedestrian Plan
- CMCOG Commuter Rail Feasibility Study

The sub-area plans looked at projected land use development and identified transportation improvements needed to support that development. The plans also provided alternative land use policies to mitigate transportation impacts. Some of the policies include:

- Encourage transit oriented development where appropriate
- Encourage mixed use development where appropriate
- Support the preservation of agriculture and open space through such measures as the purchase of land or easements
- Encourage higher densities at major activity centers to support a mix of uses that are served by adequate multimodal transportation faculties
- Provide a compatible mix of goods, services and living space in close proximity to one another
- Mixed-use commercial and residential development can create a sense of place and be planned to encourage walking and biking rather than driving.
- The concept of “complete streets” describes corridors that are “safe, comfortable and convenient for travel via auto, foot, bicycle and transit.” **Figure 31** from the “S-48 Corridor Study” shows recommended improvements to S-48 in the Town of Chapin. Transit is not a factor in the corridor so it was not included in the illustration, but could easily be accommodated.

Examples of approaches to increase the sustainability of transportation, land use planning, water and waste water, municipal solid waste and recycling, and purchasing are presented below for Boulder, CO, Cuyahoga County, OH, Miami-Dade County, FL, and Charlottesville, VA, and Durham, NC are below.

Figure 31. Complete Street Illustration



Transportation

- Boulder, CO developed a sustainable transportation system that improves the environment, improves health, and improves the quality of life in the community. The city was awarded a platinum level Bicycle Friendly Community status by the League of American Cyclists, as it has a bike-share program, bicycle parking options, and more than 150 centerline miles dedicated for cyclists.[27] In addition, Boulder has launched a ride-share matching program and a fleet of local and regional bus lines with a variety of pass options.
- The Ohio County of Cuyahoga implemented program to replace county vehicles with flex-fuel vehicles, which includes the installation of an ethanol fuel pump, and subsidizes employees who use alternative transportation. Cuyahoga County also passed idling reduction guidelines to address public health, economic development, and the county budget.[28]
- Miami-Dade County in Florida promotes sustainable transportation to not only reduce greenhouse gas emissions, but to lessen traffic congestion. The County introduced new hybrid buses, a carpool ride-share service, and is expanding the Metrorail and bicycle transit options.[29]

27. http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=8774&Itemid=2973
28. http://development.cuyahogacounty.us/en-US/vehicle-idling-reduction-guidelines.aspx
29. http://green.miamidade.gov/transportation.htm

- Charlottesville, VA also promotes alternative fuels such as hybrid-electric cars, biodiesel, and compressed natural gas, as a means to "advance air quality, public health, reduce energy consumption, and meet economic development t goals."[30]
- The City and County of Durham, NC implemented idle reduction policies to "reduce fuel costs, maintenance, pollution, and greenhouse gas emissions."[31] Commute reduction is another target for Durham. The Board of Commissioners created a program that requires major employers to offer alternate transportation options or travel reductions to employees in order to reduce traffic congestion and vehicle emissions. Durham also utilizes a regional transportation system to cover the Triangle region of the city and county and has purchased fuel-efficient vehicles for the city fleet.

Land Use Planning

- Miami-Dade County's Sustainability Plan was developed to integrate with the existing Comprehensive Development Master Plan and the Park and Open Space Master Plan, which include policies that allow land capacity to meet projected needs while preserving wetlands and agricultural areas. They also address the establishment of green pathways to connect parks and green spaces to neighborhoods and schools.[32]
- Durham City and County Planning aim to guide orderly growth while preserving cultural heritage and natural resources.[33] Durham's Comprehensive Plan includes conservation and protection of the City and County's "green infrastructure" to maintain and improve the quality of life through several areas including water and air quality, floodplain protection, and open space planning.[34]
- Cuyahoga County has passed an initiative that seeks to influence development patters by integrating economic, social and ecological systems.[35] The County also established a Council to promote development of open space and protection of riparian corridors and watersheds.
- Boulder's Comprehensive Plan is a joint plan between the City of Boulder and the County of Boulder. It includes policies to integrate Boulder's growth with the environmental goals of preserving and enhancing quality of the urban environment and biodiversity while conserving natural resources and minimizing emissions and the use of pollutants.[36] There are several plans that further the city's environmental policies, outlining actions for preservation while planning for future development.

30. http://www.charlottesville.org/Index.aspx?page=565
31. http://www.ci.durham.nc.us/departments/manager/sustainability/env_initiatives.cfm
32. http://green.miamidade.gov/buildgreen.htm
33. http://www.ci.durham.nc.us/departments/planning/
34. http://www.ci.durham.nc.us/departments/planning/comp_plan/dcp_7.pdf
35. http://planning.co.cuyahoga.oh.us/projects/
36. http://www.bouldercolorado.gov/files/PDS/BVCP/bvcp.pdf

Water and Waste Water

- The City of Charlottesville promotes the use of rain barrels to conserve water, provides suggestions for garden activities to avoid storm water pollution, and developed a storm water management program.[37] In addition, the city recently proposed a Water Resources Protection Program with the goal to "bring the community together to protect and improve the City's valuable natural and man-made resources" and the objectives of creating a comprehensive program.[38] The city also promotes rain gardens, stream clean up and restoration projects, and green roofs.
- Boulder had developed a Water Conservation Program, which offers landscape consultations, rebates, tips, tools, and education in an effort to conserve water, decrease water bills, and support a sustainable community.[39] Additionally, the Water Quality and Environmental Services department handles everything from water quality compliance to watershed education.
- Durham focuses on water conservation through rebates, promoting rain barrels, and outdoor watering requirements. The City passed a Water Conservation Ordinance, which aims to maximize the efficient use of the city's water supply, reduce damage from runoff, reduce potential for pooling, and prevent pollution from entering the environment, as well as a Water Shortage Response Plan.[40], [41] Durham provides education, tips, and tools through several water conservation websites aimed at customers and residents. Miami-Dade County is developing reclaimed water projects, including wastewater reuse, and alternative water supply projects. The county is also promoting conversation, having seen a decline over the past three years.[42]

Municipal Solid Waste and Recycling

- Boulder, CO adopted a resolution to become a zero waste community by following the Master Plan for Waste Reduction, which creates a roadmap for attaining zero waste. To meet this goal, Boulder requires that recycling be collected by waste haulers at no additional cost. The fees for trash pickup, on the other hand, are based on volume to incentivize citizens to minimize their trash. The city also recently implemented a curb-side compost pick up program. In addition, the city offers recycling drop-off centers, a Center for Hard to Recycle Materials, a free mulch pile, and free composting options for yard waste.

37. http://www.charlottesville.org/Index.aspx?page=562
38. http://www.charlottesville.org/Index.aspx?page=2308
39. http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=12698&Itemid=3604
40. http://durhamnc.gov/ich/op/dwm/Documents/Conservation%20PDF'S/water_efficiency_ordinance.pdf
41. http://durhamnc.gov/ich/op/dwm/Pages/Home.aspx
42. http://green.miamidade.gov/water.htm

- In Miami-Dade County, the Department of Solid Waste offers recycling services with waste collection and owns and operates the most "technologically advanced waste-to-energy facility in the world."[43]
- Durham City provides garbage collection, recycling, and yard waste collection including compost without sorting requirements. The Solid Waste Management Department has set a goal to reduce garbage tonnage by ten percent within three years and increase recycling to 95 percent.[44] Durham County also provides roadside recycling to unincorporated residents.
- Cuyahoga County offers a Community Recycling Awareness Grant and a Recycling Container Grant for communities to apply for. The county currently exceeds Ohio's recycling goals with 27 percent of residential and commercial waste being recycled. The county offers several recycling programs including Christmas tree recycling, hazardous waste disposal, phone book recycling, and computer recycling. [45]

Purchasing

- Durham City and County's environmental initiatives include an environmentally preferred purchasing policy and employee expectation policy to guide purchasing and use of the "most environmentally friendly products possible."[46] Additionally, Durham implemented paperless systems and records in several departments.
- Miami-Dade County created the Office of Sustainability to assist with leading initiatives that "enable the County to target and realize improved performance that simultaneously values economic, social and environmental impacts and opportunities" regarding

43. http://www.miamidade.gov/dswm/
44. http://durhamnc.gov/ich/op/swmd/Pages/Home.aspx
45. http://cuyahogaswd.org/en-US/home.aspx
46. http://www.ci.durham.nc.us/departments/manager/sustainability/env_initiatives.cfm

purchases and government operations.[47] To do so, the Department of Procurement Management created guidelines for purchasing titles the Buy Green Purchasing Guide.[48]

- The City of Boulder has an Environmental Purchasing Policy in order to strengthen the market for such products, maximize diversion of materials from the solid waste stream, and promote human and environmental health. The city provides a list of target environmental procurement products to all departments that contains which products must be purchased as recycled content.[49]
- Charlottesville, VA also offers a guide to environmentally preferential procurement for offices, which indicates acceptable green labels and how to include the standards within a contract.[50]
- Cuyahoga County developed several purchasing objectives which include reviewing procurements for compliance with the county's sustainability initiative.[51]

47. http://green.miamidade.gov/government.htm
48. http://green.miamidade.gov/departments.htm
49. http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=4408&Itemid=392
50. http://www.tjpdc.org/pdf/Environment/buyinggreen.pdf
51. http://opd.cuyahogacounty.us/en-US/Initiatives_Accomplishments.aspx

Recommendations for Implementation

This chapter has focused on broader initiatives that can improve the energy footprint of the Central Midlands Region, with an exploration of the primary issues of transportation and land use, as well as an acknowledgement of secondary issues: drinking/waste water, municipal solid waste, green purchasing, etc. Unlike conventional energy efficiency, which is usually initiated by state-level policymakers and executed by utilities, these issues are the traditional purview of local governments. Though proactive action on these issues may only affect energy use indirectly, these actions can be quite powerful but may require considerable political will. **Table 20** outlines some recommendations.

Table 20. Broader Initiative Action Items for Local Governments

Timeframe	Action
Near-term (0-12 months)	• Facilitate the implementation of appropriate goals contained in COATS/COG plans • Pilot a new program economizing commute of government employees. • Improve recycling rate by local governments, businesses, and residents. • Encourage Low Impact Development and/or Smart Growth Principles with emphasis on public properties.
Medium-term (1-5 years)	• Encourage alternatives to single-passenger vehicles. • Guide denser development clustered along growth corridors. • Phase-in improvements to municipal solid waste disposal • Increase efficiency of drinking/waste water systems. • Form a Regional Procurement Process that utilizes a “green” criteria for goods and services
Long-term (beyond 5 years)	• Implement HOV lanes and commuter transit alternative along major commuting corridors. • Convert majority of waste stream into economic inputs to production.

Near-Term Recommendations and Action Items

Facilitate the Implementation of Appropriate Goals Contained in the COATS/COG Plans

Since Richland and Lexington Counties and the City of Columbia have representatives on CMCOG and COATS policy and technical committees, they play a role in the development of regional plans, some of which have been mentioned earlier. In many cases, the regional plans have recommendations for the local governments to implement, but since CMCOG and COATS do not have a regulatory function, in many cases those recommendations are advisory; there is no enforcement action. To help implement the regional plans, the local governments should continue participation in regional activities.

City/County Actions items include:

- Continue to actively participate in regional plans.
- Incorporate recommendations from the regional plans into the appropriate local plans and take the necessary steps towards implementation.

Pilot a New Program Economizing Commute of Government Employees

The Central Midlands governments should develop a new program that encourages its employees to economize on transportation fuels when traveling between home and work. Transportation is a major contributor to the Region's energy consumption and air quality problems. Improving transportation is gradual process that can be initiated by trailblazing local governments.

City/County action items include:

- Establish a rideshare program whereby proximate employees are identified and encouraged to carpool.
- Establish preferred parking for carpooling employees and employees operating alternatively fueled vehicles (hybrids, electric vehicles, etc.) and consider charging other employees for parking.
- Provide emergency ride home taxi service, with a pre-determined reasonable rate, for any carpooling staff member who will miss their ride due to an unanticipated need to stay at work longer than their regular schedule.
- Establish a carshare program, perhaps in conjunction with the new short-term rental program at USC (similar to ZipCar), that sites shared vehicles near major local government facilities with an easy access mechanism.
- Allow employees to take their government-owned vehicles home with them, check their dispatching remotely, and head directly to their worksite(s) for the next day to reduce inefficiencies in routing.
- Evaluate more flexible schedules for each department's employees – four day work weeks, off-peak commuting, telecommuting one day per week, etc…

Improve Recycling Rate by Local Governments, Businesses, and Residents

Recycling can save a tremendous amount of energy and is the single largest generator of green collar jobs. Hence, the local governments of the Central Midlands Region should launch a long-term strategy to increase recycling. The first steps to can be taken in the short-run but the region should plan for larger steps to be taken over a longer term.

City/County Action items include:

- Roll out 95 gallon recycling carts for business and residential customers.
- Campaign to increase recycling within the Region.

Encourage Low Impact Development and/or Smart Growth Principles with Emphasis on Public Properties

The land in the Central Midlands Region is a fixed natural resource that should be carefully managed. Intelligent land use design can be the difference-maker with urban sprawl and its undesirable outcomes. As can be discerned from **Figure 9**, the Region's data on land use is of reasonably high quality. Yet, best practices in land management also call for planning what land use should be, not just what it is.

City/County action items include:

- Identify undeveloped land on the periphery of Lexington and Richland Counties where growth and development should be discouraged.
- Identify potential ribbons of undeveloped land that could serve as corridors and/or greenways with bicycling, jogging, and walking paths for recreation and even commuting.
- Identify opportunities for low impact development and landscaping to improve the passive solar properties of government facilities (e.g. northern wind breaks, overhead and eastern shade trees, etc.).
- Identify potential on private lands for a program to encourage businesses and residents of the Central Midlands Region to plant more trees (from appropriate species).
- Identify areas for green businesses. Offer incentives for green businesses such as reduced fees or expedited review times.

Medium-Term Recommendations and Action Items

Encourage Alternatives to Single-Passenger Vehicles

Miles traveled by single-passenger vehicles are an extremely inefficient use of energy that serves as the primary contributor to poor air quality. By pioneering more efficient transportation alternatives for their employees, the Central Midlands' local governments should be in a prime position to widen those programs to the greater public. Although large private employers might be the most sensible place to start, the ultimate goal should be to decrease the vehicle miles traveled by all single-passenger vehicles on the roads in the Central Midlands. Public transportation, ride sharing, biking, walking, and travelling shorter distances at lower frequencies all serve to decrease the total number of vehicle miles traveled by a person in a single-passenger vehicle. When targeting a grander scale, additional policy options also become feasible.

City/County action items include:

- Expand local government programs to larger employers in the area and then to the general public. This should include ride sharing, car sharing, preferred parking, taxi programs, taking home commercial vehicles, and implementing more flexible work schedules.
- Revitalize the bus system.
- Avoid widening roads wherever possible.

- Implement proven enhancements to traffic optimization: traffic circles, timed lights, sensors, dedicated turn lanes, etc.
- Increase walking and biking opportunities by adding sidewalks, greenways, and bike lanes; explore programs to encourage employers to install showers in workplace restrooms.

Guide Denser Development towards Clustering along Growth Corridors

Density in the Central Midlands Region is clustered in downtown Columbia and along the interstate corridors. Any development away from these pre-existing clusters constitutes sprawl and drives up the number of vehicle miles traveled per person. These pre-existing areas should be targeted for denser development, sometimes referred to as urban in-fill, while some effort should be made to preserve outlying areas as open space.

City/County action items include:

- Amend local comprehensive plan to encourage denser development along the Region's commuter corridors using policies such as density bonuses, cluster developments, purchase of development rights and transfer of development rights.
- Update zoning ordinances to encourage denser development in accordance with the comprehensive plans.
- Use an increased density allotment as an incentive for developers to build greener structures.
- Give permitting preference to infill development over greenfield development.

Phase-in Improvements to Municipal Solid Waste Disposal

There is considerable potential for improving municipal solid waste (MSW) in the Central Midlands, but it requires a longer timeframe than what is possible in the short-run. As discussed above, recycling MSW is the greatest single source of green collar jobs.

City and County action items include:

- Make garbage collection mandatory, perhaps with an initial period of opting-out.
- Charge for garbage collection and dumping at collection sites; forbid on-site incineration of waste.
- Increase the scope of materials that are not permitted in landfills (e.g. cardboard).
- Encourage recycling for County/City buildings.
- Implement single-stream, mandatory recycling.
- Improve collection logistics (e.g., a transfer center near Irmo).
- Investigate consolidations, favoring fewer, larger landfills to capture economies of scale.

Increase Efficiency of Drinking/Waste Water Systems

Both drinking and waste water systems exhibit considerable scale economies. Larger systems can handle their volumes at lower unit costs while attaining superior quality. In the process of pumping and treating water, both drinking and waste water systems use large amounts of energy. Yet, they are good candidates for on-site generation and energy efficiency retrofits, which have allowed some water utilities to be net-zero consumers of energy. The first step is for the utility to get a combined water-energy audit – each gallon of water has an embedded energy due to its pumping and treatment and thus the loss of that water from a leak results in wasting both freshwater resources and energy.

City/County action items include:

- Consolidate drinking water and wastewater systems within the Central Midlands Region.
- Conduct a joint water-energy audit of drinking water and wastewater systems.

Form a Regional Procurement Process that utilizes "green" criteria for goods and services

Richland County, Lexington County and the City of Columbia have discussed joint purchasing several times, but have not formalized an agreement. Joint purchasing of certain items, particularly those items purchased in bulk, may result in a cost savings for the participating jurisdictions. By establishing green criteria so that items purchased meet "Eco-Friendly" standards as determined by the jurisdictions, the participating jurisdictions can play a leadership role in green purchasing and depending on the items purchased, such as vehicles, could have a direct impact on minimizing the environmental affects in the region.

City/County actions items include:

- Establish a joint-purchasing committee to establish an agreement among the participating jurisdictions
- Identify the items suitable for joint purchasing and identify the green criteria to be used for procurement.
- Continue to monitor the impact the joint purchasing program and make the necessary changes to receive the most cost effective and ecologically desirable impact on the region.

Long-Term Recommendations and Action Items

Implement HOV Lanes and Commuter Transit along Major Commuting Corridors

High Occupancy Vehicle (HOV) lanes are proven methods of improving local air quality, as is light rail. These policy initiatives work best when implemented jointly and can complement initiatives to, Transit Oriented Development along these commuting corridors.

City/County action items include:

- Convert a lane on I-126, I-26, and I-20 into HOV-2 (+ electric and perhaps hybrid vehicles).

- Provide commuter transit (either bus or rail) service along I-26 from downtown to Chapin and onto Newberry, as well as from downtown to Camden.

Convert Majority of Waste Stream into Economic Inputs to Production

Like other Americans, South Carolinians generate a large waste stream. If the Central Midlands could convert this waste stream into an economic resource, then the region would do much to advance its sustainability.

City/County action items include:

- Investigate tactics to reduce waste including pay-as-you-throw programs
- Pursue gasification technology.
- Generate compost and mulch from food waste and yard waste.
- Generate biogas from anaerobic respiration on waste buried in landfills.
- Develop showcase facilities that display zero waste zones.
- Recycle locally consumed materials that are not efficiently handled by above processes (e.g. metals, glass, plastic, and paper).

4.0 INCREASING SUPPLY VIA RENEWABLE ENERGY GENERATION

Increasing Supply via Renewable Energy Generation

The material in Chapter 3 focused on reducing the region's energy footprint through cooperative measures that the local governments can implement on a regional level. Beyond the activities at the local and regional level, the discussion of energy efficiency turns to initiatives that energy utilities, when sufficiently motivated, pursue in order to boost energy efficiency. This chapter will look at the status of utility initiatives and the role that state and federal policies play in their effectiveness

Renewable energy can improve local air quality and energy security by offsetting the use of conventional energy sources and diversifying the energy portfolio. In addition, alternative energy development positively impacts the region's economic development by generating green collar jobs and keeping spending on energy within the region.

The Central Midlands Region is blessed with a reasonably good endowment of renewable resources. Yet renewable energy projects are relatively rare. State-level energy policy has succeeded in keeping electricity prices relatively low, which presents a major challenge for competing renewable generation with slightly higher unit costs at current scales.[1] However, state-level policy has also erected (perhaps inadvertently) other barriers to the success of alternative energy throughout South Carolina. Nonetheless, the state has succeeded in attracting some renewable energy technology manufacturers. A growing commitment to developing technical expertise within the state's higher education and other training institutions, relatively low property taxes, and a handful of tax incentives and other programs targeting alternative energy technologies have prompted some manufacturers of wind and solar energy system components to locate production facilities in the state. Yet, the State's generally favorable business climate could be improved for the alternative energy industry. State-level policies should be updated to make South Carolina competitive with other states, as discussed below.

Although local governments have limited influence over state-level policies aimed at creating demand for renewable energy development, there are many things they can do to improve the environment for small-scale, customer-sited renewable energy installations in the region.[2] The Region's local governments could take actions like installing more demonstration projects and improving local permitting requirements, which are further discussed below.

1. The average retail price of electricity for commercial end-users in South Carolina was 9.35 cents per kilowatt-hour (kWh) in May 2011 (U.S. EIA 2011).
2. Higher education institutions in the Region, like the University of South Carolina, are often early adopters of renewable energy technologies – at least as small-scale projects. Many of these projects experience considerable success raising awareness among students, faculty, and staff; however, most of the general public remains unaware of them because they are sited on campus.

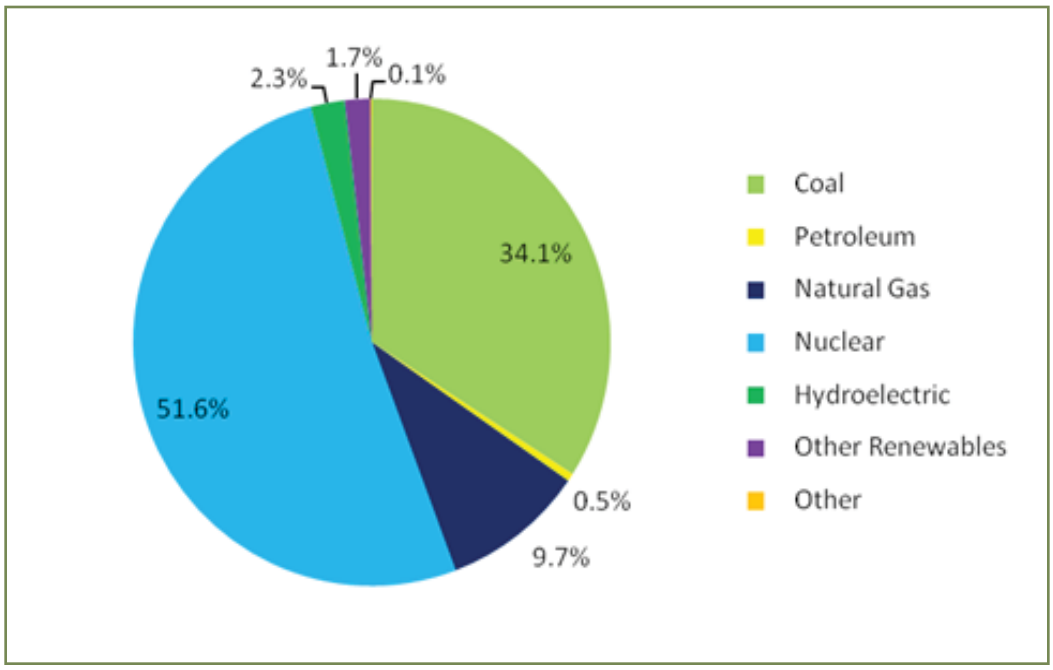
Existing Conditions

The Region's energy portfolio is almost entirely determined at the state-level. Almost all electric power is consumed from the grid, which interconnects the area with the rest of the State (and beyond). Coal and nuclear-based generation dominate the energy portfolio, despite their respective negative impacts on local air quality and energy security. Hydropower, biomass generators, solar photovoltaics and other renewable energy technologies are providing some energy to the Central Midlands Region. While their relative contribution to the energy mix is small, their presence demonstrates these resources can successfully contribute to the Rregion's energy portfolio.

Inventory of Primary Energy Sources in the Midlands

In 2009, more than half of the electricity generated and consumed in South Carolina came from nuclear power and another 34% came from coal, all of which was imported from out of state at a net cost of $1.1 billion.[3] Natural gas accounted an additional 9.7% of the total electricity generation in the State. **Figure 32** shows the breakdown of electricity generation sources in South Carolina in 2009.

Figure 32. Share of Electric Power Generated by Source in South Carolina (2009)



3. http://www.nrel.gov/applying_technologies/state_local_activities/southeast_state_findings.html#sc

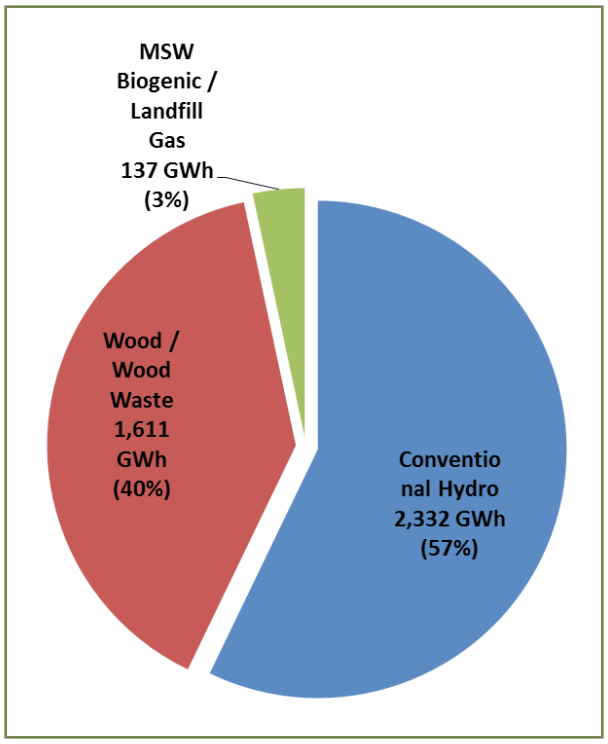


Figure 33. Reported GWh of Renewable Energy Generated in 2009 in SC

The area has been partitioned into six electric utility service territories. South Carolina Electric and Gas (SCE&G) is the dominant provider in the region's urban areas.[4] The remaining 21% of the consumers in the Central Midlands Region are located in outlying areas (including some of the large suburbs around Lake Murray) served by five different electric cooperatives: Mid-Carolina Electric, Fairfield Electric, Tri-County Electric, Aiken Electric, and Newberry Electric.[5] The cooperatives buy electricity mainly from Santee Cooper (a State-owned enterprise), but they also purchase some from SCE&G, Duke Power, and Progress Energy. The breakdown of electricity generation for all of SCE&G's territory, representing one-third of the electricity sales in the State, comes primarily from three sources: coal (51%), natural gas (23%), and nuclear (21%). In contrast, 80% of Santee Cooper's electricity is generated by coal; although statewide, the stock of investor-owned power plants is quite mature, many of Santee Cooper's coal-fired plants are relatively new.[6]

Renewable energy (including hydro) made up 4% of statewide generation in 2009. Even though the majority of this generation came from conventional hydroelectric sources, other renewable sources such as wood waste, municipal solid waste, and landfill gas contributed to the state's portfolio, as shown in **Figure 33**. There was no data reported for statewide energy generation from solar, wind, or other biomass, which is most likely due to the small amounts generated in the State.[7]

Much like the State as a whole, 4.4% of energy generated by SCE&G in 2010 came from renewable energy sources (hydroelectric and biomass).

4. SCE&G is an investor-owned utility, owned by shareholders in SCANA. Hence, their objective (as characterized by economists) is to maximize shareholder value, which market fundamentals anchor to their discounted stream of profits. Profits are earned by investing in power infrastructure and selling their generated electricity to consumers at a rate sufficiently higher than cost to receive a reasonable rate of return on that investment. Sometimes characterized as local monopolies, investor-owned utilities are subject to the regulatory oversight of the state's Public Utility Commission (which is primarily concerned with whether the utilities are charging a fair price).
5. In contrast to an investor-owned utility, a cooperative is a non-profit that does not generate electric power but buys it in bulk and then distributes it to the consumers in the cooperative's service territory.
6. This information is based on an interview with Mike Couick from Electric Cooperatives of South Carolina, November 2011.
7. U.S. Energy Information Administration. *Table 1. Summary Renewable Electric Power Industry Statistics (2009) for South Carolina.* Downloaded from http://www.eia.gov/cneaf/solar.renewables/page/state_profiles/south_carolina.html.

Renewable Resource Potential

Practical resource potential—the generation capacity reasonably expected to be developed—is inseparable from barriers to alternative energy development. Those barriers include the State's energy and environmental policies, institutional support for alternative energy, and other factors.

Different alternative energy resources have varied levels of potential in the region. While solar resource potential is relatively high, the region has no commercially viable wind resource. Large hydroelectric systems serve the region, such as the 207.3 MW Saluda Dam; however, there is limited practical potential for additional large-scale hydropower. While biomass feedstocks in the State are readily available, the industry for processing these feedstocks is currently rather limited. In addition, only emerging technologies that can generate cleanly after processing biomass (e.g. gasification) should be considered, given that direct combustion of biomass can have negative effects on local air quality.

While feasibility studies give a good indication of local alternative energy resources and the viability of specific projects, the range of suitable options narrows at the local level. Geographic features and local climatic conditions help determine suitable choices for alternative energy generation; the public's opinion of renewable energy can also be a limiting factor. The following subsections provide a brief summary of each alternative energy resource's potential in the region, as well as important considerations for each.

Biomass

Biomass refers to energy feedstocks derived from plant matter, such as trees, grasses, and agricultural waste. These resources can be used to generate electricity, heat, or alternative fuels. Biomass resources may also be used in some combined heat and power (CHP) systems.

A 2007 study estimated the practical potential of direct-fire, wood-based generation in South Carolina is 423 MW, with feedstocks coming predominantly from commercial thinning (217 MW), logging residue (180 MW), and urban wood waste (26 MW).[8] An additional 68 MW of agricultural byproduct-based generation was deemed practical, with feedstocks including corn crop residues (36 MW) and poultry litter (31 MW). In 2011, the National Renewable Energy Laboratory (NREL) estimated South Carolina's solid biomass potential to be equivalent to 7% of the State's 2008 electricity generation.[9] Biomass feedstocks for electricity generation available in the Midlands appear in **Table 21**.

8. La Capra Associates. Analysis of Renewable Energy Potential in South Carolina. 2007. www.ecsc.org/newsroom/RenewablesStudy.ppt
9. NREL. Southeast Regional Clean Energy Policy Analysis. April 2011. http://www.nrel.gov/applying_technologies/state_local_activities/pdfs/49192.pdf

Table 21. Biopower Feedstocks by County

Source: NREL. BioPower. Accessed December 12, 2011. http://rpm.nrel.gov/biopower/biopower/launch

Feedstock	Lexington County (Metric tons / year)	Richland County (Metric tons / year)
Crop Residues	8,082	8,406
Primary Mill Residue	65,654	200,398
Urban Wood and Secondary Mill Residues	27,435	40,257

Biofuels

Alternative fuels are another appropriate application of plant-based resources in the Midlands. Biodiesel derived from lynnseed or rapeseed and waste vegetable oil, for example, could be used to fuel diesel engines in vehicles, generators, or small industrial machines. While approximately 11% of the petroleum used for transportation in South Carolina could be replaced with biofuels from the State's feedstocks,[10] the State has only three biodiesel production facilities (the closest is in Winnsboro) and no ethanol facilities. Research identified only a few facilities for biodiesel fueling in Columbia. One, located near Fort Jackson (a Spinx fueling station at the corner of Decker and Percival, 1 block from the I-77 ramp), is accessible to the public; the other two are for governmental use only.[11] The Palmetto State Clean Fuels Coalition, a non-profit organization, continues to work towards increasing biofuel use, as well as electric vehicles.

Hydroelectric

While the expansion of large-scale hydropower in the Midlands region is likely not feasible, there is opportunity for moderate and small hydro systems. NREL estimates that South Carolina has small hydroelectric potential equivalent to 7% of the State's 2008 electricity generation.[12] Additional capacity could be developed by expanding or boosting the output of existing hydroelectric turbines, as modern turbines can provide both increased efficiency and reduced environmental impacts.

Combined Heat and Power (CHP)

CHP systems produce electricity for both heating and cooling from a single energy source. Also called co-generation systems, CHP systems recover heat lost in generation to provide useful thermal energy. These systems use less fuel than conventional generators to provide an equivalent amount of useful energy. CHP systems can be comprised of microturbines or reciprocating engines. Microturbines are more appropriate in the Midlands, as these systems produce fewer emissions than reciprocating engine-based CHP systems.

CHP systems are one of the most cost-competitive alternative energy technologies. Although they may soon be cost-competitive at the household

10. NREL. BioFuels Atlas. Accessed December 14, 2011. http://maps.nrel.gov/biomass
11. United Energy Dist. West (803) 796-8741 2470 Fish Hatchery Road West Columbia SC 29172 E85 B20*
12. NREL. Southeast Regional Clean Energy Policy Analysis. April 2011. http://www.nrel.gov/applying_technologies/state_local_activities/pdfs/49192.pdf

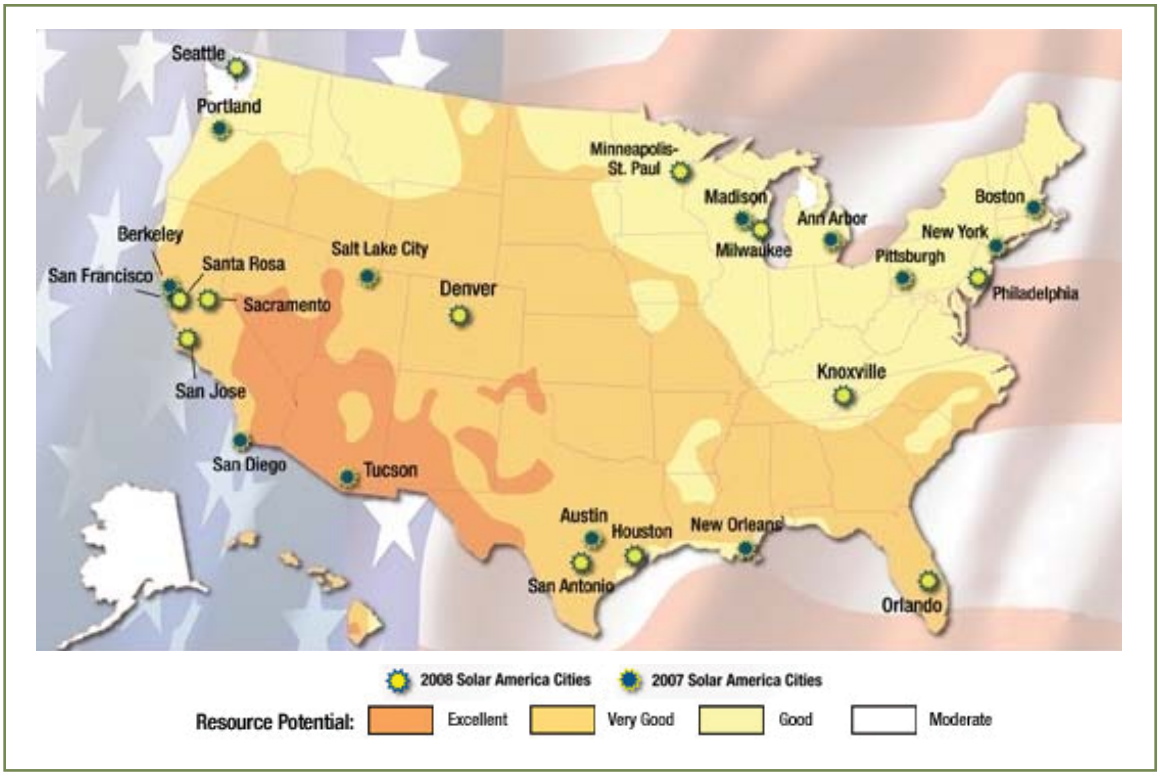
scale, CHP systems are currently most viable for larger buildings. An additional benefit of these distributed energy systems is that they decentralize the energy infrastructure, increasing energy security.[13]

CHP systems are especially well-suited for industries requiring continuous electricity and heat, such as paper manufacturing and food processing. A lack of familiarity with CHP benefits has unfortunately led to a relatively low level of deployment. South Carolina has an estimated 1,500 to 2,000 MW of CHP potential statewide.

Solar

South Carolina has abundant solar resources that could be used to generate electric power or heating applications (see **Figure 34**). At roughly the same latitude as southern California, ample solar radiation is leveled at the State; however, the total potential for solar is lower than in the Southwest due to frequent cloud cover. Utility infrastructure (e.g., transmission lines), environmental issues (e.g., wetlands), and local regulations (e.g., zoning) can significantly limit the feasibility of large ground-mounted systems. Using distributed solar photovoltaic (PV) panels to directly reduce building electricity use is more appropriate near the City of Columbia, as roof-mounted systems are a better fit for more densely populated areas.

Figure 34. United States Solar Resource Potential



Source: U.S. Department of Energy. Solar America Cities. www.solaramericacommunities.energy.gov/solaramericacities

13. Decentralization increases energy security by limiting the impacts of potential threats to the physical infrastructure upon which it resides. The principle is similar to what secures the entire internet from hostile attack; the more redundant nodes there are in the system—in one case, for production, in the other for transmission – the less damage can be caused by the loss of any one node.

A Common Fallacy on Renewable Intermittency

Although intermittent, solar and wind can be integrated into a region's energy portfolio without compromising service. Because solar resources are most abundant during summer's peak demand (mid-afternoon) and wind resources are most abundant during winter's peak demand (sunrise and sunset), they do not replace coal and nuclear-based generation facilities that are used to constantly generate a baseline aunt of electricity (i.e., satisfying "baseload" electricity demand). When integrated with traditional electric generation infrastructure, solar and wind power are most commonly deployed to displace more costly resources that traditionally serve intermediate and peak electricity demand, such as natural gas-fired generation.

Someday storage technologies, such as fuel cells, will expand the availability of renewable resources to serve baseload demand. In the interim, biomass-based generation and hydropower systems can begin to offset the need for new nuclear and coal-fired generating facilities.

Due to site conditions at the Northeast Landfill in Columbia and the Northeast Sanitary Landfill in Eastover, the U.S. EPA identified both as potential locations for landfill gas projects. Practical resource potential at the Northeast Landfill alone is estimated to be 1.6 MegaWatts (MW).

South Carolina's solar potential is estimated to be equivalent to 12% of its 2008 electricity generation. The technically feasible solar capacity for South Carolina is estimated to exceed 4,600 MW, with ground-mounted solar PV representing over 4,400 MW of this potential. While solar PV is technically feasible, other factors have led to its relatively high installed cost, making this technology less attractive than other alternatives. Improvements in photovoltaic technology will expand the potential for solar electricity generation, and, as the costs for solar electric technologies decrease, PV will have an increasingly important role in energy generation. Until then, there are other solar technologies that are already cost-competitive in the region:

- **Solar thermal systems** are used to pre-heat water before it is fed into a conventional water heater that provides hot water to kitchens and bathrooms or fed into a boiler for space heating (e.g. via radiators). An estimated 69 MW of large-scale solar water heating is currently feasible.[14]
- In **passive solar building design**, windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer. Buildings can be designed to take maximum advantage of natural opportunities for sheltering from heat in warm weather and maintaining heat in cold weather. In the summer, undesirable heat gain from solar exposure on the roof, or on eastern and western faces of a building can be mitigated by certain types of building design and landscaping (e.g. deciduous shade trees). Likewise, architectural and landscaping solutions exist to maximize solar heat gain in the winter while minimizing northern wind exposure.

Biogas

Methane, commonly referred to as natural gas, is a powerful greenhouse gas when vented into the atmosphere, but is the cleanest-burning fossil fuel by far. Large subterranean deposits, trapped under the Earth's crust and formed from decayed biomatter from earlier geologic eras, are the conventional source of methane. However, methane is also formed as microbes digest organic matter in any oxygen-poor environment, such as bogs and landfills. Hence, methane can be captured from liquid and solid waste and burned to generate heat or electricity.

The area has some experience with landfill gas to energy (LFG) systems: the landfill owned and operated by Waste Management in Richland County. LFG systems involve capturing landfill methane

14. Southern Alliance for Clean Energy. Yes We Can: Southern Solutions for a National Renewable Energy Standard. February 2009. http://www.cleanenergy.org/images/stories/files/reports/se_renewables02091.pdf.

emissions that might otherwise be flared off. **Figure 35** shows methane emissions from landfills by county; South Carolina has more landfill methane resources than neighboring states, with both Lexington and Richland shaded red to indicate greater than 10 metric tons per year of methane emitted from landfills. At present, there are 14 operational landfill gas projects in South Carolina with a total capacity close to 50 MW. The U.S. EPA Landfill Methane Outreach Program has identified eight additional candidate landfills in the State, [15] two of which are in Richland County. Practical resource potential at Richland's Northeast Landfill alone is estimated to be 1.6 MW. As with biomass projects, LFG involves combustion and thus affects local air quality, although far less than does coal-fired electric generation. As an alternative, landfills can be repurposed to host solar PV projects.

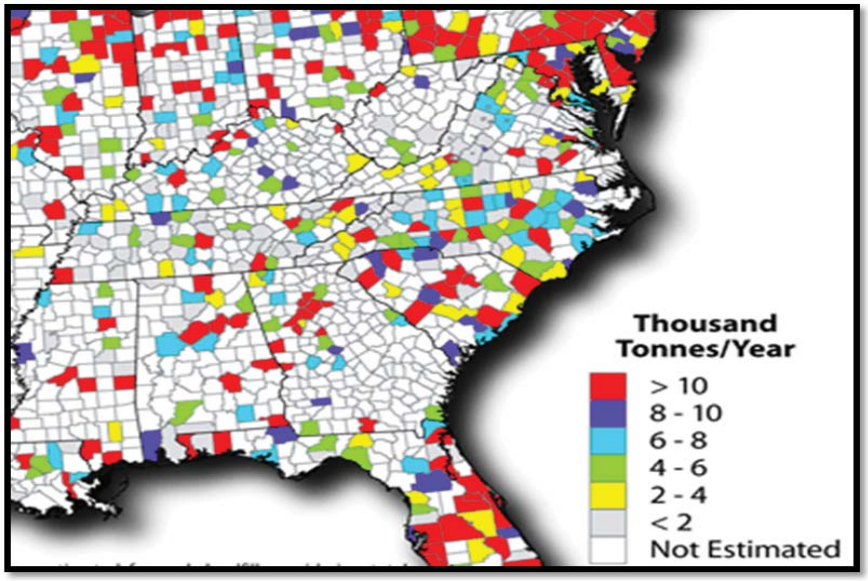


Figure 35. Methane Emissions from Landfills, By County

Source: NREL 2009

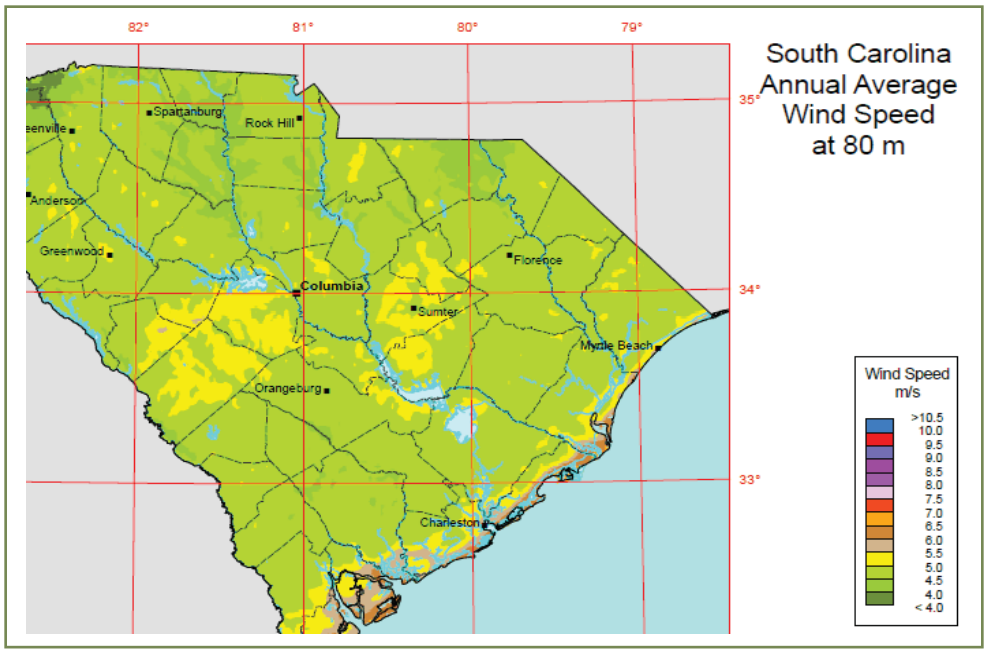
Geothermal

The region could benefit from geothermal heat pumps (GHPs), which use ultra low-grade geothermal resources for heating and cooling. GHPs use the constant temperature of the earth at shallow depths as a heat source or sink. GHPs use much less energy than other heating and cooling systems to achieve the same performance. Although not quite affordable on a household scale, GHP systems are cost competitive for larger buildings and are ideal for structures on large parcels of land (e.g. universities and industrial campuses). These systems can be readily installed in any area of South Carolina.

There is no practical potential for direct geothermal electricity generation in the Central Midlands, which requires the lithosphere (the Earth's crust) to be sufficiently thin at the site for hot magma to be near the surface.

15. Candidate landfill is a landfill that is accepting waste or has been closed for five years or less and has at least one million tons of waste and does not have an operational or under construction LFGE project; or is designated based on actual interest or planning (U.S. EPA 2011)

Figure 36. South Carolina Wind Resource Map



Source: NREL. South Carolina Annual Average Wind Speed at 80 Meters. October 26, 2010. www.windpoweringamerica.gov/pdfs/wind_maps/sc_80m.pdf.

Wind

There is significant potential for offshore wind generation; in fact, the National Renewable Energy Laboratory (NREL) estimates that South Carolina has offshore wind resources equivalent to 395% of its 2008 electricity generation. It remains unclear how much of that potential will be developed due to effects on seascapes, which are highly valued by both South Carolinians and the out-of-state coastal vacationers who power the much of the state's tourism industry.

Despite ample wind resources on the coast, the wind potential within the Central Midlands Region, which is over 75 miles from the shore, is not practical under current technology. **Figure 36** shows South Carolina's average annual wind resources (onshore). Shades of Brown exceed the 6.5 meters-per-second threshold, which is typically required for wind development to be economically viable. Only on the coast are wind speeds greater than 5 meters per second attained – wind speeds average around only 5 meters per second in the Central Midlands Region.

Regional Initiatives and Accomplishments

South Carolina has a long history of using hydroelectric resources for power stations that provide electricity to textile mills, particularly in cities along the fall line that are able to take advantage of the dramatic change in elevation.[16] For example, the Columbia Water Power Company built a powerhouse at the Columbia Canal in 1896,[17] and a hydroelectric plant has been operating at some

16. The fall line is traced out by the waterfalls and rapids occurring where the rivers in the Carolinas abruptly descend from the upland Piedmont to the lowland Atlantic coastal plain.

17. http://blogs.thestateonline.net/metrodesk/2011/02/07/history-of-the-columbia-canal-and-the-hydroelectric-plant/.

capacity since then. Over the years, additional regional hydroelectric plants have been built, including a large dam forming Lake Murray. The hydroelectric facility in Jenkinsville (Fairfield County) is heavily used by SCE&G as a demand-response tool to manage peak-load demand: essentially, it generates hydropower during peak hours and acts as an enormous battery that pumps water uphill during off-peak hours (when only the most efficient electricity generation plants are running, to keep cost low).

While hydroelectricity has long been harnessed as a source of power in South Carolina, wind projects are relatively new. In late 2010, Santee Cooper Electric Cooperative installed the State's first off-shore wind turbine in North Myrtle Beach.[18]

Figure 37. North Myrtle Beach Wind Turbine

To support increased local development of alternative energy projects, the South Carolina Energy Office awarded funds to support demonstration projects in the state. Below are a couple of examples of alternative energy projects in the Central Midlands Region that received some funding from South Carolina's Energy Office.

Columbia Museum of Art Solar PV System

The Columbia Museum of Art installed 177 poly-crystalline silicon solar PV panels on the museum rooftop to produce electricity for the building. The 41 kW PV array occupies approximately 4,000 square-feet of the museum's rooftop. This is the largest solar project in the City of Columbia, and was the largest commercial project in South Carolina until Boeing built a plant in North Charleston with the nation's sixth largest PV array on the roof.

Project Funding

An American Recovery and Reinvestment Act (ARRA) grant, awarded by the South Carolina Energy Office, covered the entire installed project cost of $213,521.

Should additional funding become available, the museum would like additional panels to further increase electricity production, and sell any excess power back to the utility via net metering.

Project Benefits

The PV system is expected to generate 53,340 kWh per year, reducing the museum's annual electricity use by an estimated 10%. This translates to an estimated annual savings of $13,606, with savings exceeding $408,000 over the useful life of the system.[19]

Further, the emissions avoided because of the PV system are estimated to exceed 40 tons each year. The project has attracted a variety of visitors who want to learn about alternative energy, including school groups and institutions interested in undertaking similar projects.

Figure 38. Solar Panels on the Columbia Museum of Art

18. http://www.wmbfnews.com/story/13592903/north-myrtle-beach-installs-first-shore line-wind-turbine.
19. South Carolina Energy Office. Association of South Carolina Energy Managers (ASCEM) Presentation. Spring 2011. www.energy.sc.gov/publications/ASCEM 2011Spring.pps.

Ashlie Lancaster, SC Energy Office Director said of the project: "*This project demonstrates the value of using solar in a facility that has a lot of visitors. We are glad the Columbia Museum of Art is using this opportunity as an educational tool for the public as well as creating a source for clean energy.*" [20]

Columbia College Solar Thermal Water Heating System

Columbia College installed a solar thermal water heating system on top of two residence halls, which house approximately one-quarter of all students living on campus. The 32-panel system replaced steam water heating produced from natural gas.

Project Funding

An ARRA grant, awarded by the South Carolina Energy Office, covered the entire installed project cost of $193,530.

Project Benefits

The Columbia College solar thermal water heating system was part of a growing effort to implement sustainability initiatives on campus. This project is expected to provide the college with reduced energy costs and carbon footprint. Further, the college hopes to educate students on the benefits of environmentally-friendly technologies, while also attracting prospective students interested in environmental issues.

John Clark, director of the Energy Office, noted, "*By installing these solar thermal water heaters, Columbia College will make significant steps towards energy efficiency as the college replaces older systems which cost much more to operate.*"[21]

Palmetto Health Solar Thermal Water Heating System

Project Funding

An ARRA grant, awarded by Richland County and allocated to Palmetto Health Richland, covered the entire installed project cost of $211,680.

Figure 39
Solar Panels on Palmetto Health

Project Benefits

Palmetto Health solar thermal water heating system was paired with a stack economizer. The solar thermal array heats the water from solar energy while the stack economizer captures waste heat from the existing boiler. Partnering energy efficiency with clean energy maximizes the return on investment. These panels are easily seen from the Children's Hospital on site.

20. Columbia Museum of Art. Learn Solar. Accessed December 14, 2011. http://www.columbiamuseum.org/learn/solar.
21. National Association of State Energy Officials. U.S. State Energy Program: An Activity Report of the U.S. State Energy Program Success Stories from the State and Territory Energy Offices. 2011. http://www.naseo.org/programs/sep/documents/SEP_Success_Stories.pdf.

Policy Context

National-Level Policy

National alternative energy policy has sluggishly evolved with the changing goals and priorities of the federal government. This fluctuation has created some uncertainty that dampens investment by energy providers, private sector decision makers, and state and local governments. Hence, alternative energy sources accounted for only 11% of the nation's energy production in 2010, despite far greater potential.[22] In the absence of comprehensive reform to the nation's energy policy, state and local governments have implemented policies and programs in support of their respective goals. Given the political divisions over alternative energy issues, this trend is unlikely to change in the immediate future. At present, federal policies and incentives that support alternative energy development include interconnection standards for transmission-level interconnection,[23] corporate depreciation incentives, tax credits, and loan and grant programs.

State-Level Policy

The relatively low cost of generating electricity from traditional resources is a primary reason that alternative energy technologies are not being developed to provide a greater portion of South Carolina's energy needs. However, there are some state-level policy barriers. South Carolina does not have a cohesive program to guide the development of on-site energy generation, which includes on-site generation of energy from renewable sources. Nonetheless, the State has been proactive in pursuing some policies that target alternative electricity generation, including:

- Construction and design incentives
- Tax incentives
- Interconnection policies
- Loan programs

State programs supporting on-site energy systems are outlined in **Table 22.**

22. U.S. Energy Information Agency. Annual Energy Review (October 2011). http://www.eia.gov/energyexplained/
23. State standards generally apply to distribution-level interconnection.

Table 22. State Programs that Support Development of On-Site Energy Systems

Incentive	Target Market	Description
Biomass Energy Production Incentive	Commercial, Industrial, and Agriculture	Performance/production-based incentive for the generation of energy in biomass-energy facilities.
Biomass Energy Tax Credit	Industrial	South Carolina offers a corporate tax credit for 25% for the purchase and installation of equipment used to create heat, power, steam, electricity, or other forms of energy for commercial use from a fuel consisting of at least 90% biomass or landfill gas resources.
Sales Tax Exemption for Hydrogen Fuel Cells	Commercial and Industrial	Any device, equipment, or machinery related to the hydrogen - fuel cell cluster (R&D, manufacturing the fuel cells, supplying hydrogen, or powered by fuel cells).
Solar Energy and Small Hydropower Tax Credit	Commercial and Residential	The State offers personal and corporate tax credits covering 25% of the costs towards purchasing and installing a solar energy system or small hydropower system for heating water or space, or for air cooling, energy-efficient daylighting, heat reclamation, energy-efficient demand response, or the generation of electricity in a building owned by taxpayers.
Renewable Energy Revolving Loan Fund	Public or Commercial, Industrial, and Agriculture	Low-interest loans to private businesses, private farming operations, private individuals, state and local governments, school districts, non-profit organizations, and public/private colleges/universities for the creation of renewable energy production facilities that produce energy or transportation fuels from biomass, solar, or wind resources. A program loan may provide up to 50% of the total cost of a project, but must not exceed $250,000 for each project. The program is administered by the South Carolina Department of Agriculture.

Source: http://www.dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=SC

In addition to the State programs outlined in **Table 22**, there are several bills under consideration in the legislature that address on-site energy generation and renewable energy, including:

- S 0096 – Encourages the State to develop a renewable energy portfolio standard.
- S 07660 – Allows electric cooperatives to advocate for energy efficiency and renewable energy initiatives.
- H 3930 – Establishes a district to promote, encourage, and facilitate renewable energy and energy-efficiency development.[24]

24. For more information on these bills and other pending energy-related legislation, see the Tax Incentives, Legislation and Publications page on the South Carolina Energy Office Website http://www.energy.sc.gov/index.aspx?m=1&t=67

Unlike neighboring North Carolina, which has experienced a rapid increase in alternative energy installations, South Carolina does not have a Renewable Portfolio Standard (RPS). A typical RPS requires utilities to meet a certain percentage of their demand with alternative energy by a certain date (e.g., 20% by 2020). These policies create a market for Renewable Energy Credits (RECs), which are valued at the environmental benefits of electricity that is produced by alternative energy systems. Thus, RECs can be used by developers to improve the economic viability of renewable energy projects. In the absence of such a market, near-commercial technologies may be prohibitively costly. NREL has found that RPSs are the most effective renewable energy policies for achieving clean air benefits.

While the mechanism most commonly used in the United States to meet state RPS mandates is competitive solicitation (e.g., utility companies required to purchase RECs do so through competitive solicitations), feed-in tariffs (FITs) can also be used. A feed-in tariffs (FIT) is an energy supply policy that guarantees payment for the electricity produced by alternative energy systems.[25] FIT payments are typically awarded to alternative energy developers according to long-term (i.e., 15-20 year) contracts, which provide developers with stable long-term revenue and drives development by creating a favorable investment environment. The NREL has found feed-in tariffs to be more effective than rebates, which have limited impact.

In the absence of an RPS in South Carolina, other policies can encourage the growth of renewable projects. If every consumer paid a benefits fee, amounting to a few additional pennies on their monthly bill, the collected funds could spur a massive build-up in alternative energy projects (or even fund energy efficiency retrofits). The fee could still be effective if it were made to be voluntary, so long as the choice mechanism is that consumers can opt-out (as opposed to opt-in). In contrast, retail electricity customers in the Midlands can already opt-in to voluntarily programs offered by utilities to support alternative energy generation – customers of SCE&G (or any other investor-owned utility) can contribute to the Palmetto Clean Energy Program (PaCE)[26] and customers of Electric Cooperatives can sign up for their Green Power Program[27] (partnering with Santee Cooper).[28]

Distributed generation systems are interconnected with the electricity grid behind an existing customer meter. In some states, net metering policies require the electric service provider to fairly compensate system owners for sending electricity back to the grid (e.g. this happens when a solar PV system produces more electricity than the building can use). Clear, comprehensive interconnection and net metering policies that do not require extensive fees are critical to promoting alternative energy development.

25. Feed-in tariffs make private investment in alternative energy more attractive by providing long-term contracts (often 15 to 25 years) that guarantee both grid access and a rate (i.e. “tariff”) for the electricity produced that is based on the cost of its generation.

26. For more information, see http://www.energy.sc.gov/index.aspx?m=6&t=103

27. For more information, see http://www.scgreenpower.com/portal/page/portal/scgreenpower/signups

28. Opting-out programs always have larger participation rates because they capture customers that are indifferent or luke-warm supporters. In order for opt-in programs to be successful, there must be an extremely successful (and ongoing) public information campaign and strong support that results in customers making an effort to participate.

In its 2010 *Freeing the Grid* report, the Interstate Renewable Energy Council (IREC) graded both South Carolina's net metering and its interconnection policies as an "F" in terms of their ability to facilitate alternative energy development. South Carolina's voluntary net metering programs vary, but many have significant limitations, and the State lacks a statewide net metering policy. South Carolina net metering incentives are only available for systems under 100 kW. Palmetto Utilities' net metering program is one of the most advantageous in the state, offering to buy back small-scale solar and wind generated power at $0.15/kWh.[29] In SCE&G's territory, when a customer undertakes a project that produces RECs by generating alternative energy on-site, the customer only owns those RECs until a market for them emerges in South Carolina, at which time SCE&G appropriates full ownership of the project's RECs.[30] In other states, the customer always retains full ownership of the RECs until the customer sells them; consequentially, REC markets are an important part of funding alternative energy projects.

Tax credits are available in South Carolina; however, the State has set relatively low limits for the maximum tax credits. The State offers a corporate tax credit for solar and small hydropower systems that covers 25% of eligible project costs, up to a maximum credit of $3,500 per tax year. In contrast, North Carolina offers a 35% corporate tax credit for renewable energy systems with a maximum limit of $2.5 million per installation. Energy projects are costly endeavors and tax benefits can be critical to a project's viability. As a result of this more favorable tax treatment, many private developers in the southeast are attracted to the development opportunities in North Carolina, which has seen a greater economic impact from renewable energy projects than South Carolina.

In order to take advantage of the incentives available to private entities, such as a 30% federal Investment Tax Credit, public entities look to alternative ownership models. In some states, systems developed for public entities are third-party owned. In a solar power purchase agreement (PPA)—a third-party system ownership model that is popular in many states—a public entity (e.g. a school district) will lease their rooftops to a private developer to install a solar PV system. The developer, in turn, sells the resulting electricity back to the public entity under a long-term contract at a lower rate than the rate charged for electricity off of the grid. This model, however, has not gained traction in South Carolina, partly due to regulatory limitations on taking electric service territory (which is designated per the Territorial Assignment Act), as well as the lack of demand for alternative energy among the utility companies.[31]

29. This rate is about 50% higher than most customers pay for retail power and 5 times higher than many utilities offer for net metering.

30. Database of State Incentives for Renewables and Efficiency (DSIRE), 2011. http://www.dsireusa.org/

31. Because an RPS requires a specified fraction of each utility's generation to be renewable, an RPS induces demand for alternative energy from utilities and subse quently spawns a market for RECs.

Institutional and Stakeholder Support

In the absence of a supportive policy environmental, institutional support for alternative energy is available to the Midlands region. The South Carolina Energy Office is responsible for implementing energy policy at the state level. The South Carolina Energy Office, in its *Plan for State Energy Policy*, provides a broad range of resources designed to help citizens, businesses, and public entities save energy and money through greater efficiency, better information, and enhanced environmental quality. Programs and services available through the South Carolina Energy Office include technical assistance and audits, workshops, financial assistance, free public awareness and informational materials, and grants, loans, and rebates. The Energy Office Website also provides some helpful information on biomass, wind, solar, small hydropower, geothermal, and hydrogen technologies.

Since 1995, the South Carolina Energy Office has helped save over $250 million through public and private energy-saving measures and clean energy technologies. In addition to managing the Renewable Energy Revolving Loan Fund, discussed in Chapter 2, the Energy Office has run a stimulus-funded program that began in 2007 to assist both for-profit and non-profit entities in assessing the feasibility of installing proven, mature renewable energy technologies. The fund specifically excluded research and pilot uses, instead targeting adoption on a larger scale.

Technical training programs, aimed at expanding local expertise in alternative energy development, are an important pre-cursor to establishing the region's green economy. There are several technical support and advocacy groups supporting these efforts, and raising awareness about the benefits of renewable energy. Efforts to build technical capacity and awareness in the region include:

- The City of Columbia's Office of Business Opportunities supported a workshop to cover National Electrical Code requirements for PV design and installation, with the goal of improving solar education in the State.
- In addition to setting up energy efficiency, wind, and geothermal training centers, the South Carolina Technical College established four Solar Energy Training Centers (SETCs) with the help of solar training grants from the State. Attendees receive a voluntary solar PV and solar thermal North American Board of Certified Energy Practitioners (NABCEP) certification, which is recognized industry-wide. The existing SETCs are all located outside of the Midlands; local training centers might help create a foundation for alternative energy investment in the region.
- The South Carolina Solar Council, the South Carolina chapter of the American Solar Energy Society, promotes utilization of solar energy through education, promoting the application of solar energy technologies, and acting as a solar energy technologies expert resource for the people of South Carolina. The council hosts events such as:

- A traveling Solar Tour and Workshop series to provide the public with the knowledge, tools, and resources necessary to understand solar energy options.
- The South Carolina Renewable Energy Forum, which is focused on renewable energy development in South Carolina and the potential economic impact from the growth of a strong green energy industry. The event features speakers from in-state electric utilities, government agencies, political experts, researchers, and commercial industries who will share their vision and expertise on how South Carolina can play a role in this growing sector.

- South Carolina Biomass Council is a consortium of biomass businesses in the state that works with legislators, biomass trade businesspersons, and product end users to create awareness about the full benefits of biomass products.
- Solar Energy Initiatives, in partnership with the State, is locating a solar technology campus in Williamsburg County to train and educate contractors and businesses in the installation of both solar PV and solar thermal systems. The facility will also serve as a demonstration and distribution center.
- The South Carolina Energy Office's One-Stop Shop Program is a collaborative effort between State agencies, the federal government, and key stakeholders to assist renewable energy businesses locate to the State.
- South Carolina Institute for Energy Studies (SCIES) at Clemson University was founded to help South Carolina address energy issues. Since 1982, SCIES has successfully completed research projects in a wide range of energy focus areas, including electric vehicles, hydrogen storage, waste-to-energy, offshore and coastal wind power, and hydropower.
- Southern Alliance for Clean Energy (SACE) promotes responsible energy choices that create global warming solutions and ensure clean, safe and healthy communities throughout the Southeast. SACE advocates for federal, state and local climate policy solutions, energy efficiency programs and policies, and renewable energy such as solar, wind, and sustainable bioenergy.

Manufacturers are increasingly taking advantage of South Carolina's business-friendly climate and increasing technical capacity by starting operations in the State. In 2010, *Business Facilities* ranked South Carolina fourth nationally for "Best Business Climate" and second in wind energy manufacturing leaders. Clemson University's Wind Turbine Drive Train Test Facility has attracted a cluster of renewable energy component manufacturers. In addition to creating more jobs in the local economy, growth in this sector increases the availability of experts who can provide much needed technical assistance.

The institutional support for the business community in South Carolina is in place; however, as available stimulus funding is exhausted, there will be fewer incentive programs. For a substantive green energy economy to take hold, barriers to alternative energy development in South Carolina must be eliminated. A further discussion of green economic development opportunities is provided in Chapter 5 of this report.

Planning and Permitting Guidance

Low disposable income and a general lack of knowledge combine to limit renewable energy adoption by private citizens. Hence, alternative energy projects in the region are more installed in community and commercial settings than in residential settings. However, even in community and commercial settings, installing alternative energy systems may require (extensive) costly permitting or even changes to local zoning ordinances. Authorities in the Midlands can follow examples pioneered by cities and towns elsewhere to facilitate alternative energy development by decreasing these costs and complicating hurdles.

Solar access, or the right to install solar energy systems and access sunlight, is protected by solar easements and ordinances. Solar access rights must typically be granted by a statute or ordinance. Local governments can lay the foundation for a smoother solar development process by supporting solar access and solar rights. Many communities grant solar access permits, in which a solar easement is automatically created when a property owner receives a permit to install solar (the easement ensures that structures or vegetation on neighboring properties cannot decrease solar access).

The South Carolina Energy Office provides sample covenant language for communities and neighborhoods that want to market themselves as “solar friendly.” While the Town of Blythewood Master Plan encourages the use of solar PV and solar thermal, it does not address solar access. For the most part, local governments in the Midlands region are largely without guidance on how to update plans and codes to attract alternative energy development that aligns their sustainability ambitions.

Alternative energy development can help improve air quality and public health, and keep energy dollars in the community. To take advantage of the benefits of alternative energy, however, key barriers policy to development must be addressed. While much of the change needed to stimulate real growth in renewable energy deployment must take place at the level of state policy, local governments can help by implementing policies to reduce permitting and other barriers in their regions, and working to increase acceptance of alternative energy among their citizens through outreach, education, and demonstration projects.

Alternative Approaches

Development of Coalitions and Targets

- Many local and regional governments have volunteer energy committees or energy task forces, comprised of city and county staff or citizen volunteers. These committees can have goals that include carbon reduction targets, a certain capacity or number of municipal renewable energy and energy-efficiency projects, and identifying cost saving opportunities through energy projects.
- Alternative energy development can be a costly and time-intensive process. Task forces should include at least one “alternative energy champion” from each jurisdiction. Ideally, the champions will have some familiarity with alternative energy technologies and policies. Outside the area, this role is filled by city planners and engineers, sustainability coordinators, staff from Mayors’ energy offices, and volunteer energy committee members.

Local Initiatives Supporting Alternative Energy Development

- As a part of the 2008 Green Communities Act, the Massachusetts Department of Energy Resources (DOER) and Massachusetts Executive Office of Environmental Affairs (EOEEA) developed an as-of-right siting model ordinance to aid municipalities and promote solar PV development while safeguarding the public welfare. This model ordinance provides guidance on the development of solar PV systems over 250 kW. In the model ordinance, as-of-right siting is defined as development that may proceed without the need for a special permit or other discretionary approval. Further, while as-of-right development projects can be reasonably regulated by the local building inspector or other local officials and subjected to plan review, they cannot be prohibited. The ordinance outlines the permitting process, lists documents required for site plan reviews, and includes requirements for project design, installation, placement, and decommissioning. These requirements ensure that large-scale PV projects have limited impacts on abutters (e.g., the model ordinance suggests setbacks of at least 50 feet when the property borders residential and/or conservation-recreation districts)/. Massachusetts communities may use the model ordinance as a blueprint for their own zoning laws, modifying it to account for local factors. The existence of the model ordinance allows local groups to adopt sensible policies without extensive or duplicative effort.
- The City of Easthampton, Massachusetts is developing a 2.2 MW solar PV system atop its municipal landfill. The City entered into a 10-year Power Purchasing Agreement (PPA) for the systemelectricity, and construction was completed in fall 2011. Almost all of the electricity produced by the system will be sold back to the grid through the Massachusetts net metering program, and the credits

will be applied to the municipality's electricity bill. Over the term of the contract, the project will save the City an estimated $1 million.[32]

- The Massachusetts Department of Energy Resources (DOER) offers comprehensive guidance for public entities procuring PPAs. A guidebook, frequently asked questions, template Request for Proposals (RFPs) and PPA contract documents, and other materials are available on the DOER Website. This guidance has facilitated the recent rapid increase in municipal solar PPAs in Massachusetts.
- An estimated 3% of total U.S. energy is consumed for water and wastewater treatment services. The municipal water treatment facility in Lee, Massachusetts provides customers with more than 300 million gallons of drinking water annually. In an effort to save money through on-site renewable electricity generation, the Town optimized the facility's 80 kW hydroelectric microturbine system and installed a 34 kW solar PV system. The modern, more efficient hydroelectric turbine generates enough electricity to meet 50% of the facility's annual needs, saving the town $28,000 each year.[33]
- The Massachusetts Clean Energy Center pilot program, SolarizeMass, works with four Massachusetts communities to help market, organize, and execute the bulk purchase of solar PV systems. By leveraging both residential and commercial demand in their respective communities, Harvard, Hatfield, Scituate, and Winchester have been able to drive down installed PV costs for participants.

Alternative Energy Education Initiatives

- Each year, the Northeast Sustainable Energy Association (NESEA) hosts a Green Buildings Open House to raise the profile of sustainable development. Homes, commercial buildings, and schools with sustainable features, including alternative energy systems, open their buildings to the public and share information with visitors about their energy efficiency and alternative energy features.
- The North Carolina Curriculum Improvement Project (CIP) is a community college, system-wide effort to integrate renewable energy and energy-efficiency elements into existing degree programs. Today, four year universities and community colleges in North Carolina are providing NABCEP and IREC training, hosting energy centers, and offering sustainable technology degrees.[34]

32. The Boston Globe. Powering Up Landfill. October 31, 2011. http://articles.boston.com/2011-10-31/news/30342891_1_solar-panels-landfills-renewable-energy.
33. U.S. EPA. Achieving Zero-Net Energy at Drinking Water and Wastewater Facilities. EPA-830-F-10-002. August 2010. http://www.mass.gov/dep/water/priorities/zeronet.pdf.
34. North Carolina Sustainable Energy Association. 2011 North Carolina Clean Energy Data Book. June 2011. http://energync.org/assets/files/NCSEA%20_2011_CEDB_COMPRESSED_FOR_WEB_low_res.pdf.

Access to alternative energy training and education through these institutions will increase as the CIP project evolves.

- The North Carolina Solar Center administers a "train-the-trainer" program funded by the U.S. Department of Energy (DOE), called the Southern Mid-Atlantic Provider of Solar Instructor Training (SMAPSIT). The program accepts 40 trainees each year from the Southern Mid-Atlantic region (including South Carolina). The goal of SMAPSIT is to provide quality technical training in solar system design, installation, sales, and inspection.
- Public alternative energy projects across the country include solar learning kits, educational kiosks displaying live production data, school lectures by developers, and alternative energy internships to graduating high school seniors. Alternative energy developers often supplement the projects with renewable energy-related curriculum materials for students of all ages.
- Colorado's third largest school district, Douglas County, is developing a total of 3.1 MW of solar PV across 31 sites in Douglas County. The School District did not contribute any upfront funds for the $18 million project; rather, it will purchase electricity produced by the PV systems under a 25-year third-party solar PPA. This expansive project is expected to save the District $5.5 million in energy costs throughout the term of the contract.[35] Data from the PV systems is being incorporated into curriculum and analyzed by students and teachers in the classroom. Utility rebates and state and federal incentives helped support the project.[36]
- The City of Raleigh, North Carolina is using its EECBG grant funds to support the professional development and training on energy efficiency and alternative energy topics. Raleigh's goal is to provide local staff and small business, including construction trades with the tools necessary to produce buildings with innovative energy systems and manage sustainability-related projects in the future. Technical courses, including those about solar PV and solar thermal, are offered in partnership with a local community college and the North Carolina Solar Center.

Technical Assistance Assets

- The Clean Energy States Alliance (CESA) works with state and local governments to help them design and evaluate their alternative energy programs.
- The U.S DOE Solar America Communities Program works with cities across the country to field test policies and programs that promote solar development.

35. Douglas County School District. Students Celebrate New Cost-saving Solar Project. 2011. https://www.dcsdk12.org/Article/index.htm?Content_ID=DCS829520.
36. The Denver Post. Solar Panels Shave Costs, Add Lessons at Douglas County Schools. November 28, 2011. http://www.denverpost.com/recommended/ci_19422849.

Local Initiatives to Support Green Economic Development

- Older manufacturing companies in Michigan are being re-tooled to attract the growing clean energy sector. Clean energy technology is now the state's fastest growing sector, with Michigan ranked fourth in the U.S. for number of solar industry jobs and first for clean energy patents. Michigan's success in attracting the alternative energy sector is related to its strong manufacturing base and skilled workforce, targeted supply chain development efforts, and business incentives (e.g., business tax credits for alternative energy supply chain development and workforce expansion, and alternative energy renaissance zone designations).[37]

Local Incentive Programs

- The City of Boston decreased the cost of building permits for solar projects by removing PV hardware from the calculation of project costs that determine the permit fee. As a result, Boston has some of the lowest solar permitting fees in the country.[38]
- San Diego County's Green Building Incentive Program provides fee waivers for building permits and plan checks of residential PV systems.[39]
- Across Massachusetts, solar and wind energy systems sited on private land are exempt from real and personal property taxes.
- In its 2004 Land Use Ordinances, the Town of Gorham, Maine provides a bonus of 5% above allowable base density for developments that provide solar access to 40% of dwelling units and ensure through deed restrictions that the units use solar energy systems for water and space heating purposes.[40]

37. Environmental Law and Policy Center. The Solar and Wind Energy Supply Chain in Michigan. March 2011. http://elpc.org/wp-content/uploads/2011/03/ELPCMichiganSolarandWindReport2011.pdf.
38. City of Boston, Mayor's Press Office. Mayor Menino's Solar Permitting Guidelines Approved. December 15, 2010. http://www.cityofboston.gov/news/default.aspx?id=4897.
39. County of San Diego. The Green Building Program. Accessed December 14, 2011. http://www.sdcounty.ca.gov/dplu/greenbuildings.html.
40. Town of Goreham, Maine. Land Use Ordinances. November 2004. http://www.gorham-me.org/Public_Documents/GorhamME_Codes/land_ord/CHAPTER_1A.pdf.

Recommendations for Implementation

Much of what will affect the future growth in alternative energy generation is beyond the control of local governments. However, the region's local governments can still take effective action to support alternative energy. At the highest level, one of the most effective actions local governments can take is to work together. By designing, developing and launching a thoughtful, collaborative, regional effort, the three governments can achieve significant economies of scale and broaden their reach beyond what would be attainable on their own. **Table 23** lists some broad action items by their timeframe, while the remainder of this section provides some explanation of these broad recommendations. In order to implement these broad recommendations, local governments' department heads will have to work out the particular details.

Table 23. Renewable Energy Action Items for Local Governments

Near-term (0-12 months)	• Establish an alternative energy Task Force • Adopt favorable zoning and permitting requirements for alternative energy development • Launch alternative energy educational initiatives • Identify opportunities for GHP and industrial CHP
Medium-term (1-5 years)	• Support reforms to State Energy Policy • Explore public alternative energy projects
Long-term (beyond 5 years)	• Consider local incentive programs • Expand Landfill Gas to Energy Project

Near Term Recommendations and Action Items

Establish an Alternative Energy Task Force

The success of alternative energy efforts can be dependent on creating a network of support across city and county governments, as well as among citizens. By tapping into the expertise and interests of government staff and citizen volunteers, the Region's local governments can create a low-cost, regional brain trust to help develop an alternative energy agenda, enhance available resources, and articulate strategies for pursuing alternative energy goals. The local governments' sustainability directors should form a regional Task Force that partners with the University of South Carolina, the South Carolina Energy Office, local advocacy groups, and any utility in the region willing to provide a representative.

City/County action items include:

- Identify and recruit task force members from diverse organizations and interests, such as elected officials, relevant department staff (e.g., energy, planning, public works, transportation, community and economic development), and interested citizens. Specifically look to include volunteer members from private sector firms with relevant skills and expertise, as well as those most active in local sustainability issues.
- Work with task force members to develop a group mission, vision, and goals, as well as coordinating logistics such as meeting regularity, times, locations, etc.
- Identify action items aimed at meeting short term milestones towards the goals.
- Assess the members' renewable energy expertise, identify targets, and track funding opportunities.
- If the group is able to support multiple purposes, the members who share similar goals may wish to form smaller action committees to pursue them, conducting self-directed research, establishing an action plan, and completing tasks and milestones.

Adopt Favorable Zoning and Permitting Requirements for Alternative Energy Development

Strategies for reducing the time and cost associated with permitting include adopting expedited permitting processes, guaranteed permitting or system inspection timelines, and granting permit waivers or reductions while community interest in solar is assessed. The Region can help reduce the costs for alternative energy development by reviewing local and regional zoning ordinances, permit requirements, etc. in the near-term.

Strategies for addressing alternative energy in planning and permitting vary, but include: allowing for alternative energy as an outright permitted use, requiring a special use permit, requiring an accessory use permit, and subjecting projects to site plan review. In communities where alternative energy systems are unpopular, for example, local governments would not want to declare alternative energy as an outright permitted use. The treatment of alternative energy in zoning ordinances should be tailored to each individual community.

County and City action items include:

- Conduct a review of local and regional master plans to identify potential bottlenecks and analyze the cost of permitting requirements on potential renewable energy development projects.
- Perform additional research of permitting approaches in other jurisdictions to provide some context and examples of alternatives.
- Research local protocols and procedures required to alter permitting and zoning protocols.
- Propose strategies to improve the permitting and zoning environment for alternative energy and reduce the costs of

implementing alternative energy projects to local decision makers.

- Follow through to support implementation approved activities to adjust existing requirements.

Launch Alternative Energy Educational Initiatives

Lack of awareness has been found to be one of the biggest barriers to alternative energy development. Municipal and county governments can help to overcome the current lack of awareness about alternative energy technologies with strong potential in the region (i.e., solar, biomass, CHP, GHP, and micro-hydro) through a focused outreach campaign that markets the benefits, available options, site considerations, costs, and how to get started.

Sustainability marketing and outreach campaigns can be particularly effective when they are coupled with demonstration projects. Particular attention should be paid to local schools, where audiences tend to be quite receptive to new alternative energy technology and projects can be used to supplement math, science, and other curriculum. Schools that lack demonstration projects should connect with other schools that have them, whether they are local (e.g., Chapin and Florence) or in other states and countries. Students and educators may be particularly interested in energy-related competitions, such as the NEED Project Youth Awards and U.S. DOE-sponsored America's Home Energy Education Challenge.

It will be particularly important for the Region's local governments to to work together on a shared outreach campaign. A collaborative approach will maximize the outreach campaign's momentum and the impact of its message while stretching human and financial resources.

City and County action items include:

- Develop a shared brand identity and message platform to ensure all materials and activities maintain a consistent look and feel and the messages achieve the desired result.
- Identify and recruit local partners work with them to gain buy-in and support for the outreach campaign.
- Conduct research on funding resources.
- Identifying appropriate outreach tactics and marketing channels for the region that leverage local partnerships and funding opportunities.
- Develop marketing materials that promote the brand identity and leverage the messaging platform, including: brochures, flyers, door hangers, advertisements, power point presentation, display booths, videos, email blasts, etc.
- Launch a campaign that maximizes grassroots and social marketing approaches. Appropriate outreach channels include: community events (e.g., farmers markets, local fairs), presentations to community groups (e.g., churches, chambers of commerce), public advertising campaigns (e.g., bus boards, local newspaper), social networking (e.g., Facebook, Twitter), and by creating and posting short videos on the local governments' websites and YouTube.

- Identify funding sources for a demonstration project at a local school (e.g. Gilbert High School's Sustainability Institute) and create a plan for selecting the school, developing the project and incorporating alternative energy education into the curriculum as well as leveraging the project for broader outreach and education in the community.

Identify Opportunities for GHP and Industrial CHP

Ideal industrial facilities for CHP have high, fairly constant electricity and thermal demand (e.g., chemicals, paper, refining, food processing, metals manufacturing). Ideal facilities for GHP are large and surrounded by ample land (e.g., Innovista). GHP and CHP systems can provide significant energy and cost savings, but have been historically underutilized due to a general lack of familiarity with these newer technologies. The Task Force (or local government staff) may be well suited to take the lead on this effort.

City and County action items include:

- Identify suitable facilities for GHP and CHP projects.
- Promote GHP and CHP among the facility owners and act as liaisons between the building owners and organizations that could provide unbiased information, technical support, or co-funding.
- Identify existing GHP and CHP systems in the region (or nearby) and promote those success stories working with both building owners and the GHP and CHP developers to share information.
- Reach out to the utilities serving candidate facilities to request technical and financial project support.
- Research DOE and other grants or loan programs to identify potential project co-funding opportunities.
- Support the development of project RFPs and selection of suitable developers.

Medium-Term Recommendations and Action Items

Support Reforms to State's Energy Policy

State policy has a significant impact on the region's capacity to increase renewable resources. Without an RPS, or other legislative advances that create the market incentives to driver alternative energy development, the state will continue to make small, incremental progress in diversifying its energy portfolio with more sustainable sources. County and city governments can lobby the state legislators representing (portions of) their jurisdictions, After all, state policy makers are supposed to act on the behalf of their constituents.

City and county action items include:

- Identify local legislative priorities and proper protocols for submitting local priorities to state representatives.
- Submit a set of legislative priorities to relevant state representatives each year. It is important to note that significant legislative action

is a multi-year process so the City and Counties should develop its policy priorities and articulate consistent, continuing support for them each year.

There is more than one possible avenue to affect the environment for increasing alternative energy resources at the state level, discussed below. Richland and Lexington Counties and the City of Columbia should explore these options further to identify those that would best serve the region.

- **Support a State Alternative Energy Standard and Alternative Fuel Standard.** South Carolina has six State policies and incentive programs that target alternative electricity generation. Neighboring North Carolina has 10 such policies. In states that are similar (in terms of climate, resource potential, and market conditions), a more advanced energy policy has led to a significant gains in their installed capacity. In early 2011, South Carolina had 1,633 MW of installed renewable energy capacity,[41] most of which is hydro, while installed capacity in North Carolina exceeded 2,200 MW. North Carolina's RPS is the most important driver for the growth of its alternative energy capacity. It requires investor-owned utilities to supply 12.5% of their retail electricity sales from alternative energy sources by 2021.[42] While South Carolina's policy-makers have made modest forays into RPS-type legislation, a bill has yet to pass the legislature.
- **Support Upgrades to the State's Alternative Energy Incentive Programs.** North Carolina offers a number of state-level incentives that have contributed to the state's success developing alternative energy. The commercial tax credit for alternative energy investments in North Carolina, for example, is capped at $2.5 million. South Carolina's maximum incentive in any given tax year is $3,500. Increasing the cap on this tax incentive is a critical first step to making alternative energy projects more attractive.
- **Support Net Metering and Interconnection Policy Reform.** In its 2010 *Freeing the Grid* report, IREC graded Utah and Massachusetts each with an "A" for their net metering and interconnection policies, which were the highest rankings among all the 50 states. Unlike net-metered customers in South Carolina, those in some other states maintain ownership of any RECs generated by their system. Under current net metering policy, if a market for RECs emerges in South Carolina, the utility would own the RECs. The aggregate capacity limit of net-metered systems is only 0.2% in South Carolina, while some other states have no limit on net metering capacity. Other states' virtual net metering programs allow alternative energy systems to send their excess electricity back to the grid, which gets credited against other predetermined utility accounts at a rate close to the delivered rate for grid electricity. No such incentive program exists in South Carolina.

41. In this context, renewable energy capacity includes hydropower, solar, wind, and biomass systems.
42. The standard for municipal and cooperative utilities is to be 10% renewable by 2018.

- **Support Third-Party Ownership Models.** The rapid development of public alternative energy projects in other regions is sometimes a result of policies that accommodate third-party and other ownership models for alternative energy systems (e.g., PPAs). Third-party ownership allows public entities to take advantage of tax incentives and deliver alternative energy without local governments having to lead these complex projects. By marketing the benefits of these contract types, the Task Force can help increase consumer demand for PPAs and other non-ownership arrangements.
- **Support the Creation of a State Energy Fund.** Financial support from state alternative energy funds and grant programs can directly decrease project costs. Many states use energy funds, often collected through small surcharges on electricity bills, to support alternative energy projects. These state funds typically cover a fraction of the project costs and are used to leverage additional funding, estimated at $5 of outside funding for every $1 of state funding. Ohio's Advanced Energy Fund, established in 1999, has invested close to $50 million for approximately 600 advanced energy projects. Each year, these projects generate more than 410,000 MWh—equivalent to the annual energy use of 36,500 Ohio homes.[43] Advanced energy projects include residential wind, solar thermal, solar PV, and energy-efficiency measures for manufacturers. The Task Force should advocate for a mandatory (perhaps with an opt-out) benefits charge applied to all utility end-user bills that could be allocated towards alternative energy projects and other sustainability initiatives (e.g. energy efficiency).

Explore Public Alternative Energy Project Options

- **Feasibility Studies for Landfill Gas, CHP, Waste-based Biomass Generation, and Small-scale Hydropower Projects.** Task Force members should review their communities for alternative energy resources and identify potential project sites. Next, with the help of technical experts (e.g., alternative energy developers, technical consultants, a prequalified technical assistance provider, South Carolina Energy Office staff), the Task Force should conduct fatal flaws assessments. The lowest cost per kWh technologies in the near term are likely to be waste-based biomass generation for electricity and space heating, CHP, and low-head hydropower projects, especially at drinking water treatment facilities. Task Force members should continue to track available funding sources.
- **Municipal Roof and Open-space Inventory.** The Task Force should partner with city and county staff to conduct a region-wide municipal roof and open-space inventory. When solar PV and solar thermal becomes more economical in South Carolina, this inventory will be a valuable resource. The inventory should document newer, flat roofs with few obstructions (e.g., without air handling

43. Clean Energy States Alliance. 2010 Report: State Efforts to Advance Clean Energy. 2010. http://www.cleanenergystates.org/assets/Uploads/Resources-post-8-16/CESA-2010-Members-Report.pdf

units and other rooftop equipment that cause shading and limits feasible PV capacity). If possible, details should be included such as the year each building was constructed, expiration year of any roof warranty, total roof area, the architect of record (architectural plans would help facilitate any needed structural analysis), the presence of nearby tall trees or buildings that may cause shade, and a facilities contact for the building. As a rule of thumb with the current technology, 250 square-feet are needed for each kilowatt of solar PV capacity. Municipal land (e.g., closed and capped landfills) that is most appropriate for solar PV projects would be close to utility infrastructure or a municipal building and would be free of environmental concerns (e.g. wetlands, endangered species, or environmental hazards).

- **CHP at Wastewater Treatment Facilities**. Wastewater treatment facilities (WWTFs) are critical to maintaining public health, and they must be operable in the absence of grid power. CHP systems are well-suited for critical infrastructure (e.g., WWTFs, 911 call centers, hospitals), because they provide on-site generation of electricity and heat. CHP systems can use biogas collected in anaerobic biodigesters as a fuel source, as well as natural gas provided by SCE&G. The technology uses digester gas much more efficiently than digester-gas fueled boilers (one WWTF in North Carolina found that 63 to 66% of gas could be used with CHP, where digester-gas fueled boilers used 33 to 38% of the gas).[44] Due to their low emissions, microturbine CHP systems are a better fit than reciprocating engine CHP systems in areas with air quality issues. The cost to generate microturbine CHP systems at WWTFs[45] in South Carolina is estimated to be 6.4 cents per kWh in locations where digester gas is already used to provide digester and space heating prior to CHP implementation. The cost is 3.9 cents per kWh for locations where natural gas is used for digester and space heating prior to CHP implementation.[46]
- **Water-Source Heat Pumps at Treatment Facilities.** WWTFs can take advantage of the relatively high temperature of effluent to power water-source heat pumps to heat operations buildings.
- **Hydropower at Drinking Water Facilities.** Drinking water facilities are well-suited to accommodate micro hydro, due to the presence of moving water. Hydropower systems tend to be very durable and have a long useful life. Boosting the efficiency of any existing hydroelectric turbines should be prioritized over new projects – modern turbines are more efficient and more environmentally-friendly than older models.

44. Fishman, Bullard, Vogt, and Lundin. Beneficial Use of Digester Gas—Seasonal Lifecycle Cost Considerations. 2009.
45. For WWTFs greater than 1 MGD (1 Million Gallons per Day).
46. U.S. EPA. Opportunities for Combined Heat and Power at Wastewater Treatment Facilities: Market Analysis And Lessons From the Field. October 2011. http://www.epa.gov/chp/documents/wwtf_opportunities.pdf.

Long-Term Recommendations and Action Items

Consider Local Incentive Programs

Absent a significant change at the state policy level, Richland and Lexington Counties and the City of Columbia may wish to explore implementing local incentive programs to promote alternative energy development in the area. However, such programs require significant resources and must be contingent upon developing a sustainable funding source. Thus, local government officials should begin to explore funding options and potential program structures that would be effective in the region in the medium term, while continuing to monitor policy activity at the state level and developing a strategy plan for longer term activity. If, in 5 years, the implementation of favorable policy at a state level appears unlikely, the City and Counties should begin to move forward on efforts to develop local incentive programs. Two options for local incentive programs that have been effective in other jurisdictions are described below.

Consider Favorable Tax Treatment for Alternative Energy Installations and Businesses. State and local governments across the U.S. promote alternative energy through favorable tax treatment. Property tax incentives include exemptions, tax abatements, and tax credits. Sales tax incentives include exemptions and sales tax refunds for the purchase and/or installation of system components. While state tax incentives may not be sufficient to drive alternative energy development, regional and local governments can design tax incentives to attract the manufacturing sector. Local governments could also offer reduced local taxes or discounted business licenses to alternative energy developers to entice them to locate in the Region.

Work with Utilities to Offer a Local "Green Up" Option. Voluntary surcharges to support alternative energy have proven to be popular in other communities and can be an effective way to amass funds to reinvest in the community. For example, if electric cooperatives can agree to a small voluntary charge (e.g., less than $0.01 per kWh), collected funds can be placed into an account administered by a regional representative and used to fund alternative energy projects for schools and other public facilities. As discussed earlier, structuring the voluntary mechanism as an opt-out rather than an opt-in, would greatly enhance the success of the program. The administrative costs for this would be paid with the money collected, and the remainder would fund the direct costs of local demonstration projects.

Expand Landfill Gas to Energy Project

Building on the success of the existing LFG project in Richland County, Task Force members should look to expanding it to handle more of the waste in the Region. In general, waste to energy processes exhibit large economies of scale[47] and consolidating the Region's waste, as well as processing waste from elsewhere, would increase scale.[48] Larger scale requires more land and labor but that remains a comparative advantage of the Central Midlands. If the technology emerges as viable, then gasification of portions of the waste stream (e.g. wood

47. Even direct combustion exhibits economies of scale, but it is not recommended due to the Region's air quality.

48. This would increase space used for landfills but old landfill sites tend to make excellent solar farms.

and paper, glass and metals are more efficiently recycled while food is better as a biofuel, compost, or even LFG) should be explored for the Region's future.

City and County action items include:

- Work with landfill owners, utilities, and other local stakeholders to identify potential candidate sites.
- As many landfills are privately owned—including the two aforementioned sites in Richland County that were identified as potentially viable candidates by EPA—extend LFG marketing efforts to the business community.
- Solicit information from interested LFG developers or technical assistance providers on potential projects, costs, and capacity estimates.
- Research available funding sources, technical assistance, and financing options and conduct a rigorous financial and due diligence analysis.

5.0 ECONOMIC DEVELOPMENT AND THE GREEN ECONOMY

Economic Development and the Green Economy

Overview of Opportunities for Green Jobs

A key consideration of this plan is its potential effect on the local economy. Economic development, particularly at the local level, is often measured in terms of new jobs – a measure of economic opportunities created for individuals. If local governments are successful in their efforts to reduce the energy footprints of Richland and Lexington Counties, then some green jobs will surely be created, but other economic activity might get curtailed. Likewise, the alternative to implementing a sustainable energy plan may also cause some jobs to be created and others to be lost. On balance, pursuing energy sustainability produces greater net benefits for a local economy than the alternative. The remainder of this chapter is devoted to a qualitative exploration of these considerations for the region comprised of Richland and Lexington Counties.

Defining "Green Jobs" and the Sustainable, Renewable Energy Economy

There is no one established and generally-agreed upon definition for the "green economy" or "green jobs." The U.S. Department of Labor's Occupational Network defines "green careers" as any occupation that deals with recycling, developing alternative energy, conserving energy, or reducing pollution. A 2011 report developed by The Brookings Institution Metropolitan Policy Program entitled *Sizing the Economy: A National and Regional Green Jobs Assessment* defines the "green" or "clean" economy as "the sector of the economy that produces goods and services with an environmental benefit." Even though these definitions seem to be reasonable, at least as an overview, it is difficult to make them truly operational at the detailed level of individual jobs – a job's greenness is really measured on a multidimensional continuum. Hence, any operational measure of green jobs or the green economy is necessarily an oversimplification.

For the purposes of this Sustainability Plan, we have identified various types of businesses and industries that can be considered a rough approximation of the "green economy" and potential areas for economic benefits and growth in addition to potential contributors to the reduction of the overall energy footprint of the Central Midlands Region.

Importantly, several of the businesses/industries considered as part of the "green economy" are neither particularly low in emissions that are detrimental to air quality, nor low in energy or other resource use. Consequently, the promotion of economic growth and job creation within such industries could potentially run counter to some of the other objectives of this sustainability plan. Hence we identify that industries can have both a "direct" role in the green economy and an "indirect" role.

Direct Businesses/Industries

Economic activities that we have categorized as "directly" a part of the green economy include renewable and alternative energy generators; recycling and

re-use operations and industries; and academic research and development in related "green" subject areas.

Indirect Business/Industries

Economic activities that we have categorized as "indirectly" a part of the green economy include manufacturers of equipment, supplies, or products for renewable and alternative energy generators and other industries within the green economy; manufacturers of equipment, supplies, or products that are in and of themselves low-emission such as fuel efficient cars or environmentally friendly such as biodegradable detergents; low environmental impact construction and retrofit industries; traditional industries that by nature have low environmental impacts (particularly low emissions) or are less reliant on energy sources; traditional industries that promote lower overall environmental impacts such as public transportation; and traditional industries that choose for other business reasons to be environmentally friendly or implement sustainability policies.

Role and Impact of Environmental Regulation

Regardless of the positive or negative trend of airborne emissions within Richland and Lexington Counties, the largest threat to increased economic development (either in green jobs or any other industries) is the potential for the area to lose its current "Attainment" status in relation to EPA emission standards for air quality. In 1997, the threshold on the maximum emissions allowed for six principal pollutants (including ozone) was revised to create more stringent National Ambient Air Quality Standards. Based on these new thresholds, portions of Richland and Lexington Counties were designated by the EPA with "Non-Attainment" status in April 2004 due to elevated ozone levels. Counties (as well as neighboring Fairfield and Newberry Counties) entered into the EPA's Early Action Compact Program in order to have the "Non-Attainment" designation suspended in exchange for local government commitment to take positive steps towards lowering emissions of ozone by December 2007.

EPA regulates local air quality because it directly contributes to public health problems (e.g. cardiopulmonary problems like heart attacks, as well as respiratory conditions like asthma and bronchitis). According to EPA's local air quality monitors and regulations, much of the area can experience dangerously high concentrations of ground-level ozone. Of the three air quality monitors in the area, displayed in Table 1, the Parklane and Sandhill monitors have a history of exceeding EPA's current standard of 0.075 ppm.[1] To date, both Richland and Lexington Counties have avoided being designated as nonattainment counties, but EPA is expected to tighten that standard in 2013 to a threshold closer to 0.06 ppm. The resulting nonattainment designation could have an unfavorable ripple effect on the Region's economy, with impacts on activities ranging from transportation planning to industrial recruitment and expansion.

In the event that the Region is officially designated with "Non-Attainment" status, state and local governments are required by the EPA to develop detailed implementation plans outlining how the area will re-attain (and maintain into the future) the established standard. These plans must be in place within three years

1. EPA uses the most current three-year average to make a determination on a county's attainment designation.

and list specific measures the area will take to reduce air pollutant emissions contributing to ground-level ozone concentrations.

The primary adverse effects of a "Non-Attainment" designation for all or part of the region in regard to economic development would be added obstacles for recruiting new business and industry to the area and/or retaining existing businesses. Companies could consequently be subject to tighter controls on their emissions, which could be unattractive to multiple industrial markets. Also, "Non-Attainment" status could have adverse effects on the area's ability to obtain federal highway infrastructure funding for upgrades to the existing transportation network. Other more indirect (but still negative) ramifications to economic development could stem from increased employee health care costs due to the health risks of poor air quality, decreased real estate values, and decreased overall quality of life – all factors that affect an area's competitiveness in attracting/retaining businesses.

Other lesser areas of concern regarding economic development and sustainability include water toxicity and water quality/quantity issues. For example, a Sierra Club study noted 39 sites in the Broad River and 19 in the Saluda River Basin with water pollution problems. Also, due to excessive storm water discharge, erosion and sedimentation, litter, and lax development standards, the water quality in the Gills Creek Watershed has been compromised. This watershed is considered the State's largest impaired urban watershed and contains approximately 90 acres of stream miles, 943 acres of lake water, and 50,000 acres of land.

Potential Economic Clusters

Because there is little agreement upon the definition of the green economy, finding metrics that are meaningful is likewise difficult. For the purpose of making comparisons, the data presented within The Brookings Institution's publication, *Sizing the Economy: A National and Regional Green Jobs Assessment* can be useful for determining the comparative strength of the Midlands to other regions. This data can also be used to determine the size of the existing cluster of green industries and the potential for future growth and development. Using The Brookings Institution's definition, there are 8,569 "clean jobs" within the Columbia metropolitan area, which makes up approximately 2.4% of all jobs in the region. Between 2003 and 2010, the Columbia Metropolitan Area added 469 clean jobs for an annual growth rate of 0.8%. The report also identifies a total of 50,424 clean jobs statewide, representing 2.7% of all jobs in the state, growing at a rate of 1.1%. The Columbia metropolitan area also lags behind the Greenville, SC, metropolitan area in each of these categories: 10,127 clean jobs (3.4% of all jobs) and 2,880 more jobs in 2008 than in 2003 (4.9% annual growth rate). Conversely, the Charleston, SC, metropolitan area was shown to have 4,369 clean jobs, which is only 1.5% of all jobs in the region. However, the number of added clean jobs (1,355) between 2003 and 2008 represents a larger annual growth rate (5.4%) than the Columbia Metropolitan Area.

Overall, the largest industries (i.e., industries with the largest number of employees) within the Richland and Lexington County region can loosely be categorized as education, public administration, accommodations, food services, professional/scientific/technical services, construction, health care, finance/insurance, and social assistance. Based on 2009 County Business Patterns, the largest number of paid employees in Richland County is employed in the following top five

industries: Health Care and Social Assistance (26,348), Retail Trade (18,071), Accommodation and Food Services (17,736), Finance and Insurance (17,256), and Manufacturing (16,803). The largest number of paid employees in Lexington County is employed in the following top five industries: Retail Trade (16,011), Health Care and Social Assistance (12,190), Accommodation and Food Services (11,077), Manufacturing (9,070), and Wholesale Trade (6,420).

There are a relatively larger number of government and education jobs in the region. In addition to Richland County and Lexington County government operations (including municipal government operations), the City of Columbia (State capital and seat of State government) is also located within the region's borders. The region is further home to the largest U.S. Army base (Fort Jackson) and a multitude of colleges and universities: the University of South Carolina, Midlands Technical College, Allen University, Benedict College, Columbia College, Columbia International University, and several other smaller institutions.

Renewable and Alternative Energy Generation Industry

As noted in Chapter 4 of this report, the area already supports some alternative energy generation in the form of hydropower, biomass, and solar photovoltaics. Although those sources generate a minor share of the overall electric power consumed by the region, renewable energy sources would swell to a major share if nuclear energy were categorized as green. Whether nuclear power is considered green remains controversial – although nuclear power plants emit a negligible amount of pollution, the technology carries serious environmental liabilities (the chief liability concerns the unsolved problem of storing radioactive solid nuclear waste generated by each plant).

The region is also a hot-bed for research into hydrogen and fuel cells, championed by the South Carolina Hydrogen and Fuel Cell Alliance, which may be key to both replacing petroleum as a primary transportation fuel and providing power storage that moderates the unsteady flow of generation from renewable sources. Both state and local governments continue to look to this research cluster as a potential source for spin-off startups.

Nonetheless, the region does not appear to be on the verge of an explosion in renewable energy generation (and its associated economic development). Wind energy generation does not offer great promise for the area due to limited resources. For the remaining technologies, the industry is primarily held back by a lack of enabling policy that would effectively incentivize alternative energy production in this area. Even the planned expansion of nuclear power generation may be limited to a couple of plants due to the difficulty in permitting new facilities, high up-front capital costs, and lack of available water resources.

Manufacturing of Equipment and Supplies for Green Industry

An indirect corollary to the alternative energy generation industry discussed above is the economic growth of those industries that, although not necessarily green themselves, directly support and supply alternative energy generators. In particular, this industry segment includes manufacturers of equipment, supplies, and products for renewable and alternative energy generators and other industries within the green economy.

In some areas of the U.S., existing industries have played a role in facilitating a transition to the emerging industries of the green economy. One prime example is the State of Michigan's concerted efforts to leverage its extensive manufacturing base to attract or develop a vibrant supply chain for the solar and wind industries. In particular, the more recent decline in Michigan's historic industries geared toward supporting the automotive industry has left an underutilized manufacturing capability and trained manufacturing workforce. Via various initiatives, the State has focused on assisting existing and new manufacturing companies locating in the area with diversification of manufacturing output to include equipment, supplies, and materials used for solar and wind energy generation.

To the extent that Michigan has had some success, it is not directly replicable in Richland and Lexington Counties. Others parts of South Carolina have seen a dramatic loss of textile manufacturing over the past decade and would be better candidates for mimicking Michigan's approach of "re-tooling" existing facilities and leveraging the existing skills and experience of the workforce. The Midlands region would need to establish new industries within this sector (or relocate existing manufacturing operations from other areas to this region) for this green industry segment to produce sizable increases in job creation.

It again should be noted, however, that companies that operate within the green manufacturing sector are not much different from traditional manufacturing companies in regard to energy and other resource uses, as well as contributions to pollutant emissions. Consequently, the benefits of economic growth and job creation resulting from these sectors must be weighed against the potential adverse affects to the area's sustainability, particularly regarding the maintenance of the current "Attainment" status.

Wind Turbines

Though large-scale direct production of wind energy in the Region is not likely, there is potential for economic growth and job expansion in the manufacturing and production sectors that support the wind industry. Other areas of the State are already active in this industry segment. GE Energy in Greenville is one of the largest manufacturers of wind turbines in the United States, and Clemson University (with funding from the DOE) has founded the Restoration Institute in North Charleston, which houses a sophisticated drive train testing facility among other resources.

Solar Panels

As is the case with wind energy production, large-scale direct production of solar energy in the Region is also not likely. But again there is potential for economic growth and job expansion in the manufacturing and production sector that supports the solar industry.

Small Reactors and Other Nuclear Power Generators

The industry for development and manufacture of small nuclear reactors (25-50 megawatt) is in its infancy. Consequently, the potential for significant economic growth and green job creation in this sector is small in the near term. In the future, the DOE may fund small modular reactor demonstration projects via grants, but no full-scale production of such reactors exists today. There is however, a potential market for small reactors, which addresses the high construction

cost of larger reactors (800+ megawatt), and offers portability via truck or rail to distributed generation sites. Also, a grouping of small nuclear reactors at an electricity generation site could in theory replace older coal-fueled power generators that are slated for retirement. Such a replacement would have an added benefit of significantly reducing carbon emissions and other pollutants that are byproducts of coal-fueled energy production.

In the Midlands, businesses and education and research institutions have formed NuHub that promotes the region as an area for small modular reactor demonstration projects. Other companies are actively working on developing technologies and manufacturing capabilities to ultimately operate within the small reactor arena in the future. For example, Flour Corp, with major operations in the Greenville, SC area, recently took over NuScale Power, LLC, a designer and future manufacturer of small modular reactors, with a $30 M investment. Westinghouse is also working on proposals to develop small modular reactors.

Other initiatives within the region include Lexington County's preliminary plans to purchase property in the Chapin area near I-26 and SC 48 (Columbia Avenue) to establish a small technology center. One purpose of the center is to attract companies that can serve nuclear power generators that SCE&G intends to add at the V.C. Summer nuclear facility located approximately 10 miles north of the of this part of Lexington County.

Fuel Cells

Several hydrogen and fuel cell initiatives within the region are specifically focused on creating a hub or cluster of these industries. Although the commercial applicability and success of these industries remain in their infancies, there has been some economic activity that has (or will) create green jobs. For example, WeylChem Sustainable Materials (a subsidiary of WeylChem US, Inc.) announced in November 2011 the beginning of commercial sale production of hydrogen-rich ammonia borane in Elgin, SC (just outside of Richland County's northeast border in Kershaw County). This compound is intended to efficiently power fuel cell devices in addition to other industrial applications. WeylChem made this announcement at the 2011 Fuel Cell Seminar and Exposition in Orlando, FL in conjunction with a joint presentation with the USC-City of Columbia Fuel Cell Collaborative.

Although WeylChem's production facility is not physically within the Richland/Lexington County boundaries, the company's production of commercial scale ammonia borane makes the compound a viable supply stream to Columbia-based Trulite, Inc. The compound represents a potential fuel option for Trulite's portable fuel cells.

Recycling and Re-Use Operations and Industries

Recycling and re-use operations and industries are considered quintessential elements of the green economy. In addition to being environmentally beneficial, these industries represent strong economic growth potential. According to one economic impact study completed by faculty of the College of Charleston in 2006, the recycling industry provided an economic impact of approximately $6.5 billion for South Carolina based on more than 300 recycling companies operating in the state. These companies, which include material haulers and processors as well

as manufacturers of equipment and other products from recyclable feedstock, employ over 37,000 individuals statewide. Furthermore, some studies have indicated that the manufacture of products from recycled steel, glass, plastic, or paper can save from 40-70% in energy consumption. In addition to being less energy-intensive, the recycling industry is more labor-intensive than traditional waste disposal (and harvesting of virgin materials); hence, the recycling industry tends to create more jobs per unit of valued output.

One recent example of economic expansion in the recycling industry is the 2011 announcement by PolyQuest, the largest distributer of virgin and recycled polyethylene terephthalate resins in North America, of plans to invest $8M and create approximately 20 jobs by expanding its existing facility in Darlington County, SC. Similarly, Adams Scrap Recycling LLC, a specialist in metal recycling, announced in 2011 a $3.2M investment that will create approximately 50 jobs by expanding operations in Greenville County.

Multiple manufacturing industries rely on a steady waste stream of recyclable material feedstock:

- Paper Industry (recycled paper, cardboard, and paper packaging materials)
- Steel and Other Metal Milling (recycled/scrap steel and other metal waste materials)
- Glass Production Industry (recycled glass products)
- Petroleum Production Industry (recycled oils and grease)
- Wood Product Production Industries such as Mulching, Pallet Production, etc. (recycled scrap wood, pallets, wood chips, and mulch)
- Energy Production Industry (re-refined oils and other petroleum products; organic waste such as food and yard waste; wood pellets and other scrap wood waste; biomass waste products such as agricultural waste)
- Electronic Components/Computer Industry (re-used/shredded electronics and recycled computer components)
- Resin Industry (recycled plastic bottles and other plastic products)
- Automotive Industry (recycled textiles)
- Furniture and Other Fabric Industries (recycled textiles and carpet)
- Construction Products such as Concrete, Asphalt, Brick, and Stone (recycled construction and demolition waste)

Government recycling programs can play a significant role in promoting recycling industries. Whether via single-stream or segregated materials curbside pick-up, the primary materials typically recovered via government recycling programs include:

- Paper products and cardboard
- Glass

- Plastics
- Aluminum and other metals

At the State level, a recycling industry business development group has been established via legislation (i.e., the Solid Waste Policy and Management Act of 1991). This group, the Recycling Market Development Advisory Council (RMDAC), includes representatives from the recycling industry, solid waste industry, government, higher education, and citizen stakeholders. In conjunction with the South Carolina Department of Commerce's "Recycling Market Development Program," the RMDAC provides technical assistance and encourages industry development by helping grow new markets for recyclable materials.

In conjunction with the RMDAC, the South Carolina Recycling Council (with further assistance from New Carolina – South Carolina's Council on Competitiveness), was formed to expand the recycling industry in the state via policy development, network creation, and market promotion, among other means. Activities associated with the Council's vision to establish South Carolina as a leader in the recycling industry have included: South Carolina Recycling Industry Legislative Day, South Carolina Recycling Specialty License Plate, South Carolina Recycling Industry Strategic Plan, and the "Share the Load" Program. Also (via a partnership with SCDHEC's Office of Solid Waste Reduction and Recycling, Center for Environmental Sustainability, and Small Business Environmental Assistance Program), the South Carolina Smart Business Recycling Program provides free, confidential, non-regulatory consultation to businesses for recycling, waste reduction, beneficial re-use, and resource conservation in order to increase bottom line profits. The program includes activities such as site visits and waste stream assessments, and educational, training, and marketing assistance.

Co-locating industries that take advantage of potential recyclable materials can also play a significant role in the promotion of recycling and re-use. Co-location of industries is primarily defined as physically siting near each other, one industry that uses the waste streams generated by other industries as part of either industry's specific industrial processes or other recycling efforts.

An example of co-location within the public sector can be found in the City of Boulder, CO, wastewater treatment operations. The City owns and operates one co-generation facility whereby energy produced as a byproduct of the wastewater treatment process at the City's 75th street Wastewater Treatment Facility (WWTF) is used to produce heat and electricity for other functions. This type of system is known as a combined heat and power (CHP) system. In this case, methane (a byproduct of wastewater treatment plant operations) is used as fuel for two engine generators that produce electricity. The high temperatures resulting from this electricity production is recovered and used to heat wastewater treatment processes as well as many of the buildings at the WWTF, which effectively reduces the amount of electricity purchased from the power grid. As an added benefit, the electricity is also used as a backup power source during power outages.

But such co-location can also have significant application within private industry – for transient industries such as building construction and demolition in addition to permanent industries with fixed production facilities. For example, some of the waste streams generated by construction and demolition activities provide

potential raw materials for recycled material haulers and processors, as well as for manufacturers of green building materials and supplies. Specific waste stream examples include gypsum, aggregates, wood, shingles, metals, and various other categories of debris. Often such waste streams can be readied for re-use via relatively simple strategies for on-site separation of waste types and pooling of loads of small quantities of recyclable materials from multiple generators and sites.

Government entities can play a role in promoting co-location of industries and/or new recycling businesses via strategies such as education and business development forums. For example, the Southeast Construction and Demolition Debris Recycling Conference was held in December 2011 in downtown Columbia, SC. This 3-day conference, sponsored by The Carolina Recycling Association, SCDHEC, North Carolina Department of Environment and National Resources, and the EPA Region 4, presented strategies for recycling debris from construction and demolition sites, potential markets for recyclable materials, and methods for earning Leadership in Energy and Environmental Design (LEED) credits through the US Green Building Council. The conference targeted government leaders, the solid waste and recycling industry, and the construction industry.

Green Construction and Retrofit Industry

While many of the previously mentioned green industries are relatively small in the area, the general construction industry is quite large. Any significant trend toward the design and construction (or retrofit) of structures to reduce environmental impacts and pollutant emissions, and/or increase energy efficient could produce two economic benefits: growth in higher-paying professional/technical/scientific industries such as architecture and engineering, and growth in more specialized building construction contractors. Further, the resulting structures would create fewer environmental impacts than tradition structures and use fewer energy sources for operation and maintenance. Building retrofits could result in a net reduction in pollutant emissions and other environmental impacts.

LEED-Certified & Low Impact Design & Construction

As described in Chapter 2 of this report, the USGBC's LEED framework and the IGCC, both initiatives to advance green building design and performance for new construction and renovation, offer advantages for growing the local economy's prevalence of designers and construction contractors that use sustainable practices. Governmental policy that requires all new government facilities (and renovations/upgrades to existing facilities) meet LEED standards (or comparable sustainability measures such as the IGCC) can significantly bolster this market. Local governments could also establish via ordinance various LEED standards or other environmentally sustainable building methods for new private-sector building construction (or renovations) to further encourage development of firms that specialize in sustainable design and construction.

For example, the City of Plano was one of the first cities in Texas to adopt LEED certification as a standard for future government buildings. The City recently adopted a policy that stipulates all future construction and major remodels of City buildings will meet the highest level of LEED Certification possible.

On the whole, South Carolina is a leader in adopting LEED standards. Based on

LEED-certified square foot per person, South Carolina was ranked 5th among all states in the U.S. by the USGBC. Within the region, USC is a leader in demanding LEED buildings.

Environmentally Friendly Equipment and Materials

Those industries that support LEED-certified and low impact design and construction with environmentally friendly equipment and materials also offer economic growth and job creation potential for the region. Specific types of companies include those that produce and/or supply:

- Environmentally Friendly & Recycled Building Materials
- Carbon Emission Scrubbers & Other Emission Mitigation Equipment
- High Efficiency HVAC Equipment
- Low Energy Appliances & Lighting
- Computerized Energy Management & Control Systems

Academic Research and Development

One major catalyst for an area's organic economic growth can stem from the commercialization of academic research and development stemming from higher education institutions. The Midlands' high concentration of academic institutions offers several opportunities for the creation of new start-up operations in the green economy.

Although the number of green jobs directly generated through college- and university-based research and development and academic study programs is small, the potential for these programs to provide a catalyst for commercial applications (and a workforce trained in these applications) in the region is much greater.

One example of the University of South Carolina's progress in establishing these programs is the October 2011 announcement by USC and San Diego, CA-based General Atomics of a new Smart State Center of Economic Excellence (CoEE), focused on strategies for improving production and use of nuclear energy. This CoEE joins the already existing CoEE dedicated to nuclear technology that began in 2008.

Traditional Industries Aligned with the "Green Economy"

As noted, energy and environmental sustainability has increasingly become an integral part of some companies' long-term business strategies, regardless of specific industry. These companies can include organizations whose end products and services are not typically associated with green jobs. Rather, these companies have integrated sustainable practices into their production of goods and services and/or have made commitments to lowering environmental impacts as a normal part of doing business.

According to the 2011 Green Rankings of the top 500 publicly traded firms in the U.S. developed by *Newsweek*, the top 25 firms leading in environmental

performance include primarily firms that are not directly associated with green jobs or green industries[2]. By nature, these firms tend to have lower environmental impacts. The companies that dominate the list include multiple information technology products and services firms such as IBM (1), Hewlett-Packard (2), Dell (5), Accenture (7), CA Technologies (9), NVIDIA (10), EMC (13), Adobe Systems (14), Intel (15), Cognizant Technologies (16), and Motorola Solutions (18). Other industries well represented on the list include medical/pharmaceutical/health-care companies: Baxter (4), Johnson & Johnson (6), Agilent Technologies (11), Allergan (20); and financial services firms: Harford Financial Services Group (12), Citigroup (24), American Express (25). Other industries include telecommunications: Sprint Nextel (3); retail operations: Office Depot (8), Staples (17), Best Buy (19); and media and publishing: McGraw-Hill (21), Walt Disney (23). It should be noted that the only more traditional "heavy industrial" manufacturer of vehicles or other capital goods on the list of U.S. firms is Ford Motor Company ranked at number 22.

A similar Green Ranking of global firms by *Newsweek* produces similar results, as information technology, financial services, and telecommunications dominate the top 10. Holland-based Philips at number 9 is the only capital goods manufacturer within the top 10.

Zero Waste Industries

Contributions to sustainability, through the reduction of waste that ultimately ends up in landfills, can be achieved via businesses committed to zero-waste strategies, regardless of whether the business is considered to be in a green industry. Businesses with operations in South Carolina that have implemented zero waste strategies include Boeing, Milliken, Freightliner Custom Chassis Corp., Shaw Fiber Extrusion, Glen Raven, and Select Comfort. Businesses like Hartsville, SC-based packaging and recycling firm Sonoco, which are readily identified within the green economy have also committed to zero (and significantly reduced) waste targets.

Other Aligned Industries

Economic growth and job expansion within the region can also be realized in industry segments that are less directly identified with the green economy but still aligned with the principals of sustainability. The types of companies that fall in this category are not easily classifiable, as they exist across multiple, sometimes unrelated industry sectors. These companies that are more tangentially associated with green or sustainable practices fall into each of the following categories:

- Industries with Federal, State, or Local Government-Mandated Emissions Targets or Limits
- Industries Less Reliant on Energy/Fuel/Transportation
- Industries Concerned with Sustainability/Energy Efficiency as part of Business Model
- Industries Concerned with Sustainability/Energy Efficiency as part of Public Relations

2. Yarett, Ian. The World's Green Giants. Newsweek. 50-56

- Construction Industries Focused on "Green" Infrastructure (Sidewalks, Bike Paths, Nature Trails, Public Parks, etc.)

In the Midlands, there are examples of industries and specific companies that fall within these broader definitions. For example, the Columbia-based Colonial Life & Accident Insurance Company announced in November 2011 that its national headquarters building earned the EPA's ENERGY STAR® certification, which recognizes buildings that meet strict energy performance standards, use less energy, are less expensive to operate, and cause fewer greenhouse gas emissions than peer buildings. Although Colonial Life does not operate within a sector typically defined in the green economy (i.e., insurance), it has established a strategic energy management program as part of its corporate image.

Other industry groups have also shown a commitment to energy use reduction in sectors as diverse as healthcare and aerospace manufacturing. For example, the American Society for Healthcare Engineering bestows annual awards to hospitals nationwide that achieve cuts in energy consumption of at least 10%. Further, national groups such as the American Council for an Energy-Efficient Economy focus on advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection across all industry sectors, regardless of industry category.

Public Transportation

Because public transportation (e.g., bus or light rail) is more energy efficient than private vehicles, it is considered part of the "green economy" and a potential industry for growth and job production.

However, in 2009 only about 2.2% of the individuals who commute in the Midlands region used public transportation as the primary means of transport. This percentage represents an approximately 13% decrease from 2000. The largest provider of public transit service for Richland and Lexington Counties by far is the Central Midlands Regional Transit Authority (CMRTA). Most of CMRTA's service area is confined to Richland County.

Based on the low number of public transportation users and large areas of the region currently not served by CMRTA, it would appear that there is a large potential market for public transportation providers, which could result in an increase in associated jobs. The region has historically struggled with increasing ridership and funding the expansion (or maintenance) of existing public transportation systems.

Workforce Readiness and Training

Increasing public support for local educational initiatives that help develop a skilled workforce is critical to the ongoing growth and development of green industries and the associated increase in green jobs for the region. This support would include measures to promote technical and vocational training for sustainable fields through business and educational institution partnerships as well as efforts to incorporate sustainability principals into the public and private K-12 and college/university curriculum. Specific goals could include matching existing workforce skills with industry needs in the region, facilitating the transfer

of existing workforce skills to new industry needs, and developing programs that offer training in new skills aligned with the workforce needs of specific green industry targets.

Promoting technical and vocational training for sustainable fields can be accomplished through existing workforce development programs such as the Midlands Workforce Investment Area (WIA), Apprenticeship Carolina, and ReadySC, each of which promote collaborations between businesses, labor and educational institutions.

The Midlands Workforce Investment Area, which operates under the Federal Workforce Investment Act (1998) and is a core program of CMCOG, operates a full service One-Stop workforce delivery system that is employer-led and demand-driven. The purpose of this program is to: develop and maintain a quality workforce; serve as a focal point for workforce development initiatives; and foster coordination and collaboration between economic development and employment training programs. With these goals in mind, WIA could be a valuable resource in promoting workforce development opportunities in the green economy by working closely with area colleges/universities and businesses to promote green jobs and green job training. By actively marketing their services to emerging green industries, WIA staff can begin work with their clients to help match interested workers with employers that can provide on the job training. Becoming regular participants at local green events, such as the Annual Columbia and Lexington County "Green is Good for Business" conference, can help to build relationships with area green businesses and help staff determine specific workforce needs and demand.

Apprenticeship Carolina and Ready SC, both of which are divisions of the South Carolina Technical College System, also strive to meet labor demands by working with employers to develop demand-driven registered apprenticeship and workforce training programs. Since the launch of Apprenticeship Carolina in 2007, the number of registered apprenticeship programs in the state has grown by more than 300 percent to more than 300 programs. South Carolina's apprenticeship programs have become a national model for workforce development. A company working with the program either hires or identifies a full-time employee for training to fit a company need, then constructs a hands-on training and classroom experience for four years. The employee's wage can rise as training progresses in the program. At the end, the employee also has a federally recognized credential certifying a broad-based level of training, adequate for hiring anywhere in the country.

Many South Carolina companies have established apprenticeships on more than one track, both electrical and mechanical, for example. The program approaches companies to tell them solutions that are available through it. Registering a company with the U.S. Department of Labor's apprenticeship program also brings a $1,000-a-year state tax credit to the company, good for as many four-year apprenticeships as the company establishes. Some of the Program's traditional targeted industry clusters include construction technologies, Health Care, Energy, IT, Advanced Manufacturing, Transportation, and Tourism. In recent years the program has also expanded to include non-traditional, emerging industry clusters in the green economy to include agribusiness and biofuels.

The purpose of the readySC program is to recruit, screen, and train individuals

for specific assignments with new and expanding businesses and industries. With the exception of very specialized areas, the workforce training is provided at no cost to the company. The program is funded entirely with state money and imposes no target populations. The readySC program is one of the oldest start-up workforce training programs in the United States and has been used as a model elsewhere. Since its inception in 1961, the program has trained nearly 267,000 workers for over 2,000 firms. Workforce training is usually short-term and is provided prior to opening day or expansion. This assures a trained workforce ready to go to work when the facility opens. The workforce training programs are usually located near the facility and often conducted at the facility itself, if feasible. Each program is customized to a company's unique specifications. When an employer decides to locate or expand in the state, readySC works to make sure the company will have the trained workers needed when the facility starts operation.

As a part of the SC Technical College System, these two programs have the potential to compliment the tremendous efforts Midlands Technical College is making to meet the growing demand for a green workforce. The College already offers a number of sustainable technology courses that include: Biofuel Production Operations, Alternative Energy Operations, Energy Auditing Software Training, Energy-Efficient Design for Architects, Fundamentals of Sustainable Buildings, Sustainability 101, Fundamentals of Solar Hot Water Heating, Home Energy Analyst (HERS), Intro to Building Energy Efficiency, Photovoltaic System Design & Installation, Natural Gas Plant Operations, and Principles of Green Buildings. These courses can be taken as individual continuing education credit or as a part of a professional certificate program such as the Senior Certified Sustainability Professional or Certified Green Supply Chain Professional programs.

Combining this type of coursework with the nationally recognized workforce development programs described above can provide the midlands area with the institutional capacity to retool the areas workforce to meet the growing demand for labor in the emerging green economy. Each of these programs has the potential to play an important role in connecting green businesses with a skilled and proficient workforce.

Recommendations

Green Economy Business Climate

Attainment: The "green economy," much like all segments of the economy, for the Midlands would be greatly impacted if the region loses its current Attainment status. Keeping this from happening is crucial to growing the green economy. The region's stakeholders should take aggressive and coordinated steps to keep its Attainment status. The three primary stakeholders (Richland County, Lexington County, and the City of Columbia) should establish a dedicated task force to develop a coordinated strategic plan for addressing this issue. The plan should include (among other initiatives)

- Specific lobbying efforts to persuade EPA to allow more time for compliance
- Transportation solutions aimed at reducing commuting distances and times

- Measures to encourage massing of development in redevelopment areas rather than urban sprawl

Marketing: Currently, the "green economy" in the region is very small (by some estimates, it is less than 2.4% of all jobs in the region). As such, the region does not represent a particularly strong green environment for companies looking to grow or locate in this region. The region needs to perform its own survey to better classify and enumerate the existing green and clean jobs to verify/quantify jobs that show a regional commitment to the green economy. It is quite possible that many jobs that are really part of the green economy are being undercounted. Additionally, those companies/industries in the green economy that have located here can help identify why this region was right for their investments, as well as to help focus marketing efforts on these factors and to identify what resources are lacking that might be addressed to improve the region's attractiveness for additional green and clean jobs.

Government Policy/Practices: Other indirect means for supporting or encouraging the development of "green" business within the region is to establish region-wide policies/practices for government entities that directly promote "green practices," but also provide market opportunities for businesses operating in the "green sector." One example could be the implementation of "green" procurement preferences for all government purchasing within the region. In general, such a preference would have the objective for government entities to purchase products that have reduced environmental impact because of the way in which they are made, transported, stored, packaged, used, and/or disposed. These preferences could include vehicles such as electric or hybrid cars, fuels with a certain percentage of biofuel content, as well as common supplies such as environmentally friendly detergents and recycled/recyclable paper products. The indirect impact of such preferences would be the increase of the number of local suppliers that offer "green" products (and employ workers in the "green economy."

Direct Green Economy Jobs

Fuel Cells: The most mature effort within the region to create jobs in the green economy is the Fuel Cell cluster initiative spearheaded by (among others) the University of South Carolina, the Hydrogen Research Institute, the SC Hydrogen and Fuel Cell Alliance, and Innovista. As these groups develop initiatives aimed at continued formulation and growth of this cluster, the region should support those efforts through funding demonstration projects, tax incentives, and marketing efforts of each stakeholder's economic development entities: Lexington County Economic Development Office, Richland County Economic Development Office, the City of Columbia Economic Development Office, the University of South Carolina's Office of Business Solutions – Innovista, and the Central SC Alliance.

Fort Jackson: Focus on the green economy in terms of renewable and alternative fuel is an important national security issue. The U.S. military is a leading proponent of advancement of renewable and alternate fuel sources for use in combat and support vehicles. The close proximity to Fort Jackson gives this region a unique opportunity for the region tied to Fort Jackson. Regional green economy initiatives such as research and development within renewable/alternative fuel arena – such as USC-led hydrogen fuel cell research – should

be coordinated with the Fort to determine which initiatives could have military applications.

Target Marketing Study: The region should jointly prepare a Targeted Marketing Study focused on manufacturing facilities for renewable and alternative energy generators. The Targeted Marketing Study should cross-reference existing resources, both physical and workforce in the region to weed out potentials that would not fit in the region. The study should include specific growing and expanding companies, and contact information, categorized by six digit NAIC codes.

Small Nuclear Reactors: In conjunction with existing organizations such as NuHub, work with SCANA, the U.S. DOE, and existing regional manufacturers (Westinghouse, etc.) to develop a strategy for promoting the small modular nuclear reactor industry and/or locating small nuclear reactor pilot programs to this region. This strategy would not necessarily focus on the construction of small nuclear reactors within the region, but on promoting the very young industries associated with building those reactors (such as the technology/engineering industry for designing and planning for those facilities). Seek DOE grants for pilot programs and demonstration programs. Partner with the University of South Carolina and Midlands Technical College for the development of educational programs/curricula.

Other Renewable/Alternative Energy Generation: In conjunction with the strategy for the small nuclear reactor industry, the region could include promotion of the technology/engineering design and planning industries for other alternative energy generation plants – advanced hydropower, biomass, solar, wind, geothermal, etc. This too should include partnering with USC and MTC for the development of educational programs/curricula.

Recycled Waste: Conduct a “survey” associated with the types and quantities of existing (and potential) waste streams handled within the region that could be captured and made available as recyclable material feedstock for manufacturing and other industries. Potential waste streams include paper products and cardboard, plastics, metals, glass, textiles, and oil/grease. Use the results of the survey to target specific industries for re-located or expanded operations in the region. This effort could be conducted in conjunction with the above-mentioned Target Industry Study. As an added benefit, any increased economic activity associated with captured recyclable material feed stock would also decrease the amount of materials that ultimately end up in regional landfills.

Indirect Green Economy Jobs

Nuclear Industry Technicians: Develop a program with Midlands Technical College for development of a nuclear technology program. Work in partnership with SCANA to define and develop a specific program focused on training technical support staff to work on the construction and operation of nuclear plants, specifically associated with the newly approved reactors located in Jenkinsville.

Wastewater: Develop a pilot program with the City of Columbia Wastewater Treatment Plant to harness methane generated at the plant for use in electrical production.

Solid Waste: Expand a pilot program for all three stakeholders and private landfills to harness methane generated at the landfills for electrical production.

LEED Certified Construction: To continue to grow the impressive cadre of green construction professionals in the region, construction of both public and private LEED certified buildings must be encouraged in the region. The best way to encourage this activity is to provide some type of incentive to meeting LEED standards. The region should adopt incentives for meeting those standards which might include: Rebated building permit fees (now being done in the City of Columbia), increased density for residential development in exchange for LEED certified construction, reduced buffers or setbacks, others incentives that might be identified to offset the additional cost for meeting LEED certifications standards. Although it would represent a less attractive alternative to positive incentives for LEED certified construction, standards for such construction could be promoted via governmental policy (for public facilities) and/or specific ordinance (for private facilities).

Other Energy Efficient Construction: Similar to LEED certified construction, incentives could be developed to encourage the upgrades or retrofits of existing buildings to increase energy efficiency. Such upgrades/retrofits would include measures such as weatherization of structure to limit energy release (insulation, multi-paned windows, energy efficient HVAC systems, energy efficient appliances, etc.). Along with rebated building permit fees, other programs such as low-interest and/or revolving loan programs could be used.

Incentives/Funding for Promotion of the "Green Economy"

Government entities within the region are presented with various options for setting aside certain tax revenues to promote any of the types of "green jobs" or "green industries" discussed in the recommendations above. The range of potential incentives can include any (or a combination) of a number of direct or indirect financial support measures. Indirect measures (i.e., those that don't require an upfront financial outlay but rather reduce future public revenues) include lower tax rates, tax rebates (such as for job creation), accelerated depreciation of property subject to property taxes, Fee-in-Lieu of Taxes (FILOT) Agreements, or fee reductions for economic development in specific industries or in specific districts. Direct measures that would require upfront financial outlays (or potential future outlays) include measures such as low-interest revolving loans, loan guarantees, and grants, as well as targeted spending on specific workforce training programs and infrastructure projects (telecommunication upgrades or "brownfield"/environmental restorations, etc.) geared towards assisting specific industries. Other measures include public funding for the establishment of "technology incubators" and/or "green business parks" geared toward "green technology" industries and that support in particular emerging start-up businesses.

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6.0 Concluding Summary of Recommendations for Implementation

Energy Efficiency Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 months**	**Responsible Parties**	**Measureable**
2.1	Implement Internal City/County Sustainability Policies Supported by Green Teams	All employees, Green Team Members, PIO, Webmaster, Relevant Department Heads	Decrease total energy usage by 10% relative to a baseline of the usage in 2011
2.1.1	Lighting		
2.1.2	Office Equipment		
2.1.3	Kitchen/Break Room		
2.1.4	General		
2.1.5	Identify and recruit green team members from diverse organizations and relevant city/county departments to help promote that policy		
2.1.6	Establish a schedule of regular meetings for green teams. Work with green team members to development a promotional strategy and vision for ongoing improvements to the policy`		
2.1.7	Develop a plan and identify resources to promote sustainability through events, contests, internal newsletters, public relations, information on the intranet, videos, posters, calendars, brown-bag lunch seminars, etc.		
2.1.8	Access ENERGY STAR resources to support the policy's goals, including		
2.1.9	Bring Your Green to Work with ENERGY STAR		
2.1.10	Energy IQ test		
2.1.11	Tip cards and posters to share with coworkers, distribute at events and hand in the employee break room		
2.1.12	Creating a green team		
2.1.13	Change the World Start with ENERGY STAR Challenge		

Energy Efficiency Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 months**	**Responsible Parties**	**Measureable**
2.2	Assess Enforcement of Current Energy Building Codes	Sustainability Coordinator and Building Code Official, Building Inspector	A report documenting the assessment of the current Energy Building Codes
2.2.1	Increase emphasis on building codes related to energy efficiency. Enhance training programs to inform all stakeholders in the building community about the code, what it entails, and how it will be enforced.		
2.2.2	Develop educational materials with guidelines and requirements for builders, architects and others in the construction community to comply with the new code.		
2.2.3	Review enforcement strategies at the local level to ensure they facilitate compliance with the code.		
2.2.4	Evaluate compliance tools to demonstrate compliance with the new code.		
2.2.5	Conduct plan check inspections and onsite building evaluations using a random sampling approach to verify that builders and developers are following the code and buildings are in compliance.		
2.3	Launch an Energy Efficiency Education Initiative	Sustainability Coordinator, Manager/Administrator, Public Information Officer, SC Energy Office, Governing Body	Annual report on the status of the Energy Efficiency Education Initiative
2.3.1	Commit both human and financial resources to the initiative.		
2.3.2	Identify creative ideas and funding sources for implementing the initiative.		

Energy Efficiency Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 months**	**Responsible Parties**	**Measureable**
2.3.3	Create a marketing and implementation plan.		
2.3.4	Solicit involvement and sponsorship from private entities, state agencies, local utilities, non-profits, educational institutions, and other neighboring local governments.		
2.4	Conduct Energy Audits of Municipal/ County Buildings	Sustainability Coordinator and Facilities Director	Completed Energy Audit
2.4.1	Conduct comprehensive, portfolio-wide energy audits every five years.	Sustainability Coordinator, Manager/Administrator, Public Information Officer, SC Energy Office, Governing Body	Annual report on the status of the Energy Efficiency Education Initiative

Energy Efficiency Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 years**	**Responsible Parties**	**Measureable**
2.5	Adopt a Green Building Resolution for current and future Municipal/County Buildings	Sustainability Manager, Facilities Director, Building Official, Building Inspector, Procurement Director, Manager/Administrator, Governing Body	The adopted resolution
2.5.1	Conduct research on green building resolutions adopted by other jurisdictions		
2.5.2	Evaluate the applicability of the components of identified resolutions and weigh the pros and cons of each in the context of local conditions (e.g., the technical capacity of the local commercial building community, the availability and cost of advanced energy technologies).		

Energy Efficiency Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 years**	**Responsible Parties**	**Measureable**
2.5.3	Research the process required to adopt resolutions by each jurisdiction. Develop a proposal for review by key stakeholders.		
2.5.4	Promote the benefits of the resolution and gather stakeholder support.		
2.5.5	Implement the required procedures and protocols to pass the resolution.		
2.6	Implement Incentives for Green Building Practices	Sustainability Coordinator, Building Official, Governing Body	Adopt Incentives for Green Building Practices
2.6.1	Conduct research on green building incentives adopted by other jurisdictions		
2.6.2	Evaluate the applicability of the various incentive programs and weigh the pros and cons of each in the context of local conditions, particularly considering new building codes adopted by the State and required enforcement activities.		
2.6.3	Establish metrics for evaluating green building permit applications. Develop protocols for verifying and approving green building permit applications.		
2.6.4	Identify funding sources for energy efficiency projects and incentives		
2.6.5	Research the process required to adopt the selected incentives in each jurisdiction. Develop a proposal for review and approval by key stakeholders.		
2.6.6	Promote the incentives among members of the building community.		

Energy Efficiency Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 years**	**Responsible Parties**	**Measureable**
2.7	Support Reforms to State Energy Policy	Sustainability Coordinator, Manager/Administrator, SC Energy Office, Governing Body	Meet annually with the Legislative Delegation regarding State Energy Policy
2.7.1	Identify local legislative priorities and proper protocols for submitting local priorities to State representatives.		
2.7.2	Submit a set of legislative priorities to relevant State representatives each year.		
2.8	Improve the Efficiency of Municipal/ County Building Stock	Sustainability Coordinator, Facilities Director, Manager/Administrator, Governing Body	Decrease total energy usage by 10% relative to a baseline of the usage in 2011
2.8.1	Develop selection criteria for recommended energy efficiency improvements.		
2.8.2	Set an efficiency goal for Btu's/sq. ft.		
2.8.3	Develop a list of priority efficiency upgrades and building improvements based on the identified selection criteria.		
2.8.4	Investigate possible funding strategies to support implementing the upgrades.		
2.8.5	Utility resources.		
2.8.6	Performance contracting.		
2.8.7	Grants.		
2.8.8	Loans.		

Energy Efficiency Implementation			
No.	**Long Term Recommendations and Action Items 7 years and beyond**	**Responsible Parties**	**Measureable**
2.9	Enact a More Efficient Local Building Energy Code	Sustainability Coordinator, Building Official, Manager/ Administrator, Governing Body	Decrease the total energy usage of non-governmental entities by 1% relative to a baseline of the usage in 2011
2.9.1	Refer to the DOE publication, Going Beyond Code for guidance.		
2.9.2	Research requirements to apply for a local code that differs from the State standard.		
2.9.3	Follow the recommendations outlined above to prepare for the adoption of the new building code.		
2.10	Assess Options for Local Incentive or Loan Programs	Sustainability Coordinator, Manager/Administrator, Governing Body	Develop a report regarding options for Local Incentives or Loan Programs.
2.10.1	Assess potential funding options. Incentive or loan programs require sustainable, long term funding.		
2.10.2	Identify potential programs.		
2.10.3	Develop a budget.		
2.10.4	Assess staff resources.		
2.10.5	Solicit involvement and support from other stakeholder organizations.		
2.10.6	Make a go/no-go decision.		

Broader Initiatives Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 Months**	**Responsibility Parties**	**Measurable**
3.1	Facilitate the Implementation of Appropriate Goals Contained in the COATS/COG Plans	Sustainability Coordinator/ Manager/Administrator/ Governing Body	Adopt local plans in accordance with COATS and COG regional plans.
3.1.1	Continue to actively participate in regional plans		
3.1.2	Incorporate recommendations from the regional plans into the appropriate local plans and take the necessary steps towards implementation.		
3.2	Pilot a New Program Economizing Commute of Government Employees	Sustainability Coordinator, GIS, IT, Manager/Administrator, Governing Body	Achieve a 5% participation rate in the program
3.2.1	Establish a rideshare program whereby proximate employees are identified and encouraged to carpool.		
3.2.2	Establish preferred parking for carpooling employees and employees operating alternatively fueled vehicles (hybrids, electric vehicles, etc.) and consider charging other employees for parking.		
3.2.3	Provide an emergency ride home taxi service, with a pre-determined reasonable rate, for any carpooling staff member who will miss their ride due to an unanticipated need to stay at work longer than their regular schedule.		
3.2.4	Establish a carshare program, perhaps in conjunction with the new short-term rental program at USC (similar to ZipCar), that sites shared vehicles near major local government facilities with an easy access mechanism.		

Broader Initiatives Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 Months**	**Responsibility Parties**	**Measurable**
3.2.5	Allow employees to take their government-owned vehicles home with them, check their dispatching remotely, and head directly to their worksite(s) for the next day to reduce inefficiencies in routing.		
3.2.6	Evaluate more flexible schedules for each department's employees – four day work weeks, off-peak commuting, telecommuting one day per week, etc…		
3.3	Improve Recycling Rate by Local Governments, Businesses and Residents	Sustainability Coordinator, Solid Waste Director, Recycling Coordinator	Improve recycling rates by 10% annually above 2011 baseline rate.
3.3.1	Roll out 95 gallon recycling carts for business and residential customers.		
3.3.2	Campaign to increase recycling within local governments.		
3.4	Encourage Low Impact Development and/or Smart Growth with Emphasis on Public Properties	Sustainability Coordinator, Stormwater Manager, Planning Director, Economic Development Director, Facilities Director	Approve 5 projects with Low Impact Development and/or Smart Growth principles.
3.4.1	Identify undeveloped land on the periphery of Lexington and Richland Counties where growth and development should be discouraged.		
3.4.2	Identify potential ribbons of undeveloped land that could serve as corridors and/or greenways with bicycling, jogging, and walking paths for recreation and even commuting.		

Broader Initiatives Implementation			
No.	**Near-Term Recommendations and Action Items 0-12 Months**	**Responsibility Parties**	**Measurable**
3.4.3	Identify opportunities for Low Impact Development and landscaping to improve the passive solar properties of government facilities (e.g. northern wind breaks, overhead and eastern shade trees, etc.).		
3.4.4	Identify potential on private lands for a program to encourage businesses and residents of the Central Midlands to plant more trees (from appropriate species).		
3.4.5	Indentify areas for green businesses. Offer incentives for green businesses such as reduced fees or expedited review times.		

Broader Initiatives Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 Years**	**Responsible Parties**	**Measurable**
3.5	Encourage Alternatives to Single-Passenger Vehicles	Sustainability Coordinator, Traffic Engineer/Transportation Planner, COATS, SCDOT CMRTA	Increase the participation of carpool and transit ridership by 10% each decade.
3.5.1	Expand local government programs to larger employers in the area and then to the general public.		
3.5.2	Revitalize the bus system		

Broader Initiatives Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 Years**	**Responsible Parties**	**Measurable**
3.5.3	Avoid widening roads wherever possible.		
3.5.4	Implement proven enhancements to traffic optimization: traffic circles, timed lights, sensors, dedicated turn lanes, etc.		
3.5.5	Increase walking and biking opportunities by adding sidewalks, greenways, and bike lanes; explore programs to encourage employers to install showers in workplace restrooms.		
3.6	Guide Denser Development Towards Clustering Along Growth Corridors	Planning Director, Economic Development Director, Planning Commission, Governing Body	Amend the Comprehensive Plan and related ordinances to encourage denser development along the growth corridors
3.6.1	Amend local comprehensive plan to encourage denser development along the regions' commuter corridors using policies such as density bonuses, cluster developments, purchase of development rights and transfer of development rights.		
3.6.2	Update zoning ordinances to encourage denser development in accordance with the comprehensive plans.		
3.6.3	Use an increased density allotment as an incentive for developers to build greener structures.		
3.6.4	Give permitting preference to infill development over greenfield development.		

Broader Initiatives Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 Years**	**Responsible Parties**	**Measurable**
3.7	Phase-in Improvements to Municipal Solid Waste Disposal	Sustainability Coordinator, Recycling Coordinator, Solid Waste Director, SCDHEC, Private Sector Providers	Increase solid waste collection by 5% above 2011 baseline collection
3.7.1	Make garbage collection mandatory, perhaps with an initial period of opting-out.		
3.7.2	Charge for garbage collection and dumping at collection sites; forbid on-site incineration of waste.		
3.7.3	Increase the scope of materials that are not permitted in landfills (e.g. cardboard).		
3.7.4	Encourage recycling for County/City Buildings		
3.7.5	Implement single-stream, mandatory recycling.		
3.7.6	Improve collection logistics (e.g., a transfer center near Irmo).		
3.7.7	Investigate consolidations, favoring fewer, larger landfills to capture economies of scale.		
3.8	Increase Efficiency of Drinking/Waste Water Systems	Sustainability Coordinator, Public Works Director, Utilities Director	Decrease total energy usage by 10% relative to a baseline of the usage in 2011
3.8.1	Consolidate drinking water and wastewater systems within the Central Midlands.		
3.8.2	Conduct a joint water-energy audit of drinking water and wastewater systems.		
3.8.3	Explore alternative energy sources for water and wastewater systems		

Broader Initiatives Implementation			
No.	**Medium Term Recommendations and Action Items 1-6 Years**	**Responsible Parties**	**Measurable**
3.9	Form a Regional Procurement Process that utilizes a "green" criteria for goods and services	Sustainability Coordinator, Procurement Director, Manager/Administrator/ Governing Body	Identify at least three items to be purchased cooperatively.
3.9.1	Establish a joint-purchasing committee to establish an agreement among the participating jurisdictions		
3.9.2	Identify the items suitable for joint purchasing and identify the green criteria to be used for procurement		
3.9.3	Continue to monitor the impact the joint purchasing program and make the necessary changes to receive the most cost effective and ecologically desirable impact on the region		

Broader Initiatives Implementation			
No.	**Long Term Recommendations and Action Items 7 Years and Beyond**	**Responsible Parties**	**Measurable**
3.10	Implement HOV Lanes and Commuter Transit Along Major Commuting Corridors	COATS, CMRTA, SCDOT	Increase the participation of carpool and transit ridership by 10% each decade.
3.10.1	Convert a lane on 126, I-26, and I-20 into HOV-2 (+ electric and perhaps hybrid vehicles).		
3.10.2	Provide a commuter transit (either bus or rail) service along I-26 from downtown to Chapin and onto Newberry, as well as from downtown to Camden.		

Broader Initiatives Implementation			
No.	**Long Term Recommendations and Action Items 7 Years and Beyond**	**Responsible Parties**	**Measurable**
3.11	Convert Majority of Waste Stream into Economic Inputs to Production	Sustainability Coordinator, Recycling Coordinator, Solid Waste Director, Utilities Director, SCDHEC	Redirect 5% annually of 2011 baseline solid waste collection to an alternate form of disposal.
3.11.1	Investigate tactics to reduce waste; including pay as you throw programs		
3.11.2	Pursue a gasification technology		
3.11.3	Generate compost and mulch from food waste and yard waste.		
3.11.4	Develop showcase facilities that display zero waste zones		
3.11.5	Generate biogas from anaerobic respiration on waste buried in landfills.		
3.11.6	Recycle locally consumed materials that are not efficiently handled by above processes (e.g. metals, glass, plastic, and paper).		

Renewable Energy Generation Implementation			
No.	**Near-Term Recommendations and Action Items**	**Responsibility Parties**	**Measurable**
4.1	Establish an Alternative Energy Task Force	Sustainability Coordinator, Economic Development Director, Colleges/Universities, Manager/Administrator, Governing Body	An Alternative Energy Task Force that meets on at least a quarterly basis
4.1.1	Identify and recruit task force members from diverse organizations and interests, such as members of council, relevant department staff (e.g., energy, planning, public works, transportation, community and economic development), and interested citizens.		
4.1.2	Work with task force members to develop a group mission, vision, and goals, as well as coordinating logistics such as meeting regularity, times, locations, etc.		
4.1.3	Identify action items aimed at meeting short term milestones towards the goals.		
4.1.4	Assess the members' renewable energy expertise, identify targets, and track funding opportunities.		
4.1.5	If the group is able to support multiple purposes, the members who share similar goals may wish to form smaller action committees to pursue them, conducting self-directed research, establishing an action plan, and completing tasks and milestones.		

Renewable Energy Generation Implementation			
No.	**Near-Term Recommendations and Action Items**	**Responsibility Parties**	**Measurable**
4.2	Adopt Favorable Zoning and Permitting Requirements for Alternative Energy Development	Sustainability Coordinator, Planning Director, Building Official, Planning Commission, Governing Body	Encourage the development of at least one alternative energy development per year.
4.2.1	Conduct a review of local and regional master plans to identify potential bottlenecks and analyze the cost of permitting requirements on potential renewable energy development projects.		
4.2.2	Perform additional research of permitting approaches in other jurisdictions to provide some context and examples of alternatives.		
4.2.3	Research local protocols and procedures required to alter permitting and zoning protocols.		
4.2.4	Propose strategies to improve the permitting and zoning environment for alternative energy and reduce the costs of implementing alternative energy projects to local decision makers.		
4.2.5	Follow through to support implementation approved activities to adjust existing requirements.		

Renewable Energy Generation Implementation			
No.	**Near-Term Recommendations and Action Items**	**Responsibility Parties**	**Measurable**
4.3	Launch Alternative Energy Education Initiatives	Manager/Administrator, Governing Body, Colleges/Universities, School Districts	Annual report on the status of the Energy Efficiency Education Initiative
4.3.1	Develop a shared brand identity and message platform to ensure all materials and activities maintain a consistent look and feel and the messages achieve the desired result.		
4.3.2	Identify and recruit local partners work with them to gain buy-in and support for the outreach campaign.		
4.3.3	Conduct research on funding resources.		
4.3.4	Identifying appropriate outreach tactics and marketing channels for the region that leverage local partnerships and funding opportunities.		
4.3.5	Develop marketing materials that promote the brand identity and leverage the messaging platform, including: brochures, flyers, door hangers, advertisements, power point presentation, display booths, videos, email blasts, etc.		

Renewable Energy Generation Implementation			
No.	**Near-Term Recommendations and Action Items**	**Responsibility Parties**	**Measurable**
4.3.6	Launch a campaign that maximizes grassroots and social marketing approaches. Appropriate outreach channels include: community events (e.g., farmers markets, local fairs), presentations to community groups (e.g., churches, chambers of commerce), public advertising campaigns (e.g., bus boards, local newspaper), social networking (e.g., Facebook, Twitter), and by creating and posting short videos on the local governments' websites and YouTube.		
4.3.7	Identify funding sources for a demonstration project at a local school (e.g. Gilbert High School's Sustainability Institute) and create a plan for selecting the school, developing the project and incorporating alternative energy education into the curriculum as well as leveraging the project for broader outreach and education in the community.		
4.3.8	Coordinate with Midlands Technical College, State Agencies and green industry leaders to ensure that curricula matches state of the art industry needs.		
4.4	Identify Opportunities for GHP and Industrial CHP	Sustainability Coordinator, Economic Development Director	Identify 3 potential sites
4.4.1	Identify suitable facilities for GHP and CHP projects		
4.4.2	Promote GHP and CHP among the facility owners and act as liaisons between the building owners and organizations that could provide unbiased information, technical support, or co-funding.		

Renewable Energy Generation Implementation			
No.	**Near-Term Recommendations and Action Items**	**Responsibility Parties**	**Measurable**
4.4.3	Identify existing GHP and CHP systems in the region (or nearby) and promote those success stories working with both building owners and the GHP and CHP developers to share information.		
4.4.4	Reach out to the utilities serving candidate facilities to request technical and financial project support.		
4.4.5	Research DOE and other grants or loan programs to identify potential project co-funding opportunities.		
4.4.6	Support the development of project RFPs and selection of suitable developers.		

Renewable Energy Generation Implementation			
No.	**Medium Term Recommendations and Action Items**	**Responsible Parties**	**Measurable**
4.5	Support Reforms to State's Energy Policy	Sustainability Coordinator, Manager/Administrator, Governing Body	Meet annually with the State Energy Office regarding the State's energy policy
4.5.1	Identify local legislative priorities and proper protocols for submitting local priorities to state representatives.		
4.5.2	Submit a set of legislative priorities to relevant state representatives each year.		

Renewable Energy Generation Implementation			
No.	**Medium Term Recommendations and Action Items**	**Responsible Parties**	**Measurable**
4.6	Explore Public Alternative Energy Project Options	Sustainability Coordinator, Facilities Director, Public Works Director, Utilities Director	Decrease total energy usage by 10% relative to a baseline of the usage in 2011
4.6.1	Feasibility Studies for Landfill Gas, CHP, Waste-based Biomass Generation, and Small-scale Hydropower Projects.		
4.6.2	Municipal Roof and Open-space Inventory.		
4.6.3	CHP at Wastewater Treatment Facilities.		
4.6.4	Water-Source Heat Pumps at Treatment Facilities.		
4.6.5	Hydropower at Drinking Water Facilities.		
4.6.6	Work with school districts to do rooftop inventories for solar usage		

Renewable Energy Generation Implementation			
No.	**Long Term Recommendations and Action Items**	**Responsible Parties**	**Measurable**
4.7	Consider Local Incentive Programs	Sustainability Coordinator, Economic Development Director, Manager/Administrator, SC Energy Office, Governing Body	Adopt Incentives for Alternative Energy Practices
4.7.1	Consider Favorable Tax Treatment for Alternative Energy Installations and Businesses.		
4.7.2	Work with Utilities to Offer a Local “Green Up” Option.		

Renewable Energy Generation Implementation			
No.	**Long Term Recommendations and Action Items**	**Responsible Parties**	**Measurable**
4.8	Expand Landfill Gas to Energy Project	Sustainability Coordinator, Public Works Director, Private Sector Landfill Owner, Manager/Administrator/ Governing Body	Development of One Landfill Gas to Energy Project
4.8.1	Work with landfill owners, utilities, and other local stakeholders to identify potential candidate sites.		
4.8.2	As many landfills are privately owned—including the two aforementioned sites in Richland County that were identified as potentially viable candidates by EPA—extend LFG marketing efforts to the business community.		
4.8.3	Solicit information from interested LFG developers or technical assistance providers on potential projects, costs, and capacity estimates.		
4.8.4	Research available funding sources, technical assistance, and financing options and conduct a rigorous financial and due diligence analysis.		

Economic Development and the Green Economy		
Green Economy Business Climate Recommendations and Action Items	**Responsibility Parties**	**Measurable**
Take steps to prevent the region from being designated "Non-attainment."	Sustainability Coordinator, Traffic Engineer/Transportation Planner, COATS, SCDOT CMRTA	Maintain "Attainment" status
Develop a regional task force to coordinate activities		
Coordinate with EPA to allow more time for compliance		
Implement regional transportation solutions aimed at reducing congestion		
Implement land use policy to encourage higher density along the commuter corridors		
Implement a marketing campaign to encourage green businesses to locate in the region	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	A report of the reults of the survey with action items to address its findings
Develop a survey to better classify and enumerate the existing green and clean jobs to verify/quantify the number of jobs and identify what makes the region attractive for green business		
Implement government policies that support green businesses	Sustainability Coordinator, Procurement Director, Manager/Administrator, Governing Body	Identify at least three items to be purchased cooperatively.
Form a Regional Procurement Process that utilizes a "green" criteria for goods and services		

Economic Development and the Green Economy		
Direct Green Economy Jobs Recommendations and Action Items	**Responsibility Parties**	**Measurable**
Fuel Cells	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Implementation of one demonstration project
Support those efforts through funding demonstration projects, tax incentives, and marketing efforts of each stakeholder's economic development entities		
Fort Jackson	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Meet annually with the coordinating committee to determine status of the Fort's needs.
Regional green economy initiatives such as research and development within renewable/alternative fuel arena – such as USC-led hydrogen fuel cell research – should be coordinated with the Fort to determine which initiatives could have military applications		
Target Marketing Study	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Annually report on the status fo the marking study
The region should jointly prepare a Targeted Marketing Study focused on manufacturing facilities for renewable and alternative energy generators.		
Small Nuclear Reactors	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Meet annually with the coordinating committee to determine status of the industry's needs.
In conjunction with existing organizations such as NuHub, work with SCANA, the U.S. DOE, and existing regional manufacturers (Westinghouse, etc.) to develop a strategy for promoting the small modular nuclear reactor industry and/or locating small nuclear reactor pilot programs to this region.		

Economic Development and the Green Economy		
Direct Green Economy Jobs Recommendations and Action Items	**Responsibility Parties**	**Measurable**
Other Renewable/Alternative Energy Generation	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Meet annually with the coordinating committee to determine status of the industry's needs.
Promote the technology/engineering design and planning industries for other alternative energy generation plants – advanced hydropower, biomass, solar, wind, geothermal, etc.		
Recycle Waste	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Annually report on the status of the survey results
Conduct a "survey" associated with the types and quantities of existing (and potential) waste streams handled within the region that could be captured and made available as recyclable material feedstock for manufacturing and other industries.		
Use the results of the survey to target specific industries for re-located or expanded operations in the region.		

Economic Development and the Green Economy		
Indirect Green Economy Jobs Recommendations and Action Items	**Responsibility Parties**	**Measurable**
Nuclear Industry Technicians	Sustainability Coordinator, Economic Development Director, Manager/Administrator, Governing Body	Annually report on the placement rate of graduates of the program and make changes to the curriculum as warranted
Develop a program with Midlands Technical College for development of a nuclear technology program.		
Wastewater	Sustainability Coordinator, Utilities Director, Manager/Administrator, Governing Body	Implement the pilot program and monitor its outcome.
Develop a pilot program with the City of Columbia Wastewater Treatment Plant to harness methane generated at the plant for use in electrical production.		
Solid Waste	Sustainability Coordinator, Public Works Director, Manager/Administrator, Governing Body	Implement the pilot program and monitor its outcome.
Expand a pilot program for all three stakeholders and private landfills to harness methane generated at the landfills for electrical production.		
LEED Certified Construction	Sustainability Coordinator, Building Official, Manager/Administrator, Governing Body	Approve one LEED standard project per year
The region should adopt incentives for meeting LEED standards which might include: Rebated building permit fees (now being done in the City of Columbia), increased density for residential development in exchange for LEED certified construction, reduced buffers or setbacks, others incentives that might be identified to offset the additional cost for meeting LEED certifications standards.		

Economic Development and the Green Economy		
Indirect Green Economy Jobs Recommendations and Action Items	**Responsibility Parties**	**Measurable**
Other Energy Efficient Construction	Sustainability Coordinator, Building Officials, Manager/Administrator, Governing Body	Adopt Incentives for Green Building Practices
Incentives should be developed to encourage the upgrades or retrofits of existing buildings to increase energy efficiency such as weatherization of structure to limit energy release (insulation, multi-paned windows, energy efficient HVAC systems, energy efficient appliances, etc.)		

Funding

Marginal Improvements in energy efficiency usually do not require costly measures; immediate measures can be implemented quickly, easily, and at low or no cost. This report has placed a special emphasis on this "low-hanging fruit," which can nonetheless be make noticeable improvements in the region's energy efficiency (and, hence, sustainability). These measures simply require changes in priorities or behaviors. For example, government employees may be educated on the benefits of recycling, and the resulting change in behavior can yield a positive impact on the region's environment—all at practically no cost. It is simply a matter of distributing sufficient information to affect behavior when making everyday decisions.

Other measures, such as retrofits to buildings, are considerably costlier; but, even for these measures, convenient financing options may exist to make the cost more bearable. In the case of building retrofits, governments may take advantage of energy performance contracting, which guarantees that energy savings resulting from a retrofit will pay for the cost of the project over time. If the savings do not exceed the costs for a particular time period, the contractor will pay the difference. This lowers the risk involved in retrofitting buildings and ensures that savings will be realized.

Local utilities may also have programs that governments can use to offset the costs of energy efficiency measures; these should be investigated. Of course, as suggested in previous chapters, the number of programs offered by local utilities is largely a function of the requirements placed upon them by the state. The state and federal governments sometimes also support measures directly through their own incentive programs for promoting energy efficiency improvements. Naturally, local governments should make use of these resources wherever practical.

Tax revenue is a yet another source of funding. If a project can be linked to hospitality and falls under hospitality tax usage requirements, then hospitality tax revenue could be used to finance the project. Likewise, other usage fees can sometimes be utilized to make investments in energy efficiency. For instance, energy efficiency projects that are beneficial for the city's storm water management could be financed from that enterprise fund. For the most expensive projects, namely infrastructure and transportation, a larger revenue source is needed – a small sales tax could be as effective in the Midlands as it was in Charleston.

Of course, myriad funding options exist, and some may be more appropriate than others for any given project. Exploring these is a substantial task in itself, and so this document cannot hope to provide an exhaustive discussion of all the possibilities. The governments should explore these options on their own, matching funding options to the recommendations they intend to implement. Perhaps a working subcommittee can be formed to explore financing options for green projects, or financing options can be determined on a case-by-case basis.

Metrics

In order for actions to be reviewable, their intended results must be concrete and somehow quantifiable. Otherwise, there is no measure of success, and progress toward energy efficiency goals cannot be evaluated. For example, a goal to "recycle more" is difficult to enact because it gives no indication of how much progress should be made, whereas a goal of "increase recycling by 10 percent" or "divert 15 percent of waste from landfills" can be objectively measured because it provides a concrete metric to use.

Metrics will naturally vary across objectives; recycling, for example, is measured in different units than carpooling. Thus, metrics must be assigned on a case-by-case basis. The following table lists some types of objectives and some possible metrics. This list is not meant to be exhaustive, and careful attention should be given to choosing the proper metric given the unique set of constraints present for a particular objective.

Objective	Metric
Increase energy efficiency in buildings	Building energy usage (adjusted for appropriate building characteristics, such as square footage)
Increase recycling	Quantity of materials recycled (adjusted for the volume of waste deposited in landfills)
Reduce the environmental impact of transportation	Proportion of employees who carpool or use alternative forms of transportation
Purchase more green products	Purchasing dollars spent on products designated as green
Use more alternative energy	Total alternative energy production
Communicate important ideas to legislators	Number of face-to-face meetings with the legislative delegation

Monitoring

In order to take effective action toward enhancing energy efficiency, multiple dimensions of energy usage must be monitored to gauge progress over an established baseline. The exact method of monitoring progress toward energy efficiency may vary depending on the particular goal and metric, but some general principles can be used to ensure that progress is indeed being made.

Quantifiable annual goals should be established based on the appropriate metrics. The first chapter of this report introduced 5 quantifiable metrics to judge progress across the entire region: air quality, energy efficiency (of local governments), energy efficiency (of the general public), green jobs, and renewable energy demonstration projects. Performance should be tracked throughout the year and progress should be reviewed at the end of each year. These broad goals should be divided across the local governments and even within them – splitting up across department heads, each responsible for seeing that the goal is met within their own department. Accountability is quite important when establishing and reviewing these goals. Within a local government, a single department or person should be held responsible for progress towards a goal whenever appropriate. This way, it is clear who should be coordinating efforts to improve energy efficiency.

Furthermore, the quality of performance should have real effects. Departments meeting energy efficiency goals should be rewarded, and departments failing to meet energy efficiency goals should be penalized. Otherwise, goals are meaningless, and guiding the region toward energy efficiency will be difficult without incentives. This would ensure that serious attention is paid to improving sustainability and would demonstrate a credible commitment to energy efficiency. Such an approach is more likely to lead to positive results. Otherwise, energy efficiency goals might simply be lost in the midst of competing problems; if there are no consequences for performance, then the implicit message is that energy efficiency is relatively unimportant.

Perhaps the best approach to enforcement is tying energy efficiency goals to department budget allocations. More money could be made available to departments that perform well on energy efficiency, and departments that fail to meet goals could be penalized. This would put money at stake in meeting performance goals, which would likely influence decision-making.

Ideally, progress would be evaluated by an outside party to ensure that the process is fair and honest, particularly if material consequences are attached to the attainment of goals. A third party is less likely to brush past problems in meeting performance goals because they hold no stake in the outcome (only in the credibility of the methods). Thus, an outside party provides additional confidence in the integrity of results to outside stakeholders who value sustainability. Furthermore, analysis of data on energy usage (from billing statements) and air quality (from EPA's monitors) can quickly become complicated and thus requires intensive expertise in data management and statistical methods.

Key Terms and Acronyms

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ARRA—American Recovery and Reinvestment Act

CAEA—Clean and Affordable Energy Act of 2008

CECO—Commercial Energy Conservation Ordinances

CEPCI—The Central Electric Power Cooperative, Inc.

CFL—Compact Florescent

CHP—Combined Heat and Power

CMRTA—Central Midlands Regional Transit Authority

COATS—Columbia Area Transportation Study

CoEE—Center of Economic Excellence

CPAC—City of Columbia's Climate Projection Action Campaign

Distributed generation—Electricity generated from several small sources.

DOE—US Department of Energy

DSM—Demand-Side Management

EERS—Energy-Efficiency Resource Standards

EISA—2007 Energy Independence and Security Act

EPA—US Environmental Protection Agency

FIT—Feed-In Tariffs

Gasification – A process that depends on oxygen-deprived chemical reactions at high temperatures instead of direct combustion, to convert appropriate wastes (e.g., wood, cardboard) into gases that can be used to generate electricity or power fuel cells (e.g. hydrogen and methane), plus other residual matter.

GHG—Greenhouse Gas

GHP—Geothermal Heat Pumps

GI—Green Infrastructure

GWh—Gigawatt Hour

HOV Lane—High Occupancy Vehicle Lane

ICLEI—International Council for Local Environmental Initiatives

IECC—International Energy Conservation Code kBtu—Kilo British Thermal Unit

IGCC—International Green Construction Code

IREC—Interstate Renewable Energy Council

kWh—Kilowatt Hour

LED—Light-emitting Diode

LEED—Leadership in Energy and Environmental Design

LID---Low Impact Development: A planning, design and development framework that uses existing on site natural features and engineered facilities to minimize development impacts and mimic predevelopment hydrologic conditions.

LRTP—Long Range Transportation Plan

MSA—Metropolitan Statistical Area

MW—Megawatt

NABCEP—North American Board of Certified Energy Practitioners

NAICS—North American Industrial Classification System

Net metering— Policy to allows owners of small alternative-energy generation systems to connect to the electricity grid and sell electricity back to the utility provider

Non-attainment--A non-attainment area is one that does not meet the Environmental Protection Agency's standards for ozone pollution and can be classified as "non-attainment" of those standards.

NREL—National Renewable Energy Laboratory

PaCE—Palmetto Clean Energy Program

PCS—SC Public Service Commission

PPA—Power Purchase Agreement

Ppm—Parts Per Million

PV—Photovoltaic

REC—Renewable Energy Credits

RECO—Residential Energy Conservation Ordinances

RMDAC—Recycling Market Development Advisory Council

RPS—Renewable Portfolio Standard

SACE—Southern Alliance of Clean Energy

SCDOT—South Carolina Department of Transportation

SCDHEC—South Carolina Department of Health and Environmental Control

SCE&G—South Carolina Electric and Gas

SCIES—South Carolina Institute for Energy Studies

SETC—Solar Energy Training Center

SEU—Sustainable Energy Utility

USC—University of South Carolina

USGBC—US Green Building Council

VMT—Vehicle-miles Travelled

VHT—Vehicle Hours Travelled

WWTF—Wastewater Treatment Facility

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Appendix

Appendix

Alternative Energy Projects in the Midlands Region by Technology

Table A-1. Alternative Energy Projects in the Central Midlands Region

Project Name	System Type	Capacity	Year Installed	Location
Columbia Museum of Art Solar Panels	Roof-Mounted PV Panels	41kW	2010	Columbia
Columbia College Solar Panels	Roof-Mounted PV Panels	-	2011	Columbia
West Columbia Holiday Inn & Suites Solar Water Heating System	Solar Water Heating System	-	2009	West Columbia
Lofts at Printer Square Solar Water Heating System	Solar Water Heating System	-	2009	Columbia
Lexington Family Practice Solar Water Heating System	Solar Water Heating System	-	2009	Irmo
SC Veterinary Specialists Solar Water Heating System	Solar Water Heating System	-	2008	Columbia
Chapin Middle School Solar System	Pole-Mounted PV Panels	2kW	2008	Chapin
Hopkins Middle School Solar System	Pole-Mounted PV Panels	2kW	2008	Hopkins
University of South Carolina Pedestrian Walkway Solar System	Roof-Mounted PV Panels	27kW	2007	Columbia
University of South Carolina Green Quad Water Heating	Solar Water Heating System	-	2004	Columbia


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