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# Energy Supply Technical Work Group

## Summary List of Recommended Priority Policy Options for Analysis

| Option No. | Policy Option | GHG Reductions ($MMtCO_2e$) | | | Net Present Value 2008–2020 (Million $)[1] | Cost-Effectiveness ($/tCO_2e$)[1] | Level of Support |
|---|---|---|---|---|---|---|---|
| | | 2012 | 2020 | Total 2008–2020 | | | |
| ES-1 | A thorough study of energy options for portfolio standards, including renewables, energy efficiency, nuclear power, waste to energy, landfill gas, offshore wind, and hydro | *(Portfolio composition To Be Determined (TBD))* | | | | | Pending |
| *ES-1a: Renewable Only, No PV* | *All GDS/La Capra "practical" renewable potential* | *1.2* | *3.0* | *21.0* | *$232* | *$11* | Pending |
| *ES-1b: Renewable With PV* | *ES-1a plus 100 MW PV, ½ utility & ½ distributed* | *1.2* | *3.1* | *21.9* | *$356* | *$16* | Pending |
| *ES-1c: Offshore Wind Only* | *500 MW in 2013, 500 MW in 2016* | *0.0* | *2.0* | *14.1* | *$447* | *$32* | Pending |
| *ES-1d: Nuclear Only* | *1,000 MW in 2017, 1,000 MW in 2019* | *0.0* | *10.6* | *32.7* | *$884* | *$27* | Pending |
| *ES-1e: Energy Efficiency* | *Same as RCI-1; 1%/yr by 2015, 1.5% by 2020* | *1.5* | *8.2* | *43.0* | *–$1,127* | *–$26* | Pending |
| ES-2 | Technology research and development, including state funding | *Not quantified* | | | | | Pending |
| ES-3 | Renewable energy (full range) financing, tax incentives, loans<br>*Note: Only PV, small hydro, and distributed wind analyzed thus far* | 0.03 | 0.11 | 0.66 | $116 | $177 | Pending |
| ES-4 | Regulatory model to equalize utility earnings on energy efficiency with earnings on traditional power supply to allow investment in energy efficiency and renewable technologies to be considered in part with investment in new conventional capacity. | TBD | TBD | TBD | TBD | TBD | Pending |
| *ES-4a* | *Assuming utility gets 10% of avoided costs* | *1.5* | *8.2* | *43.0* | *–$916* | *–$21* | Pending |
| *ES-4b* | *Assuming utility gets 90% of avoided costs* | *1.5* | *8.2* | *43.0* | *776* | *18* | Pending |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ES-5 | New nuclear power, including reprocessing | TBD | TBD | TBD | TBD | TBD | Pending |
| ES-6 | Green power purchases and marketing, 1% participation by 2012 | 0.2 | 0.2 | 1.7 | $46 | $27 | Pending |
| ES-7 | Attract renewable energy technology businesses to South Carolina | *Not quantified* | | | | | Pending |
| ES-8 | Distributed renewable energy incentives and/or barrier removal (Including Interconnection Rules) | TBD | TBD | TBD | TBD | TBD | Pending |
| | **Sector Total After Adjusting for Overlaps** | TBD | TBD | TBD | TBD | TBD | |
| | **Reductions From Recent Actions** | TBD | TBD | TBD | TBD | TBD | |
| | **Sector Total Plus Recent Actions** | TBD | TBD | TBD | TBD | TBD | |

* The numbering used to denote the above policy options is for reference purpose only; it does not reflect prioritization among these policy options.

[1]All costs are reported in 2005 US dollars, net present value as of January 1, 2009.

General definition: For the purposes of the policies discussed here, and unless otherwise noted, “renewable energy” is defined as follows: A renewable energy resource includes solar; wind; small hydroelectric geothermal; ocean current or wave energy; biomass resources, including agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, and landfill methane; waste heat derived from a renewable energy resource and used to produce electricity; and hydrogen derived from a renewable energy resource.

# ES-1. Study the Energy Options for Portfolio Standards

## Policy Description

This option recommends that the state undertake a thorough study of energy options for portfolio standards, including renewable technologies, energy efficiency, nuclear power, waste to energy, landfill gas, offshore wind, and hydropower.

## Policy Design

**Goals:** The following scenarios are to be considered:

- 3% energy efficiency, 3% renewable energy, 6% nuclear relative to projected load;
- 10% energy efficiency, all practical renewables as outlined below, zero new nuclear

Energy efficiency includes applications that provide measurable, verifiable, long-term savings to the retail customer compared with current technology in use, including (but not limited to) appliances; lighting; heating, ventilation, and air conditioning; building envelope; and efficient motors.

*See "Key Assumptions" for additional detail on interpretation of goals for analytical purposes.*

## Implementation Mechanisms

The portfolio standard will consider the following implementation parameters:

- Ensure that the short-term and long-term demand for electricity in South Carolina is met without causing undue economic harm to its citizens.
- Protect and enhance the quality of the environment in South Carolina through increased use of renewables, energy efficiency, nuclear, and/or other low-greenhouse-gas (GHG)-emitting sources.
- Encourage the development, construction, and operation of clean energy resources at sites in this state that have the greatest economic potential.

Renewable requirements may only be met with in-state resources brought on line no earlier than January 2004.

## Related Policies/Programs in Place

South Carolina Energy Efficiency Act, Title 48, Chapter 52.

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

Table 1 presents the estimated GHG emission reductions and the net costs or savings from implementing this policy option.

**Table 1. Estimated GHG reductions and net costs of or savings from ES-1**

| Scenario | GHG Reductions ($MMtCO_2e$) | | | Gross Cost (Million $) | Gross Benefits (Million $) | Net Present Value 2009–2020 (Million $) | Cost-Effective-ness ($/tCO$_2$e) | Net per kWh Produced in 2020 (cents/ kWh) | Net per SC kWh in 2020 (cents/ kWh) |
|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2020 | Total 2009–2020 | | | | | | |
| GDS Renewables | 1.2 | 3.0 | 21.0 | $1,287 | –$1,054 | $232 | $11 | 1.6 | 0.061 |
| Renewables + PV | 1.2 | 3.1 | 21.8 | $1,455 | –$1,099 | $356 | $16 | 2.1 | 0.087 |
| Offshore Wind | 0.0 | 2.0 | 14.1 | $1,137 | –$691 | $447 | $32 | 4.0 | 0.107 |
| Nuclear | 0.0 | 10.6 | 32.7 | $2,409 | –$1,525 | $884 | $27 | 3.3 | 0.464 |
| Energy Efficiency | 1.5 | 8.2 | 43.0 | $987 | –$2,114 | –$1,127 | –$26 | N/A | –0.367 |

**Data Sources:**

*Cost of Power Plants:*

- GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.
- La Capra Associates, Inc., GDS Associates, Inc., and Sustainable Energy Advantage LLC (December 2006), *Analysis of a Renewable Portfolio Standard for the State of North Carolina,* prepared for the North Carolina Utilities Commission. Available at: http://www.ncuc.commerce.state.nc.us/rps/NC RPS Report 12-06.pdf.
- National Renewable Energy Laboratory, National Wind Technology Center (November 19, 2007), "Wind Integration Impacts: Results of Detailed Simulation Studies and Operational Practice in the U.S.," (presents data on wind integration costs) . Available at: http://www.neo.ne.gov/renew/wind-working-group/ milligan_wind-integration-nppd.ppt.
- Stoddard, J. Abiecunas, and R. O'Connell (May 2005–April 2006), *Economic, Energy, and Environmental Benefits of Concentrating Solar Power in California*, NREL/SR-550-39291, U.S. DOE, National Renewable Energy Laboratory. Available at: http://www.nrel.gov/csp/pdfs/39291.pdf.
- U.S. DOE, EIA (2007), "Assumptions to the Annual Energy Outlook 2007," Electricity Market Module. Available at: http://www.eia.doe.gov/oiaf/aeo/assumption/index.html.

- Moody's Investors Service, October 2007. New Nuclear Generation in the United States: Keeping Options Open vs. Addressing An Inevitable Necessity.
- Catherine Morris et al. (June 2007), Nuclear Power Joint Fact-Finding, The Keystone Center. Available at: http://www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007(1).pdf.
- Ryan Wiser and Mark Bolinger (May 2007), *Annual Report on U.S. Windpower Installation, Cost, and Performance Trends: 2006,* U.S. DOE, Lawrence Berkeley National Laboratory. Available at: http://www.nrel.gov/docs/fy07osti/41435.pdf.
- Ryan Wiser, Mark Bolinger, Peter Cappers, and Robert Margolis (January 2006), *Letting the Sun Shine on Solar Costs: An Empirical Investigation of Photovoltaic Cost Trends in California*, LBNL-59282, U.S. DOE, Lawrence Berkeley National Laboratory. Available at: http://eetd.lbl.gov/ea/EMP/reports/59282.pdf.

*Cost of Energy Efficiency Measures:*

- GDS Associates, Inc. (2006), A *Study of the Feasibility of Energy Efficiency as an Eligible Resource as Part of a Renewable Portfolio Standard for the State of North Carolina, Report for the North Carolina Utilities Commission,* December 2006. Available at: http://www.ncuc.commerce.state.nc.us/reps/NCRPSEnergyEfficiencyReport12-06.pdf.
- GDS Associates, Inc. (2007) "Electric Energy Efficiency: Potential Study for Central Electric Power Cooperative, Inc.: Final Report," Updated September 21, 2007, available at: www.ecsc.org/newsroom/EfficiencyStudy.ppt.
- Forefront Economics, Inc., H. Gil Peach & Associates LLC, and PA Consulting Group (July 24, 2007), *Duke Energy Carolinas DSM Action Plan: South Carolina Draft Report*.

*Experience in Other States:*

- ACEEE 2004—Martin Kushler, Dan York, and Patti White (April 2004), *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies,* Washington, DC: American Council for an Energy Efficient Economy. Available at: http://www.aceee.org/pubs/u041.htm.
- Gene Fry, "Massachusetts Electric Utility Energy Efficiency Database," Massachusetts Department of Telecommunications and Energy, 2003 edition. Available at:
- Heschong Mahone Group, Inc. (June 2005), *New York Energy $mart$^{SM}$ Program Cost-Effectiveness Assessment*, prepared for New York State Energy Research and Development Authority. Available at:
- Bill Prindle (September 28, 2007), "Energy Efficiency: The First Fuel in the Race for Clean and Secure Energy," Presentation at the NAPEE Southeast Energy Efficiency Workshop on American Council for an Energy-Efficient Economy. Available at: http://www.epa.gov/solar/pdf/southeast_28sep07/prindle_new_napee_presentation_atlanta_9_28_07.pdf.
- WGA 2006—Western Governors Association (January 2006), *Clean and Diversified Energy Initiative: Combined Heat and Power White Paper*. Available at: http://www.westgov.org/wga/initiatives/cdeac/CHP-full.pdf.

*Renewable Energy Potential:*

- GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.
- South Carolina Energy Office (April 9, 2007 rev.), *Biomass Energy Potential in South Carolina: A Conspectus of Relevant Information*—Final Report, and Southeast Biomass State and Regional Partnership. Available at: http://www.energy.sc.gov/publications/Biomass Conspectus 4-10-07.pdf.
- Robert A. Harris, et al., *Final Report to the South Carolina Forestry Commission on Potential for Biomass Energy Development in South Carolina*, U.S. Department of Agriculture, U.S. Forest Service and South Carolina Forestry Commission. Available at: http://www.state.sc.us/forest/prod1004.pdf.

**Quantification Methods:** The analysis estimates and compares the aggregated costs and benefits of four distinct scenarios on Energy Portfolio Standards. Specifically this analysis involves the following steps:

- Determine the policy goals in terms of the percentage of energy covered by portfolio standards each year through 2020.
- Determine what type of conventional generation will be displaced or avoided by this policy.
- Identify the type of resources that would most likely be developed to meet the Energy Portfolio Standard in each scenario, and determine an appropriate resource mix among energy resources.
- Estimate the annualized costs and avoided emission benefits of each scenario.

**Key Assumptions:**

*Avoided costs*—Avoided cost of electricity at the generator bus in South Carolina is $58/MWh.

*Operational and Economic Resource Parameters*
For purposes of analysis only, we assume the following resource potentials"

- 100 MW of small hydro
- 50 MW of on-shore wind
- 1000 MW of off-shore wind (two 500 MW projects installed in 2015 & 2017, respectively)
- Biomass total potential based on "practical potential" from GDA/La Capra study, split evenly between co-firing and direct-firing.
- 15 MW of PV potential by 2020
- 4000 MW of nuclear by 2020
- 1% per year load reduction potential by 2015, 1.5%/year by 2020, relative to the baseline.

- For the percentage-based renewable energy goals, resources will be included in proportion to their potential *or* in increasing order by resource cost.

- Costs to be analyzed on a dollar per kilowatt-hour ($/kWh) basis, as well as dollar per metric ton of carbon dioxide-equivalent ($/t$CO_2$e) avoided.
- Nuclear costs from Moody's and Keystone study.
- Pre-2015 eligible resources assumed to receive a production tax credit (PTC) throughout the period. *(TWG members have suggested performing the analysis with and without PTC as a sensitivity analysis.)*
- Biomass co-firing projects receive a PTC of 1 cent/kWh, and other biomass projects receive a PTC of 1.5 cents/kWh.

A summary of economic and operational assumptions for renewable energy resources used in the analysis is shown in Table 2; economic parameters used for new nuclear power plants are shown in Table 3. Note that the costs and economic model parameters are under review.

**Table 2. Summary Parameters for Renewable Energy Resources**

| Renewable Technologies | Typical Size (MW) | Capacity Factors | Average Installed Cost (2006$/kW) | High Installed Cost (2006$/kW) | Fixed O&M (2006 $/kW) | Variable O&M (2006$/MWh) | Heat Rate (Btu/kWh) |
|---|---|---|---|---|---|---|---|
| Landfill Gas ICE (>5 MW)[1] | 5–10 | 80%–85% | $1,750 | $2,000 | $100 | $12 | 9,500 |
| Landfill Gas ICE (<5 MW)[1] | 1–5 | 80%–85% | $2,500 | $3,000 | $100 | $12 | 9,500 |
| Biomass (Co-Fire Blending)[2,3,5] | 5% of host capacity | 70%–75% | $75 | $100 | $12 | $5 | 12,000 |
| Biomass (Co-Fire Retrofit)[2,4,5] | 15%– 20% of host | 70%–75% | $230 | $300 | $12 | $5 | 12,000 |
| Biomass (Stoker)[5] | 25 | 80%–90% | $2,700 | $2,970 | $75 | $10 | 13,000 |
| Biomass (Fluidized Bed)[5] | 25 | 80%–90% | $3,000 | $3,300 | $75 | $10 | 13,800 |
| Anaerobic Digester (Swine Waste) | 0.1 | 70%–80% | $4,000 | $6,000 | $270 | $0 | 14,000 |
| Wind (Onshore) | 25–50 | 25%–28% | $1,800 | $2,000 | $45 | $2 | |
| Wind (Offshore) | 50–400 | 30–35% | $2,800 | $3,300 | $80 | $2 | |
| Hydropower (Conventional) | 1–50 | 25%–35% | $2,000 | $3,500 | $12 | $3 | |
| Hydropower (Small Hydro) | 1–30* | 25%-35% | $3,000 | $4,000 | $20 | $5 | |
| Hydropower (Low Head) | <1* | 20%–35% | $4,000 | $5,000 | $50 | $10 | |
| Solar PV (Utility Scale) | 1–10 | 19%–21% | $4,000 | $5,000 | $15 | | |
| Solar PV (Commercial) | 0.025–0.050 | 19%–21% | $6,000 | $8,000 | $30 | | |
| Solar PV (Residential) | 0.002 | 19%–21% | $8,000 | $10,000 | $50 | | |

ICE = internal combustion engine; PV = photovoltaic

Source: GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.

Note: Capital costs for renewables and nuclear are reduced over time following AEO 2007 trends analysis. No cost decrease is assumed for wind technology.

Notes:

1 The fuel cost range for landfill gas projects is assumed to be $0.50–$1.50 per million British thermal units (mmBtu) [2006$]).

2 Co-firing costs are calculated as incremental costs of avoiding coal consumption for generation ($2.25/mmBtu [2006$] coal cost assumed). No additional avoided costs are assumed for this resource.

3 Blending refers to retrofitting coal plants with the ability to blend some biomass (up to 5% of fuel consumption of site) with coal fuel.

4 Retrofit refers to greater capital improvements needed to accommodate higher levels of biomass co-firing (15%–20% of fuel consumption of site) with coal.

5 The biomass fuel cost range is assumed to be $1.88–$3.90/mmbtu (2006$).

* The size of hydro facilities is measured in MWh, based on annual average flow, rather than nameplate capacity.

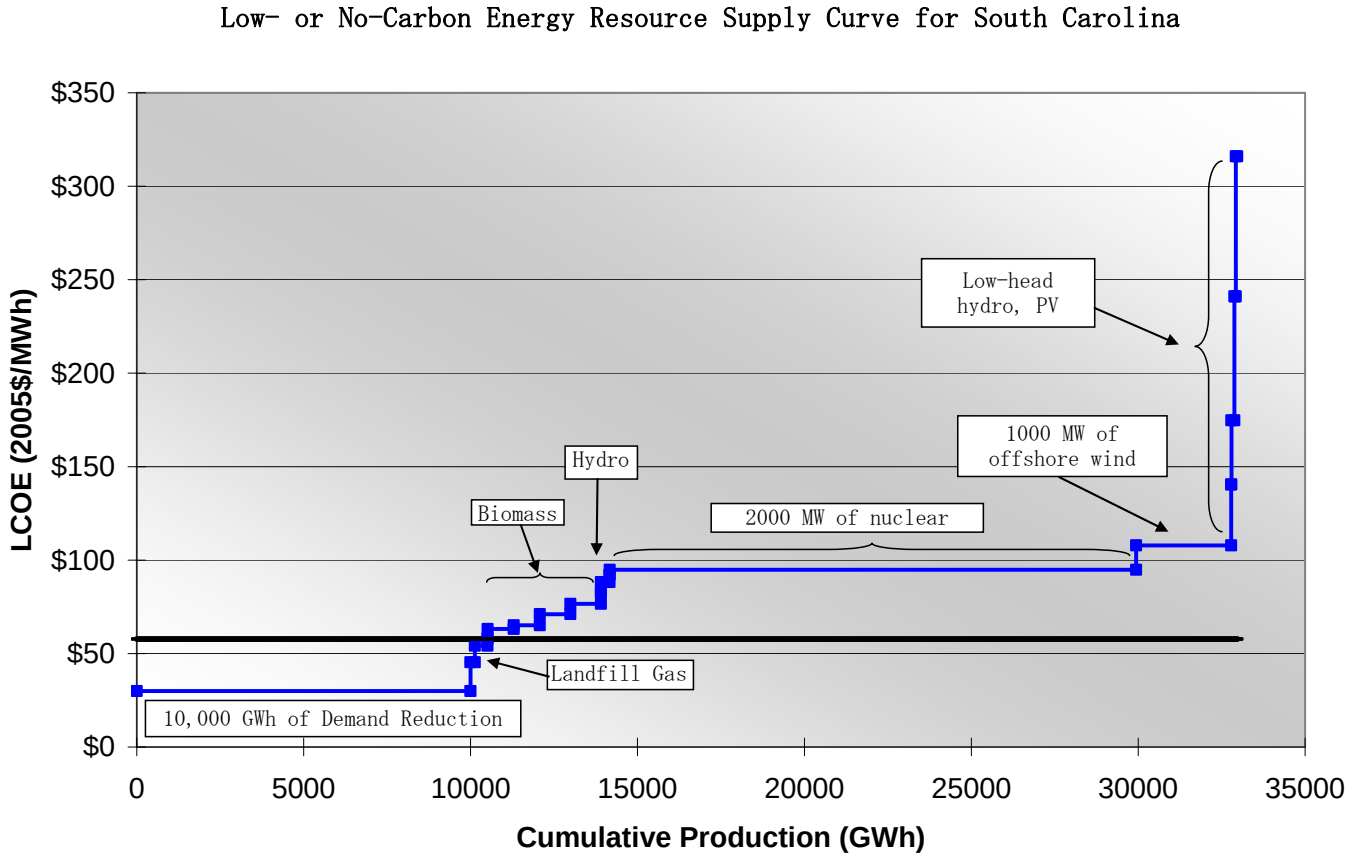
### Table 3. Summary Parameters for Nuclear Resources

**Nuclear Power Cost Assumptions**

| Parameter | Value | Units | Source |
|---|---|---|---|
| Installed cost | 5500 | $/kW | Moody's |
| Capacity Factor | 90% | | Moody's |
| "To-go" Costs* | 5.5 | $/MWh | Moody's |
| Variable O&M | 12.5 | $/MWh | Moody's |
| Fixed O&M cost | 110 | $/kW-yr | Keystone |
| Fuel | 15 | $/MWh | Keystone |

*i.e., incremental capital costs, admin and general costs, insurance costs and other fees

The figure below presents a supply curve of all of the available low-carbon and no-carbon resources considered in the ES-1 analysis. For scale, projected energy use in South Carolina for 2020 is projected to be about 107,000 GWh. Cost and quantity sources are discussed below. Note the dark horizontal line shows the avoided cost of conventional energy.




*Cost of Energy Efficiency Measures or Saved Electricity*

- For North Carolina: See Table 3.

**Table 3. Cost of energy efficiency measures or saved electricity for North Carolina**

| Sector | Present Value of Total EE Program Costs (2006$) | Value of Lifetime GWh Savings—Customer Meter Level | Levelized Cost per Lifetime kWh Saved* |
|---|---|---|---|
| Residential Sector | $262,528,658 | 9,674 | $0.027 |
| Commercial Sector | $352,185,339 | 8,702 | $0.040 |
| Industrial Sector | $124,388,270 | 6,805 | $0.018 |
| **Total—All Sectors** | **$739,102,267** | **25,181** | **$0.029** |

*Source: GDS Associates, Inc. 2006; *Does not include avoided energy savings.

- For Other States: See Table 4.

**Table 4. Cost of energy efficiency measures or saved electricity for other states**

| State/Utility | CSE ($kWh) | Program Year | Source |
|---|---|---|---|
| Western Utilities | 0.025 | 1978-2004 | WGA 2006 |
| Northwest Energy | 0.02 | 2006 | Montana PSC Docket No.: D2005.5.88 07/12/06 |
| New York | 0.03 | 2004 | Heschong Mahone Group, Inc. 2005 |
| Massachusetts IOUs | 0.038 | 2002 | Gene Fry 2003 |
| California | 0.03 | n/a | ACEEE 20004 |
| Connecticut | 0.023 | n/a | ACEEE 20004 |
| New Jersey | 0.03 | n/a | ACEEE 20004 |
| Vermont | 0.03 | n/a | ACEEE 20004 |

*Efficiency Measure Lifetime/Amortization Period*: 13 years on average.

*Displaced Emissions*: Energy efficiency measures are assumed to displace generation from existing facilities in the short term and to contribute to postponing the construction of new conventional power plants in displaced emissions in the long term. Table 5 presents projected avoided emissions from electricity consumption as a result of South Carolina's implementation of energy efficiency measures. The data in Table 5 are based on North Carolina data.

**Table 5. Avoided emissions from electricity consumptions resulting from implementing energy efficiency measures**

| Year | Avoided Emissions From Electricity ($tCO_2$/MWh) |
|---|---|
| 2006 | 0.880 |
| 2007 | 0.880 |
| 2008 | 0.880 |
| 2009 | 0.880 |
| 2010 | 0.880 |
| 2011 | 0.863 |
| 2012 | 0.847 |
| 2013 | 0.830 |
| 2014 | 0.813 |
| 2015 | 0.796 |
| 2016 | 0.780 |
| 2017 | 0.763 |
| 2018 | 0.746 |
| 2019 | 0.729 |
| 2020 | 0.713 |

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

## Feasibility Issues

TBD – [as needed and approved by the TWGs]

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-2. Technology Research and Development

## Policy Description

A number of energy technology research and development R&D programs are already underway at organizations and academic facilities throughout South Carolina. R&D funding can be targeted toward a particular technology or group of technologies as part of a state initiative to build or expand an industry or core technical competency around that technology in the state, and/or to set the stage for adoption of the technology for use in the state. (For example, part of the South Carolina Hydrogen and Fuel Cell Alliance's mission is to help develop and deploy hydrogen technologies in the state). R&D funding can also be made available to any renewable or other advanced technology (including nuclear) through an open bidding procedure (i.e., driven by bids received, rather than by a focused strategy to develop a particular technology). Funding can also be provided for demonstration projects to help commercialize technologies that have already been developed, but that are not yet in widespread use. Finally, funding could be targeted to increase collaboration among existing institutions in the state for R&D.

## Policy Design

- Establish an energy technology roadmap for South Carolina to focus on efforts that have the greatest potential for achieving reduced GHG emissions, economic development opportunities, national security, and energy independence for the state. Include the South Carolina Department of Commerce, economic development organizations, utilities, as well as state technology providers in the process.
- Support and provide funding opportunities and incentives for developing and implementing new technologies for GHG reduction that encourage collaborations among R&D, government, academic, and commercial sectors.

**Goals:**

- Complete detailed evaluation study for offshore wind energy potential in South Carolina.
- Provide additional state funding of $20 million for R&D initiatives in clean energy.
- Establish hydrogen infrastructures that are accessible to a majority of the population of South Carolina.
- Complete a least one high-visibility R&D demonstration to showcase alternative energies.
- Create a technology advisor position in the Governor's office.

**Timing:** [TBD]

**Parties Involved:** [TBD]

**Other:** [As needed]

## Implementation Mechanisms

- H. 3146—The Hydrogen Infrastructure Act identifies a potential $5 million for energy technology R&D in 2008 (proposed $15 million total over 5 years) for in-state projects. (This has passed but has not been funded.)
- H. 3649—South Carolina Renewable Energy Infrastructure Development Fund.
- Small Business Innovation Research/Tech Transfer Phase I Matching Grant Programs.
- South Carolina Research Authority (SCRA) SC Launch! Program—$200k per entity is available for entrepreneur assistance.
- State-funded R&D infrastructure
- State-funded South Carolina Centers of Economic Excellence Endowed Professorship Program

## Related Policies/Programs in Place

- University of South Carolina's National Science Foundation Center for Fuel Cells and Clean Coal Center of Excellence.
- Energy research conducted at the Savannah River National Laboratory and Center for Hydrogen Research.
- Clemson University's Restoration Institute's research in bio-energy and wind.
- Clemson's University's International Center for Automotive Research automotive system integration and materials science program.
- The Greater Columbia Fuel Cell Challenge—creating a plan to make the region a center for fuel cell use.
- South Carolina Research Authority's clean energy initiatives programs.
- Nonprofit organizations that promote researchers, entrepreneurs, and businesses preparing for the emerging technologies in energy—e.g., EngenuitySC, Concurrent Technologies, New Carolina, FuelCellSouth.
- State-supported organizations that encourage R&D—e.g., South Carolina Biotechnology Incubation Program (SC Bio), South Carolina Hydrogen and Fuel Cell Alliance, South Carolina Biomass Council, South Carolina Institute for Energy Research.

## Type(s) of GHG Reductions

Nonquantifiable due to the uncertainty of selected research endeavors.

## Estimated GHG Reductions and Net Costs or Cost Savings

Nonquantifiable due to the uncertainty of selected research endeavors.

**Data Sources:**

Committee on Benefits of DOE R&D on Energy Efficiency and Fossil Energy (2001), *Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000*, Washington D.C: National Academies Press. Available at: http://www.nap.edu/openbook.php?isbn=0309074487.

**Quantification Methods:**

This policy will not be analyzed quantitatively.

**Key Assumptions:** Not applicable.

## Key Uncertainties

Not applicable.

## Additional Benefits and Costs

- Job creation within South Carolina from utilizing enhanced R&D to build an energy industry is an additional benefit. The state is poised through its strength in hydrogen research to become a national leader in the hydrogen economy. By 2020, it is estimated hydrogen could have potential for more than 40,000 jobs in South Carolina and $10 billion in capital investments.
- With its strong nuclear industry, South Carolina has the potential to capitalize on the emerging renaissance, by establishing itself as a hub for nuclear expertise and training. The state is also in a position to benefit from the R&D focus on nuclear production of hydrogen (as was recommended in the National Research Council's *Review of DOE's Nuclear Energy Research and Development Program.*[1]
- Additional benefits of reduced dependence on foreign oil and improved environmental conditions can be realized.

## Feasibility Issues

TBD

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

[1] National Research Council, Board on Energy and Environmental Systems (October 2007), *Review of DOE's Nuclear Energy Research and Development Program,* National Academies Press. See http://books.nap.edu/openbook.php?record_id=11998&page=24.

# ES-3. Renewable Energy Financing

## Policy Description

This policy option concerns financial incentives to encourage investment in the full range of renewable energy resources. The intent of these financial incentives will be to help overcome barriers for renewable energy development. Institutional and market barriers include price distortions, inadequate information, institutional barriers to grid interconnection, high transaction costs because of small projects, and high financing costs because of lender unfamiliarity and perceived risk. These can be overcome through a suite of financial and regulatory redresses, as well as through information and public education campaigns.

Financial obstacles can also be addressed through property tax exemptions, exclusions, and credits; personal income tax credits or deductions to cover the expense of purchasing and installing renewable energy equipment; loan programs to aid in financing the purchase of renewable energy equipment; and grant programs designed for R&D or to help a project achieve commercialization.

## Policy Design

**Goals:** The initial evaluation should include several different types of financial incentives to represent the range of opportunities.

- Remove legislative caps on current tax incentives for renewable fuel use.
- Offer tax credits or other incentives of $3,500 per kW-equivalent for small solar photovoltaic (PV), solar and geothermal hot-water systems, micro-hydro, and small wind up to 50 kW of grid-connected generation.
- Provide a subsidy to renewable energy generators of 1 cent/kWh for electricity generated from a renewable resource, unless that electricity is used to meet a federal, state, or voluntary renewable energy standard.
- Establish feed-in tariffs for large-scale, zero-pollution renewable generation projects, providing a guaranteed price for electricity or the market rate (if higher) by guaranteeing rate base recovery, as follows:
    - first 100 MW—15 cents/kWh
    - second 100 MW—14 cents/kWh
    - third 100 MW—12 cents/kWh
    - fourth 100 MW—10 cents/kWh
    - fifth 100 MW—8 cents/kWh
- Offer low-interest loans for feasible and desirable biomass generation that meets exemplary environmental performance standards, with partial loan forgiveness for equipment that fails to perform to standard.

**Timing:** Tax credits and subsidies are available from 2009 through 2025; feed-in tariffs are guaranteed for the lifetime of a project, up to 25 years, for projects brought online between 2009 and 2015; loans are available for projects brought online between 2009 and 2015.

**Parties Involved:** All power producers operating qualifying facilities for incentives other than tax credits, which would be available to any grid-connected customer.

**Other:** The Energy Supply (ES) Technical Work Group (TWG) members were divided on whether this policy should apply to municipal solid waste to energy conversion.

## Implementation Mechanisms

Incentives to be considered include:

- Direct subsidies for purchasing and selling renewable technologies;
- Tax credits or exemptions for purchasing renewable technologies;
- Feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility;
- Government-sponsored or -facilitated loan programs;
- Tax credits for each kWh generated from a qualifying renewable facility; and
- Regulatory policies that provide incentives and/or assurance of cost recovery for utilities that invest in central station renewable energy systems.

In all instances, financial incentives should be structured in such a way as to promote feasible and desirable renewable energy development and minimize distortions to any existing markets involving renewable energy, or renewable energy feedstocks (e.g., biomass).

## Related Policies/Programs in Place

See the list of current and pending legislation posted by the South Carolina Energy Office, at http://www.energy.sc.gov/index.aspx?m=1&t=67. [TWG volunteers to identify legislation that applies.]

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

**Data Sources:**

*Renewable Energy Potential:* See ES-1.

*Cost of Renewable Energy:* See ES-1 for utility-scale costs.

*General Distributed Generation Cost and Performance Data:*

- Center for Sustainable Energy California (2007), "Statewide Self-Generation Incentive Program Data & Reports" (updated October 2007, 2.3 MB XLS [they now have a Jan. 8,

2008 update]). Available at: http://www.energycenter.org/ContentPage.asp?ContentID=279&SectionID=276&SectionTarget=35.

- GRI and NREL 2003—Gas Research Institute and U.S. DOE National Renewable Energy Laboratory (2003), Gas-Fired Distributed Energy Resource Technology Characterizations: Bringing You a Prosperous Future Where Energy Is Clean, Abundant, Reliable, and Affordable. Available at: www.eea-inc.com/dgchp_reports/TechCharNREL.pdf.
- Navigant Consulting (2006), "Energy Cost Savings Module for Customer-Sited DG," prepared for the Massachusetts DG Collaborative. Available at: http://masstech.org/renewableenergy/public_policy/DG/EnergyCostSavingsModule-Jan202006.zip.
- Synapse Energy Economics and Zapotec Energy (August 2005), *Feasibility Study of Alternative Energy and Advanced Energy Efficiency Technologies for Low-Income Housing in Massachusetts*, prepared for The Low-Income Energy Affordability Network, Action for Boston Community Development, and Action Inc. Available at: http://www.synapse-energy.com/cgi-bin/synapseProjects.pl?ClientName=+&ClientType=Other+Public+Interest+Group&Topic=Energy+Efficiency+%26+Load+Response&Year=+&submit=Submit.
- Distributed PV/small hydro costs based on GDS Associates study. Costs for biomass and distributed wind are from the above-noted California Self-Generation Incentive Program database and Synapse/Zapotec study.

**Quantification Methods:**

- Establish targets (or assumptions) for the type and the amount of renewables installed through 2020 including the size of renewables (i.e., small systems up to 50 kW and larger systems).
- Determine the potential biomass generation that meets environmental performance standards
- Determine the type and amount of renewable energy imported to South Carolina from an area directly connected to the South Carolina grid
- Estimate energy production from new renewable resources
- Apply financial incentives, as noted above, to each renewable energy resource
- Estimate the aggregate cost of renewable energy production & displaced emissions following ES-1.

**Key Assumptions:**

Table 6 presents the total South Carolina state budget for incentives scaled from the California budget by total utility revenues in 2006. The allocation percentages are based on assumption made by Center for Climate Strategy (CCS) analysts.

**Table 6. South Carolina budget assumptions for renewable energy**

| Resource | Allocation | Budget ($M) | kW/year in budget |
|---|---|---|---|
| Biomass | 35% | $13.3 | n/a |
| PV | 35% | $13.3 | 3,793 |
| Hydro | 20% | $7.6 | 2,168 |
| Wind | 10% | $3.8 | 1,084 |
| **Total** | | **$37.9** | **7,045** |

*Avoided Costs*: See ES-1.

*Displaced Emissions*: See ES-1.

*Cost of Renewable Energy Systems*: See ES-1 for most of renewables.

Other state processes may provide a basis for establishing assumptions for analysis.

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

## Feasibility Issues

See comments below.

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-4. Return on Investments in Energy Efficiency

## Policy Description

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

Under traditional rate making, costs incurred by utilities, including a return on investment, are recovered through the sales of electricity. Because EE and DG renewable energy sources can decrease the volume of electricity sales, traditional cost-recovery mechanisms have created a financial disincentive to utility support for energy efficiency and renewables.

In the short run (between rate cases), lost sales due to EE programs reduce revenue by the full tariffed rate, thereby undermining the utility's recovery of costs. When this net lost revenue is taken into account, utilities may be unable to recover costs and face profit losses for EE and DG measures.

The goal of this policy is to implement a regulatory model that equalizes the incentive for utilities to invest in cost-effective EE and DG with the incentive to invest in new supply resources. By equalizing utility earnings on demand-side management (DSM) and EE programs with earnings on traditional power supply, utilities will consider investment in EE in parity with investment in new conventional capacity.

This strategy is intended to be coupled with EE strategies being evaluated in the Residential, Commercial and Industrial TWG to achieve actual reductions in energy demand and in GHG emissions.

## Policy Design

**Goals:** The contemplated regulatory model would provide for the following:

- *Timely Recovery of Costs*—Provided utilities timely recovery of all costs associated with the implementation of DSM and EE programs. Depending on each utility's proposed plan, this should include the recovery of program costs and lost margins, as well as any incentives. These costs would be recovered through an annual DSM/EE adjustment clause and rider.
- *Recovery of Lost Revenues*—Include lost revenues experienced by the utility as a result of the implementation of DSM/EE programs in the costs recovered through the annual DSM/EE rider.
- *Financial Incentives*— Allow utilities to earn a financial incentive for the implementation of DSM/EE programs. Incentives may include sharing of savings achieved by the DSM/EE programs, or could be based on the capitalization of a percentage of avoided costs achieved by the programs.

Because parity in returns does not in itself guarantee any particular level of investment, equalization of revenues as a policy may be evaluated in a comparative framework. Assuming that all cost-effective EE is implemented, compare the cost and the level of EE achieved with and without equalization of utility revenues. The benefit of this policy will be its marginal contribution to the availability of cost-effective EE. If a method for estimating all cost-effective EE is not available, then the analysis may assume all EE up to 5 cents/kWh with and without the disincentive of net lost revenue as addressed through a mechanism that accomplishes the above goals.

**Timing:** Regulatory model implemented in 2008 and fully available in 2009.

**Parties Involved:** South Carolina Public Service Commission to implement rule, if necessary, affecting all investor-owned utilities.

**Other:**

This proposal contains some elements that are consistent with the conventional notion of "decoupling," which is designed to remove utility disincentives for pursuing EE by ensuring recovery of utility costs, regardless of the level of sales (i.e., utilities will not be penalized for effectively reducing their own sales.) It also has some features in common with Duke's proposed "Save-A-Watt" program in that the avoided cost of energy would be shared between he utility and the ratepayer. The current proposal goes beyond the concept of decoupling by:

- Ensuring that utilities' total *earnings* will not be adversely affected by pursuing EE efficiency instead of generation investments, and
- Providing an incentive payment for utilities, based on avoided cost, to promote additional investment in EE and load reduction.

The TWG has not endorsed any particular sharing ratio of avoided cost benefits between the utility and the consumer. Duke's proposal has a 90% share for the utility. In this analysis, we have provided results for a 90% utility share and a 10% utility share.

## Implementation Mechanisms

In general, we contemplate that whatever state policies are selected to achieve EE, they should include a provision for timely recovery of costs and appropriate financial incentives. Furthermore, for large commercial and industrial customers that can have the internal capacity to finance and implement EE measures and can demonstrate that they have previously implemented conservation measures that are comparable to what the utility offers, there should be consideration of an opt-out provision.

The following elements are central to the current proposal:

- Provide a financial structure that is comparable to new supply-side generation for utilities that invest in energy supply and use end-use technologies that are cost-effective and reduce energy consumption or demand. This structure can include (but is not limited to) decoupling, cost recovery, cost recovery capitalization, and lost revenues, and may also include utility incentives, such as shared savings or a percentage of avoided cost of generation.
- Require that the Public Service Commission establish rates and charges that ensure that the electric or gas utility's earnings, after implementation of cost-effective DSM/EE measures is

at least as high as the earnings would have been if the DSM/EE measures had not been implemented, without allowing for excessive, imprudent, or unreasonable returns.

## Related Policies/Programs in Place

TBD

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

**Data Sources:**

- *Cost of Energy Efficiency Measures:*
  - Forefront Economics, Inc., H. Gil Peach & Associates LLC, and PA Consulting Group, (July 24, 2007), *Duke Energy Carolinas DSM Action Plan: South Carolina Draft Report,* prepared for Duke Energy Carolinas.
  - GDS Associates, Inc. (2006), *A Study of the Feasibility of Energy Efficiency as an Eligible Resource as Part of a Renewable Portfolio Standard for the State of North Carolina*, Report for the North Carolina Utilities Commission, December 2006. Available at: http://www.ncuc.commerce.state.nc.us/reps/NCRPSEnergyEfficiencyReport12-06.pdf.
- *Experience in Other States on Cost of Energy Efficiency:*
  - Bill Prindle (2007), "Energy Efficiency: The First Fuel in the Race for Clean and Secure Energy," presentation at the National Action Plan for Energy Efficiency Southeast Energy Efficiency Workshop on September 28, 2007. Available at: http://www.epa.gov/solar/pdf/southeast_28sep07/prindle_new_napee_presentation_atlanta_9_28_07.pdf.
  - Martin Kushler, Dan York, and Patti White (April 2004), *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies,* Washington, DC: American Council for an Energy Efficient Economy. Available at: http://www.aceee.org/pubs/u041.htm.
  - Gene Fry, "Massachusetts Electric Utility Energy Efficiency Database," Massachusetts Department of Telecommunications and Energy, 2003 edition. Available at:
  - Heschong Mahone Group, Inc. (June 2005), *New York Energy $mart$^{SM}$ Program Cost-Effectiveness Assessment*, prepared for New York State Energy Research and Development Authority. Available at:
  - WGA 2006—Energy Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governor's Association (January 2006), *The Potential for More Efficient Electricity Use in the Western United States*. Denver, CO: Western Governors' Association. Available at: http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf.

- *Energy Efficiency Potential:*
  - GDS Associates, Inc. (2007), "Electric Energy Efficiency Potential Study for Central Electric Cooperative, Inc." Retrieved 10/1/07 from http://www.ecsc.org/newsroom/EfficiencyStudy.ppt.
  - Forefront Economics, Inc., H., Gil Peach & Associates LLC, and PA Consulting Group, (July 24, 2007), *Duke Energy Carolinas DSM Action Plan: South Carolina Draft Report,* prepared for Duke Energy Carolinas.
- *Avoided Cost of Electricity (Delivered):*
  - Duke Energy filing to South Carolina Public Service Commission (SCPSC), "Proceeding for Approval of the Public Utility Regulatory Policies Act of 1978 (PURPA) Avoided Cost Rates for Electric Companies—Letter Regarding Revisions to Schedule PP (SC)," July 27, 2007, Duke Energy Carolinas, LLC. Available at: http://dms.psc.sc.gov/matters/matters.cfc?Method=MatterDetail&MatterID=187531.
  - Progress Energy filing to SCPSC, "Proceeding for Approval of the Public Utility Regulatory Policies Act of 1978 (PURPA) Avoided Cost Rates for Electric Companies—Letter Regarding Revised Schedule CSP-23," November 29, 2007. Available at: http://dms.psc.sc.gov/attachments/8D4605A3-D0C6-1E0B-7E9AFC3D3422E8A0.pdf.

**Quantification Methods:**

- Project energy savings based on the stated electricity savings target (a 1% per year reduction in total annual consumption by 2015, increasing to 1.5% per year by 2020). Annual consumption will be adjusted each year based on the previous year's DSM impacts.
- Estimate the total cost of electricity savings using state-specific or region-specific data on cost of saved energy from electric energy efficiency measures.
- Estimate the GHG emission reductions through the electric energy efficiency measures..

**Key Assumptions:**

- *Discount Rate:* 5% real.
- *Avoided Cost of Electricity (Delivered):* $54.96/MWh (2006$), based on SC utility avoided cost filings. The actual implications of avoided electricity may be different for customers.
- *Transmission and Distribution (T&D) Electricity Losses:* 6% (consistent with the Energy Supply (ES) TWG assumptions).
- *Cost of Energy Efficiency Measures:*
  - For Duke Energy: 500 GWh of annual savings in the residential sector and about 300 GWh of annual savings in the nonresidential sector at a cost of about $0.03 per kilowatt-hour (kWh) of saved electricity. For a comparison, Duke's annual electricity sales are

5,440 GWh according to the U.S. Department of Energy's (DOE's) Energy Information Administration (EIA).[2]

- For North Carolina: See Table .

**Cost of energy efficiency measures for North Carolina**

| Sector | Present Value of Total Costs (2006$) | Value of Lifetime kWh Savings - Customer Meter Level | Levelized Cost per Lifetime kWh Saved |
|---|---|---|---|
| Residential Sector | $262,528,658 | 9,673,701,174 | $0.027 |
| Commercial Sector | $352,185,339 | 8,702,321,930 | $0.040 |
| Industrial Sector | $124,388,270 | 6,805,459,342 | $0.018 |
| **Total—All Sectors** | **$739,102,267** | **25,181,482,446** | **$0.029** |

Source: GDS Associates, Inc. 2006.

- For other states: See Table .

**Cost of energy efficiency measures for Other States**

| State/Utility | CSE ($kWh) | Program Year | Source |
|---|---|---|---|
| Western utilities | 0.025 | 1978–2004 | WGA 2006[3] |
| Northwest Energy | 0.02 | 2006 | Montana PSC Docket No.: D2005.5.88 07/12/06 |
| New York | 0.03 | 2004 | Heschong Mahone Group, Inc. 2005[4] |
| MA IOUs | 0.038 | 2002 | Gene Fry 2003[5] |
| California | 0.03 | n/a | ACEEE 20004[6] |
| Connecticut | 0.023 | n/a | ACEEE 20004 |
| New Jersey | 0.03 | n/a | ACEEE 20004 |
| Vermont | 0.03 | n/a | ACEEE 20004 |

[2] Forefront Economics, Inc., H. Gil Peach & Associates LLC, and PA Consulting Group (July 24, 2007), *Duke Energy Carolinas DSM Action Plan: South Carolina Draft Report,* prepared for Duke Energy Carolinas.

[3] Energy Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governor's Association (January 2006), *The Potential for More Efficient Electricity Use in the Western United States*. Denver, CO: Western Governors' Association. Available at: http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf.

[4] Heschong Mahone Group, Inc. (June 2005), *New York Energy $mart$^{SM}$ Program Cost-Effectiveness Assessment*, prepared for New York State Energy Research and Development Authority. Available at:

[5] Gene Fry, "Massachusetts Electric Utility Energy Efficiency Database," Massachusetts Department of Telecommunications and Energy, 2003 edition. Available at:

[6] Martin Kushler, Dan York, and Patti White (April 2004), *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies,* Washington, DC: American Council for an Energy Efficient Economy. Available at: http://www.aceee.org/pubs/u041.htm.

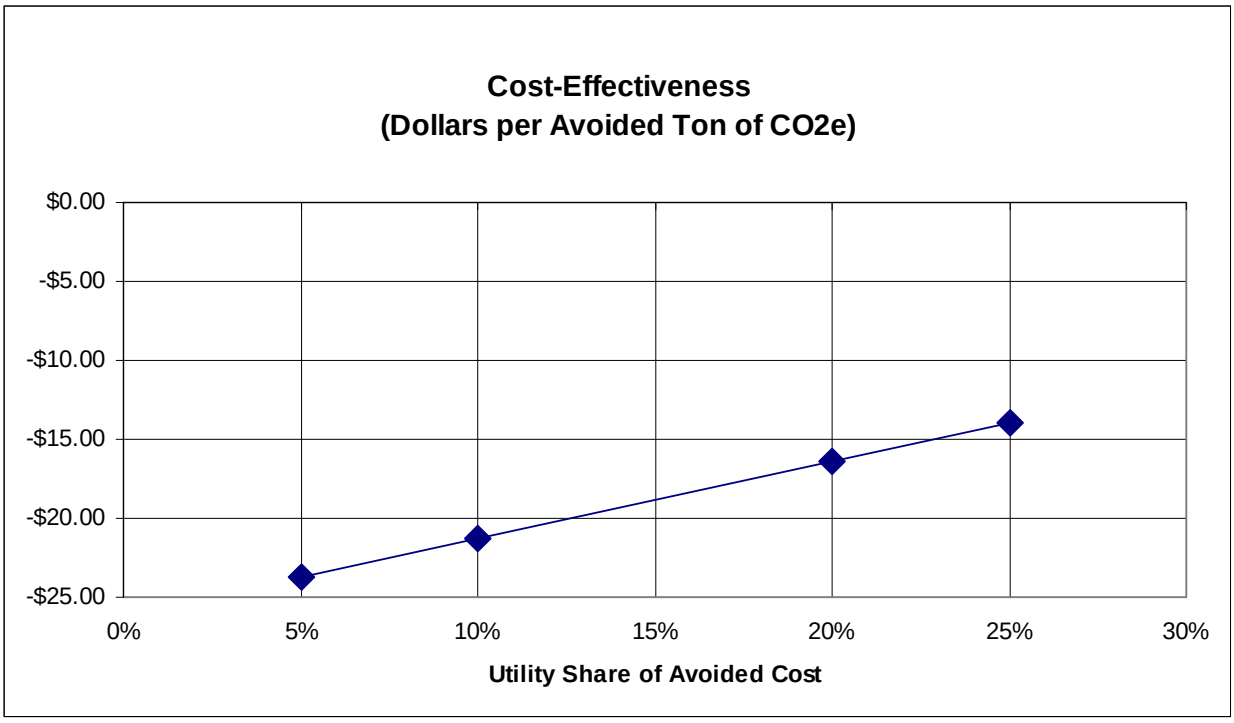
- *Efficiency Measure Lifetime*: 13 years on average,
- *Displaced Emissions, Electricity*: tons of $CO_2$-equivalent emissions per billion British thermal units 235 ($tCO_2e$/Bbtu) (placeholder from NC).

*Sharing of avoided energy cost benefit:* Analysis performed with sharing of:

- 90% to utilities (Duke Save-A-Watt proposal), and
- 10% to utilities

The Figure below shows the impact of varying utility shares from 5% to 25% on the ultimate cost savings for ratepayers. Below a utility share of 55% the policy has a net savings for consumers; above this level it has a net cost.

**Impact of varying utility shares on ratepayer cost savings**




The ES TWG and/or CECAC's assistance will be needed to craft details on the following assumptions:

- Specific financial incentive mechanism, if other than avoided cost sharing
- Proposed utility share of avoided cost, if mechanism is avoided cost sharing
- Targets for electricity and natural gas savings, if other thanRCI-1 targets shown here. Decoupling (or a related policy) in and of itself will not decrease usage

For each EE measure, energy savings will be assumed to continue until 2020 with no decay of program effects, because the study period is less than the average lifetime of EE measures. The

annualized program costs (amortized over a period of 13 years or longer, consistent with the life of the asset) will be included in the analysis through 2020.

This policy analysis does not include the costs and benefits of load management.

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

## Feasibility Issues

TBD – [as needed and approved by the TWGs]

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-5. New Nuclear Power

## Policy Description

Nuclear power currently provides about 20% of U.S. electricity supply and accounts for approximately 50% of the electricity produced in South Carolina. South Carolina currently has seven nuclear reactors, making it the state with the third highest total nuclear generating capacity. During operation, nuclear plants generate no GHG emissions, although there are GHG emissions associated with the mining, enrichment, and transport of nuclear fuel and the construction and decommissioning of plants. Nuclear power generation is the largest single source of noncarbon-emitting electric generation.

Electricity demand is increasing each year in South Carolina. Estimates are that it would take approximately 10 years to design, permit, and construct a new nuclear plant, making rapid action in this area imperative if expanded nuclear power generation is to play a role in mitigating GHG emissions in the near future. Recently enacted federal energy legislation includes financial incentives for new nuclear plants in an effort to jump-start the nuclear power industry, providing cost savings in-state for new nuclear facilities.

Reprocessing spent nuclear fuel significantly reduces the volume of high level-radioactive waste. Through reprocessing, the recovered uranium and plutonium can be recycled into new fuel. Recycling involves the re-enrichment of the recovered uranium for use in light-water-reactor fuel assemblies and the conversion of the recovered plutonium into mixed-oxide fuel assemblies, which also can be used in light-water nuclear reactors. This approach offers the benefits of significantly reducing the inventories of commercial spent nuclear fuel and plutonium, as well as reducing the total volume of waste requiring geologic disposal. Recycling technologies have evolved significantly since the United States abandoned commercial recycling in the 1970s and can now be deployed in a manner consistent with U.S. and international safety and nonproliferation standards.

The focus of this policy should be to recommend actions—e.g., state legislative and regulatory actions—that would support the construction of new nuclear power generating facilities in South Carolina, and to address the nuclear waste disposal issue by supporting the reprocessing and recycling of nuclear fuel.

## Policy Design

**Goals:** The goals of this policy are:

(1)(a) Quantify the costs and identify the benefits (to include avoidance of GHG emissions) associated with building new nuclear power plants in South Carolina.

(1)(b) Evaluate the economic, environmental, waste reduction, national energy security, and other implications of nuclear waste reprocessing-recycling in the South Carolina.

(2)(a) If new nuclear power is shown to be a viable option for new base-load generation in South Carolina, expeditiously implement applicable regulatory and legislative actions to support the construction of new nuclear plants in South Carolina

(2)(a) If reprocessing and recycling of spent nuclear fuel.is shown to be a viable option for South Carolina, expeditiously implement applicable regulatory and legislative actions to support the construction of such facilities.

**Timing** This policy would become effective immediately upon approval by the South Carolina General Assembly.

**Parties Involved:** Electric utilities, environmental advocacy groups, state legislators, county government, economic development leaders, manufacturer-business advocacy groups, and energy users/energy ratepayer advocacy groups.

**Other:** [As needed]

## Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

## Related Policies/Programs in Place

- South Carolina Electric & Gas (SCE&G)/Santee Cooper have plans for a new nuclear plant. (Plans are to apply for permits for two 1,100-MW units.)
- Savannah River National Laboratory, which is partnered with the Economic Development Partnership of Aiken and Edgefield counties, and EnergySolutions will each receive a part of the $10 million in Global Nuclear Energy Partnership grants to allow for detailed studies of the proposed nuclear waste recycling plants.
- Savannah River National Laboratory is applying for the nuclear recycling program.
- Duke Energy has applied for a new William S. Lee III Nuclear Station (possibly two 1,100-MW units) in Cherokee County.

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

Data Sources:

- Massachusetts Institute of Technology (2003), *The Future of Nuclear Power: An Interdisciplinary MIT Study*, ISBN: 0-615-12420-8. Available at: http://web.mit.edu/nuclearpower/.
- Catherine Morris et al. (June 2007), *Nuclear Power Joint Fact-Finding*, The Keystone Center. Available at: http://www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007(1).pdf.

- U.S. DOE, EIA (2007), "Assumptions to the Annual Energy Outlook 2007," Electricity Market Module. Available at: http://www.eia.doe.gov/oiaf/aeo/assumption/index.html.

**Quantification Methods:** [e.g. Life-cycle analysis on TWG approval]

**Key Assumptions:** [TBD, as needed on TWG approval]

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

Additional new nuclear power plants in South Carolina, as well as a nuclear fuel reprocessing-recycling plant, would contribute substantially to the South Carolina economy. Nuclear plants generate significant employment benefits during construction, as well as providing a number of long term jobs, creating economic activity in the region and supporting the tax base.

TBD – [as needed and approved by the TWGs]

## Feasibility Issues

While reprocessing of nuclear fuel may decrease certain high-level waste streams, concern has been raised that it could significantly increase other waste streams, including waste that is both radioactive and highly acidic. Reprocessing has also been found to be uneconomic in all current implementations. Finally, decreasing the waste stream would require a sufficient number of nuclear facilities which could use the reprocessed fuel as feedstock.

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-6. Green Power Purchases and Marketing

## Policy Description

This policy would establish a voluntary green power program offering a green power option to consumers throughout the state. The green power purchases are comprised of a variety of consumer-driven strategies to increase the production and delivery of low-GHG power sources.

Palmetto Clean Energy (PaCE) is an independent, nonprofit organization established in August 2007. It consists of representatives from the South Carolina Office of Regulatory Staff, South Carolina Energy Office, Duke Energy Carolinas, Progress Energy Carolinas, and SCE&G. PaCE is a renewable energy program designed to encourage the development of renewable energy resources that improve the environment through reduced GHG emissions. Consumers can elect to fund green power purchases by South Carolina investor-owned electrical utilities.

Contributions to the program help provide financial incentives for generators of electricity from renewable sources. To supplement the activities of voluntary green power programs in South Carolina (PaCE and Santee Cooper Green Power), this policy provides support for marketing green power to consumers and for the developers of renewable generation through state-funded green power initiatives coordinated by the South Carolina Energy Office.

The relationship between this policy and a renewable portfolio standard needs to be determined by the CECAC.

## Policy Design

**Goals #1:** Educate consumers about the power (fuel) sources and emissions associated with the electricity they use.

**Goals #2:** Establish a Voluntary Green Power Utility Program.

**Timing:** Operational by April 2008; 1%–5% participation of retail customers by 2012.

**Parties Involved:** South Carolina Office of Regulatory Staff, South Carolina Energy Office, Duke Energy Carolinas, Progress Energy Carolinas, SCE&G, Santee Cooper, Lockhart Power Company, and the Public Service Commission of South Carolina.

**Other:** Definition of "green power"—A renewable energy resource includes solar (roofing materials with built-in solar PV cells, solar PV panels erected on roofs, solar water-heating and solar space-heating systems; wind; hydroelectric (less than 10 kW); geothermal; ocean current or wave energy; biomass resource, including agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, and landfill methane; waste heat derived from a renewable energy resource and used to produce electricity; or hydrogen derived from a renewable energy resource.

**Goal #3:** Sponsor green power initiatives.

To supplement the activities of voluntary green power programs in South Carolina (PaCE and Santee Cooper Green Power), this policy also provides marketing and renewable resource development assistance through state-funded green power initiatives coordinated by the South Carolina Energy Office.

**Timing:** Fully implemented by 2012.

**Parties Involved:** South Carolina Energy Office, Duke Energy Carolinas, Progress Energy Carolinas, SCE&G, Santee Cooper, Lockhart Power Company, the Public Service Commission of South Carolina and PaCE.

**Other:** [As needed]

## Implementation Mechanisms

Table 7 presents demand- and supply-side recommendations for implementing this policy option.

**Table 7. Demand- and supply-side recommendations for implementing ES-6**

| Demand-Side Recommendations | Supply-Side Recommendations |
|---|---|
| • Provide consumer education programs and green power promotional materials.<br>• Provide incentives for new or expanding businesses to purchase power through voluntary green power programs.<br>• Provide tax credits for companies purchasing from power through voluntary green power programs.<br>• Provide incentives for homebuilders to include one year of green energy through PaCE with the purchase of new homes<br>• Provide assistance and participation in consumer and business marketing programs.<br>• Provide Web-based technical assistance to consumers. (See Maine Public Utilities Commission program.)<br>• Provide incentive through reward and recognition for Industry to purchase power through voluntary green power programs. | • Provide support for R&D on new and developing renewable energy technologies.<br>• Provide support for feasibility studies of various renewable energy technologies.<br>• Provide a mechanism for long-term contract guarantees for renewable energy producers.<br>• Provide support for renewable energy development projects, thereby leading to more options and sales tools.<br>• Provide low- or no=interest loans for qualified developers of renewable energy projects.<br>• Provide incentive through reward and recognition for the top generators of green power. |

## Related Policies/Programs in Place

- Green Power program through Santee Cooper (landfill methane—five sites), expanding into solar. Eighteen electric co-ops also participate in the green power program through Santee Cooper.
- Palmetto Clean Energy (PaCE).
- North Carolina Power.

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

Table 8 presents the estimated GHG reductions and net costs of or savings from this policy option.

**Table 8. Estimated GHG reductions and net costs of or savings from ES-6**

| ES-6 Options | GHG Reductions ($MMtCO_2e$) 2012 | 2020 | Total 2009-2020 | Gross Costs (Million $) | Gross Benefits (Million $) | Net Present Value 2009–2020 (Million $) | Cost-Effectiveness ($/tCO_2e$) |
|---|---|---|---|---|---|---|---|
| ES-6 @ 1% | 0.2 | 0.2 | 1.7 | $46 | –$0 | $46 | $27 |
| ES-6 @ 5% | 0.8 | 0.8 | 8.3 | $223 | –$0 | $223 | $27 |

**Data Sources:**

- "Santee Cooper Fingertip Facts", Jan. 1, 2006–Dec. 31, 2006, page 24. Available at: https://www.santeecooper.com/portal/page/portal/SanteeCooper/AboutUs/CorporatePublications/2006_Fingertip_Facts.pdf.
- NREL 2007—Lori Bird and Marshall Kaiser (October 2006), *Trends in Utility Green Pricing Programs*, NREL/TP-640-40777, U.S. DOE, National Renewable Energy Laboratory. Available at: http://www.nrel.gov/docs/fy07osti/40777.pdf.
- U.S. DOE, Office of Energy Efficiency and Renewable Energy, "Can I Buy Green Power in My State?" Accessed December 6, 2007, at: http://www.eere.energy.gov/greenpower/buying/buying_power.shtml?state=SC&print.
- GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.
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- Ryan Wiser and Mark Bolinger (May 2007), *Annual Report on U.S. Windpower Installation, Cost, and Performance Trends: 2006,* U.S. DOE, Lawrence Berkeley National Laboratory. Available at: http://www.nrel.gov/docs/fy07osti/41435.pdf.
- Ryan Wiser, Mark Bolinger, Peter Cappers, and Robert Margolis (January 2006), *Letting the Sun Shine on Solar Costs: An Empirical Investigation of Photovoltaic Cost Trends in California*, LBNL-59282, U.S. DOE, Lawrence Berkeley National Laboratory. Available at: http://eetd.lbl.gov/ea/EMP/reports/59282.pdf.

**Quantification Methods:**

- Identify a resource mix of renewable energy in conjunction with ES-1 that will be developed under this policy option and costs.
- Estimate ramp-in to meet the program participation goal for a low-participation scenario and a high-participation scenario.
- Estimate the average amount of green power purchases per participant and the number of participants per year.
- Estimate the costs of the green power purchasing program to customers.
- Estimate the costs of energy production from renewable energy sources following ES-1.
- Estimate the GHG emission reductions associated with the green power program.

**Key Assumptions:**

*Amount of Green Power Purchased by Each Customer*

- Table 9 presents the assumed average purchases of renewable energy per residential customer (kWh/year).

**Table 9. Average purchases of renewable energy per residential customer (kWh/yr)**

| % of Customers | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| 100% | 2,400 | 2,900 | 3,400 | 4,000 | 4,200 | 4,400 |

Source: NREL 2006, p. 10.

- The average purchase of renewable energy per residential customer is assumed to grow at the same rate indicated by the NREL 2006 data above (but starting in 2009), until customers are purchasing a maximum of 30% of their total consumed electricity as green power.
- This ramp-in rate is consistent with current green power purchasing in South Carolina. According to an employee for the Santee Cooper Green Power Program, customers currently purchase about 2,400 kWh/year of green power.
- The average purchase of renewable energy per commercial and industrial customer (kWh/year) is assumed to be 30% of their total consumption.
- Table 10 presents the umber of customers, broken down by sector, and total purchases for Santee Cooper's Green Power Program in 2006:

**Table 10. Number of customers involved in the Santee Cooper Green Power Program in 2006**

| Number of customers in the Santee Cooper Green Power Program in 2006 | |
|---|---|
| Number of Residential Customers | 1,527 |
| Number of Commercial Customers | 283 |
| Number of Industrial Customers | 1 |
| Customers Reached Through Cooperatives and Municipalities | 2,519 |
| **Green Power Sales (MWh)** | **15,984** |

- The current level of participation in green power programs in South Carolina is assumed to be approximately the total number of customers in the 2006 Santee Cooper Green Power Program, divided by the total number of 2006 retail electricity customers in South Carolina.
- The participation rate is assumed to steadily increase between 2009 and 2012.
- The participation rate is assumed to be constant after it reaches the goal in 2012.
- The projected number of retail electricity customers in South Carolina by sector.
- The projected retail electricity sales in South Carolina.
- The emissions associated with avoided fossil fuel generation and renewables (see ES-1).
- The average premium for green power purchases is 3 cents/kWh based on the following existing programs:
    - Santee Cooper (3 cents/kWh): Primarily uses landfill gas.
    - North Carolina Power (4 cents/kWh): Uses a mix of solar, wind, landfill gas, and biomass. For purchases of more than 10 MWh per month, the premium is 2.5 cents/kWh, with a different mix of renewables, including small hydroelectric and clean wood waste.
    - The national average premium as reported in 2006 by NREL (2.6 cents/kWh).
- The premium is assumed to cover program costs as well as the incremental costs of green power.
- The avoided GHG emissions associated with landfill gas do not include methane, since it is assumed that the landfill gas would otherwise be flared.

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

Would help to provide local employment and grow renewable energy use.

## Feasibility Issues

Interaction with other options to promote renewable energy needs to be taken into account.

Third-party verification may be necessary and would add incrementally to program cost,

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-7. Renewable Energy Technology Businesses

## Policy Description

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

The CECAC accepted this policy priority for analysis in order to capture a comprehensive range of options for attracting renewable energy technology businesses to South Carolina.

## Policy Design

**Goals:**

- South Carolina has a internationally respected renewable energy business cluster, making it an obvious destination point for company facilities.
- South Carolina is a top-five U.S. state (per capita) for new renewable energy installations per year.
- South Carolina ranks as a leader in higher education and technical education for R&D and implementation of renewable technologies.

**Timing:**

- January 2009: State legislators are educated on the magnitude of the economic potential for renewable energies in South Carolina.
- July 2009: Incentives are in place for promoting widespread adoption of renewable energy in South Carolina.
- December 2009: A plan is in place for luring businesses to South Carolina (includes an information packet, materials, policies, marketing, etc.).
- October 2010: Programs are in place at universities, colleges, and technical schools for renewable energy R&D, training, and education.
- January 2010: A renewable energy cluster in place with two to five businesses signed on.
- 2012: South Carolina cracks the top-five list of states with new renewable energy installations.

**Parties Involved:** State and local governments, community and business leaders, citizens, education facilities, students, and visitors.

## Implementation Mechanisms

Elements of this policy could include the following policies and incentives:

- Incentives for business operations:
  - Tax credits
  - Low-cost financing
  - Business energy tax credit
  - Alternative Energy Product Manufacturers Tax Credit (as in New Mexico)
- Policies for promoting locations in South Carolina:
  - Recruitment marketing plan (for developing a state renewable cluster)
  - Infrastructure improvement assistance
  - Workforce and wage level availability
  - Reliable and reasonably priced power
  - Mothballed plants and analyzed or potential sites
  - Railways, roadway, transportation hubs identified and targeted
  - Trained workforce—quantify and develop
  - Increased incentives for projects utilizing in-state manufactured equipment
  - Cost of living in South Carolina—positive part of promotion
  - International presence in South Carolina—positive attraction
  - South Carolina is good location for manufacturing engineers
  - Job training plan
  - R&D plan
- Market-generating policies/incentives (overlap with other ES options):
  - Renewable energy feed-in production incentive
  - Energy efficiency and renewable energy bond program
  - Sales and tax abatement on capital equipment
  - Statewide net metering
  - Statewide interconnection standards
  - Renewable portfolio standard
  - Tax credits
- Other policies and incentives:
  - Educating legislators on the potential of renewable technologies (world/state economic potential analysis)
  - Implementation of renewable technologies on government owned facilities

## Related Policies/Programs in Place

None identified.

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

The costs and benefits associated with this policy will not be quantified.

**Data Sources:** [TBD by CCS on TWG approval]

**Quantification Methods:** [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

**Key Assumptions:** [TBD, as needed on TWG approval]

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

## Feasibility Issues

TBD – [as needed and approved by the TWGs]

## Status of Group Approval

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]

# ES-8. Distributed Renewable Energy

## Policy Description

Distributed generation refers to the production of electricity at or near the sites of consumption. Distributed renewable energy[7] is energy specifically generated by naturally replenishing resources. The production of renewable energy results in few or no GHG emissions. Institutional and market barriers to distributed renewable energy include:

- Inadequate information;
- Institutional barriers to grid interconnection;
- Community barriers (e.g., local covenants and restrictions);
- Limited availability of qualified contractors;
- High transaction costs;
- High financing costs (e.g., due lender unfamiliarity and perceived risk);
- Interconnection rules (e.g., standby fees, exit fees);
- Ownership of renewable energy credits (RECs);
- Pricing of net generation; and
- Failure of the market to value the public benefits of renewable technologies and the social cost of fossil fuel technologies.

These barriers can be overcome through a suite of financial and regulatory redresses, as well as through information and public education campaigns.

This policy should identify all renewable energy sources that could lead to possible distributed generation options for residences and commercial and industrial facilities, as well as the uncertainties and risks associated with greater adoption of these resources. In addition, this policy should identify and examine current and potential barriers impeding current and interested participants. Finally, it should identify and propose specific incentives or policies that would eliminate or limit barriers and expand distributed generation in South Carolina, and should quantify the impact of distributed renewable energy goals.

## Policy Design

**Definition:** Distributed renewables include solar PV and solar thermal; wind power; micro-hydropower (< 20MW); fuel cells using renewable fuels; biomass, including nonwoody energy crops, wood wastes and agricultural waste; methane from animal waste; and geothermal.

[7] For the purpose of this policy description, please consider Solar Hot Water systems apart of distributed renewable energy.

**Goal:**

- 3 MW per year of new distributed renewable generation (this numerical goal is for analytical purposes only, and does not carry TWG's endorsement of the "best" number).

**Timing:** New distributed renewable generation beginning at __ MW in 2009, increasing to __ MW per year by 2014 and thereafter.

**Parties Involved:** Any industrial, commercial, or residential entity operating qualifying distributed renewable energy systems, whether directly connected to the South Carolina grid or otherwise could participate.

**Other:**

## Implementation Mechanisms

Elements of this policy could include the following policies and incentives:

- Adoption of Interstate Renewable Energy Council Model Interconnection Standards and Procedures for Small Generator Facilities Statewide.
- Adoption of Interstate Renewable Energy Council Model Net-Metering Rules Statewide.
- Uniform permitting standards for large/industrial distributed renewable generation.
- State licensing and/or training for distributed renewable generation installers and contractors.
- Consideration of adoption by state regulatory authorities of rate designs (possibly incorporating into the rate design a value for offsetting $CO_2$ emissions), coupled with the necessary metering technology, that promote reduction in GHG emissions by encouraging consumers to install renewable distributed generation systems.
- Financial incentives, including:
    - Expand/increase existing corporate tax credits to include all qualifying distributed renewable energy systems.
    - Expand/increase existing personal tax credits to include all qualifying distributed renewable energy systems.
    - Expand the state rebate program for solar thermal installations on EarthCraft homes to all qualifying distributed renewable energy systems and all homes.
    - Institute a sales tax exemption for distributed renewable energy systems
    - Institute a property tax exemption for distributed renewable energy systems.
    - Set distributed renewable energy procurement standards for the state government.
    - Provide grants and incentive programs for schools and higher education institutions unable to benefit from state and federal tax incentives.

## Related Policies/Programs in Place

None identified.

## Type(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

## Estimated GHG Reductions and Net Costs or Cost Savings

**Data Sources:**

*Renewable Energy Potential:*

- GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.
- South Carolina Energy Office (April 9, 2007 rev.), *Biomass Energy Potential in South Carolina: A Conspectus of Relevant Information*—Final Report, and Southeast Biomass State and Regional Partnership. Available at: http://www.energy.sc.gov/publications/Biomass Conspectus 4-10-07.pdf.
- Robert A. Harris, et al., *Final Report to the South Carolina Forestry Commission on Potential for Biomass Energy Development in South Carolina*, U.S. Department of Agriculture, U.S. Forest Service and South Carolina Forestry Commission. Available at: http://www.state.sc.us/forest/prod1004.pdf.
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- Joseph R.V. Flora and Cyrus Riahi-Nezhad (August 2006), *Availability of Poultry Manure as a Potential Bio-Fuel Feedstock for Energy Production*, submitted to the South Carolina Energy Office Available at: http://www.scbiomass.org/Publications/Poultry Litter Final Report.pdf.

*Cost of Renewable Energy:*

- GDS Associates, Inc., and La Capra Associates, Inc. (September 12, 2007), "Analysis of Renewable Energy Potential in South Carolina: Renewable Resource Potential—Final Report," prepared for Central Electric Power Cooperative, Inc. Available at: http://www.ecsc.org/newsroom/RenewablesStudy.ppt.
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- Ryan Wiser, Mark Bolinger, Peter Cappers, and Robert Margolis (January 2006), *Letting the Sun Shine on Solar Costs: An Empirical Investigation of Photovoltaic Cost Trends in California*, LBNL-59282, U.S. DOE, Lawrence Berkeley National Laboratory. Available at: http://eetd.lbl.gov/ea/EMP/reports/59282.pdf.


*General DG Cost and Performance Data:*


- Center for Sustainable Energy California (2007), "Statewide Self-Generation Incentive Program Data & Reports" (updated October 2007, 2.3 MB XLS [they now have a Jan. 8, 2008 update]). Available at: http://www.energycenter.org/ContentPage.asp?ContentID=279&SectionID=276&SectionTarget=35.
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- Navigant Consulting (2006), "Energy Cost Savings Module for Customer-Sited DG," prepared for the Massachusetts DG Collaborative. Available at: http://masstech.org/renewableenergy/public_policy/DG/EnergyCostSavingsModule-Jan202006.zip.
- Synapse Energy Economics and Zapotec Energy (August 2005), *Feasibility Study of Alternative Energy and Advanced Energy Efficiency Technologies for Low-Income Housing in Massachusetts*, prepared for The Low-Income Energy Affordability Network, Action for Boston Community Development, and Action Inc. Available at: http://www.synapse-energy.com/cgi-bin/synapseProjects.pl?ClientName=+&ClientType=Other+Public+Interest+Group&Topic=Energy+Efficiency+%26+Load+Response&Year=+&submit=Submit.


**Quantification Methods:**

- Identify distributed renewable energy potential in South Carolina, and define the resource mix.
- Project energy production from new renewable energy-based distributed generation development through 2020.
- Estimate the cost of energy production from the distributed generation development.
- Estimate the benefits of the above as in the avoided costs of electricity.
- Estimate GHG emission reductions from the distributed generation development.

**Key Assumptions:**

*Capital and O&M Costs of Renewable Energy Technologies* See ES-1.

*Emission Factors*:

*Discount Rate*:

## Key Uncertainties

TBD – [as needed and approved by the TWGs]

## Additional Benefits and Costs

Benefits of distributed renewable energy accrue to owners of the resource, the public, utilities, and the economy. In particular, for distributed renewable energy resource, owner benefits could include:

- Reduced utility costs
- Revenue from net generation
- Stabilized costs on the portion of utility replaced renewably
- Revenue from selling RECs

For the public, benefits could include:

- Reduced air pollution
- Increased renewable energy awareness
- Increased energy security/reliability
- Technological innovation
- Reduced export of South Carolina energy dollars

For utilities, benefits could include:

- Reduced peak demand and associated expenses
- Reduced system load (e.g., transmission)
- Avoided cost of new transmission and generation
- Reduced transmission and distribution losses
- Expanded resource investment opportunities

For the economy, benefits could include:

- Expanded renewable energy markets (including service business opportunities, South Carolina employment opportunities, and creating a marketplace where renewable energy manufacturing businesses will want to locate)
- Increased disposable income for consumers

- Reduced export of South Carolina energy fuel dollars

## Feasibility Issues

Uncertainties and risks associated with distributed renewable generation and their increased adoption also exist. Can increased adoption of distributed renewable generation lead to increased costs for utilities? How will owners of distributed generation resources interface with wholesale electricity markets? How reliable will distributed renewable resources be? What will the future capital investment requirements be? How long will federal and other incentives for distributed renewable generation last? How will grid-connected distributed renewable energy affect system reliability? Also uncertain is the status of the CECAC's approval.

Pending – [until CECAC moves to final agreement at Meeting #5 or #6]

## Level of Group Support

TBD – [blank until CECAC Meeting #5 or #6]

## Barriers to Consensus

TBD – [blank until final vote by the CECAC]