



www.arclimatechange.us/

Energy Supply (ES) Technical Work Group

Summary List of Pending Priority Policy Options for Analysis

	Policy Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2009–2025 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total 2009–2025			
ES-1	Green Power Purchases and Marketing	<i>Not Yet Quantified</i>					Pending
ES-2	Technology Research & Development	<i>Not Yet Quantified</i>					Pending
ES-3	Renewable and/or Environmental Portfolio Standard (RPS/EPS)	<i>Not Yet Quantified</i>					Pending
ES-4	Grid-based Renewable Energy Incentives and/or Barrier Removal	<i>Not Yet Quantified</i>					Pending
ES-5	Approaches Benefiting from Regional Application	<i>Not Yet Quantified</i>					Pending
ES-6	Combined Heat and Power	<i>Not Yet Quantified</i>					Pending
ES-7	Geological Underground Sequestration for New Plants	<i>Not Yet Quantified</i>					Pending
ES-8	Transmission System Upgrades	<i>Not Yet Quantified</i>					Pending
ES-9	Nuclear Power	<i>Not Yet Quantified</i>					Pending
ES-10	Carbon Tax	<i>Not Yet Quantified</i>					Pending
ES-11	Efficiency Improvements and Repowering of Existing Plants	<i>Not Yet Quantified</i>					Pending

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

Energy Supply Technical Work Group Reference Table
(AR GCGW meeting #5)
Priority Policy Options for Analysis and Corresponding Catalog Options

Proposed Option #	Proposed Option Name	# From Catalog of State Actions
High-Priority (Tier I)		
ES-1	Green Power Purchases and Marketing	2.4 (Green power purchases and marketing)
ES-2	Technology Research & Development	5.1 (CCSR incentives/enabling policies) 3.1 (advanced fossil fuel technologies) 1.6 (technology research and development) 3.5 (technology-focused initiatives) 4.4 (incentives/requirements for low-GHG coal production) 5.2 (R&D for CCSR)
ES-3	Renewable and/or Environmental Portfolio Standard (RPS/EPS)	2.1 (Renewable and/or Environmental Portfolio Standard (RPS/EPS))
ES-4	Grid-based Renewable Energy Incentives and/or Barrier Removal	2.2 (Grid-based Renewable Energy Incentives and/or Barrier Removal)
ES-5	Approaches Benefiting from Regional Application	2.10 (Explore regional economies of scale for cost-effective implementation of RE) 1.1 (GHG cap and trade)
ES-6	Combined Heat and Power	2.5 (Combined Heat and Power)
ES-7	Geological Underground Sequestration for New Plants	3.6 (Geological Underground Sequestration for New Plants)
ES-8	Transmission System Upgrades	6.1 (Transmission system upgrades) 6.2 (Reduction of transmission and distribution line losses) 6.3 (General distributed generation support)
ES-9	Nuclear Power	3.2 (New nuclear power) 3.3 (Relicensing/up-rating of existing nuclear power)
ES-10	Carbon Tax	1.2 (Carbon Tax)
ES-11	Efficiency Improvements and Repowering of Existing Plants	3.4 (Efficiency Improvements and Repowering of Existing Plants)

ES-1. Green Power Purchases and Marketing

Policy Description

Green power purchasing refers to a variety of consumer-driven strategies to increase the production and delivery of low-GHG power sources, beyond levels achieved through Renewable Portfolio Standards and other mandatory programs. These programs provide consumers with information about alternative green sources that can be then be selected by the consumer rather than the traditional, more carbon-intensive source.

Policy Design

Goals: Electric facilities purchase green power to cover [x] % of their power needs by [year]. Implement programs to provide consumers the option to purchase green power.

Timing: Consumer purchasing participation of green power by [year].

Implementing Parties: State facilities, electric utilities, renewable energy producers, electricity consumers, and buyers of energy-using appliances and equipment.

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-2. Technology Research & Development

Policy Description

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 which are not yet in widespread use. Finally, funding could be targeted to increase collaboration among existing institutions in the state for R&D.

States can undertake initiatives focused on developing, promoting, and/or implementing one or more specific fossil fuel or nuclear technologies that show promise for reducing GHG emissions. Technologies could include, among others, carbon capture and storage (to sequester carbon dioxide emissions from power plants, oil and gas operations, and/or refineries); biomass blending in coal power plants; implementation of equipment in oil and gas operations that increases efficiency and reduces losses (e.g. remote sensors of leaks).

Policies to encourage carbon dioxide capture and storage or reuse (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 carbon or to capture and reuse it.

Policy Design

Goals: The goals of this policy include:

- To identify the likely funding mechanisms and policy tools that would provide further stimulus for the development of new, reasonable cost, low and zero greenhouse gas emitting electricity generation in Iowa.
- Complete a detailed evaluation study for [specific alternative] energy potential in Arkansas.
- Complete a least one high-visibility R&D demonstration to showcase alternative energies.

Timing: Establish funding in the [year] legislative session. Study finished in [year]. First RFP issued [month, year].

Parties Involved: State government, private and public partners on a voluntary basis.

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-3. Renewable and/or Environmental Portfolio Standard (RPS/EPS)

Policy Description

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). An environmental portfolio standard (EPS) expands that notion to include energy efficiency or other GHG emissions-reducing technologies as an eligible resource. About 20 states currently have an RPS in place, while a handful have implemented an EPS. In some cases, utilities can also meet their portfolio requirements by purchasing Renewable Energy Certificates (REC) from eligible renewable energy projects.

Policy Design

Goals: Each investor-owned and public utility should:

- Meet [x] percent of its load using renewable energy resources by [year], increasing to [x] percent by [year].
- Implement a plan to achieve [x] percent of cost-effective energy conservation by [year].
 - By [year], identify its achievable cost-effective energy conservation for the subsequent [x] years.

Timing: beginning in 20xx.

Parties Involved: Investor-owned utilities, electric cooperatives, state government.

Other: None cited.

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-4. Grid-based Renewable Energy Incentives and/or Barrier Removal

Policy Description

This policy option reflects financial incentives to encourage investment in renewable energy resources. Examples include: (1) direct subsidies for purchasing/selling renewable technologies; (2) tax credits or exemptions for purchasing renewable technologies; (3) feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (4) tax credits for each kWh generated from a qualifying renewable facility; (5) regulatory policies that provide incentives and/or assurance of cost recovery for utilities that invest in central station renewable energy systems. In addition, this policy option would make it a priority for the Legislature, the Public Service Commission, and other relevant state agencies to identify and rectify barriers which are impeding the development of renewable resources in the state.

Policy Design

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

- Offer tax credits or other incentives of \$[x] per kW-equivalent for small solar PV, micro-hydro, and small wind up to [x] kW of grid-connected generation.
- Provide a subsidy to renewable energy generators of [x] cent(s)/kWh for electricity generated from a renewable resource, unless that electricity is used to meet a federal, state, or voluntary renewable energy standard.
- 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 available beginning in [year] through [year]; loans are available for projects brought online between [year] and [year].

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

Other:?

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-5. Approaches Benefiting from Regional Application

Policy Description

A regional GHG tax would be a tax on each ton of CO₂ equivalent emitted from certain sources. The tax could be imposed upstream, based for example on the carbon content of fuels (e.g. fossil fuel suppliers) or at the point of combustion and emission. Although taxed entities would pass some or all of the cost on to consumers, there would be competitive pressure to find cost-effective ways to lower (or offset) emissions. Consumers who see the implicit cost of GHG emissions in products and services could adjust their behavior to lower emissions and reduce cost. The program can be designed to be “revenue neutral” (not a net tax increase) for example by offsetting with an income tax reduction, can fund policies and programs to assist with reducing GHG emissions, or can be directed to helping the competitiveness of industries or assisting communities affected by the tax.

Policy Design

Goals: Apply an \$X tax to

Timing: Beginning in [year]

Parties Involved: Target entities.

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-6. Combined Heat and Power

Policy Description

Combined heat and power (CHP) refers to any system that simultaneously or sequentially generates electric energy and utilizes the thermal energy that is normally wasted. The recovered thermal energy can be used for industrial process steam, space heating, hot water, air conditioning, water cooling, product drying, or nearly any other thermal energy need in the commercial, and industrial sector. The end result is significantly increased efficiency over generating electric and thermal energy separately. In fact, many CHP systems are capable of an overall efficiency of over 80%—double that of conventional systems. Another significant advantage is the reduced transmission and distribution (T&D) losses associated with centralized power generation.

Policy Design

Goals: Reduce use of fossil fuel from large industrial sources by [x] %

Timing: Beginning in [year]

Parties Involved: State government and regulators, electric utilities, and renewable energy and CHP industry.

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-7. Geological Underground Sequestration for New Plants

Policy Description

This policy refers to the capture of carbon dioxide from fossil fuel-fired power plant emissions and its sequestration in geologic formations includes oil and gas reservoirs, unmineable coal seams, and deep saline reservoirs. Broadly, three different types of technologies exist: Post-combustion, pre-combustion, and oxyfuel combustion. After capture, the CO₂ must be transported to suitable storage sites; this is often done by pipeline.

Policy Design

Goals: Capture [percent] of CO₂ emissions from new power plants

Timing: Reductions achieved beginning in [year]

Parties Involved: [large, new power plants]

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-8. Transmission System Upgrades

Policy Description

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 impact 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 of new transmission lines.

One goal of this policy can be to reduce transmission and distribution line losses. Utilities use a variety of components throughout the transmission and distribution system to manage losses. Increasing the efficiency of these components can further reduce losses and associated GHG emissions. For example, the state of Vermont offers a rebate to encourage the installation of energy efficient transformers. Regulations, incentives, and/or support programs can be applied to achieve greater efficiency of transmission and distribution system components.

Another goal can be the general distribution of generation support (interconnection rules, net metering, etc.). Well-designed interconnection rules will ensure that distributed power products meet minimum requirements for performance, safety, and maintenance, at the same time significantly advancing the commercialization of these technologies.

Policy Design

Goals: Achieve [x] % effective improvement in energy efficiency through reduced transmission and distribution system losses.

Timing: Phased-in beginning in [year] with established goal achieved by [year].

Parties Involved: Arkansas Utilities Board, Investor-owned utilities, generation and transmission electric cooperatives, municipalities, representatives of environmental and economic development organizations, the FERC, and transmission owners.

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-9. Nuclear Power

Policy Description

Nuclear power has historically presented a low-GHG source of electricity. However, no new commercial reactor has come on line in the US 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.

Nuclear plant relicensing allows a nuclear power plant to extend the life of the facility for twenty years past its original 40-year license term. This is considered a low-cost and low-emissions source of energy because there is limited additional capital cost 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.

Policy Design

Goals: Increase generation from nuclear power by [x] percent

Timing: By [year]

Parties Involved: Arkansas Utilities Board, Investor-owned utilities

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]

ES-10. Efficiency Improvements and Repowering of Existing Plants

Policy Description

Efficiency improvements at existing plants refers to increasing generation efficiency through improvements such as more efficient boilers and turbines, improved control systems, or combined cycle technology. This could also include switching to lower or zero emitting fuels at existing plants, or new capacity additions. Policies to encourage efficiency improvements and repowering of existing plants could include incentives or regulations s.

Policy Design

Goals: x% increased efficiency at existing plants

Timing: Beginning in [year]

Parties Involved: generators > X;

Other: TBD – [as needed and approved by the TWG]

Implementation Mechanisms

TBD – [as approved by the TWG]

Related Policies/Programs in Place

TBD – [as needed and approved by the TWG]

Type(s) of GHG Reductions

TBD – [as approved by the TWG]

Estimated GHG Reductions and Costs or Cost Savings

TBD – [as approved by the TWG]

Data Sources: [TBD, as approved by the TWG]

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

Key Assumptions: [TBD, as approved by the TWG]

Key Uncertainties

TBD – [as needed and approved by the TWG]

Additional Benefits and Costs

TBD – [as needed and approved by the TWG]

Feasibility Issues

TBD – [as needed and approved by the TWG]

Status of Group Approval

Pending – [until GCGW moves to final agreement at meeting #7 or #8]

Level of Group Support

TBD – [blank until GCGW meeting #7 or #8]

Barriers to Consensus

TBD – [blank until final vote by the GCGW]