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## Catalog of State GHG Reduction Policy Actions Energy Supply (ES)

A catalog of state-level, greenhouse gas (GHG)-reducing actions and policy options prepared by the Center for Climate Strategies (CCS) and the Kentucky Climate Action Plan Council, based on actions undertaken or considered in state-wide climate change action plans by multi-stakeholder groups in a wide cross-section of U.S. states and by state, local, and private participants.

### Key to Future Rankings of Options in the Tables That Follow:

Potential GHG Emission Reductions <sup>1</sup>	Potential Cost or Cost Savings <sup>1, 2</sup>
<b>High (H):</b> At least 1.0 million metric tons (MMt) carbon dioxide equivalent (CO <sub>2</sub> e) per year by 2020	<b>High (H):</b> \$50 per metric ton CO <sub>2</sub> e (tCO <sub>2</sub> e) or above
<b>Medium (M):</b> From 0.1 to 1.0 MMtCO <sub>2</sub> e per year by 2020	<b>Medium (M):</b> \$5 to \$50/tCO <sub>2</sub> e
<b>Low (L):</b> Less than 0.1 MMtCO <sub>2</sub> e per year by 2020, or 1 MMtCO <sub>2</sub> e by 2050	<b>Low (L):</b> Less than \$5/tCO <sub>2</sub> e
<b>Uncertain (U):</b> Not able to estimate at this time	<b>Uncertain (U):</b> Not able to estimate at this time
<sup>1</sup> Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently of other measures.	
<sup>2</sup> Costs are denoted by a positive number. Cost savings (i.e., “negative costs”) are denoted by a negative number.	

**Definition of “Priorities for Analysis”:**

- **High:** High-priority options will be analyzed first.
- **Medium:** Medium-priority options will be analyzed next, time and resources permitting.
- **Low:** Low-priority options will be analyzed last, time and resources permitting.

***Important Note: The state actions are numbered in this catalog solely for convenience in referencing them. Their numbers do NOT reflect a ranking or prioritization of the actions.***

## Energy Supply (ES)

*Note that this listing will be developed more fully during the ES Technical Work Group (TWG) process. TWG members are encouraged to provide input on policies and programs in place in Kentucky to assist in defining baselines. The “Notes” column should be used to record recently enacted policies and programs in Kentucky relevant to state actions in the catalog.*

Option No.	Greenhouse Gas (GHG) Reduction Policy Option	Potential GHG Emissions Reduction	Cost per Ton	Externalities, Feasibility Considerations	Priority for Analysis	Notes / Related Actions in Kentucky
<b>ES-1</b>	<b>EMISSION POLICIES AND OVERARCHING ITEMS</b>					
1.0	Overarching Items					
1.1	GHG Cap and Trade					
1.2	Carbon/GHG Tax					
1.3	Generation Performance Standards and/or Mitigation Requirements for Electricity					
1.4	GHG Targets or GHG Performance Standards					
1.5	Technology Research and Development					Advanced Battery Manufacturing Center at the University of Kentucky (UK). Join effort of Energy and Environment Cabinet (EEC), UK, and Argonne National Laboratory will conduct advanced automotive battery manufacturing research and development.

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1.6	Integrated Resource Planning					Utilities in Kentucky (KY) have had to prepare Integrated Resource Plans since the 1990s. These plans do not currently require the quantification of environmental risks and costs associated with greenhouse gases (GHGs).
1.7	Carbon Markets					
1.8	Midwest Renewable Energy Planning Group					Might be better considered in the Cross-Cutting Issues TWG.
<b>ES-2</b>	<b>RENEWABLE ENERGY AND ENERGY EFFICIENCY</b>					
2.1	Renewable and/or Environmental Portfolio Standard					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) recommends the adoptions of Energy Efficiency Resource Standards sufficient to meet a 2025 goal of a 16% reduction below business-as-usual energy requirements through efficiency, and implement an RPS with the goal to triple the generation of renewable energy to 1000 megawatts (MW). An RPS, a Clean Energy Portfolio Standard, and an EEPS have been considered by the State Legislature.

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2.2	Grid-Based Renewable Energy Incentives and/or Barrier Removal					Incentives for the Energy Independence and Security Act (EISA) include tax incentives available for up to 25 years, up to a maximum of 50% of the capital investment.
2.3	Distributed Renewable Energy Incentives and/or Barrier Removal					EISA incentives include tax incentives available for up to 25 years, up to a maximum of 50% of the capital investment.
2.4	Combined Heat and Power Incentives and/or Barrier Removal					
2.5	Green Power Purchases and Marketing					
2.6	Pricing Strategies to Promote Renewable Energy (e.g., Net Metering)					Utilities are required to allow net metering of electricity up to 30 kilowatts and only up to the customer's usage. This option would remove this limit and have utilities purchase excess production at the customer's retail rate.
2.7	Renewable Energy Development Issues (Zoning, Siting, etc.)					
2.8	Demand-Side Energy Efficiency (RCI Focus)					

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2.9	Hydro Efficiency Improvements, Capacity Increase, and Barrier Removal					
2.10	Utility Energy Efficiency Incentives and Barrier Removal					KY's demand-side management (DSM) statute, KRS 278.285, allows utilities to recover the cost of providing DSM programs, including the net revenues lost due to the programs.
2.11	Consumer Energy Efficiency Incentives and Barrier Removal					
2.12	Research and Development for Renewable Technologies					
2.13	Co-Location or Integration of Energy-Producing Facilities					
2.14	Wind Energy Potential Evaluation					The National Renewable Energy Laboratory has estimated that Kentucky has 40,000 MW of wind potential at a 100-meter hub height.
2.15	Photovoltaic Demonstration Projects					
2.16	Inclined Block Rates					Also proposed in RCI-1.14 and RCI-5.4.
2.17	Feed-in-Tariff					Feed-in tariffs have been considered in the State Legislature.
2.18	Pyrolysis Demonstration/ Evaluation Projects					

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ES-3	<b>FOSSIL FUEL AND NUCLEAR ELECTRICITY</b>					
3.1	Advanced Fossil Fuel Technology (IGCC, CCSR, Advanced Pulverized Coal, CFB) Incentives, Support, or Requirements					<p>The KY Geologic Survey (KGS) conducted a feasibility study of carbon capture, utilization, and sequestration in KY. That study has resulted in development of projects involving actual carbon dioxide (CO<sub>2</sub>) sequestration in a test well in Hancock County, and planning for another test well in Eastern Kentucky.</p> <p>The KY Department for Energy Development and Independence (DEDI) has a Request for Information out for sites and partners to test sequestration of locally produced CO<sub>2</sub>.</p> <p>EEC has helped provide funds to CAER to commercialize sequestration of CO<sub>2</sub> emissions from power plants in an algae bioreactor.</p> <p>The Commonwealth supports the Carbon Management Research Group (CMRG), a consortium of major power companies, the UK Center for Applied Energy (CAER),</p>

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						<p>and the EEC. The CMRG will carry out a 10-year, \$24-million research program to develop and demonstrate cost-effective, practical technologies for reducing and managing CO<sub>2</sub> in existing coal-fired electric power plants. There are three main research projects envisioned:</p> <ul style="list-style-type: none"> <li>• Investigation of post-combustion CO<sub>2</sub> control technologies using the CAER pilot plant. The CAER will complete a detailed parametric testing for the particular coal that will be fired in a slip-stream field-testing site and provide the optimum operational conditions as well as solvent management protocol.</li> <li>• Slip-stream investigation of post-combustion CO<sub>2</sub> control technologies at a consortium power plant. The CAER will complete a portable slip-stream apparatus fabrication, installation, and commissioning.</li> <li>• Development of chemical looping combustion/gasification for solid fuels. The CAER will complete design and fabrication of a bench-scale redox apparatus.</li> </ul>

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3.2	Efficiency Improvements and Repowering Existing Plants					
3.3	Biomass Co-firing at New Fossil Fuel Power Stations					<p>“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) states KY’s forest resources can potentially contribute more than 50% of KY’s renewable energy potential, and calls for the state to review its policies and regulations to encourage the responsible, sustainable use of woody biomass.</p> <p>The CAER is partnering with the East Kentucky Power Cooperative (EKPC) on a pilot project to co-fire biomass at EKPC’s circulating fluidized-bed generators.</p> <p>See the Governor’s Biomass Task Force Report:  <a href="http://www.energy.ky.gov/NR/rdonlyres/EB1A582B-7FC4-440D-A697-D673929A5B55/0/FinalReport.pdf">http://www.energy.ky.gov/NR/rdonlyres/EB1A582B-7FC4-440D-A697-D673929A5B55/0/FinalReport.pdf</a>.</p>
3.4	Nuclear Power Review, Support, and Incentives [not applicable in Kentucky]					<p>“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) calls for legal hurdles to the successful inclusion of nuclear power in Kentucky’s energy mix to be examined. Specifically, removal or</p>

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						revision of the legislative ban on new nuclear power plants must be addressed, and Incentives that reduce the risk of capitalizing and financing a new power plant should be considered.
3.5	Relicensing/Up-rating Existing Nuclear Power [not applicable in Kentucky]					
3.6	New Nuclear Energy Capacity					<p>“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) calls for research to be conducted to assess the desirability of co-locating nuclear power plants with advanced coal conversion plants to assess the effects on reducing CO<sub>2</sub> emissions, provide ready access to electricity and/or steam, and possibly use waste heat for the coal conversion process.</p> <p>The Legislature has discussed lifting the ban on new nuclear power plants.</p>
<b>ES-4</b>	<b>FOSSIL FUEL PRODUCTION, PROCESSING, AND DELIVERY</b>					
4.1	Oil and Gas Production: GHG Emission Reduction Incentives, Support, or Requirements					

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4.2	Natural Gas Transmission and Distribution					
4.3	Oil Refining: GHG Emission Reduction Incentives, Support, or Requirements					
4.4	Coal Production: GHG Emission Reduction Incentives, Support, or Requirements					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) states Kentucky will produce the equivalent of 100% of its annual natural gas requirement by 2025 by augmenting in-state natural gas production with synthetic natural gas (SNG) from coal-to-gas processing. The plan calls for more research by the CAER, and a Public Service Commission administrative case should be initiated to ensure that Kentucky local distribution companies and customers are not harmed by direct sales of gas from SNG producers to industrial plants.
4.5	Coal-to-Liquids and Gas-to-Liquids Production: GHG Emission Reduction Incentives, Support, or Requirements					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) states the goal for Kentucky to develop a coal-to-liquids (CTL) industry that will use 50 million tons of coal per year to produce 4 billion gallons of liquid fuel per year by 2025.

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						<p>To accomplish this, the plan calls for Kentucky to sanction two 500-million-gallon-per-year (approximately 35,000 barrels per day) CTL fuel facilities in both 2013 and 2014, and then two additional 480-million-gallon-per-year CTL fuel facilities by 2018, and two more by 2025, for a total of eight new CTL facilities. The plan advises Kentucky to evaluate its current coal mining capabilities to ensure that it can achieve the necessary levels of coal production to support both coal-fired electricity generation and the development of a CTL industry in the near term.</p> <p>EISA promotes development of alternative fuel facilities or gasification facilities that are carbon capture ready and use coal or biomass as the primary feedstock.</p>
4.6	Low-GHG Hydrogen Production Incentives and Support					
4.7	Shale Gas Development					
4.8	Infrastructure to Facilitate Transition to Natural Gas in Transportation					This is analogous to TLU-3.6, Alternative-Fuel Infrastructure Development.

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<b>ES-5</b>	<b>CARBON CAPTURE AND STORAGE OR REUSE (CCSR)</b>					
5.1	CCSR Enabling Policies (Administration, Regulation, Liability)					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) states the goal that by 2025, Kentucky will have evaluated and deployed technologies for carbon management, with use in 50% of KY’s coal-based energy applications. Also, legal hurdles to successful carbon capture and storage are to be examined, with recommended legislative solutions provided to the 2010 General Assembly.
5.2	CCSR Incentives and Infrastructure					
5.3	CCSR Research and Development					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) calls for more support of the Carbon Management Research Group (CMRG), which will carry out a 10-year program of research to develop and demonstrate cost-effective and practical technologies for reducing and managing CO <sub>2</sub> emissions in existing coal-fired electric power plants. Also, the EEC should work closely with university researchers and industry partners to

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						undertake one large-scale carbon mitigation project to utilize algae to capture carbon from flue gases, and then convert the algae to biofuels.  DEDI has an RFI out for sites and partners to test sequestration of locally produced CO <sub>2</sub> .
5.4	Enhanced Oil Recovery Using CO <sub>2</sub>					"Intelligent Energy Choices for Kentucky's Future" (7-point energy plan) states that the Consortium for Carbon Storage, which was established by the KGS with a seed grant from the EEC, should be supported. The Consortium will determine the potential for sequestration and for enhanced oil and gas recovery and enhanced coal-bed methane recovery using CO <sub>2</sub> .
<b>ES-6</b>	<b>OTHER ENERGY SUPPLY OPTIONS (Including enabling policies)</b>					
6.1	Transmission System Upgrading					Smart Grid Grant currently offered, \$2,650,000; DEDI is evaluating grant proposals for the development of Smart Grid proposals. See 6.8 below.
6.2	General Distributed Generation Support (Interconnection Rules, Net Metering, etc.)					Net Metering KRS 278.466: Utilities are required to allow net metering of electricity up to the customer's usage.

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6.3	Reduce Transmission and Distribution Line Losses					
6.4	Environmental/GHG Emissions Disclosure					
6.5	Public Benefits Charge Funds					“Intelligent Energy Choices for Kentucky’s Future” (7-point energy plan) recommends the adoption of public benefits charge funds to support non-utility investments in energy efficiency (see ES-2.1) and observes that a Kentucky Public Benefits Charge of 1 mil per kilowatt-hour would generate approximately \$67 million annually, based on 2006 retail sales of 66,886,000 megawatt-hours by Kentucky’s regulated investor-owned and cooperative utilities.
6.6	Regulatory Reform for Electric Co-ops					
6.7	N <sub>2</sub> O Reduction Co-Benefit					
6.8	Smart Grid Policies					Smart Grid Grant currently offered, \$2,650,000; DEDI is evaluating grant proposals for the development of Smart Grid proposals. See 6.1 above.

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6.9	Landfill Gas Demonstration/ Evaluation Projects					This is analogous to AFW-9.3, Landfill Methane Energy Programs.
6.10	Sustainable Energy Utility					
6.11	Cost-of-Service Utility Rate Structure					

AFW = Agriculture, Forestry, and Waste Management; CAER = Center for Applied Energy; CCSR = carbon capture, storage, and reuse; CMRG = Carbon Management Research Group; CO<sub>2</sub> = carbon dioxide; CTL = coal-to-liquids; DEDI = Department for Energy Development and Independence; DSM = demand-side management; EEC = Energy and Environment Cabinet; EEPS = energy efficiency portfolio standard; EISA = Energy Independence and Security Act; EKPC = East Kentucky Power Cooperative; GHG = greenhouse gas; IGGC = integrated gasification combined cycle; KGS = Kentucky Geological Survey; KRS = Kentucky Revised Statutes; MW = megawatt; N<sub>2</sub>O = nitrous oxide; RCI = Residential, Commercial, and Industrial; T&D = transmission and distribution; RPS = resource portfolio standard; SNG = synthetic natural gas; TLU = Transportation and Land Use; TWG = Technical Work Group; UK = University of Kentucky.

Note: There is some overlap with and repetition with RCI.