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## Energy Supply (ES) Technical Work Group

### List of Volunteers for Priority Policy Options for Analysis

Option #	Policy Option	Straw Proposal Volunteers
ES-1	Advanced Fossil Fuel Technology Incentives, Support, or Requirements	
ES-2	Nuclear Capacity	
ES-3	Transmission System Upgrading	
ES-4	Renewable Portfolio Standard (RPS)	
ES-5	CCSR Incentives, Requirements and/or Enabling Policies	
ES-6	Technology-Focused Initiatives, Including Grant Programs	
ES-7	Research and Development for CCSR	
ES-8	Technology Research and Development	
ES-9	Green Power Purchases and Marketing	
ES-10	Energy Efficiency Resource Portfolio Standard	
ES-11	General Education to Public on Energy Supply Options	
ES-12	Efficiency Improvements and Repowering Existing Plants	

**Summary List of Pending Priority Policy Options for Analysis**

Policy No.	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2015	2025	Total (2010–2025)			
ES-1	Advanced Fossil Fuel Technology Incentives, Support, or Requirements	<i>Not Yet Quantified</i>					Pending
ES-2	Nuclear Capacity	<i>Not Yet Quantified</i>					Pending
ES-3	Transmission System Upgrading	<i>Not Yet Quantified</i>					Pending
ES-4	Renewable Portfolio Standard (RPS)	<i>Not Yet Quantified</i>					Pending
ES-5	CCSR Incentives, Requirements and/or Enabling Policies	<i>Not Yet Quantified</i>					Pending
ES-6	Technology-Focused Initiatives, Including Grant Programs	<i>Not Yet Quantified</i>					Pending
ES-7	Research and Development for CCSR	<i>Not Yet Quantified</i>					Pending
ES-8	Technology Research and Development	<i>Not Yet Quantified</i>					Pending
ES-9	Green Power Purchases and Marketing	<i>Not Yet Quantified</i>					Pending
ES-10	Energy Efficiency Resource Portfolio Standard	<i>Not Yet Quantified</i>					Pending
ES-11	General Education to Public on Energy Supply Options	<i>Not Yet Quantified</i>					Pending
ES-12	Efficiency Improvements and Repowering Existing Plants	<i>Not Yet Quantified</i>					Pending

CCSR = carbon capture, storage, and reuse; GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

Note: The numbering used to denote the above pending priority policy options is for reference purposes only; it does not reflect prioritization among these important draft policy options.

## ES-1. Advanced Fossil Fuel Technology Incentives, Support, or Requirements

### Policy Description

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#### 1.1 Advanced Fossil Fuel Technology (e.g., IGCC, CCSR, Advanced Pulverized Coal, CFB) Incentives, Support, or Requirements

Advanced fossil technologies include more efficient, and thus lower-emitting, generation technologies. Advanced fossil technologies combined with carbon capture and sequestration or reuse (CCSR) may have the potential to significantly lower CO<sub>2</sub> emissions associated with fossil fuel-based electricity generation. Advanced fossil technologies that could be considered include integrated gasification combined-cycle (IGCC), advanced pulverized coal, and advanced circulating fluidized-bed (CFB) technology.

Policies to encourage the development of these technologies may include mandates or incentives to use advanced coal technologies for new coal plants, such as a mandate that requires new fossil fuel-fired power plants to achieve a specific low net CO<sub>2</sub> emission rate. Alternatively, a mandate might require that all or a portion of new coal plants be of a certain type, such as IGCC. Incentives may take the form of direct subsidies or assistance in securing financing, and/or off-take agreements. A combination of mandates and incentives is also possible.

Policies to encourage CCSR could include a state agency or department within an existing agency tasked with promoting CCSR, evaluation studies to identify geologically sound reservoirs, R&D funding to improve CCSR technologies, and/or financial incentives or mandates to capture and store or capture and reuse carbon.

#### Related Kansas Programs/Actions

- KSA 2007 Supp. [79-233](#) exempts any carbon capture, storage and recovery (CCSR) equipment from all property taxes. KSA 2007 Supp. [79-32,256](#) provides additional tax incentives for CCSR.
- KSA 2007 Supp. [79-32,228](#) – [32,232](#) and [79-32,238](#) – [32,241](#) provide tax credits and KSA 2007 Supp. [74-8949a](#) authorizes Kansas Development Finance Authority financing for building and expanding integrated gasification combined-cycle (IGCC) plants.
- The 2007 Kansas Energy Plan recommends that the KCC consider the value of lower-emission-coal generation and CCSR technologies when evaluating investments or purchase power agreements for IGCC with CCSR.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-2. Nuclear Capacity

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#### 2.1 New Nuclear Capacity

Nuclear power has historically been a low-GHG source of electricity. However, no new commercial reactor has come on line in the United States since 1996 due to extremely high capital costs, the absence of any plan or technology for permanent disposal of nuclear waste, and risks to public safety exemplified by high-profile accidents at Three Mile Island and Chernobyl. The current Administration has been supportive of nuclear expansion, emphasizing its importance in maintaining a diverse energy supply and its reputation for producing electricity with negligible pollutant emissions during operation. Congress has also offered significant financial subsidies for new nuclear plants in an effort to jump-start the industry, including limitations on liability for nuclear accidents.

Steps to encourage nuclear power options in Kansas could include the provision of streamlined siting review at existing nuclear facilities, including a streamlined appeals process. Kansas could develop finance authority to assume the developer role (and potentially an equity ownership role) for new nuclear resources. Under such a scenario, the state would not necessarily need to be an operator of nuclear facilities. Instead, it could serve as a facilitator in developing a new nuclear facility, recognizing the cost and financing burdens such a facility could impose on existing Kansas companies, including those as large as Westar, Inc., and Kansas City Power & Light. Small-scale nuclear power options could also be considered.

#### 2.2 Relicensing/Up-Rating Existing Nuclear Power

Nuclear plant relicensing allows a nuclear power plant to extend the life of the facility for 20 years past its original 40-year license term. This is considered a low-cost and low-emission source of energy because there are limited additional capital costs or additional embodied emissions associated with extending the life of fully depreciated and operating nuclear plants. The Nuclear Regulatory Commission (NRC), the nation’s regulatory authority for nuclear power, considers the relicensing program one of its major cornerstones of current regulatory activity. A nuclear power plant uprating is a process whereby a licensee receives approval from the NRC to operate a plant at a higher power level than the level authorized in the original license.

#### 2.3 Research and Development for Nuclear Technological and Efficiency Improvements

This option focuses on R&D efforts related to nuclear power technologies and efficiency improvements. Efficiency improvements refer to increasing generation efficiency at power stations through incremental improvements at existing plants (e.g., more efficient boilers and

turbines, improved control systems, or combined-cycle technology). Policies to encourage efficiency improvements could include incentives or regulations as described in other options, with adjustments for financing opportunities and emission rates of existing plants.

### **Related Kansas Programs/Actions**

- KSA 2007 Supp. [79-230](#) has a property tax exemption for new nuclear facilities built near other nuclear facilities.
- [SB 586](#) (2008) provides electric utilities the ability to recover certain costs related to planning for new nuclear generation capacity.
- Westar is exploring relicensing their current nuclear facilities.

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**Timing:**

**Parties Involved:**

**Other:**

## ES-3. Transmission System Upgrading

### Policy Description

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### 3.1 Transmission System Upgrading

Measures to improve transmission systems to reduce bottlenecks and enhance throughput may be required to satisfy long-term electricity demands and improve the efficiency of operations system-wide. Opportunities may exist to substantially increase transmission line carrying capacity through the implementation of new construction and retrofit activities on the transmission grid, including incorporating advanced composite conductor technologies, capacitance technologies, and grid management software. Siting new transmission lines can be a difficult process, given their cost and their local impacts on the environment and on the use, enjoyment, and value of property. Policy measures in support of this option could provide incentives to utilities to upgrade transmission systems and reduce barriers to siting new transmission lines.

### Related Kansas Programs/Actions

- Kansas Electric Transmission Authority was created to manage transmission issues and upgrades.
- Westar is in the process of siting a [new 765 kV transmission line](#).

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**Timing:**

**Parties Involved:**

**Other:**

## ES-4. Renewable Portfolio Standard (RPS)

### Policy Description

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#### 4.1 Renewable Portfolio Standard

A Renewable Portfolio Standard (RPS) is a requirement that utilities must supply a certain, generally fixed, percentage of electricity from an eligible renewable energy source(s). About 20 states currently have an RPS in place. In some cases, utilities can also meet their portfolio requirements by purchasing Renewable Energy Certificates (RECs) from eligible renewable energy projects. With REC “trading,” it may be beneficial to consider a variety of renewable resources.

#### Related Kansas Programs/Actions

- Voluntary RPS to meet 10% of Kansas energy demand with wind power by 2010 and 20% by 2020. See KSA 2007 Supp. [66-1,184\(g\)](#).
- Since December 2006, nearly
- 1,000 megawatts (MW) of potential new wind power was announced by a number of the state’s leading utilities. The new Smoky Hill Wind Project, along I-70 in Lincoln and Ellsworth Counties, was developed by TradeWind Energy, LLC, a Kansas developer, and will be owned by Enel North America, Inc. It features 100 MW of wind generation to be divided among Sunflower Electric, Kansas City Board of Public Utilities, and Midwest Energy.
- The state’s largest utility, Topeka-based Westar, announced on February 26, 2007, a request for proposals (RFP) for 500 MW of renewable energy. This was followed by a joint announcement on March 20 by KCP&L and the Sierra Club of a commitment of another 400 MW of wind generation. Westar plans to have about 300 MW of the development installed by the end of 2008. KCP&L already owns the Spearville Wind Energy Facility in Ford County that was put into operation in Fall 2006.
- These announcements will ensure Kansas utilities will meet a voluntary goal of 1,050 MW of wind by 2010, as announced by Governor Sebelius during the State of the State address in January 2007. This equals about 10% of nameplate electric generation capacity for the state’s utilities. The utilities agreed to a commitment of a 20% voluntary goal by 2020.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-5. CCSR Incentives, Requirements and/or Enabling Policies

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#### 5.1 CCSR Incentives, Requirements, and/or Enabling Policies (Administration, Regulation, Liability, Incentives)

Carbon capture and storage or reuse (CCSR) is a process that includes separation of CO<sub>2</sub> from industrial and energy-related sources, transport to a storage location, and permanent or long-term storage in isolation from the atmosphere. Ideally, the CO<sub>2</sub> from large point sources of emissions, such as power plants, can be compressed and transported for storage in geological formations, in the ocean, and in mineral carbonates, or for use in industrial processes. Captured carbon can also be used for enhanced recovery of oil and gas. The net reduction of emissions to the atmosphere through CCSR depends on the fraction of CO<sub>2</sub> captured, the relative increase in CO<sub>2</sub> production resulting from loss in the overall efficiency of power plants that capture carbon, energy used for transport and storage, any leakage from transport, and the fraction of CO<sub>2</sub> retained in storage over the long term.

Policies to encourage development of CCSR technology could include a state agency or department within an existing agency tasked with promoting CCSR, financial incentives to capture and store or capture and reuse carbon, and/or mandates—coupled with technical feasibility and cost and investment recovery mechanisms, if appropriate—to capture and store or reuse CO<sub>2</sub> from power plants.

#### Related Kansas Programs/Actions

- KSA 2007 Supp. [79-233](#) and KSA 2007 Supp. [79-32,245](#) provide property tax incentives for the sequestration of CO<sub>2</sub>, beginning with Fiscal Year 2008.
- EPA has put out a proposed rule on the [Underground Injection Control Program](#) for Carbon Dioxide Geologic Sequestration Wells.
- Kansas Geological Survey is a partner in the [Southwest Regional Partnership on Carbon Sequestration](#) (SWP). SWP was developed as a part of the U.S. Department of Energy’s effort to respond to global climate change. The SWP has been challenged to evaluate available technologies that capture and store CO<sub>2</sub> in the southwest region. The SWP includes portions of Arizona, Colorado, Kansas, Nevada, New Mexico, Oklahoma, Texas, Utah and Wyoming. Participants include the coal, oil, and gas industries; electric utilities; the Navajo Nation; nongovernmental organizations; universities; and U.S. federal agencies.
- The use of sequestered CO<sub>2</sub> to enhance oil recovery is of great interest due to the rise in the price of crude oil. Wellfields that were once marginal may be brought back to production. Some of these efforts include:

- An ongoing project at the [University of Kansas Energy Research Center](#) (ERC), which includes research by the KU Tertiary Oil Recovery Project, the Kansas Geological Survey, and the ERC for enhanced oil recovery in Kansas using miscible-CO<sub>2</sub> flooding.
- A partnership between Coffeyville Resources Nitrogen Fertilizers and Blue Source to develop options for the utilization of CO<sub>2</sub> captured from petroleum coke gasification-based ammonia and urea ammonium nitrate production. Particular focus is proposed to develop an enhanced oil recovery project.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-6. Technology-Focused Initiatives, Including Grant Programs

### Policy Description

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#### 6.1 Technology-Focused Initiatives (Biomass Co-Firing, Energy Storage for Renewable Energy Generation, Fuel Cells, etc.), Including Grant Programs

Kansas could create a “New Energy Technology Program,” such as a grant program aimed at developing innovative energy-efficient technologies and renewable energy technologies that save energy, improve air quality, and generate economic and employment opportunities for small firms in Kansas.

#### Related Kansas Programs/Actions

- The 2007 Kansas Renewable Energy & Energy Efficiency Conference, held September 25–26, had over 500 attendees. Multiple concurrent sessions on various energy topics were facilitated by over 40 energy experts from Kansas and throughout the country. Topics included efficiency and conservation, new technologies, wind and solar energy, biofuels, public education and loan programs, and federal policy updates. Another Renewable Energy Conference will be held in September 2008.
- KSA 2007 Supp. [79-32.233](#) - [32.237](#) provides tax incentives for biomass-to-energy plants
- Some Kansas university research centers are focusing on these issues.

### Policy Design

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-7. Research and Development for CCSR

### Policy Description

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#### 7.1 R&D for CCSR

Technological as well as financial barriers exist to implementation of CCSR. While separation, capture, and transport of CO<sub>2</sub> are themselves mature technologies, only three industrial-scale storage projects are currently in operation: the Sleipner project in an offshore saline formation in Norway, the Weyburn enhanced oil recovery project in Canada, and the In Salah project in a gas field in Algeria. Further R&D funding to improve CCSR technologies and evaluation studies to identify geologically sound reservoirs will be needed for this technology to play a significant role in reducing GHG emissions.

#### Related Kansas Programs/Actions

- Various carbon sequestration research efforts exist in Kansas, including KU ERC and Kansas State University’s Soil Carbon Center.
- Carbon reuse opportunities are proposed by Sunflower Electric for the Holcomb facility. Utilization of flue-gas for the enhanced production of algae for integration with the production of high-value products. Has potential application in many industrial facilities that use conventional fossil fuel.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-8. Technology Research and Development

### Policy Description

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### 8.1 Technology Research and Development

Research and development (R&D) funding can be targeted toward a particular technology or group of technologies as part of a state initiative to build an industry around that technology in the state, and/or to set the stage for adoption of the technology for use in the state. For example, an agency can be established with a mission to help develop and deploy energy storage technologies. R&D funding can also be made available to any renewable or other advanced technology 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 given 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.

Technology R&D is necessary for the preservation of a reliable electricity supply under the carbon constraints that are being contemplated as a matter of public policy. A single technology will not accomplish the broad objectives; rather, technologies of various types and that now exist at various points along the technology development curve will require consideration.

### Related Kansas Programs/Actions

*None Listed*

### Policy Design

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-9. Green Power Purchases and Marketing

### Policy Description

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#### 9.1 Green Power Purchases and Marketing

Green power refers to electricity produced by environmentally benign sources, such as wind, solar, biomass, and hydroelectric generating resources. Green power purchasing programs are state or utility programs that allow consumers to purchase “green tags” along with their electricity, ensuring that a quantity of electricity equal to their purchase contributed to the development and support of renewable resources. Generally voluntary, these programs can be implemented on a statewide or regional basis. These programs are distinct from renewable energy credit or carbon offset markets.

#### Related Kansas Programs/Actions

- Green power purchases were offered by Westar in 1999, but discontinued due to low participation. A new green power purchase program is in development at Westar.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-10. Energy Efficiency Resource Portfolio Standard

### Policy Description

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#### 10.1 Energy Efficiency Resource Portfolio Standard

An Energy Efficiency Resource Portfolio Standard requires utilities to supply a certain, generally fixed, percentage of electricity from both eligible renewable energy source(s) and energy efficiency or other GHG emission-reducing technologies. About 20 states currently have a Renewable Portfolio Standard in place, while only a handful have implemented an Energy Efficiency Resource Portfolio Standard.

#### 10.2 Consumer Energy Efficiency Incentives or Other Barrier Removal

This policy option reflects financial incentives for consumers to encourage investment in energy efficiency and conservation technologies. Considerations for this option could include corporate tax incentives, sustainable building tax credits, green building incentives, green building standards for state facilities, energy efficiency bond programs, personal tax incentives, sales tax incentives, lease purchase programs, grant programs, and loan programs.

### Related Kansas Programs/Actions

*None Listed*

### Policy Design

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**Goals:**

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**Parties Involved:**

**Other:**

## ES-11. General Education to Public on Energy Supply Options

### Policy Description

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#### 11.1 General Education to Public on Energy Supply Options

There may be indirect effects on GHG emissions if the public or specific groups are well informed about aspects of the technical, economic, and/or environmental dimensions of energy supply options. Approaches can include public forums, educational programs, materials, Web sites, educational curricula, tours of energy facilities, and others. No one option that is adopted for the energy supply sector would be focused on any more than other options with this education program.

#### Related Kansas Programs/Actions

- Some energy generation facilities in Kansas provide educational public tours, such as the Bowersock hydro facility.

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**Goals:**

**Timing:**

**Parties Involved:**

**Other:**

## ES-12. Efficiency Improvements and Repowering Existing Plants

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#### 12.1 Efficiency Improvements and Repowering Existing Plants

Efficiency improvements refer to increasing generation efficiency at power stations through incremental improvements at existing plants (e.g., more efficient boilers and turbines, improved control systems, or combined-cycle technology). Repowering existing power plants refers to switching to lower- or zero-emitting fuels at existing plants, or for new capacity additions, including use of biomass or natural gas in place of coal or oil. Policies to encourage efficiency improvements and repowering of existing plants could include incentives or regulations as described in other options, with adjustments for financing opportunities and emission rates of existing plants.

#### Related Kansas Programs/Actions

*None Listed*

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**Parties Involved:**

**Other:**