

Chapter 5

Energy Supply

Overview of GHG Emissions

Greenhouse gas (GHG) emissions from Arkansas's energy supply (ES) sector include emissions from electricity generation and represent a substantial portion of the state's overall GHG emissions (approximately 32% of gross emissions on a consumption basis in 2005). From 1990 to 1999 and from 2001 to 2004, Arkansas was a net exporter of electricity, meaning that Arkansas power plants have produced more electricity than is consumed in the state.¹ For 2000 and 2005, Arkansas was a net importer of electricity. Based on the approval of the Arkansas Governor's Commission on Global Warming (GCGW), the final reference case forecast assumes that Arkansas is self-sufficient in electricity production, and that there will be no net imports over the revised forecast period (2006–2025). For the purpose of estimating emissions, natural gas-fired generation is assumed to fill any gaps in the supply of electricity to meet Arkansas demand during the forecast period.

In the absence of any mitigation efforts, GHG emissions from Arkansas's ES sector are expected to increase from 2005 base year levels of 27.2 million metric tons (MMt) of carbon dioxide equivalent (CO₂e) to about 37.4 MMtCO₂e by 2025, or by approximately 37.2% over this 20-year period. The reference case forecast includes the following two coal plants: Plum Point to be brought on-line in 2010 and the Turk plant in Hempstead County to be brought on-line in 2012. The reference case projections reflect the planning assumption that sufficient high-efficiency natural gas-fired capacity is built within the state to satisfy future retail electricity demand growth in Arkansas. This trend is summarized in Figure 5-1. It is important to emphasize that these GHG reduction trends are evident prior to the implementation of any of the ES mitigation measures recommended by the GCGW.

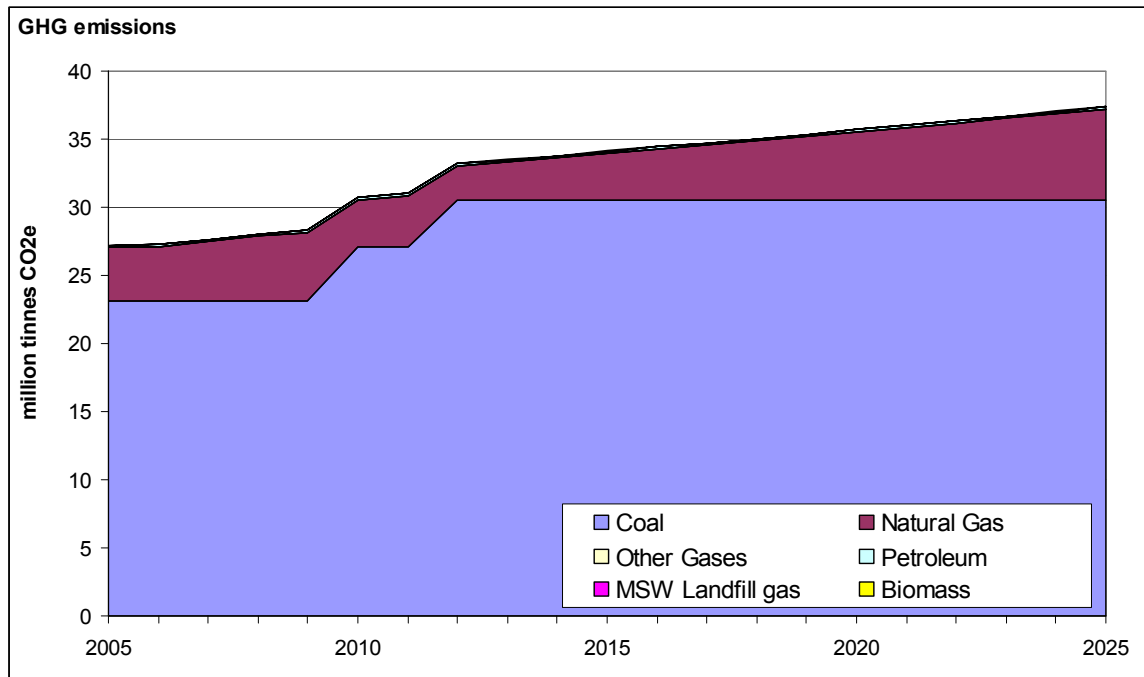
Key Challenges and Opportunities

The key challenge in addressing GHG emissions from Arkansas's ES sector is the state's continued reliance on coal-fired generation inside the state. The share of GHG emissions from coal-fired generation was about 85% in 2005, and is projected to reach 92% in 2012 when both the new Plum Point and Hempstead plants are on line, and drop only slightly—to 82% in 2025—associated with the addition of high-efficiency natural gas generation.

Like many other states, the projected large growth in electricity sales is the primary driver for Arkansas' GHG emissions. The projected average annual growth rate of electricity sales in Arkansas between 2005 and 2025 is rather substantial—about 1.37% per year. This rate incorporates any current demand-side management programs in the state.

¹ Estimating the emissions associated with electricity use requires an understanding of the electricity sources (both in state and out of state) used by utilities to meet consumer demand. The current estimates reflect some very simple assumptions, as described in Appendix A of the Inventory and Projections report.

Figure 5-1. Recent and projected GHG emissions from the electricity sector, Arkansas, 2005–2025 (consumption basis)



GHG = greenhouse gas; MMtCO₂e = million metric tons carbon dioxide equivalent; MSW = municipal solid waste.

Arkansas has several opportunities for reducing the growth in GHG emissions attributable to energy production and supply. For example, the carbon intensity of in-state electricity generation could be decreased through the introduction of new renewable resources, such as wind and biomass, the addition of carbon capture and storage technologies for existing (through retrofits) coal-fired stations in the state once such technology is commercially available, and the penetration of combined heat and power systems. Significant opportunities to reduce GHG emissions through options to further reduce electricity consumption also exist, and can often provide net cost savings to Arkansas consumers and the state. Several demand-side management, energy efficiency, and conservation measures recommended in the residential, commercial, and industrial sector are detailed in Chapter 4 of this report.

Overview of Policy Recommendations and Estimated Impacts

The GCGW analyzed and is recommending several policies for the ES sector that offer the potential for significant GHG emission reductions, as summarized in Table 5-1. All policy recommendation totals are relative to the underlying assumption that electricity expansion in Arkansas will proceed with the installation of the Plum Point pulverized coal station in 2010 and the installation of the Hempstead pulverized coal plant in 2012. In making this assumption, the GCGW is not recommending for or against the need for or merits of the addition of the Hempstead plant.

Table 5-1. Summary results for energy supply policy recommendations and existing actions

No.	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Net Present Value (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total 2009–2025			
ES-1*	Green Power Purchases and Marketing	<i>Transferred to RCI TWG</i>					Unanimous
ES-2*	Technology Research & Development	<i>Not Quantified</i>					Unanimous
ES-3 [†]	3a: Renewable Portfolio Standard (RPS)	0.3	3.6	21.9	\$548	\$25.0	Majority (10 objections)
	3b: Renewable Energy Feed-In Tariff (REFIT)	0.2	2.0	12.3	\$399	\$32.5	Super Majority (4 objections)
ES-4 [†]	Grid-Based Renewable Energy Incentives and/or Barrier Removal	<i>Not Quantified</i>					Unanimous
ES-5 [†]	Approaches Benefiting From Regional Application	<i>Not Quantified</i>					Unanimous
ES-6*	Combined Heat and Power	0.6	2.9	20.0	\$886	\$44.3	Unanimous
ES-7 [†]	Geological Underground Sequestration for New Plants	2.9	5.6	56.5	\$1,801	\$31.9	Majority (10 objections)
ES-8 [†]	Transmission System Upgrades	<i>Not Quantified</i>					Unanimous
ES-9*	Nuclear Power	0.0	9.8	58.9	\$1,574	\$26.7	Unanimous
ES-10 [†]	Carbon Tax	<i>Not Quantified</i>					Super Majority (4 objections)
ES-11*	Efficiency Improvements and Repowering of Existing Plants	2.3	2.3	31.8	\$1,568	\$49.3	Unanimous
	Sector Total After Adjusting for Overlaps[‡]	6.0	22.6	179.4	\$6,228	\$34.7	
	Reductions From Recent Actions	0	0	0	\$0	\$0.0	
	Sector Total Plus Recent Actions[‡]	6.0	22.6	179.4	\$6,228	\$34.7	

GHG = greenhouse gas; MMtCO₂e = million metric tons of carbon dioxide equivalent; \$/tCO₂e = dollars per metric ton of carbon dioxide equivalent.

Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings.

The numbering used to denote the above policy recommendations is for reference purposes only; it does not reflect prioritization among these important policy recommendations.

All totals are relative to the underlying assumption that electricity expansion in Arkansas proceeds with the planned additions of the coal-fired Plum Point and Hempstead County power stations.

* The GCGW approved this option at Meeting #9 (September 9, 2008); 18 members present and voting (one by phone).

[†] The GCGW approved this option at Meeting #10 (September 25, 2008); 21 members present and voting (none by phone).

[‡] The cumulative results are based on the sum of the following:

- ES-3b (Renewable Energy Feed-In Tariff [REFIT]);
- ES-6 (Combined Heat and Power);
- ES-7 (Geological Underground Sequestration for New Plants);
- ES-9 (Nuclear Power); and
- ES-11 (Efficiency Improvements and Repowering of Existing Plants).

ES-3b and ES-6 overlap with AFW-4 (Expanded Use of Agriculture and Forestry Biomass Feedstocks for Electricity, Heat, or Steam Production: Energy From Biomass and Capture of Waste Heat). These overlaps were addressed by excluding the emission reductions and costs/savings associated with the biomass and waste heat components for AFW-4 from the cumulative totals for all AFW policy recommendations combined.

These recommendations include efforts to support technology research and development (R&D) activities (ES-2), encourage the penetration of renewable energy (ES-3), provide incentives for renewable energy (ES-4), encourage regional approaches to GHG reductions (ES-5), promote combined heart and power (CHP) systems (ES-6), sequester GHG emissions from coal-fired stations (ES-7), encourage support for transmission and distribution (T&D) upgrades (ES-8), promote nuclear power (ES-9), support a carbon tax (ES-10), and promote efficiency improvements at existing power plants. These policy recommendations contribute to GHG emission reductions during 2009–2025, as outlined in Table 5-1.

Overall, the ES mitigation recommendations yield annual GHG emission reductions from reference case projections of about 22.6 MMtCO₂e in 2025 and cumulative reductions of 179.5 MMtCO₂e from 2009 through 2025, at a net cost of approximately \$6.228 billion through 2025 on a net present value basis. The weighted-average cost of saved carbon for the ES measures is about \$35/tCO₂e avoided. An overview of each policy recommendation is provided in this chapter. Additional details regarding the application of these recommendations to Arkansas (targets, implementation mechanisms, parties involved, modeling approach, etc.) are provided in Appendix H.

Energy Supply Sector Policy Descriptions

The ES sector has several opportunities for mitigating GHG emissions from electricity generation, including mitigation activities associated with the generation, transmission, and distribution of electricity—whether generated through the combustion of fossil fuels, renewable energy sources in a centralized power station supplying the grid, distributed generation facilities, or imported into the state.

ES-2. Technology Research & Development

This recommendation involves support for R&D that targets a particular GHG-mitigating technology as part of a state initiative to build an industry around that technology in the state, and sets the stage for future adoption of the technology for use in the state. This recommendation also includes funding for demonstration projects to help commercialize technologies that have already been developed, but are not yet in widespread use. Finally, funding is also intended to support increased collaboration among existing institutions in the state for R&D.

ES-3a. Renewable Portfolio Standard (RPS)

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 expands that notion to include energy efficiency or other GHG emission-reducing technologies as an eligible resource. About 20 states currently have an RPS in place. In some cases, utilities can also meet their portfolio requirements by purchasing Renewable Energy Certificates from eligible renewable energy projects. The application of an RPS in Arkansas is provisional. That is the primary recommendation for achieving greater penetration of renewable energy in the recommendation described in ES-3b (Renewable Energy Feed-In Tariff [REFIT]). However, if certain goals of the REFIT recommendation are not achieved, the RPS would go into effect. If regional and national bulk electric transmission lines (the equivalent of the interstate highway system) are not built, access to significant and cost-effective renewable generation will be obstructed, and goals for such must be scaled back to levels reliably and economically achievable.

ES-3b. Renewable Energy Feed-In Tariff (REFIT)

A Renewable Energy Feed-In Tariff (REFIT) provides guaranteed above-market rates for a given period to entities that install qualifying sources of renewable energy and sell energy back to the grid. The higher rate helps overcome the cost disadvantages of renewable energy sources and may be set at different levels for the various forms of renewable power generation. Utilities would be able to recover the cost of the program, plus a reasonable profit, from their ratepayer base. In cases where the entity does not have the capital available to finance the renewable

energy installation, it can display this utility guarantee to a financial institution to aid in obtaining a loan for the purchase price of the installation.

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

This policy recommendation involves tax incentives and innovative financing programs for residential and commercial utility users who develop or apply successful renewable energy systems. The tax and loan incentives would be proportional to the amount of renewable energy they are using, with the greatest incentives for those who use net metering and return energy to the grid for use by other utility customers. Legislative Council, the Arkansas Department of Finance and Revenue, the Arkansas Development Finance Authority, the Arkansas Department of Environmental Quality, and the Arkansas Science and Technology Authority, in coordination with the GCGW and the appropriate legislative leaders, should research model programs in other states and countries and make recommendations on specific policies in time for the next legislative session. In addition, pilot and demonstration programs should be established to demonstrate the effectiveness of these policies as they are implemented. Alternative sources of funding, including foundations, utility companies, and others, should be sought to supplement state revenue for these policies.

ES-5. Approaches Benefiting From Regional Application

The primary goal of this policy recommendation is to establish a program that will allow Arkansas to adapt to and be prepared for a federally implemented cap-and-trade system. A cap-and-trade system is a market mechanism by which GHG emissions are limited or capped at a specified level, and those participating in the system are required to hold permits for each unit of emissions. Through trading, participants with lower costs of compliance can choose to overcomply and sell their additional reductions to participants for whom compliance costs are higher. In this fashion, the overall costs of compliance are lower than they would otherwise be.

ES-6. 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 sectors. 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 T&D losses associated with centralized power generation.

ES-7. Geological Underground Sequestration for New Plants

This policy recommendation refers to the capture of CO₂ from fossil fuel-fired power plant emissions and its sequestration in geologic formations, including oil and gas reservoirs,

unminable 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, which this is often accomplished via pipeline.

This policy affects all new coal-fired power plants, both those that are currently under construction and those that have not yet received full approval for construction in Arkansas. Plants currently under construction (including the Plum Point plant) should install and employ post-combustion carbon capture and storage (CCS) as soon after the plant's opening as the technology becomes available. Plants that have not yet received full approval for construction (including the Hempstead plant) should employ CCS as soon as they begin operations. All other new coal-fired generating plants should employ state-of-the-art pre-combustion CCS as soon as they begin operations.

This policy implies that, except for the already-permitted Plum Point plant, there will be no new coal-fired generating plants in Arkansas until sequestration is ready. Until that time, the electricity that would have been generated by new plants should be replaced with expanded energy efficiency, renewable energy, and, as a last resort, natural gas combined-cycle technology.

ES-8. Transmission System Upgrades

This recommendation involves measures to improve transmission systems to reduce bottlenecks and enhance throughput while satisfying long-term electricity demands, improving the efficiency of operations, and allowing for delivery of diverse and renewable energy sources located outside of the state. Opportunities 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. This recommendation is important, as 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.

ES-9. Nuclear Power

Nuclear power has historically been a low-GHG source of electric power. However, no new nuclear power plants have come on line in the United States since 1996 due to high capital costs. Long-term disposal of nuclear waste and public safety are public policy concerns with nuclear power. With the national pricing of the GHG cost of fossil fuel generation, with either a cap-and-trade system or a carbon tax, nuclear power may be more cost-competitive.

The Energy Policy Act of 2005 included provisions encouraging the construction of new nuclear units. There are currently nine applications for a new plant on file with the Nuclear Regulatory Commission (NRC). The one nearest to Arkansas is adjacent to the existing Grand Gulf unit in Port Gibson, Mississippi; it has been accepted for docketing by the NRC. As new nuclear power plants come on line in the future in the Arkansas region, they will offer Arkansas electric utilities an alternative to the construction of fossil fuel generation units.

ES-10. Carbon Tax

The primary goal of this policy recommendation is to establish a mechanism that will allow Arkansas to adapt to and be prepared for a federally implemented carbon tax and other federal climate policies. A carbon tax sets a fee, or tax, for the release of carbon to the atmosphere. It does not set a limit, reduce, or otherwise control the tons of carbon released. The tax raises the cost of carbon-based emissions and, therefore, encourages investment in low-carbon or no-carbon alternatives. It also generates revenue for the government, which could be directed toward energy efficiency, the development and use of renewable energy, climate change adaptation investments, and other measures to mitigate or address the impacts of climate change. Many proposals also have options to rebate the tax back to the ratepayer, particularly low-income ratepayers. A carbon tax could be implemented as a tax on fossil fuels according to the amount of CO₂ emitted by their combustion. One of the benefits is that the tax can be more easily applied across all sectors. To achieve the stated goal, the amount of the tax must be high enough to trigger financial and behavioral decisions toward conservation or a shift to lower-emitting fuels.

The design elements of this policy include the following:

- Arkansas should only consider carbon tax programs that are national in scope, and in conjunction with other carbon tax and “cap-and-trade” programs that are proposed. The state should opt for national programs that use revenue sharing back to state government for purposes of implementing state initiatives on global warming. The state should promote a national carbon tax that does not put Arkansas at a competitive disadvantage with other states.
- Arkansas should make the cost of inefficient or higher CO₂-emitting activities more expensive than alternatives, thereby creating a financial incentive to discourage activities that result in CO₂ emissions. The amount of revenue that the carbon tax generates annually should depend on the facilities subject to the tax. The amount of the tax should be high enough to contribute to the reduction targets specified in a statute. From a competitive perspective, one advantage of a carbon tax is that it is constant and predictable, making a business case more stable than some alternatives.

A carbon tax should include options to rebate the tax back to the ratepayer, thus creating a true cost of carbon but keeping ratepayers from paying more on their utility bills. This should include rebates on income and payroll taxes, particularly for low-income ratepayers.

- Voluntary carbon offset programs should be established in Arkansas through utility bills and other mechanisms.

ES-11. Efficiency Improvements and Repowering of Existing Plants

This recommendation involves improving efficiency at existing plants through such improvements 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 and/or regulations. Although most economic improvements have already been made, existing power plants should be encouraged to reach specific energy efficiency goals before new plants are constructed.