

SC ENERGY OFFICE



SC BUDGET AND CONTROL BOARD

The State of Energy in the State

Building Enclosure Council

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Before there were presentations, there were conversations, which were a little like presentations but used fewer bullet points, and no one had to dim the lights.

**The New Yorker, *Annals of Business*
Section, Pg. 76 May 28, 2001**

S.C. Energy Office Mission

*Helping citizens, businesses and public entities
save energy and money through greater
efficiency and cleaner energy sources*



Programs

- Transportation Alternatives
- Renewable Energy
- Energy Efficiency
- Energy Education and Outreach
- Energy Planning and Forecasting
- Low level Radioactive Waste Issues



WHAT DO WE KNOW ABOUT ENERGY IN SC?



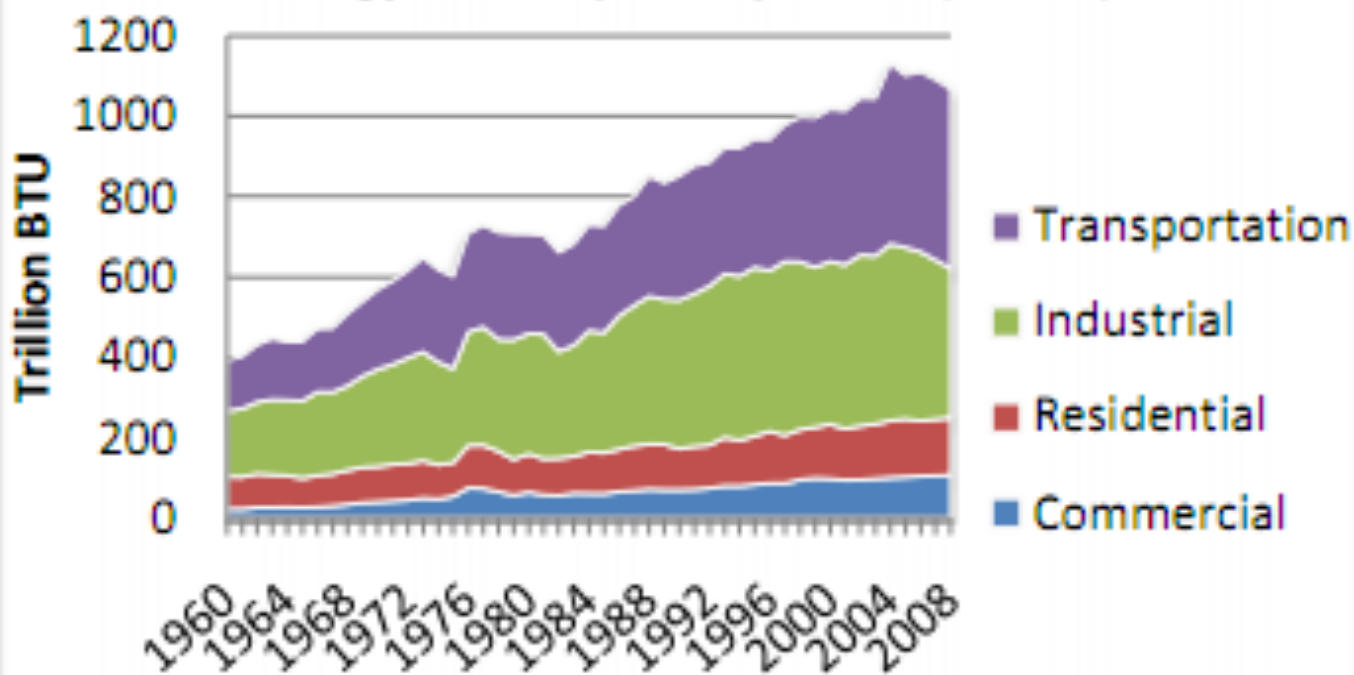
**Table 1. Energy Intensity in South Carolina Relative to the Rest of the United States
(1 = Most Energy Intensive)**

Category	Rank
Electricity Consumption Per Capita*	7 th
Energy Consumption Per Capita	15 th
Energy Consumption Per Dollar of GSP	13 th
Total Electricity Consumption	18 th
Total Energy Consumption	22 nd

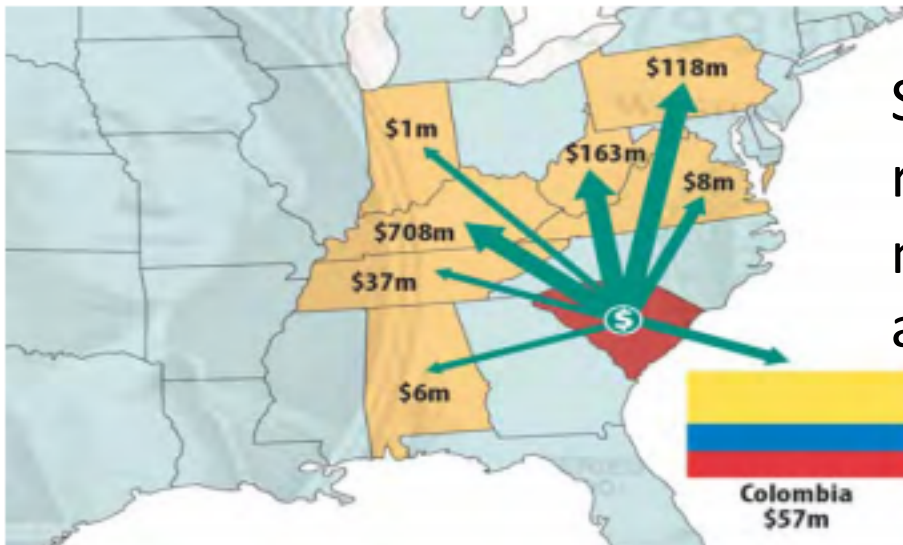
* ACEEE estimate (EIA 2009b, Economy.com 2009)

ACEEE South Carolina's Energy Future, Nov 2009, based on 2007 use

South Carolina Total End-Use
Energy Consumption by Sector ('60-'08)

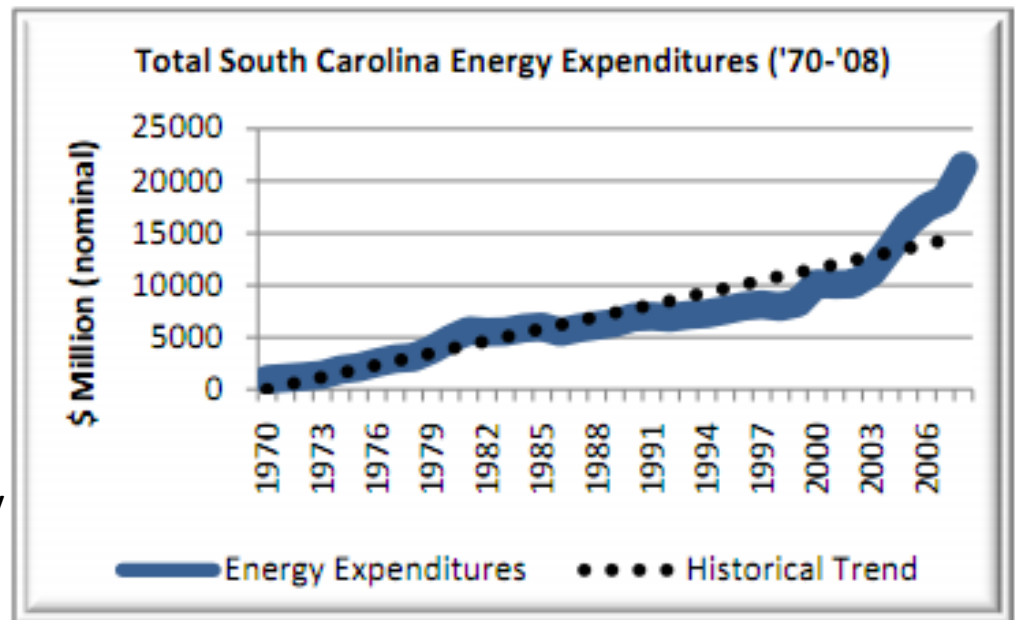


Money Leaving South Carolina for Coal Imports ('08)

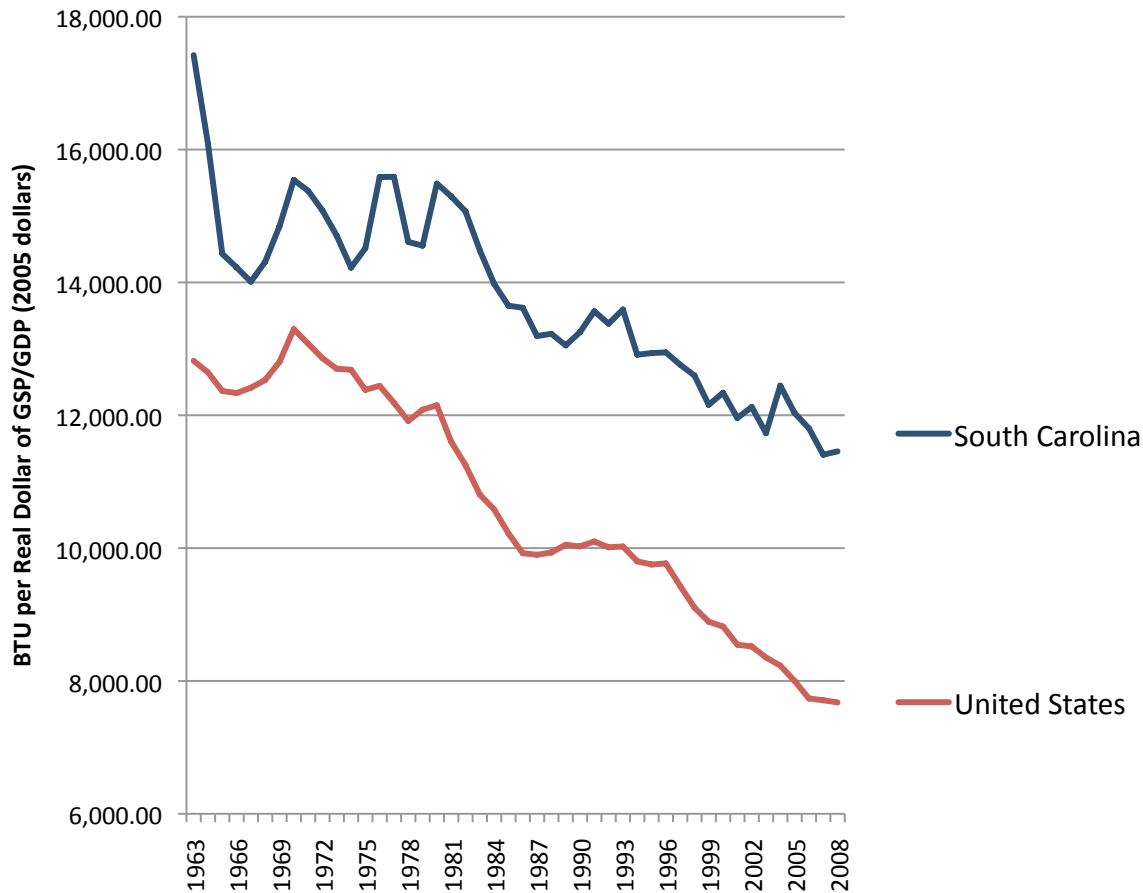


SC has no conventional energy resources – importing coal, uranium, natural gas & petroleum costs money and jobs

Spend about **\$20 billion** on energy annually



Total Energy Consumption per real \$ of GSP/GDP, South Carolina vs. United States (1963-2008)



Change in total energy consumption per real dollar of gross product:

1963 – 2008

S.C. -34.24%

U.S. -40.11%

1990 – 2008

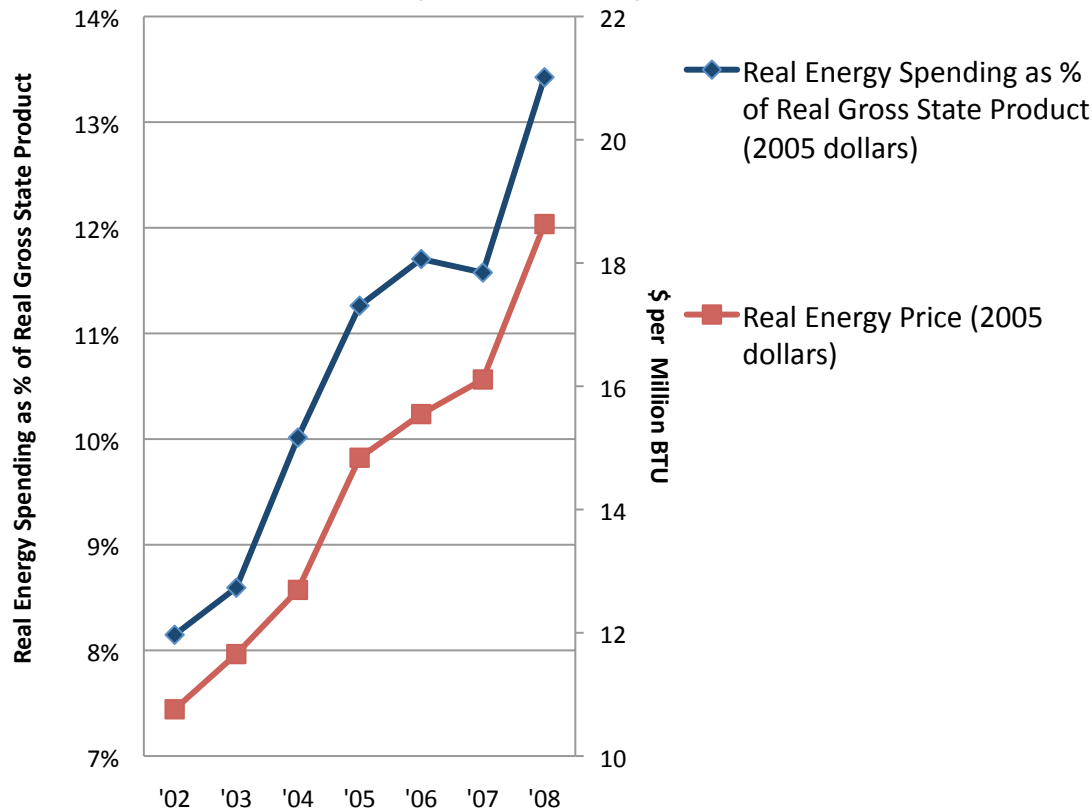
S.C. -13.54%

U.S. -23.43%

DOE Goal: 25% reduction over 1990 levels by 2012

Sources: U.S. Energy Information Administration,
U.S. Bureau of Economic Analysis

South Carolina Energy Spending as % of real GSP, and Energy Price (2002-2008)



Average energy price per MMBTU (2008):

S.C. \$20.54

U.S. \$21.44

Energy spending as % of gross product (2008):

S.C. 13.4%

U.S. 10.0%

S.C. state ranks (2008):

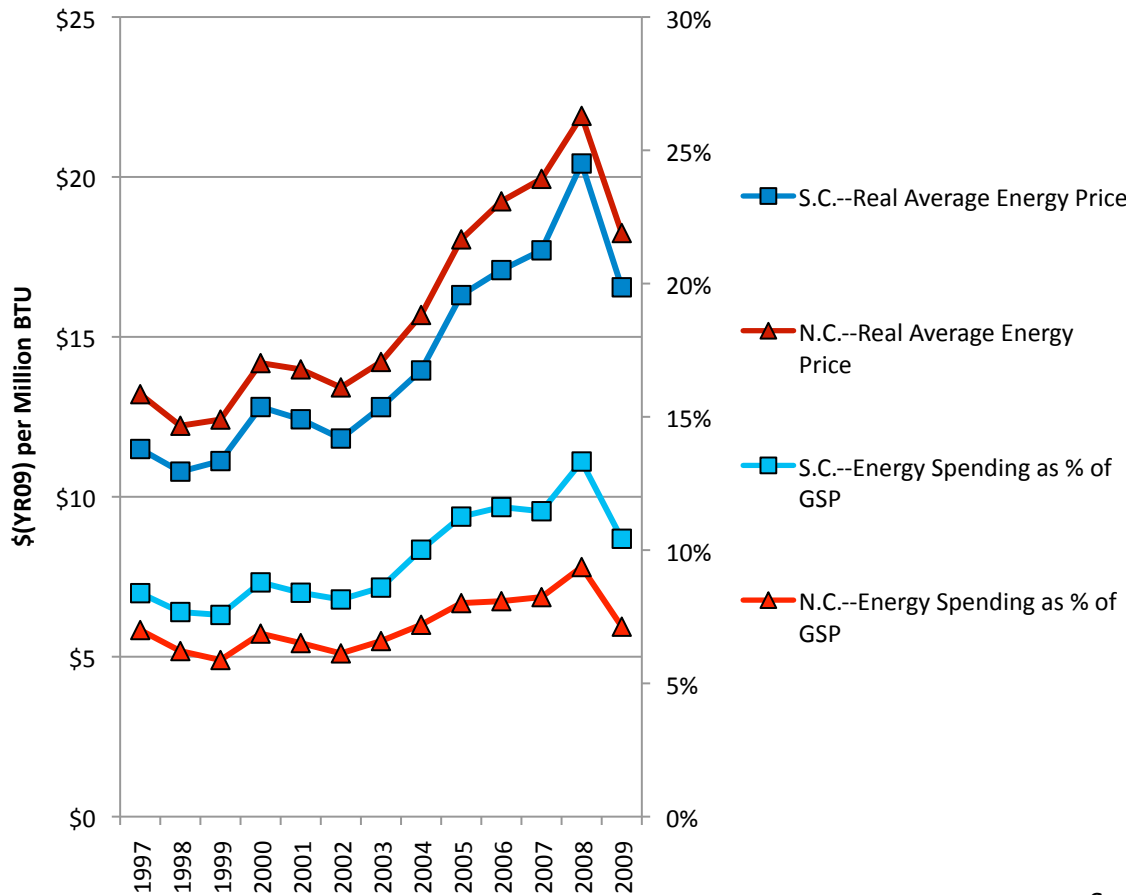
25th lowest total energy price

13th highest energy spending as % of gross product

Sources: U.S. Energy Information Administration,
U.S. Bureau of Economic Analysis

South Carolina vs. North Carolina—

Real Average Energy Price, and Energy Spending as a Percentage of Gross State Product



Average energy price per MMBTU (2009):

S.C.	\$16.55
N.C.	\$18.25
U.S.	\$17.03

Energy spending as % of
gross product (2009):

S.C.	10.4%
N.C.	7.1%
U.S.	7.6%

S.C. state ranks (2009):

25th lowest total energy price

10th highest energy spending
as % of gross state product

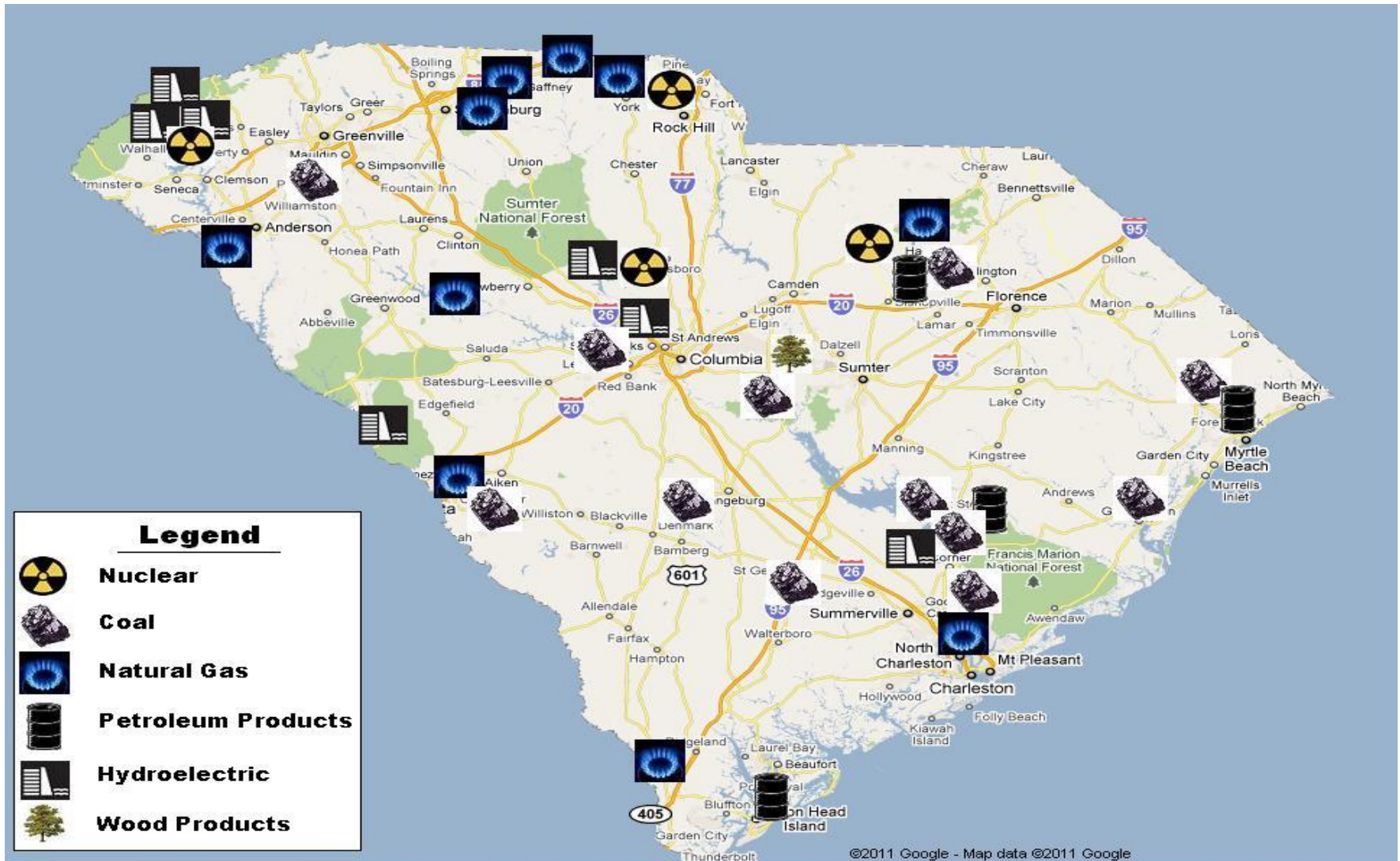
N.C. state ranks (2009):

15th highest average energy price

19th lowest energy spending
as % of gross state product

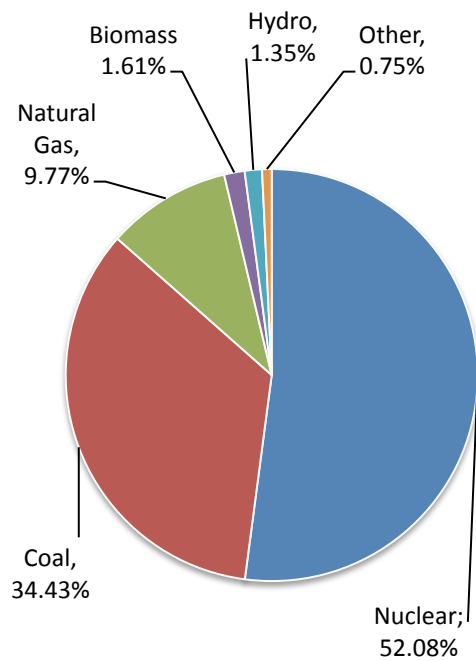
Sources: U.S. Energy Information Administration,
U.S. Bureau of Economic Analysis

S.C. Power Plants, capacity ≥ 100 MW

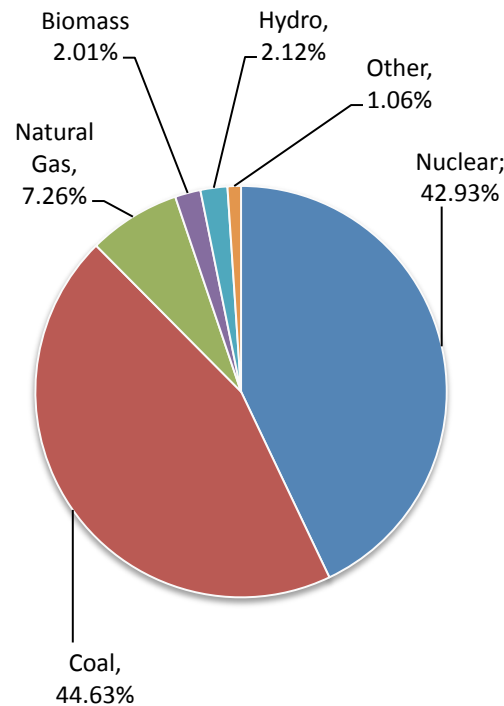


Electricity Generation—Fuel Mix

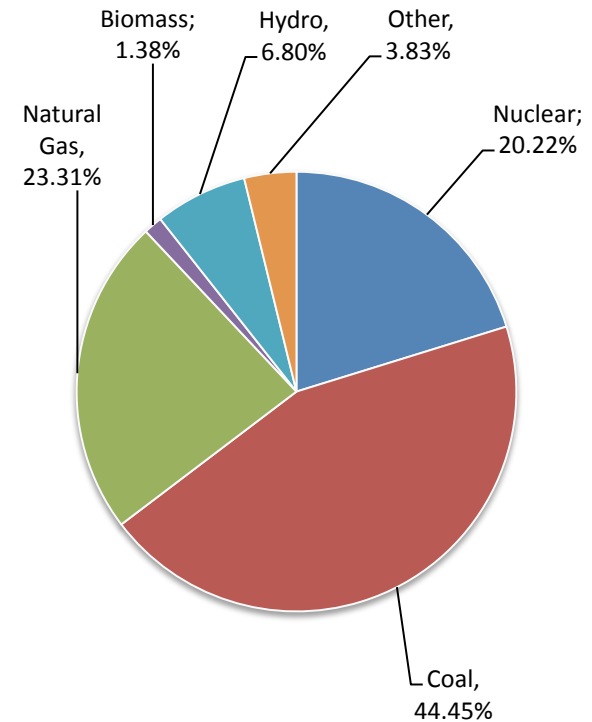
**South Carolina
(2009)**



VACAR Region (2009)



United States (2009)

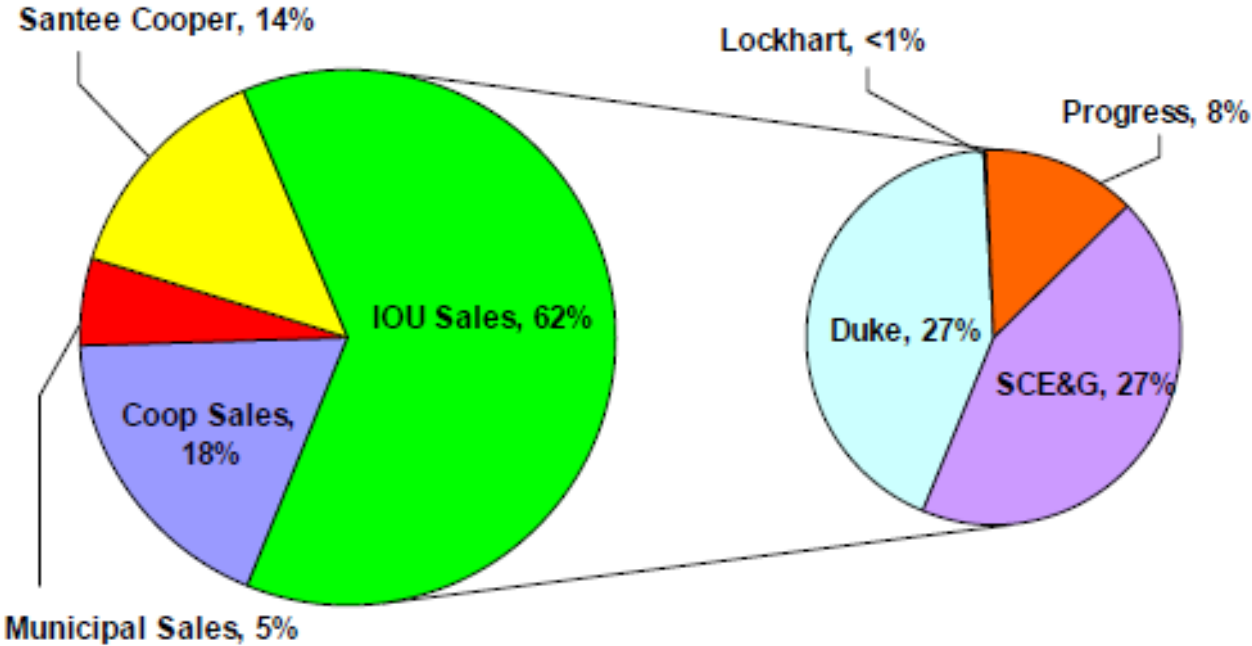


Sources: U.S. Energy Information Administration,
U.S. Environmental Protection Agency

Note: CARVA includes South Carolina, North Carolina, and systems in Virginia signatory to the Virginia – Carolinas Reliability Agreement.

"Other" includes petroleum products, wind, solar, and geothermal

Figure 4. Electricity Deliveries (GWh) by Supplier in 2007



Source: EIA (2009a)

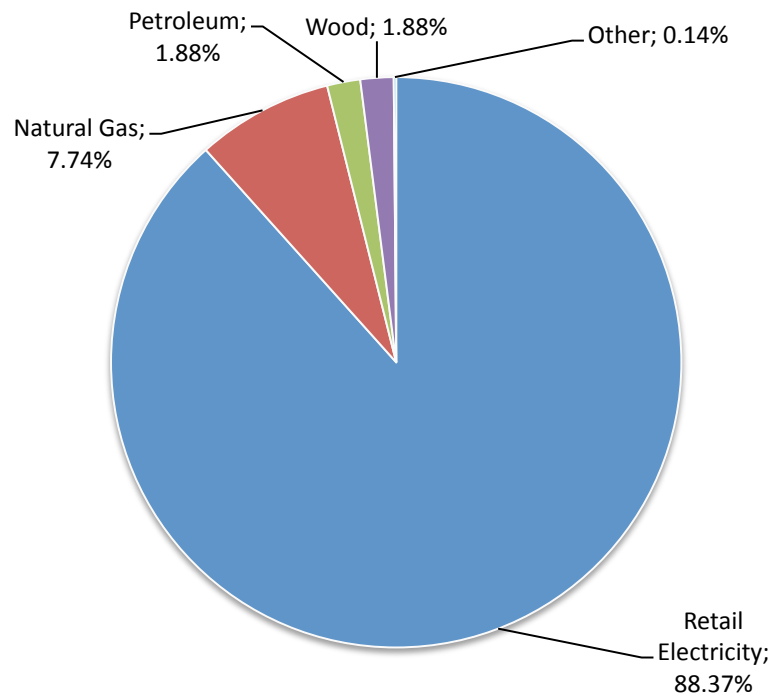
S.C. Residential Energy Intensity

- S.C. households are dependent on purchased electricity, which is more resource-intensive than primary fuels or on-site generation
- S.C. had 5th highest per-capita residential total energy consumption in 2008
- S.C. had 2nd highest per-capita residential electricity consumption in 2008
- S.C. per-capita residential electricity consumption is growing at the 7th highest rate

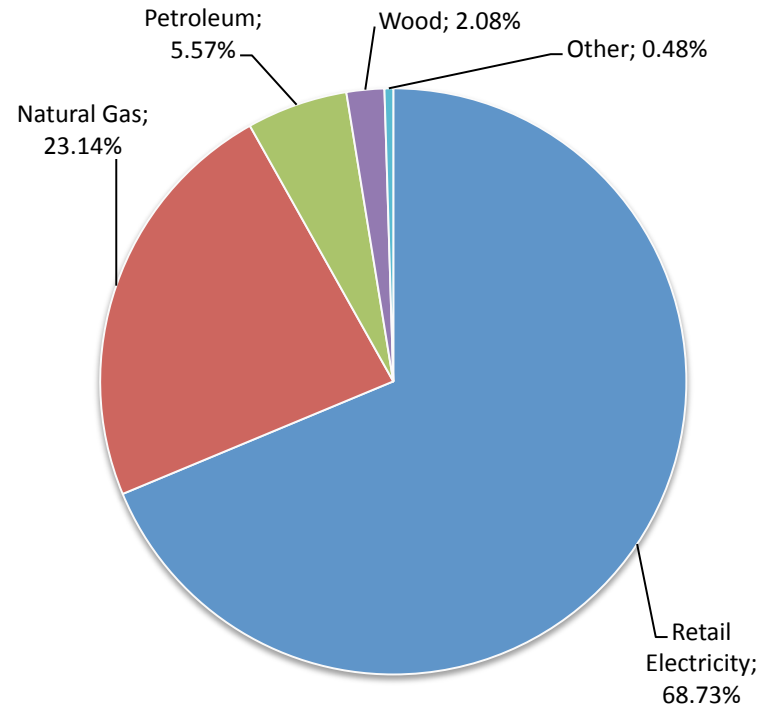
Sources: U.S. Energy Information Administration, National Renewable Energy Laboratory

SC vs. US Residential Energy Sources

South Carolina (2008)

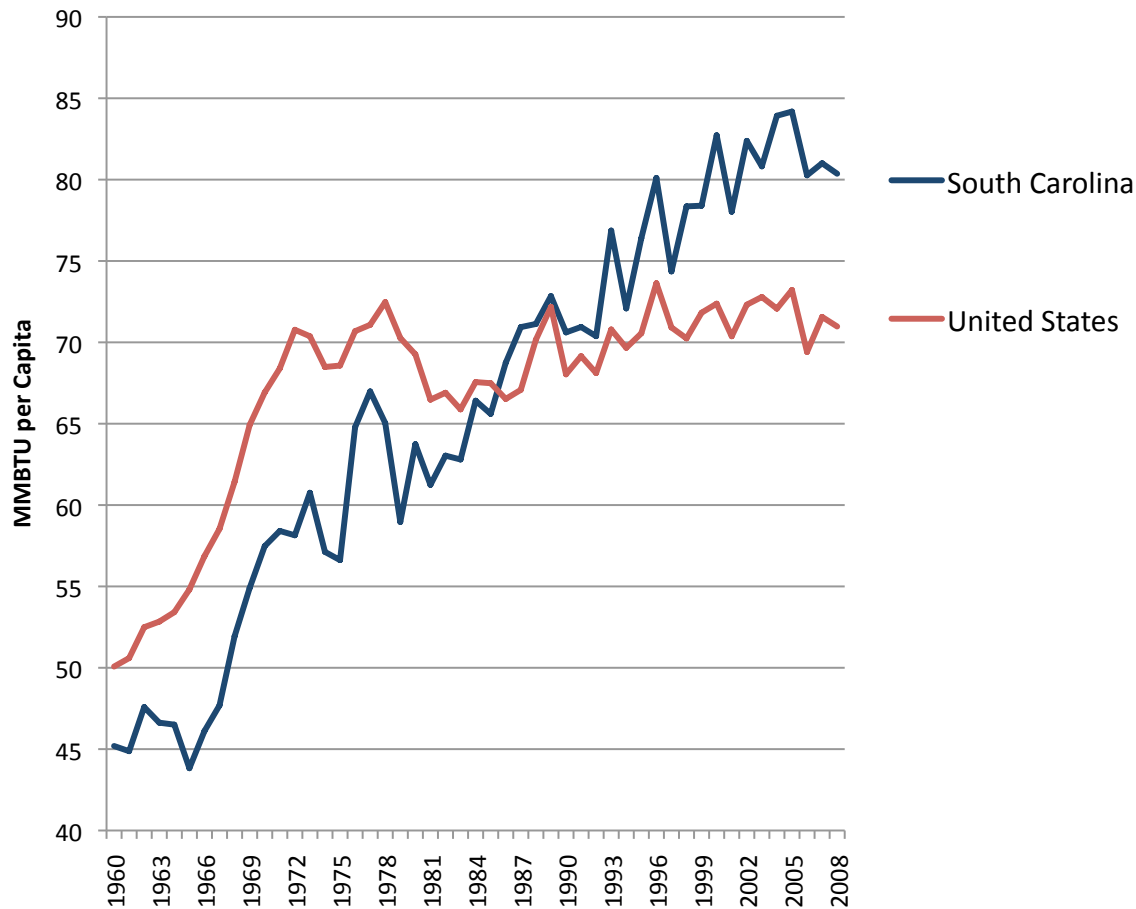


United States (2008)



Source: U.S. Energy Information Administration
Note: "Other" includes on-site solar, geothermal, and coal

Total Residential Energy Consumption per capita, South Carolina vs. United States (1960-2008)



Change in total residential
energy consumption
per capita:

1960 – 2008

S.C. +77.83%
U.S. +41.74%

1990 – 2008

S.C. +13.81%
U.S. +4.32%

Sources: U.S. Energy Information Administration,
U.S. Census

Residential Energy Consumption

In 2008, South Carolina households purchased 6,599 kWh of home electricity per person....

- State ranking: **2nd highest**

...and consumed 80.36 MMBTU of total home energy per person.

- State ranking: **5th highest**



Sources: U.S. Energy Information Administration,
U.S. Census

Residential Energy Spending

In 2008, South Carolina households at the median income spent an average of 5.0% of their earnings on home energy costs.

- State ranking:
17th highest



Sources: U.S. Energy Information Administration,
U.S. Census, U.S. Bureau of Economic Analysis

Residential Energy Spending

In 2008, 2.5% of total South Carolina personal income was spent on home energy expenditures.

- State ranking: **18th highest**

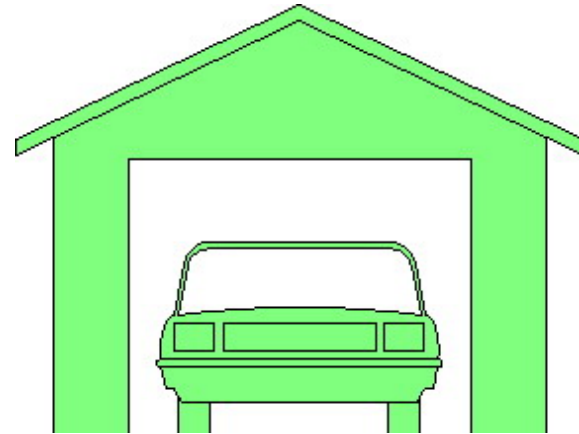


Sources: U.S. Energy Information Administration,
U.S. Census, U.S. Bureau of Economic Analysis

S.C. Household Transportation

In 2009, S.C. residents drove an average of 14,752 miles per driver.

- **8th highest in the nation**
- U.S. average—12,888 miles per driver



In 2009, the tax-inclusive price of motor gasoline in S.C. averaged \$1.99 per gallon.

- **3rd lowest in the nation**
- U.S. average—\$2.12

→ S.C. had the **4th lowest** state gas tax in 2009



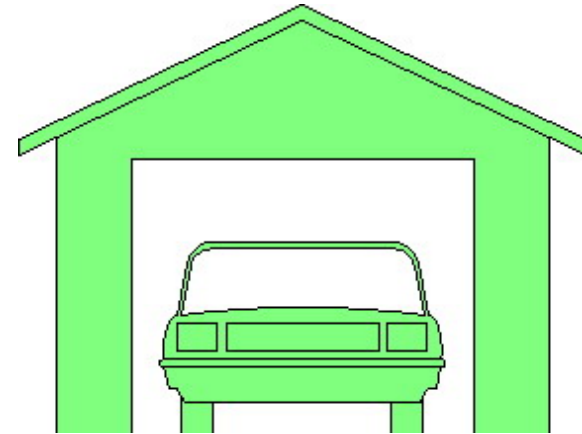
Sources: U.S. Department of Transportation/
National Household Transportation Survey,
U.S. Energy Information Administration,



N.C. Household Transportation

In 2009, N.C. residents drove an average of 14,244 miles per driver.

- **15th highest in the nation**
- U.S. average—12,888 miles per driver



In 2009, the tax-inclusive price of motor gasoline in N.C. averaged \$2.12 per gallon.

- **25th lowest in the nation**
- U.S. average—\$2.12

→ N.C. had the **14th highest** state gas tax in 2009



Sources: U.S. Department of Transportation/
National Household Transportation Survey,
U.S. Energy Information Administration,

WHAT DOES THIS MEAN?





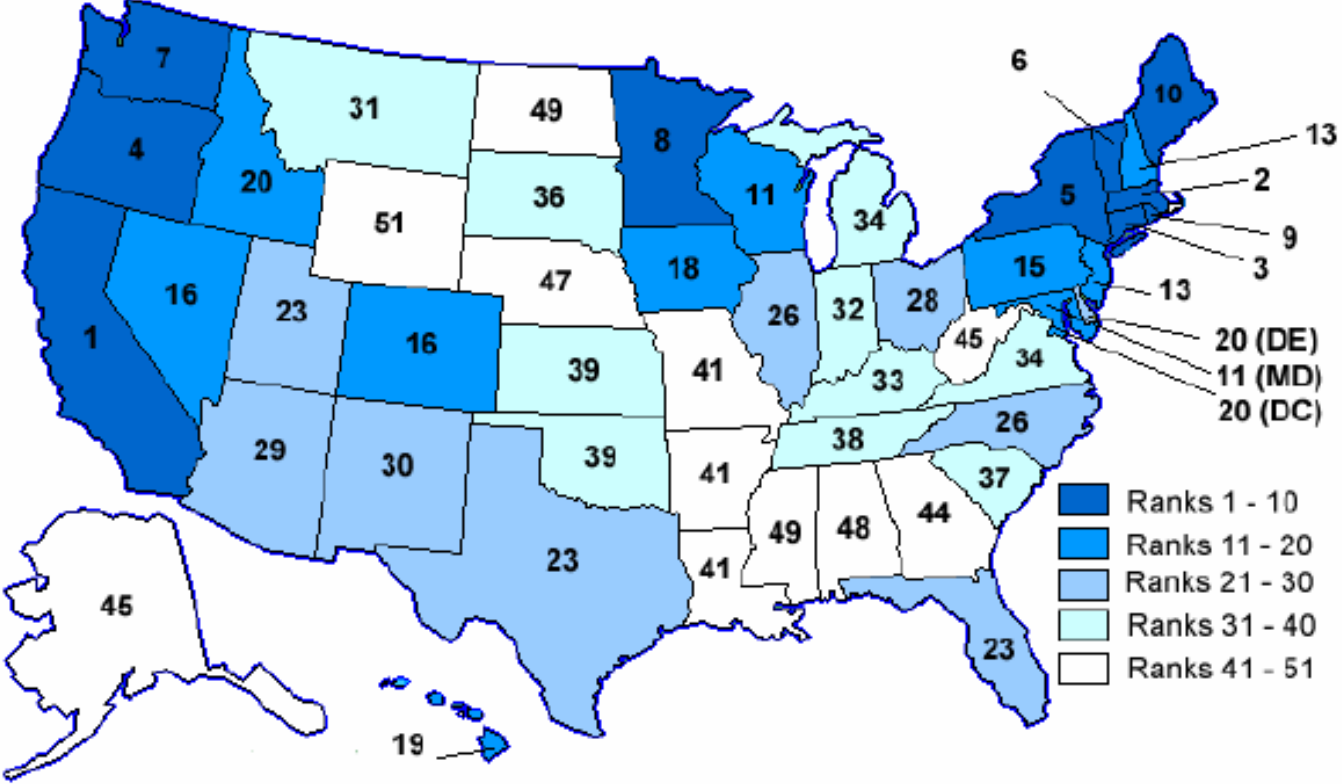
Efficiency First

“maximizing energy efficiency and decreasing energy use will remain the lowest hanging fruit of the next several decades.”

U.S. Energy Secretary Steven Chu

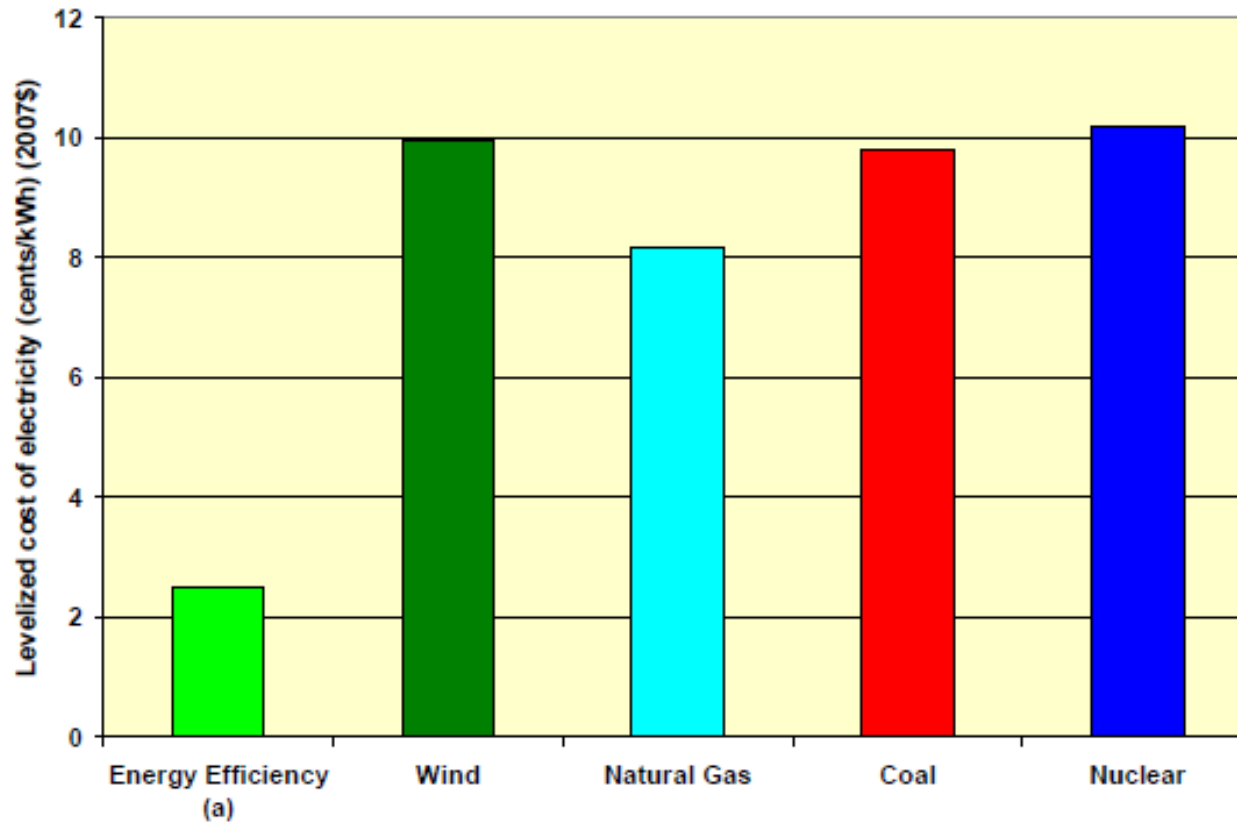


Figure 5. 2009 State Efficiency Scorecard Results



Source: Eldridge et al. (2009)

Figure 1. Levelized Electricity Resource Cost Estimates for 2020



Source: EIA 2009(e), except for (a): Energy efficiency program costs are the estimate of current utility efficiency program cost of saved energy (CSE), as described in Friedrich et al. (2009).

Table ES-3. Economic Impact of Energy Efficiency Investments in South Carolina

Macroeconomic Impacts	2010	2015	2020	2025
Jobs (Actual)	13,597	18,891	19,625	21,887
Wages (Million \$2007)	\$402	\$533	\$515	\$408
GSP (Million \$2007)	\$767	\$985	\$716	\$99

Including direct and indirect employment effects, these new jobs would be the equivalent of 175 new manufacturing facilities locating in the state

SCEO Stimulus Funding Overview

Total stimulus funding of \$70 Million over 3 years in 5 programs:

- A. State Energy Program - \$50,550,000 (Closed 4/2012)
 - 1. Energy retrofits for state buildings - \$38,872,417 + \$300,000 for Multi-District Career Centers
 - 2. Energy Efficiency Training Collaborative - \$910,000
 - 3. Low-Income Manufactured Housing Retrofit and Evaluation - \$3,000,000
 - 4. Industrial Energy Incentives - \$2,800,000
 - 5. Renewable Energy and Advanced Technology Grant Program - \$3,318,361
- B. Energy Efficiency and Conservation Block Grant - \$9,593,500 (Closed 9/2012)
 - 1. Local Government Energy Efficiency and Conservation – \$6,433,488
 - 2. Energy Efficiency and Conservation for Residential and Institutional Buildings - \$451,452
 - 3. Multi-Tenant Metering Efficiency Assessment - \$590,751
 - 4. Biodiesel and Ethanol Fuel Quality Assistance - \$50,721
 - 5. Energy Technical Assistance Program - \$2,067,088
- C. Clean Cities - \$4,759,344 (Closed 6/2012)
- D. Appliance Rebates - \$4,298,000 (Closed 2/2012)
- E. Energy Assurance and Smart Grid Resiliency - \$611,034 (Closes 8/2013)



ARRA – Retrofits

Direct benefits from SEP-ARRA retrofits anticipated—

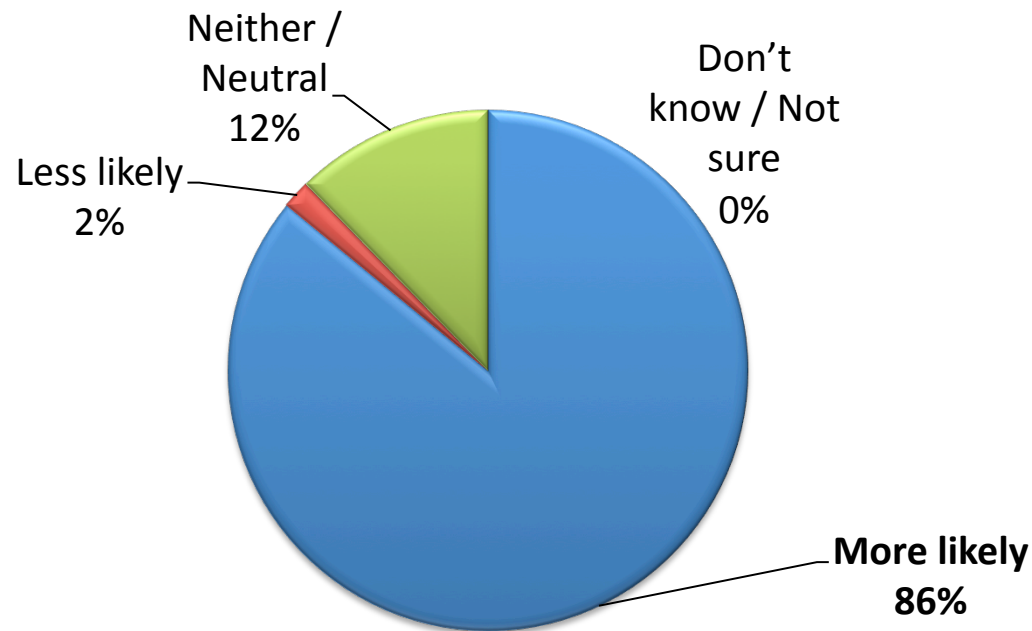
- Over 350,000,000 kBTU of annual site energy savings
 - Enough to power 5,000 typical homes in the Southeast per year
- Over \$10,000,000 of annual energy cost savings
 - Enough to hire 300 full-time employees at the median annual salary in South Carolina



ARRA

“Would you be more or less likely to do the following as a result of your ARRA-funded energy projects:”

- “Take additional steps to reduce your organization’s energy demand or produce its own renewable energy.”



Non-weighted

What Works - Horry County School District - \$598,438

- 1651 Occupancy Sensors
- Savings - \$ 289,000 annually
 - \$2,896,000 lifetime
- Received \$93,400 rebate from Santee Cooper’s *“Reduce The Use – South Carolina”* campaign



What Works - Sumter School District 17

- ARRA funding of \$241,757
- Direct Digital Controls
- Savings – \$ 48,826 annually
 - \$976,527 lifetime
- Received \$96,076 rebate from Progress Energy's Energy Efficiency for Business program



What Works – Sumter County Schools

- Install and recommission direct digital controls
- ConserFund Loan : \$ 495,550
- Total Costs (2% interest/7 years): \$535,980
- Estimated annual savings: \$71,492
- Estimated payback: 7.5 years



What Works – Oconee School District

- New chiller, direct digital controls
- ConserFund Loan: \$500,000.00
- Total Costs (3% interest/5 years): \$545,886
- Estimated annual savings: \$ 65,000.00
- Estimated payback: 7.7 Years
- Projected lifetime savings: \$1.3 million



Carrots and Sticks: Sticks

- State agencies & school districts must reduce energy use 1% annually for 5 years
- Ultimate goal is 20% energy use reduction by 2020, from 2000 baseline
- Section 48-52-620 SC Code of Laws

Table 1. Public Facilities - Percent Changes 2004-2008

Square Footage	Total Energy Cost (\$)	Total Energy Use (kBtu)	Energy Cost per Square Foot (\$)	Energy Use per Square Foot (kBtu)
9.58%	30.65%	6.04%	19.66%	-2.47%

Carrots and Sticks: Sticks

- Title 48, Chapter 53, Sections 800-860 - Energy Efficiency Act of 2007
- **Major Facility Projects** must be designed, constructed, and certified at least:
 - Two globes/Green Globes
 - Silver/LEED
- Projects certified at the LEED Silver standard or higher must be inspected by a third-party commissioning agent in the **fifth, tenth, and fifteenth year** following certification

Did You Know?

South Carolina ranks
5th in LEED certified
buildings *per capita* in
the *nation*?

Did You Know?

Which school has *more*
LEED certified buildings
USC or **Clemson**?

State LEED Projects

<u>Project Name</u>	<u>Owner</u>	<u>Rating</u>
➤ Clemson Univ. Advanced Material Research Park Innovation Center*	Clemson University	Silver
➤ Fraternity Dorms Renovation	Clemson University	Silver
➤ ICAR Parking Structure	Clemson University	Gold
➤ Institute of Packaging Design & Graphics Construction	Clemson University	Gold
➤ ICAR Graduate Engineering Center	Clemson University	Silver
➤ Rowing Facility	Clemson University	Silver
➤ Rhodes Hall Annex (Bioengineering)	Clemson University	Gold
➤ Baruch Institute - Office/Lab Building	Clemson PSA	Gold
➤ Athletic Training Facility	Coastal Carolina University	Gold
➤ Craig Cafeteria*	College of Charleston	Gold
➤ Student Center Renovation*	Greenville Technical College	Silver
➤ Centinial Residence Hall	Lander University	Certified
➤ Edisto Beach State Park Education Center	Parks, Recreation & Tourism	Certified
➤ Charles Town Landing*	Parks, Recreation & Tourism	Gold
➤ West Quad- Learning Center	USC - Columbia	Silver
➤ Thomas Cooper Library Special Collection Addition	USC – Columbia	Gold
➤ Health Education Complex*	USC – Upstate	Silver
➤ Lois West Health, Physical Education & Wellness Center	Winthrop University	Silver

*Required to be certified by law

Clemson's Advanced Materials Research Lab





USC West Quad



The Edisto Beach State Park Education Center

SC Department of Natural Resources & SC Department of Parks, Recreation, and Tourism



Energy Savings: 1040 kWh/year **Water savings: 215,000 gallons/year**

The Edisto Beach State Park Education Center incorporates green building design throughout the complex. Everything from site selection and landscaping to building materials and infrastructure is considered for its impact on people and the environment.

Constructed in the beautiful ACE Basin in Edisto Beach State Park, the Education Center had to be carefully site planned to minimize disturbance to trees and vegetation, and at a safe distance from the creek and salt-marsh.

The buildings are oriented to maximize access to views, winds, and solar angles of the site, taking advantage of the energies that nature provides rather than relying heavily on off-site resources.

Lower operating costs save money over time – these buildings are constructed from recycled and easily-renewable materials. Construction waste was minimized and recycling efforts continue at the Center today.

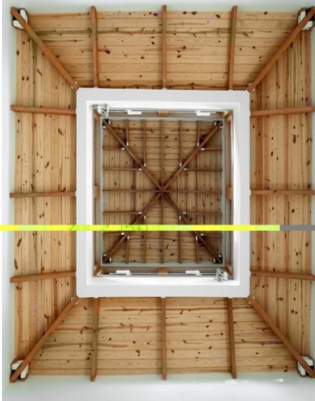
liollo
architecture

LEED® Principles

Minimized Site Lighting	Passive Shading/ High-Performance Glazing	Xeriscaping/Rainwater Capture System	Erosion & Sediment Control	Post-Industrial Recycling (wood chips)	Recycled Content – Steel Framing	Zero and Low VOC Finishes
Geothermal HVAC System	Certified Wood Products	Minimize Viewscape	Light Pollution Reduction	High Performance Materials	Use of Daylighting & Views	Highly Pervious Surfaces
Recycled Exterior Materials	High Thermal Efficiency of Envelope	Permanent Monitoring	Energy Efficient Lighting/ Control	Locally Available Materials	Minimal Site Disturbance	Encourage Natural Ventilation

Sustainability Facts

Edisto Beach State Park Education Center	
Building Use	Education/Recreation Center
Location	Edisto Beach, SC
Site	17.88 AC
Cost	\$1,000,000
LEED-NC Rating: out of 69	
Target Total Score	20
Sustainable Sites	5
Water Efficiency	4
Energy & Atmosphere	7
Materials & Resources	5
Indoor Environmental Quality	5
Innovation & Design Process	3
Certification Level: Certified	
Energy Savings (kWh/yr, \$/yr)	1040 kWh/yr
Carbon Emissions Avoided (tons)	NA
Water Savings (gallons/yr, \$/yr)	215,000 gallons/yr
Operations & Maintenance (kWh/yr, \$/yr)	NA
Productivity Enhancements (\$/yr)	NA
Natural Habitat Restored (acres)	NA
Project Team Profile	
Owner	SC Dept. of Parks, Recreation & Tourism SC Dept. of Natural Resources
Architect	Liollo Architecture
Engineers	BP Barbour GSA, LLC
Contractor	Palmetto Construction
Landscape Architect	SCPRT
Commissioning Agent	SCPRT





Clemson University Fraternity Quad



USC Thomas Cooper Library Special Collections



College of Charleston Admissions in Craig Hall

Carrots and Sticks: State Incentives

Renewable/Alternative

- Credits for biomass energy and equipment purchases
- Incentive payments for biomass energy users
- Credits for biofuel production and use
- Credits for solar energy equipment & installation
- Credits for plug-in hybrid vehicle purchase

Efficiency

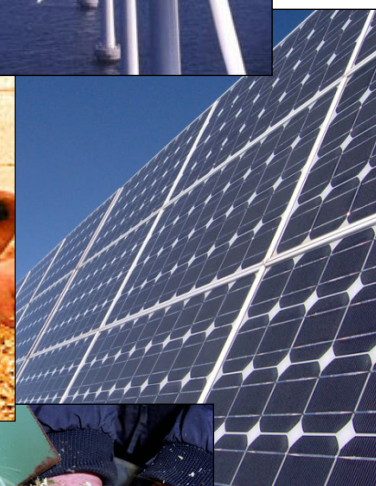
Virtue is its own reward.

Maybe that's why I'm so bored!

-Margaret Fishback

Renewable Energy Options in S.C.

- Biomass-to-Energy
 - Wood wastes
 - Switchgrass
 - Landfill gas
 - Animal and human waste
- Wind
 - Offshore
 - Small-scale, land-based
- Solar
- Small-scale hydro
- Hydrogen fuel cells



What Works: Methane Capture at Renewable Water Resources (ReWa)

- Awarded \$500,000, total project cost \$2,187,000
- Installed a co-generator at the Mauldin Road WWTP and Pelham Road WWTP in Greenville
- Expected savings over \$3 million



Mauldin Road WWTP

What Works – Landfill Gas

- Santee Cooper producing a combined total of 30 megawatts at 6 landfills around the state.



Lee County Landfill - 10.9 megawatts



Anderson County Landfill - 3.2 megawatts

What Works – Landfill Gas

40 percent of its operations powered by methane gas captured at the Greenwood county landfill

County would have had to install collection system, but pumped to FujiFilm instead, where it replaces natural gas to fire boilers.

Fuji Film



What Works – Pig Power

Burrows Hall, in Williamsburg County, raises hogs and uses anaerobic digesters to produce 180 kW of energy for Santee Cooper



What Works – Solar at IMO

- One of world's leading manufacturers of slewing rings and slew drives for wind turbines and other applications.
- Based in Bavaria, this is first US venture
- Will power at least 33% percent of plant with solar tracker.
- Solar parking lot lighting.
- Efficiency upgrades.



What Works – Solar

- Carolina Ingredients in Rock Hill
- 33 PV kW array, plus solar thermal



HOW DO WE KEEP IT GOING?



More Grants?



Loans

- ConserFund
- Energy Efficiency Revolving Loan
- USDA and Other Federal Loans
- ARRA loan repayment



Utility Rebates

- Information on web site
- Can pay up to half of the project cost
- Call to clarify custom rebates



Energy Efficiency for Business



Smart Saver[®] Incentive Program

Incentives and Impediments?

- What would help you be more energy efficient?
- What would help the state increase energy efficiency?
- What is getting in your way?
- What can be done right now to fix it?



QUESTIONS?

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