

Appendix G

Residential, Commercial, and Industrial Sectors Policy Recommendations

Summary List of Policy Recommendations

No.	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Net Present Value 2009–2025 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total 2009–2025			
RCI-1*	Improved Building Codes	0.2	0.6	5.3	–\$118	–\$22	Super Majority (1 objection)
RCI-2a*	Utility and Non-Utility DSM for Peak Use Electricity	0.01	0.02	0.21	–\$11	–\$52	Super Majority (1 objection)
RCI-2b*	Utility and Non-Utility DSM and Energy Efficiency for Electricity	1.1	4.1	30.5	–\$1,450	–\$48	Majority (7 objections)
RCI-3a*	Reduced Energy Use in New and Retrofitted State-Owned Buildings	0.1	0.6	4.3	–\$42	–\$10	Super Majority (1 objection)
RCI-3b*	Reduced Energy Use in State-Owned Buildings	0.2	0.4	4.2	–\$46	–\$11	Super Majority (1 objection)
RCI-4a*	Promotion and Incentives for Improved New Building Design and Construction	0.2	1.1	7.0	–\$160	–\$23	Super Majority (1 objection)
RCI-4b*	Promotion and Incentives for Improved Existing Buildings	0.0	0.3	1.7	–\$39	–\$23	Super Majority (1 objection)
RCI-5*	Education for Consumers, Industry Trades, and Professions	<i>Not Quantified</i>					Unanimous
RCI-6 [†]	Incentives and Funds To Promote Renewable Energy and Energy Efficiency	0.2	0.8	5.1	–\$118	–\$23	Super Majority (1 objection)
RCI-7*	Green Power Purchasing for Consumers	0.2	0.6	4.7	\$61	\$13	Unanimous
RCI-8*	Nonresidential Energy Efficiency	0.4	1.0	8.6	\$583	\$68	Unanimous
RCI-9 [†]	Support for Energy-Efficient Communities, Including Smart Growth	<i>Not Quantified</i>					Unanimous
RCI-10 [†]	Energy-Savings Sales Tax	0.0	0.1	0.7	–\$33	–\$47	Super Majority (1 objection)
	Sector Total After Adjusting for Overlaps	2.55	9.24	69.77	–\$1,313.37	–\$18.82	
	Reductions From Recent Actions (ESIA Title II requirements for new appliances and lighting)	0.34	0.89	8.02	<i>Not Quantified</i>		
	Sector Total Plus Recent Actions	2.89	10.13	77.79	–\$1,313.37	–\$18.82	

DSM = demand-side management; EISA = Energy Independence and Security Act of 2007; 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.

* 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).

Overlap Discussion

The Governor's Commission on Global Warming (GCGW) and the Residential, Commercial, and Industrial (RCI) Technical Work Group (TWG) have developed 10 policy recommendations to reduce the emissions of greenhouse gases (GHGs) in the RCI sector. In addition to estimating the impacts of each individual policy recommendation, the combined impacts of the policy recommendations in each sector were estimated, assuming that all were implemented together. This involved eliminating any overlaps in coverage that would occur to avoid double counting of impacts. Also, some of the policy recommendations in one sector overlapped with those in another sector; therefore, these overlaps were identified, and the impact analysis was adjusted to eliminate double counting of impacts associated with these intersectoral overlaps. The following section identifies where these overlaps occurred and explains the methods used to adjust the impacts analysis to avoid double counting of impacts.

Method for Analyzing RCI Cumulative Impacts

To assess the cumulative emission reductions for the policies in the RCI sector, it is necessary to consider any overlaps among the policies that affect similar types of energy use. Specifically, some policies (such as RCI-3) are defined by their goals for reducing energy use, while others (such as RCI-1 and RCI-2) are defined by addressing a specific type of energy use. In these cases, it is important to consider whether addressing the specific energy use would add to the overall reductions, or would just be subsumed into the more general reduction goal. To address this issue, policies were compared in terms of the type of energy use they target and the energy reduction strategies they implement. Overlaps were identified and quantified by sector (RCI or government/institutional), type of energy use targeted (water heating, space heating, etc.), and measure (e.g., solar hot water). If a policy's impact by sector and type of energy use was less than the impact from an overlapping policy for that same sector and type of energy use, it was excluded from the cumulative analysis.

RCI-1 (Improved Building Codes) doesn't overlap with RCI-2b, at least in theory, because RCI-2b either should be applied to existing demand or would be for energy efficiency improvements beyond new codes. There are no overlaps for this policy recommendation.

RCI-2a (Utility and Non-Utility DSM for Peak Use Electricity) quantifies the reduced use of electricity due to more rational pricing mechanisms, such as real-time pricing. Higher prices result in lower energy use overall. The quantification of this policy recommendation explicitly excludes conservation measures, such as high-efficiency air conditioners and chillers, which are included in RCI-1. This policy recommendation does not overlap with any other policy recommendations and is assumed to be additional to existing utility demand response measures.

RCI-2b (Utility and Non-Utility DSM and Energy Efficiency for Electricity) is the "headline" energy efficiency policy recommendation that potentially subsumes other policy recommendations.

RCI-3a and RCI-3b (Reduced Energy Use in New and Retrofitted [3a] and Existing [3b] State-Owned Buildings) typically show little overlap with utility programmatic investments and are additional to code improvements. These policy recommendations do not overlap with any other policy recommendations.

RCI-4a and RCI-4b (Promotion and Incentives for Improved New [4a] and Existing [4b] Building Design and Construction) are improvements “beyond code” only for new buildings and for major retrofits. These policy recommendations were quantified so that the energy efficiency measures deployed were additional to the more generation energy efficiency measures under RCI-2b. There are no overlaps for these policy recommendations.

RCI-6 (Incentives and Funds To Promote Renewable Energy and Energy Efficiency) provides additional energy efficiency funding and implementation mechanisms for low-income residential customers. Well-designed utility and non-utility energy efficiency/demand-side management programs will target these populations, but not at the level identified under this policy recommendation. RCI-6 is assumed to overlap 50% with RCI-2b.

RCI-7 (Green Power Purchasing for Consumers) voluntary purchasing programs in the residential sector do not overlap with other RCI policy recommendations, nor with Energy Supply (ES) policy recommendations, because green power purchasing is a voluntary, demand-side measure, in contrast to the regulatory, supply-side renewable portfolio standard promulgated under ES-3a and/or 3b. This policy recommendation is assumed to not overlap with any other ES policy recommendations. However, the biomass generation resulting from this recommendation partly overlaps with Agriculture, Forestry, and Waste management (AFW) policy recommendation AFW-4 (Expanded Use of Agriculture and Forestry Biomass Feedstocks for Electricity, Heat, or Steam Production), and is adjusted for this overlap in the AFW totals.

RCI-8 (Nonresidential Energy Efficiency) is a combined heat and power policy recommendation that is unique to the RCI sector and is not analyzed in the ES TWG. This recommendation is assumed not to overlap with any other ES policy recommendations. However, the biomass generation resulting from this policy recommendation partly overlaps with AFW-4 (Expanded Use of Agriculture and Forestry Biomass Feedstocks for Electricity, Heat, or Steam Production), and is adjusted for this overlap in the AFW totals.

RCI-10 (Energy-Savings Sales Tax) reduces prices for energy-efficient goods and increases the demand for these items that would have not occurred otherwise. There are no overlaps for this policy recommendation.

Overlaps Between Sectors. The electricity energy efficiency investments from the suite of RCI policy recommendations reduce electricity demand and thus make it possible to meet renewable energy mandates more cost-effectively. For example, under RCI-2b, electricity demand in 2025 is reduced by almost 9,600 gigawatt-hours (GWh) versus the reference case. ES-3a assumes a 15% renewable portfolio standard (RPS) by 2025, and with the implementation of RCI-2b would require 1440 GWh fewer of renewable resources to meet the target. Using the renewable energy cost assumptions for RCI-7, the reduced spending on higher-cost renewables in 2025 would result in savings of \$13 million in that year alone, and a net present value (NPV) of \$54 million from 2009 to 2025.

RCI-1. Improved Building Codes

Policy Description

This policy recommendation enforces existing building codes by strengthening and streamlining the building codes adoption and enforcement processes to increase energy efficiency (reduce energy consumption) for residential, commercial, and industrial buildings.

According to the U.S. Department of Energy (DOE), almost half of U.S. GHG emissions are associated with the construction and operation of buildings. Building energy codes specify minimum energy efficiency requirements for new buildings or for existing buildings undergoing a major renovation. Given the long lifetime of most buildings, enforcing existing state building codes will provide long-term GHG savings.

Also, the state can improve codes that are not limited to heating, ventilation, and air conditioning (HVAC) systems, including daylighting design to reduce lighting needs, electric lighting design, building envelope design, and integrated building design strategies.

In Arkansas, residential structures account for 60% of building energy use, with commercial structures accounting for the remaining 40%. In 2004, the residential sector accounted for 19% of Arkansas' total energy consumption, and the commercial sector accounted for 14%. Emphasis on enforcing residential codes holds a large potential for reducing GHG emissions.

Policy Design

Goals:

- Expand statewide adoption and enforcement of existing building codes (nonquantifiable).
- Follow national codes without amendments in Arkansas, and update Arkansas codes in concert with the timing of the national codes.
- Achieve a 10% improvement in energy efficiency through educational programs for builders, building inspectors, and other building industry professionals to ensure that the existing codes are implemented and enforced.

Timing:

- Expand adoption and enforcement efforts of existing code requirements immediately.
- Coordinate adoption and enforcement initiatives with new code review cycles.

Implementing Parties: Building code officials, homeowners, building owners, builders, contractors, developers (new construction and existing buildings).

Implementation Mechanisms

Consider updating Arkansas building energy codes through an administrative rulemaking process, rather than through legislative amendments.

Related Policies/Programs in Place

- Arkansas Energy Code:
 - Residential—2003 International Energy Conservation Code (IECC), with Arkansas supplements and amendments to the 2003 IECC.
 - Commercial—2003 IECC (including ASHRAE/IESNA [American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society of North America] 90.1-2001), with Arkansas supplements and amendments to the 2003 IECC.
 - No set code review cycle.
 - Last effective date, October 1, 2004.
- National Energy Code:
 - Residential—2006 IECC.
 - Commercial—2006 IECC (including ASHRAE/IESNA 90.1-2001), with Arkansas supplements and amendments to the 2003 IECC.
 - 3-year code review cycle with yearly supplements.

Based on Arkansas Public Service Commission (APSC) data, statewide annual natural gas energy efficiency expenditures in 2008 are extrapolated to be \$4.6 million. Using the levelized cost assumptions in RCI-2b, gas existing actions are estimated to produce 1,200 billion British thermal units (BBtu) of reductions, which are subtracted from the total GWh reductions under RCI-1 and RCI-4a and RCI-4b equally each year through 2025.

Type(s) of GHG Reductions

Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-1. Estimated GHG reductions and costs of or cost savings from RCI-1

Quantification Factors	2015	2025	Units
GHG emission reductions	0.22	0.63	MMtCO ₂ e
Net present value	-\$27.3	-\$117.6	\$ Million
Cumulative GHG reductions	0.89	5.30	MMtCO ₂ e
Cost-effectiveness	-\$30.64	-\$22.18	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources:

A. Energy Consumption by Sector (Billions of British thermal units [BBtu])

Historical energy consumption in the state, by sector, is taken from the DOE Energy Information Administration (EIA) State Energy Data System, available at:

<http://www.eia.doe.gov/emeu/states/seds.html>. To calculate future projected energy consumption through 2030, growth factors were applied to the historical 2005 data. The growth factors are based on a combination of two parameters:

- *Growth Within the RCI Sectors*—Growth factors for the residential sector are based on projected population growth. Population figures are from the University of Arkansas Center for Business and Economic Research Population Projections for 2001 to 2004 (<http://cber.uark.edu/default.asp?show=population>), and the Time Series Extrapolations for 2005 to 2030 (<http://www.aiea.ualr.edu/research/demographic/population/default.html>). Growth in the commercial sector is based on nonmanufacturing employment growth projections, and industrial growth is based on manufacturing employment. Employment projections were taken from the Arkansas Department of Workforce Service's long-term industry employment projections (<http://www.discoverarkansas.net/?PageID=156>), with estimated 2004 employment and 2014 projected employment figures for the manufacturing and nonmanufacturing sectors.
- *Growth in Electricity Sales*—This factor was calculated based on historical retail sales from 1990 to 2005, obtained from the EIA Arkansas Electricity Profile, in gigawatt-hours (GWh), available from Table 8 at: http://www.eia.doe.gov/cneaf/electricity/st_profiles/arkansas.html.

B. Baseline Power Station Electricity Generation (GWh) and Fuel Use (BBtu)

Gross generation for 2005 was obtained from the EIA databases (EIA-906 and EIA-920) on fuel stocks at all electric power sector generating facilities, broken down by fuel type (http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html). Data for later years were projected from the 2005 figure, based on projections of growth in generation for the Southwest Power Pool (SPP) region and the Southeastern Reliability Council (SERC) region. EIA assumes that Arkansas is located partly (85%) in the SERC region and partly (15%) in the SPP region. The projected regional consumption and generation data are from the EIA *Annual Energy Outlook 2008* (AEO2008) and can be accessed by downloading the “Electric Generation & Renewable Resource” file at <http://www.eia.doe.gov/oiaf/aeo/supplement/index.html>. On-site use was subtracted from all generation figures. The analysis is based on *consumption-based* generation, meaning it is based on the electricity sources that deliver electricity to consumers *in state*; therefore, the generation of electricity that is exported is not considered.

C. Costs Associated With Electricity Generation

The costs in the United States to produce electricity using different types of technologies are from the EIA *Annual Energy Outlook 2007* (AEO2007), which used the EIA National Energy Modeling System. Capital costs and fixed and variable operations and maintenance costs are from Table 39 in the Electricity Market Module, available at: <http://www.eia.doe.gov/oiaf/archive/aeo07/assumption/index.html>. Prices for delivered fuel (in 2005\$/million [MM] Btu) are provided in the EIA Supplemental Tables to the AEO2007 by region, with projections through 2030. (Download “Consumption & Prices by Sector & Census

Division” at: <http://www.eia.doe.gov/oiaf/aeo/supplement/>; fuel prices by region begin with Table 11.) Transmission costs are added to the total as a constant \$80/kilowatt (kW).

Quantification Methods

A. Heat Rates (Btu/kilowatt-hour [kWh])

Heat rates indicate how much fuel is used (Btu) to generate a given amount of electricity (kWh). They vary greatly, depending on the type of power stations and the fuel used. Heat rates are used to convert figures for electricity into figures for fuel use, so the amount of fuel used can then be converted into GHG emissions using the appropriate GHG emission factors. Heat rates for 2005 for each type of generation and fuel were calculated from 2005 fuel use (in Btu) divided by 2005 generation (GWh). Projections for 2006 and beyond are based on annual combustion efficiency growth rates for the Mid-Atlantic Area Power Pool region. Combustion efficiency for a given year is calculated for each fuel type as the fuel use (in quadrillion Btu) divided by the electricity generated (in billion kWh), and the combustion efficiency growth rate applied to this value is based on the change in combustion efficiency from the previous year.

B. GHG Emissions Associated With End-Use Consumption (by Sector)

Historical CO₂ data by sector (and further broken down by fuel type) were calculated by two U.S. Environmental Protection Agency (EPA) State Greenhouse Gas Inventory Tool (SIT) software modules: the Fossil Fuel Combustion Module and—for emissions from industrial sources—the SIT module for industry. CH₄ and N₂O emissions were calculated by the Stationary Combustion Module and—for emissions from industrial sources—the SIT module for industry.

Projected emissions through 2030 were based on the 2005 data, with growth factors compounded from year to year, as discussed above in section A of the Data Sources section for energy consumption.

C. GHG Emissions Associated With Electricity Generation From Different Technologies and Fuels

The projected data for each GHG were calculated for each fuel and generation type (e.g., non-lignite coal in a steam plant) as a direct product of the projected generation data (in GWh) described above in section B. Metric tons (t) of CO₂ are calculated from generation as:

$$\text{tCO}_2 = \text{GWh} * (\text{Btu/kWh}) * (\text{tCO}_2/\text{MMBtu}) * (\% \text{ of that fuel in the fuel mix})$$

where (Btu/kWh) is the heat rate and (tCO₂/MMBtu) is the CO₂ emission factor. The calculation is similar for CH₄ and N₂O, which are then converted to CO₂ equivalents (CO₂e) using global warming potentials of 21 for CH₄ and 310 for N₂O. The emission factors used for each GHG were the same as those used in the EPA SIT software modules.

Key Assumptions:

- The rate at which cash flows are discounted is 5%.
- NPV is calculated in 2005 dollars.
- The NPV base year is 2009.

- Transmission and distribution (T&D) losses are 8.1%.¹
- Manufactured housing is not included in the building code improvement quantification.
- Renovated commercial space is 30% of new building construction. Renovated residential space does not fall under code improvements.
- The new building construction rate is 1.3%/year for the residential sector,² and 2.0%/year for the commercial sector.³
- The 2008 avoided delivered electricity cost (\$2005) is \$58.28/megawatt-hour (MWh) The 2008 avoided peak delivered electricity cost is estimated at \$74.02/MWh.⁴ The 2008 avoided natural gas cost (\$2005) is \$7.28/MMBtu.⁵
- The levelized capital cost of electricity energy efficiency (\$2005) is \$34.10/MWh.⁶ This includes utility fixed costs of marketing, evaluation, and administration, which add an estimated 24% to the capital costs listed in Quantec et al. (2008).⁷ This figure represents the total utility and participant costs that are typically figured into a total resource cost measure.
- The levelized cost of natural gas efficiency (\$2005) is \$5.10/MMBtu.⁸ This includes utility fixed costs of marketing, evaluation, and administration, which add 24% to capital costs. This figure represents the total utility and participant costs that are typically figured into a total resource cost measure.
- T&D electricity losses are estimated at 8.1%, which is an average of 2005 and 2006 estimated losses/retail sales.⁹
- To estimate emission reductions from policy recommendations that are expected to displace conventional grid-supplied electricity (i.e., energy efficiency), a simple, straightforward approach is proposed. Through 2012, we assume that these policy recommendations would

¹ U.S. Department of Energy, Energy Information Administration. State Electricity Profiles 2006. Data for Arkansas. Available at: http://www.eia.doe.gov/cneaf/electricity/st_profiles/arkansas.html.

² Based on U.S. Census Bureau data for new housing starts in Arkansas in 2005. Available at: <http://www.census.gov/const/C40/Table2/t2yu200512.txt>.

³ Forecasted annual change in commercial floor space of 2.0% in West South Central, from AEO2005 output files. (Not available online.)

⁴ Entergy Arkansas, Inc. Docket No. 81-071-F. Public Utility Regulatory Policies Act - Section 210. Filed on June 30, 2008. Available at: http://www.apscservices.info/pdf/81/81-071-f_319_1.pdf. The avoided cost is the average of all periods. The avoided peak cost is the average of summer and winter peaks.

⁵ U.S. Department of Energy, Energy Information Administration. "Natural Gas Prices." January 2008 Arkansas City Gate Price. Available at: http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SAR_m.htm.

⁶ Quantec LLC, Summit Blue Consulting, Nextant, Inc., A-TEC Energy Corporation, and Britt/Makela Group. *Assessment of Energy and Capacity Savings Potential in Iowa: Final Report*, vol. I. Prepared for the Iowa Utility Association. February 2008. (Not available online.)

⁷ Ibid.

⁸ Ibid.

⁹ U.S. Department of Energy, Energy Information Administration. "Arkansas Electricity Profile." DOE/EIA-0348. 2006. Available at: http://www.eia.doe.gov/cneaf/electricity/st_profiles/arkansas.html.

displace generation from a “marginal” mix of fuel-based electricity sources comprised of 50% coal and 50% gas. This would equate to an emissions intensity of approximately 0.70 MMtCO₂e/MWh through 2012. (We assume that sources without significant fuel costs would not be displaced, e.g., generation of nuclear, hydro, or other renewable resources). The Hempstead coal plant is expected to come on line during this period. However, beginning in 2013, the policy recommendations are assumed to avoid a mix of new fossil fuel-based capacity additions for the balance of the planning period. The thermal new-build mix following 2012 is estimated to be 100% natural gas combined-cycle plants. This would equate to an emissions intensity of approximately 0.43 MMtCO₂e/MWh from 2013 to 2025.

Key Uncertainties

None identified.

Additional Benefits and Costs

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar photovoltaic (PV) panels, LED (light-emitting diode) lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-2a. Utility and Non-Utility DSM for Peak-Use Electricity

Policy Description

Demand-side management (DSM) is a policy approach that requires actions that influence both the quantity and the patterns of energy consumed by end users. This policy recommendation focuses on increasing investment in electricity DSM programs. The goals may be accomplished through programs run by utilities or others, energy efficiency funds, and/or energy efficiency measures. These strategies are typically termed DSM activities, and may be designed to work in tandem with other strategies that can also encourage efficiency gains.

Natural gas utilities have experienced declines in sales to consumers over the last 10 years. As a result, the RCI TWG has decided that it is not necessary to impose a state goal for utilizing DSM programs to reduce consumption of natural gas. However, the APSC envisions increased direct natural gas use, and carbon pricing and other national market factors may also increase gas use in the future. While promoting direct natural gas use where it accomplishes energy efficiency and climate change goals, Arkansas should take advantage of any additional opportunities to promote increased efficiency in the use of natural gas.

GHGs from peak electricity DSM can be reduced from two sources. The first is the reduction of absolute levels of energy use by consumers due to higher prices. Real-time pricing and smart metering give consumers information about their energy use that enables them to better rationalize their use. Time-of-use pricing or other schemes to reflect rational pricing that result in price increases during peak periods potentially reduce demand by the estimated price elasticity of demand, typically by -0.20% to -0.50% (U.S. EIA, 2003), so that a 10% increase in prices would lead to a 2%–5% reduction in demand. In a survey of experience with smart metering, Owen and Ward (2006) find energy savings of 0%–10%. Peak avoided costs in 2008 are an average of 74% higher than nonpeak avoided costs, so the demand reductions could be larger, but this price differential would limit voluntary adoption of the program without regulatory encouragement.

In Arkansas, the avoided cost of peak electricity is 74% higher than nonpeak electricity. Using a -0.20% elasticity, this would result in a 15% reduction in demand if the full price were passed on to customers. However, given uncertainty about the percentage price increase passed along to the customer (that it will not reflect the full peak cost), and issues about voluntary adoption, the program is phased in over time, and demand reductions are statically estimated at 5% for the customers who receive the peak demand measures. For this reason, the statewide reductions from the program are modest. The costs savings from the program result from assuming that the cost of the demand reduction measures is less than the avoided cost of electricity.

The other source of GHG reductions from policies to reduce peak demand is energy efficiency measures that reduce demand during peak periods, such as high-efficiency air conditioners and chillers. Included in the existing DSM measures in RCI-2b, these measures also reduce new generation capacity investments, a factor that is not quantified for GHG reductions. The GHG impacts of other types of rate structures are more difficult to quantify. Curtailment programs that

allow loads to be shifted during peak periods might result in different emission profiles as these loads move from peak to shoulder or baseload periods. Overall CO₂ savings from these programs are also difficult to quantify. (This element of this policy recommendation is not quantified.)

Policy Design

Goals: Implement energy efficiency programs and DSM to reduce growth in electric peak demand by 5% per year by 2010 and by 10% per year by 2015. Energy efficiency gains remain constant from 2015 through 2025.

Timing: See above.

Implementing Parties: All electric utilities (public and private), municipal electric systems, electric cooperatives, regulators, and customers (all sectors).

Implementation Mechanisms

Statewide expansion of energy efficiency programs.

Related Policies/Programs in Place

There are currently no regulatory requirements for municipally owned electric systems and electric cooperatives to offer energy efficiency programs to their customers, although this could change in the next several years.

The current rate design for electric and gas utilities links a significant amount of the utilities' revenues to the amount of electricity or natural gas sold. Consequently, the utilities' revenues may be reduced with the introduction of energy efficiency programs, conservation programs, and DSM programs that reduce the amount of electricity or natural gas sold. To encourage the utilities to offer and promote these programs, the APSC should adopt rate designs and cost recovery mechanisms that are necessary and in the public interest, to decouple the recovery of the utilities' revenues from the amount of electricity or natural gas sold. Further, the APSC should identify appropriate incentives that are necessary and in the public interest, to further encourage the utilities to offer energy efficiency, conservation, and DSM programs.

Energy Efficiency and Conservation Programs in Arkansas—Ark. Code Ann. §§23-3-401 *et seq.* authorizes the APSC to develop energy efficiency and conservation programs to address high energy costs. The statute was passed in 1977 during the previous energy crisis. During the 2005 session, the Arkansas General Assembly passed Act 1939, which asked the Commission to report on any actions taken or planned pursuant to Ark. Code Ann. §§23-3-401 *et seq.*

The initial programs are “quick-start” programs offered by the utilities during the initial period of the APSC’s rules. The total cost of the initial quick-start programs is approximately \$18,530,924 for the initial 2-year period ending December 31, 2009. The total cost of all of the energy efficiency and conservation programs is approximately \$0.08–\$0.46 per month for an average residential electric or gas customer. (See http://www.apscservices.info/rules/energy_conservation_rules_06-004-R.pdf.)

Net Metering Service—Another service offering is net metering service. Pursuant to Ark. Code Ann. 23-18-601 *et seq.*, the APSC adopted net metering rules. (See http://www.apscservices.info/rules/net_metering_rules.pdf.) Net metering permits customers to provide all or part of their monthly electricity needs through generating facilities powered by renewable resources. The maximum size is 25 kW for residential customers and 300 kW for other customers. Customers are able to offset their usage and receive a credit for any excess generation delivered to the electric utility during a 12-month period.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-2. Estimated GHG reductions and costs of or cost savings from RCI-2a

Quantification Factors	2015	2025	Units
GHG emission reductions	0.01	0.02	MMtCO ₂ e
Net present value	-\$3.9	-\$11.1	\$ Million
Cumulative GHG reductions	0.06	0.21	MMtCO ₂ e
Cost-effectiveness	-\$69.71	-\$52.20	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

- Gill Owen and Judith Ward. *Smart Meters: Commercial, Regulatory and Policy Drivers*. Appendix 2. Sustainability First. March 2006. Available at: <http://www.sustainabilityfirst.org.uk/docs/smartmeterspdfappendices.pdf>.
- U.S. Department of Energy, Energy Information Administration. "Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models." 2003. Available at: <http://www.eia.doe.gov/oiaf/analysispaper/elasticity/>.

Quantification Methods: See RCI-1.

Key Assumptions:

- Demand response measures reduce the growth in peak electricity demand by the program targets 5% in 2010 and 10% in 2015. This number is consistent with the survey in Owen and Ward (2006), which finds that energy savings from smart meters vary from 0% to 10%. This is similar to what price elasticity of demand would predict. If peak price tariffs are 10%–20% higher than nonpeak tariffs, then demand reductions would range from 2.5% to 10% using price elasticities of –0.20% to –0.5% (EIA, 2003).

- Incremental (new) demand response for new peak electricity savings end in 2015 at 10% (plus avoided T&D), but the program delivers this savings level through 2025.
- Residential, commercial, and industrial customers all implement the program at the same rate.
- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- Peak load hours are 44% of total hours.
- T&D losses are estimated at 8.1%.
- Peak DSM displaces 100% natural gas generation (TWG assumption).
- CO₂ reductions and electricity savings from investments in measures to reduce peak demand, such as high-efficiency air conditioners and chillers, are not quantified under this policy recommendation, as they are included in RCI-2b.

Key Uncertainties

None identified.

Additional Benefits and Costs

T&D losses are typically greater during peak hours than during nonpeak hours. This analysis uses average T&D losses, so emission reductions might be modestly understated.

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-2b. Utility and Non-Utility DSM and Energy Efficiency for Electricity

Policy Description

DSM is a policy approach that requires actions that influence both the quantity and the patterns of energy consumed by end users. This policy recommendation focuses on increasing investment in electricity DSM programs. The goals may be accomplished through programs run by utilities or others, energy efficiency funds, and/or energy efficiency goals. These strategies are typically termed DSM activities, and may be designed to work in tandem with other strategies that can also encourage efficiency gains.

Natural gas utilities have experienced declines in sales to consumers over the last 10 years. For this reason, the TWG has decided that it is not necessary to impose a state goal for utilizing DSM programs to reduce consumption of natural gas. However, the APSC envisions increased direct natural gas use, and carbon pricing and other national market factors may increase gas use in the future as well. While promoting direct natural gas use where it accomplishes energy efficiency and climate change goals, Arkansas should take advantage of any additional opportunities to promote increased efficiency in the use of natural gas.

Policy Design

Goals:

- Implement an aggressive goal for energy efficiency and other DSM programs that eliminates electric utility demand growth over a realistic phase-in period. At this time and for the GCGW's purposes, average electricity demand growth is projected to be 1.4% through 2030. Therefore, energy efficiency and DSM programs that deliver demand reductions of 1.4% of total sales (based on a prior 3-year running average) would be phased in through 2015. Thereafter, energy efficiency and DSM programs delivering demand reductions equal to 1.4% of total electricity sales would be continued, unless a comprehensive assessment of potential efficiency gains in Arkansas and best practices nationwide indicates that greater gains are possible.
- Implement energy efficiency programs and DSM to reduce growth in total electricity demand so that annual electricity load growth is equal to 0% by 2015, when all new electricity use is met with DSM and energy efficiency investments.

Timing: Interim targets are to be linear reductions of projected load growth beginning in 2010. Approximately 16% of load growth will be met in each year with new energy efficiency investments during 2010–2015: 16% in 2010, 32% in 2011, 48% in 2012, 64% in 2013, 80% in 2014, and 100% by 2015.

Implementing Parties: All electric utilities (public and private), municipal electric systems, electric cooperatives, regulators, and customers (all sectors).

Implementation Mechanisms

In 2009, Arkansas should engage expert assistance in providing an in-depth, comprehensive, state-specific energy efficiency analysis that outlines the potential to cost-effectively meet future energy utility demand through efficiency, DSM, and renewable energy (Maryland and Florida recently made such analyses the basis for energy policy planning). That in-depth study should quantify, among other things, the climate change emission reductions below baseline that would result from achieving that potential, and should become a basis for DSM program implementation.

For utilities subject to the authority of the APSC, the APSC should review any allocations that are subsidies coming from ratepayers and ensure that there is not inappropriate cross-subsidization between classes of consumers. For utilities (e.g., municipal utilities) that are not subject to the authority of the APSC, the governing body for the utility should review any allocations that are subsidies coming from ratepayers and ensure that there is not inappropriate cross-subsidization between classes of consumers.

Related Policies/Programs in Place

The current rate design for electric and gas utilities links a significant amount of the utilities' revenues to the amount of electricity or natural gas sold. Consequently, the utilities' revenues may be reduced with the introduction of energy efficiency, conservation, and DSM programs that reduce the amount of electricity or natural gas sold. To encourage the utilities to offer and promote these programs, the APSC should adopt rate designs and cost recovery mechanisms that are necessary and in the public interest, to decouple the recovery of the utilities' revenues from the amount of electricity or natural gas sold. Further, the APSC should identify appropriate incentives that are necessary and in the public interest, to further encourage the utilities to offer energy efficiency, conservation, and DSM programs.

There are currently no regulatory requirements for municipally owned electric systems and electric cooperatives to offer energy efficiency programs to their customers, although this could change in the next several years.

Off-Peak and Interruptible Electric Service Rate Schedules and Demand Response

Programs—In addition to the specific programs listed above, all of the electric utilities offer a variety of rate schedules to encourage commercial and industrial customers to avoid or reduce electricity usage at peak periods. The rate schedules offer discounts for the use of electricity at off-peak periods and penalties for use at peak periods. Additionally, customers can choose to take interruptible service, which permits the utility to interrupt those customers at peak periods and provides those customers with discounted rates for the electricity consumed. The electric utilities also offer time-of-use rates for commercial and industrial customers.

Electric Cooperative Energy Efficiency and Conservation Programs and Demand Response

Programs—In addition to the energy efficiency and conservation programs introduced in response to the APSC's rules, the electric cooperatives of Arkansas offer a number of programs, including customer education efforts through the *Rural Arkansas* magazine, Web page information, the Doug Rye radio program, articles by Doug Rye, and educational materials for schools in the cooperatives' service territory. The cooperatives offer some home weatherization services for customers in their territory; various appliance programs, including heating and air

conditioning equipment and water heaters; direct load control of irrigation equipment and air conditioning equipment; and extensive interruptible service offerings, off-peak service offerings, and other rate schedules.

Oklahoma Gas and Electric Company Energy Audit Program—This program has a cost of approximately \$119,250. It provides residential energy audits that identify potential energy savings associated with installing weatherization improvements and replacing or upgrading heating and air conditioning equipment with more energy-efficient equipment. Customers will be provided a report and recommendations based upon the audit to improve the efficiency of their electricity use.

Entergy Arkansas, Inc., Home Energy Solutions Program—This program has a cost of approximately \$1,415,000 over the 2-year period ending December 31, 2009. It provides a variety of offerings to residential customers to promote the use of energy-efficient appliances and heating and air conditioning equipment. The program provides coupons of up to \$250 per customer for the purchase of ENERGY STAR appliances, heating and air equipment, and windows, and up to \$200 per customer to pay for tune-ups of heating and air conditioning systems to improve their operating efficiency.

Decoupling Mechanisms—In the recent rate cases for Arkansas Western Gas Company, Arkansas Oklahoma Gas Corporation, and CenterPoint Energy Arkla, the APSC approved mechanisms to ensure that the utilities do not suffer a loss in revenues due to declines in usage. These mechanisms address the declining usage per customer that the gas utilities have confronted. An additional benefit is that the mechanisms should enable the gas utilities to implement energy efficiency and conservation programs without negatively affecting revenues. The mechanisms were approved by the APSC as experimental or pilot programs for a number of years.

Oklahoma Gas and Electric Company Commercial Lighting Replacement Program—This program has a cost of approximately \$122,362. It provides coupons to assist commercial customers in replacing inefficient lighting systems with more energy-efficient lighting systems.

Oklahoma Gas and Electric Company Electric Motor Replacement Program—This program has a cost of approximately \$145,350. It provides education to commercial and industrial customers about the benefits of more efficient electric motors, and up to \$170 toward the replacement of each 25-horsepower motor.

Compact Fluorescent Light Bulb Replacement Program—This program is offered by Entergy Arkansas, Inc., Oklahoma Gas and Electric Company, and Southwestern Electric Power Company. Intended to promote the use of compact fluorescent light bulbs (CFLs), the program provides coupons of \$1–\$4 to apply toward the purchase of CFLs. The energy savings from a single CFL will most likely outweigh the cost of the entire energy efficiency and conservation program for an average residential customer. The cost of the program is approximately \$820,000.

Based on APSC data, statewide annual electricity energy efficiency expenditures in 2008 are extrapolated to be \$4.6 million. Using the levelized costs assumptions in RCI-2b, electricity existing actions are estimated to produce 181 GWh of reductions, which are subtracted from the

total GWh reductions under RCI-2b each year through 2025. CO₂ reductions are estimated using TWG assumptions in RCI-1.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-3. Estimated GHG reductions and costs of or cost savings from RCI-2b

Quantification Factors	2015	2025	Units
GHG emission reductions	1.06	4.15	MMtCO ₂ e
Net present value	-\$140.4	-\$1,450.1	\$ Million
Cumulative GHG reductions	1.06	30.45	MMtCO ₂ e
Cost-effectiveness	-\$47.99	-\$47.62	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

Quantification Methods: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- T&D losses are estimated at 8.1%.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., which might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Additional Benefits and Costs

Maintenance and operating costs should be considered in the life-cycle cost accounting of high efficiency buildings.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Majority (7 objections).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings. Other members were concerned about the long-term feasibility of the energy efficiency goals.

RCI-3a. Reduced Energy Use in New and Retrofitted State-Owned Buildings: Government “Lead by Example”

Policy Description

Government-led, or “lead by example,” initiatives help state and local governments achieve substantial energy cost savings, while promoting the adoption of clean energy technologies for significant GHG emission reductions in new and existing state and local government buildings. The proposed policy provides energy efficiency targets that are much higher than code standards. This policy recommendation sets energy efficiency goals for new construction and major renovations.

Policy Design

Goals:

- Require that all new state buildings (buildings that utilize a minimum of 20% of state funds), developments, and major renovations be designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% less energy use than the ASHRAE 90.1-2004 energy standard. Special-use facilities, such as state laboratories, can receive an exemption from this rule, as determined by the Arkansas Energy Office (AEO).
- Increase the fossil fuel reduction standard for all new buildings to:
 - 60% reduction in 2012,
 - 70% in 2017,
 - 80% in 2020,
 - 90% in 2025, and
 - Carbon-neutral in 2030 (using no GHG-emitting energy to operate).
- For verification of energy efficiency performance, require state-funded buildings to be certified by the Leadership in Energy and Environmental Design™ (LEED) certification standards.
 - Buildings can also be verified through Green Globes for New Construction (with independent third-party verification), or other similarly stringent, national, third-party-verified green building certification system.

Timing: Beginning in 2009.

Implementing Parties: State government agencies, local governments, schools, and universities.

Implementation Mechanisms

The state should include full life-cycle cost accounting for all its procurement. ENERGY STAR-rated appliances are to be a minimum acceptable level of energy efficiency for procurement where applicable.

New Buildings:

- State building procurement regulations that include energy requirements for the respective year.
- Database of new building performance that includes pertinent building metrics (energy savings, GHG emission reductions, operational savings, return on investment).

Major Renovations:

- Implementation of energy conservation measures to reduce energy use within state-funded buildings.
- A retained savings policy, whereby agencies can retain funds saved by improving energy efficiency to additional energy efficiency investments.

Certification System:

- AEO can determine which certification systems would be appropriate for energy efficiency validation.

Related Policies/Programs in Place

Natural Gas Commercial and Industrial Energy Audits—The Natural Gas Commercial and Industrial Energy Audits program provides energy audits conducted by a qualified third-party vendor to commercial and industrial customers of the natural gas distribution utilities in Arkansas. The program has a total cost of approximately \$351,000. It includes an audit of the building envelope and of all end-use natural gas equipment, which identifies potential energy savings associated with installing weatherization improvements and replacing or upgrading equipment with more energy-efficient equipment. Customers are provided a report and recommendations based upon the audit to improve the efficiency of their natural gas energy use.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-4. Estimated GHG reductions and costs of or cost savings from RCI-3a

Quantification Factors	2015	2025	Units
GHG emission reductions	0.10	0.63	MMtCO ₂ e
Net present value	-\$12.5	-\$41.6	\$ Million
Cumulative GHG reductions	0.37	4.31	MMtCO ₂ e
Cost-effectiveness	-\$33.55	-\$9.65	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- 90% of new and retrofitted buildings comply with the policy; the remaining 10% that don't comply are 20% less energy efficient than the policy calls for.
- The state begins to purchase renewable energy for the fossil fuel reduction targets when all energy efficiency gains are assumed to be made, which is estimated at a 70% reduction from current efficiency levels.
- The growth rate for new government buildings is 2% per year, which is the growth rate in new commercial buildings.
- For every square foot of new government buildings, 30% of equivalent square footage is retrofitted each year.

Quantification Methods: See RCI-1.

Key Uncertainties

None identified.

Additional Benefits and Costs

Maintenance and operation costs should be considered in life-cycle cost accounting for high-efficiency buildings.

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-3b. Reduced Energy Use in Existing State-Owned Buildings: Government “Lead by Example”

Policy Description

Government-led, or “lead by example,” initiatives help state and local governments achieve substantial energy cost savings, while promoting the adoption of clean energy technologies for significant GHG emission reductions in existing state and local government buildings. The proposed policy provides energy efficiency targets for existing buildings that are much higher than code standards.

The Arkansas state government is a significant consumer of energy. The state owns or leases approximately 29.45 million square feet of building space, and pre-K through 12 schools account for an additional 85 million square feet. Additional local government buildings are not in this inventory, such as courthouses, city halls, and other facilities.

Arkansas’ public school buildings are in need of approximately \$1.6 trillion of repairs and improvements that “Impact Functioning of School, i.e., Mechanical, Electrical, HVAC.” These needs are opportunities for installing more energy-efficient equipment.¹⁰

Policy Design

- **Goals:** Set a state goal to reduce by 2030, from a 2009 baseline, a minimum of 30% of electricity consumed by existing state and local facilities, schools, and universities. Require that 20% of the square footage of the existing state building stock (buildings that utilize a minimum of 20% of state funds) achieve 7 points (approximately 30% energy savings) per the full requirements of the LEED for Existing Buildings, Energy and Atmosphere Credit 1 by 2012. A similarly stringent, third-party-verified green building certification system for commercial buildings may also be used.
- Require the total square footage of buildings that meet the efficiency standard for existing buildings to be increased as follows:
 - 40% in 2014,
 - 60% in 2016,
 - 80% in 2018, and
 - 100% in 2020. By this date, the entire state existing building stock will have received efficiency investments to reach the 30% improvement target.
- Adjust the improvement targets and execute programs to achieve additional savings in 2020–2030.

¹⁰ Task Force to Joint Committee on Educational Facilities. *Arkansas Statewide Educational Facilities Assessment—2004. Final Report to the Joint Committee on Educational Facilities.* November 30, 2004, p. 20. Available at: <http://www.arkleg.state.ar.us/data/education/statereport.pdf>.

- Create a program to audit energy use, with a goal of at least 20% of all buildings being audited annually, and require state and local governments to submit annual energy plans to the state.
- Set a statewide goal that by 2025, a minimum of 15% of energy consumed by state and local government buildings will come from renewable in-state energy sources. This policy will allow the state to “lead by design,” and will create an established market for green power generators.

Timing: Beginning in 2010.

Implementing Parties: State government agencies, local governments, schools, and universities.

Implementation Mechanisms

- Establish a Sustainability Coordinator function that will define the current performance of existing building stock, set priorities, and define energy efficiency programs. Utilize LEED or a similarly stringent rating system to verify and certify performance.
- Implement a retained savings policy, whereby agencies can retain a portion of funds saved by improving energy efficiency and apply them to additional energy efficiency investments.

State Audits

Audits of energy use and associated GHG emissions by state agencies are vital for establishing baseline levels needed to set achievable goals for reducing emissions. It will be important to audit both state agency facilities and activities in order to fully assess and mitigate each agency’s carbon footprint. It will also be important for state agencies to audit energy use and GHG emissions annually for tracking progress toward meeting GHG reduction goals. In so doing, the GCGW recommends that state agencies consider a phased approach by assessing energy use and associated emissions first for state facilities and then for state activities.

- *State Facilities*—Since facilities are stable and stationary entities, protocols for auditing energy use and emissions should be fairly routine to implement annually and would assist the agencies in developing experience that can be applied to assess energy use associated with their activities.
- *State Activities*—Development and implementation of protocols to assess energy and interior and exterior water use and emissions associated with state agency activities may be more difficult, because activities vary depending on the mission of each agency, and are likely to change frequently, even within an agency. Nevertheless, an analysis of energy use and emissions associated with agency activities is necessary to develop plans to mitigate GHG emissions and demonstrate progress toward meeting GHG emission reduction goals.

In addition, the state should consider a phased approach, starting with the larger state government agencies first, to develop protocols and experience that can then be used to assist smaller agencies and the university system. Such an approach should be designed to leverage experience and assessment tools that can be used by other entities (e.g., school districts) to foster consistency in developing and implementing audit protocols on a routine basis.

Related Policies/Programs in Place

The existing Sustainable Building Design Practices Legislative Task Force is addressing issues associated with high-performance buildings.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-5. Estimated GHG reductions and costs of or cost savings from RCI-3b

Quantification Factors	2015	2025	Units
GHG emission reductions	0.19	0.44	MMtCO ₂ e
Net present value	-\$11.0	-\$46.3	\$ Million
Cumulative GHG reductions	0.70	4.21	MMtCO ₂ e
Cost-effectiveness	-\$15.61	-\$11.00	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

Quantification Methods: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1
- Arkansas state and local governments occupy 15.6% of commercial floor space in the state.
- All government buildings are commercial buildings.
- Renewable energy consisting of 80% wind and 20% biomass meets 25% of government electricity consumption in 2025.
- The state begins to purchase renewable energy for the fossil fuel reduction targets when all energy efficiency gains are assumed to be made, which is estimated at a 70% reduction from current efficiency levels.
- 90% of retrofitted buildings comply with the policy; the remaining 10% that don't comply are 20% less energy efficient than the policy calls for.

Key Uncertainties

None identified.

Additional Benefits and Costs

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-4a. Promotion and Incentives for Improved New Building Design and Construction

Policy Description

Almost half of all GHG emissions in the United States are associated with residential, commercial, and industrial buildings and the energy associated with building materials. Improving the energy efficiency design and construction of buildings will have an immediate and ongoing impact on GHG reduction.

This policy provides incentives and targets to induce the owners and developers of new buildings to improve the efficiency with which energy and other resources are used in those buildings, along with provisions for raising targets periodically and providing resources to building industry professionals to help achieve the desired building performance. This policy can include elements to encourage the improvement and review of energy use goals over time, and to encourage flexibility in contracting arrangements to encourage integrated energy- and resource-efficient design, construction, and renovation. Incentives could include low-cost loans for investments in energy efficiency, tax credits, and feebates. The use of third-party rating systems will reduce the requirement for significant oversight and enforcement by state organizations.

Policy Design

Goals:

- Provide tiered incentives for energy efficiency in new buildings that achieve at least a 20% reduction in energy use relative to the ASHRAE 90.1-2004 energy standard for commercial buildings, and the 2004 Arkansas Energy Code for residential buildings through certification in one of the following rating systems:
 - LEED (New Construction, Core & Shell, Commercial Interiors, Homes, or other appropriate version),
 - Green Globes New Construction, or
 - Similarly stringent, third-party-verified green building certification system for commercial or residential buildings.
- Make the incentives for this program commensurate with the energy efficiency threshold achieved. Tier the thresholds as follows:
 - 20%
 - 25%
 - 30%
 - 30% and above
- Increase the benchmark minimum efficiency standard for existing buildings as follows:
 - 20% in 2014
 - 25% in 2016
 - 30% in 2018

- 35% in 2020
- Require participating organizations or individuals to provide feedback on the costs and actual performance of energy efficiency improvements, and annual GHG reduction levels in new construction as compared to the Arkansas Energy Code.

Timing: Develop legislation in 2009; make incentives available in 2010; begin compliance in 2011.

Implementing Parties: All builders, building material suppliers, recycled building material sellers, and home improvement stores.

Implementation Mechanisms

- A reference guide for defining the appropriate rating systems and verification requirements;
- Initial building audits of energy performance and operations of state buildings to define initial priorities;
- Low-cost loans for improving energy efficiency in residential buildings, including a weatherization program;
- A retained savings policy, whereby agencies can retain funds saved by improving energy efficiency and apply them to additional energy efficiency investments;
- Low-interest loans to fund energy efficiency retrofits for commercial and industrial buildings;
- Tax credits for energy-efficient residential, commercial, and industrial buildings; and
- A feebate program that allows for a self-funded financial mechanism.

Related Policies/Programs in Place

Based on APSC data, statewide annual natural gas energy efficiency expenditures in 2008 are extrapolated to be \$4.6 million. Using the levelized cost assumptions in RCI-2b, gas existing actions are estimated to produce 1200 BBtu of reductions, which are subtracted from the total GWh reductions under RCI-1 and RCI-4a and RCI-4b equally each year through 2025.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-6. Estimated GHG reductions and costs of or cost savings from RCI-4a

Quantification Factors	2015	2025	Units
GHG Emission reductions	0.21	1.06	MMtCO ₂ e
Net present value	-\$21.8	-\$160.1	\$ Million
Cumulative GHG reductions	0.64	7.00	MMtCO ₂ e
Cost-effectiveness	-\$33.88	-\$22.87	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

Quantification Methods: See RCI-1.

Key Assumptions:

- Baseline electricity use by sector that falls under RCI-4a (GWh):
 - Residential sector—51% (all end uses except refrigerators and 50% of appliances and lighting);¹¹
 - Commercial sector—74% (all end uses except office equipment); and¹²
 - Industrial sector—14% (used for HVAC, lighting, and "other facility support," including natural gas used in the South Census region).¹³
- New building construction rate/year:
 - Residential sector—1.3%;¹⁴
 - Commercial sector—2.0%; and¹⁵
 - Industrial sector—0.4%.¹⁶

¹¹ U.S. Department of Energy, Energy Information Administration. "Residential Energy Consumption Survey 2001 Consumption and Expenditure Data Tables." Available at: <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html - space>.

¹² U.S. Department of Energy, Energy Information Administration. "2003 Commercial Buildings Energy Consumption Survey Detailed Tables." Table C1: Total Energy Consumption by Major Fuel for Non-Mall Buildings. December 2006. Available at: http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html - consumexpen03.

¹³ U.S. Department of Energy, Energy Information Administration. (2001). "2002 Manufacturing Energy Consumption Survey." Table 5.8: End Uses of Fuel Consumption, 2002. Form EIA-846. Available at: http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/pdf/table5.8_02.pdf.

¹⁴ U.S. Census Bureau. Table 2u: New Privately Owned Housing Units Authorized Unadjusted Units for Regions, Divisions, and States. December 2005. Available at: <http://www.census.gov/const/C40/Table2/t2yu200512.txt>.

¹⁵ Forecasted annual change in commercial floor space of 2.0% in West South Central from AEO2005 output files.

- Estimated based on relative use of electricity and gas by sector (ratio of electricity savings to gas savings: BBTu/GWh):
 - Residential sector—101.4%;¹⁷
 - Commercial sector—63.5%; and¹⁸
 - Industrial sector—82.0%.¹⁹
- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- 90% of new buildings comply with the policy; the remaining 10% that don't comply are 20% less energy efficient than the policy calls for.

Key Uncertainties

None identified.

Additional Benefits and Costs

Wood products contain much less embodied energy than other building materials and, unlike other building materials, function as long-term sequesters of carbon. Additionally, wood products sourced locally have more energy and carbon advantages compared to products transported from distant sources. For example, a lumber-framed wall or floor system requires just 40% of the fossil fuel energy needed to manufacture a concrete wall or floor system and only 20% of the fossil fuel energy need to manufacture a steel wall or floor.²⁰

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

¹⁶ Forecasted annual change in industrial electricity consumption from the Arkansas inventory and forecast, reduced by 25% for improvements in energy intensity per square foot (estimate).

¹⁷ Based on the ratio of natural gas fuel use to site electricity use for residential buildings in Arkansas' climate zone. Source: U.S. Department of Energy, Energy Information Administration. "2001 Residential Energy Consumption Survey: Household Energy Consumption and Expenditures Tables." Table CE1-1c: Total Energy Consumption in U.S. Households by Climate Zone. Available at: http://www.eia.doe.gov/emeu/recs/recs2001/ce_pdf/enduse/ce1-1c_climate2001.pdf.

¹⁸ Based on the ratio of natural gas fuel use to site electricity use for commercial buildings nationwide. Source: U.S. Department of Energy, Energy Information Administration. "2003 Commercial Buildings Energy Consumption Survey Detailed Tables." Available at: http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html - consumexpen03.

¹⁹ Gas facility support divided by electricity facility support (in BBTu) in the South Census region. Source: U.S. Department of Energy, Energy Information Administration. "2002 Energy Consumption by Manufacturers—Data Tables." Table 5.7: Energy Consumed as a Fuel by End Use—By Region With Total Consumption of Electricity. March 8, 2005. Available at: <http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html>.

²⁰ J. Boyer, S. Bratkovich, A. Lindburg, and K. Fernholz. *Wood Products and Carbon Protocols: Carbon Storage and Low Energy Intensity Should Be Considered*. Dovetail Partners, Inc. April 28, 2008. Available at: <http://www.dovetailinc.org/reportView.php?action=displayReport&reportID=92>.

Operation and maintenance costs should be considered in life-cycle cost accounting for high-efficiency buildings.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-4b. Promotion and Incentives for Improved Existing Building Design and Construction

Policy Description

Almost half of all GHG emissions in the United States are associated with residential, commercial, and industrial buildings and the energy associated with building materials. Improving the energy efficiency design of buildings will have an immediate and ongoing impact on GHG reduction.

This policy provides incentives and targets to induce the owners and developers of existing buildings to improve the efficiency with which energy and other resources are used in those buildings, along with provisions for raising targets periodically and providing resources to building industry professionals to help achieve the desired building performance. This policy can include elements to encourage the improvement and review of energy use goals over time, and to encourage flexibility in contracting arrangements to promote integrated energy- and resource-efficient design, energy demand reduction, and practices that maintain optimal energy use. Incentives could include low-cost loans for investments in energy efficiency, tax credits, and feebates.

Policy Design

Goals:

- Measure the performance of energy efficiency improvements in existing buildings against a regional average of similar building types.
- Provide tiered incentives for energy efficiency in existing buildings that achieve at least a 15% reduction in energy use versus the regional average for similar buildings through certification in one of the following rating systems:
 - LEED for Existing Buildings or
 - Similarly stringent, third-party-verified green building certification system for commercial or residential buildings.
- Make the incentives for this program commensurate with the energy efficiency threshold achieved. Tier the thresholds as follows:
 - 15%
 - 20%
 - 25%
 - 30% and above
- Increase the benchmark minimum efficiency standard for existing buildings as follows:
 - 20% in 2014
 - 25% in 2016
 - 30% in 2018
 - 35% in 2020

- Require participating organizations or individuals to provide feedback on the costs and actual performance of energy efficiency improvements, and annual GHG reduction levels in new construction against the benchmark.
- Offer low-cost loans or incentives to consumers for weatherization programs, including weatherstripping and insulation improvements.

Timing: Develop legislation in 2009; make incentive measures available in 2010; begin program in 2011.

Implementing Parties: All builders, building material suppliers, recycled building material sellers, and home improvement stores. The aforementioned should be considered for both private and public construction projects.

Implementation Mechanisms

LEED, or equivalent rating system, will be used to define the benchmark and actual energy savings achieved. Relevant implementation mechanisms may include:

- Retro-commissioning of existing buildings;
- Audits of energy performance and operations by state and other government buildings;
- Implementation of design features to reduce energy use within state-funded buildings, through incorporation of proven planning guides and regulations;
- Financial and technical assistance for implementation of energy-saving programs in existing buildings, and a requirement that all state-owned buildings implement an energy management program;
- Low-interest loans to fund energy efficiency retrofits for commercial and industrial buildings; and
- Tax credits for energy-efficient RCI buildings. Funding for education programs could come from a variety of sources, including professional associations, matching grants from federal agencies, regional market energy efficiency organizations, and energy efficiency from utilities and non-utilities, among others.

Related Policies/Programs in Place

Oklahoma Gas and Electric Company Energy Audit Program—This program has a cost of approximately \$119,250. It provides residential energy audits that identify potential energy savings associated with installing weatherization improvements and replacing or upgrading heating and air conditioning equipment with more energy-efficient equipment. Customers are provided a report and recommendations based upon the audit to improve the efficiency of their electricity use.

Based on APSC data, statewide annual natural gas energy efficiency expenditures in 2008 are extrapolated to be \$4.6 million. Using the levelized cost assumptions in RCI-2b, gas existing actions are estimated to produce 1200 BBtu of reductions, which are subtracted from the total GWh reductions under RCI-1 and RCI-4a and RCI-4b equally each year through 2025.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-7. Estimated GHG reductions and costs of or cost savings from RCI-4b

Quantification Factors	2015	2025	Units
GHG emission reductions	0.05	0.27	MMtCO ₂ e
Net present value	-\$5.3	-\$39.0	\$ Million
Cumulative GHG reductions	0.16	1.72	MMtCO ₂ e
Cost-effectiveness	-\$34.06	-\$22.66	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

Quantification Methods: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- 90% of retrofitted buildings comply with the policy; the remaining 10% that don't comply are 20% less energy efficient than the policy calls for.
- This policy only applies to major retrofits (major renovations, i.e., "down to the studs") of existing buildings.
- The rate of major retrofits is assumed to be 30% of the following new building construction rates/year:
 - Residential sector—1.3%;
 - Commercial sector—2.0%; and
 - Industrial sector—0.4%.
- Baseline electricity use by sector that falls under RCI-4b (GWh):
 - Residential sector—51% (all end uses, except refrigerators, and 50% of appliances and lighting);
 - Commercial sector—74% (all end uses, except office equipment); and
 - Industrial sector—14% (used for HVAC, lighting, and "other facility support," including natural gas used for the South Census region).
- Estimated based on relative usage of electricity and gas by sector. Ratio of electricity savings to gas savings (BBtu/GWh):

- Residential sector—101.4%;
- Commercial sector—63.5%; and
- Industrial sector—82.0%.

Key Uncertainties

None identified.

Additional Benefits and Costs

Wood products contain much less embodied energy than other building materials and, unlike other building materials, function as long-term sequesters of carbon. Additionally, wood products sourced locally have more energy and carbon advantages compared to products transported from distant sources. For example, a lumber-framed wall or floor system requires just 40% of the fossil fuel energy needed to manufacture a concrete wall or floor system and only 20% of the fossil fuel energy need to manufacture a steel wall or floor.²¹

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis. Operation and maintenance costs should be considered in life-cycle cost accounting for high-efficiency buildings.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

²¹ J. Boyer, S. Bratkovich, A. Lindburg, and K. Fernholz. *Wood Products and Carbon Protocols: Carbon Storage and Low Energy Intensity Should Be Considered*. Dovetail Partners, Inc. April 28, 2008. Available at: <http://www.dovetailinc.org/reportView.php?action=displayReport&reportID=92>.

RCI-5. Education for Consumers, Industry Trades, and Professions

Policy Description

Education under this policy recommendation falls under two broad categories:

- Consumer awareness education on how consumers can reduce GHG emissions, and
- Technical education for builders and contractors on the specific methods they can incorporate to reduce GHG emissions at every stage of construction.

The ultimate effectiveness of emission reduction activities in many cases depends on providing information and education to consumers regarding the energy and GHG emission implications of their choices. Public education and outreach is vital to fostering a broad awareness of climate change issues and effects (including co-benefits, such as clean air and public health) among the state's citizens. Such awareness is necessary to engage citizens in actions to reduce GHG emissions in their personal and professional lives.

This policy recommendation also addresses education and outreach programs for building professionals to encourage incorporation of energy efficiency and GHG emission reduction considerations, such as programs to train builders and contractors.

Education and training should also be made available to builders and contractors and others for retrofitting existing buildings.

Policy Design

Goals: Develop consumer and technical/professional education courses and outreach programs for GHG emission reductions to increase the number of professionals trained in energy efficiency.

Timing: By 2010, put the education/training recommendation in place and begin outreach programs.

Implementing Parties: Consumers, retailers, manufacturers, technicians, and professionals in building and related trades, code enforcement agencies, trade schools, community colleges, universities, Arkansas Department of Higher Education.

Issues related to Arkansas K-12 public schools are addressed in Cross-Cutting Issues policy recommendation CC-6 (State Climate Public Education and Outreach).

Implementation Mechanisms

Funding for education programs could come from a variety of sources, including professional associations, matching grants from federal agencies, regional market energy efficiency organizations, and energy efficiency surcharges paid by energy customers or from utilities and non-utilities, among others.

Related Policies/Programs in Place

Energy Efficiency Arkansas Education Program—This program is a component of a larger group of energy efficiency and conservation programs offered by the electric and gas utilities in Arkansas. It is intended to help Arkansas utility customers identify opportunities to engage in energy efficiency and conservation practices. The program has an overall cost of \$2.4 million, or approximately \$0.01–\$0.04 per month for an average residential electric or gas customer.

Natural Gas Customer Education Programs—CenterPoint Energy Arkla, Arkansas Western Gas Company, and Arkansas Oklahoma Gas Corporation will each provide additional company-specific customer education messages. The cost of the program is approximately \$409,636. The messages will be designed to support the statewide education program and direct customers to energy efficiency and conservation opportunities specific to each company.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Not quantifiable.

Data Sources: Not applicable.

Quantification Methods: Not quantifiable.

Key Assumptions: Not applicable.

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

RCI-6. Incentives and Funds To Promote Renewable Energy and Energy Efficiency

Policy Description

This policy recommendation refers to financial mechanisms for energy efficiency that could increase program participation and investment by providing incentives to a variety of customer classes to improve the energy performance of buildings, equipment, and residences. These incentives could be targeted to residential customers, small businesses, and low-income consumers, as well as to other customer classes, including larger businesses and the industrial sector.

A public benefits charge (sometimes called a systems benefits charge) is a fee attributed to utility customers based on their use of energy in a given time period. With deregulation in many states, the public utility commissions often lost the ability to require electric utilities to implement efficiency programs. The result in many states was the development of the public benefits charge, which is a non-bypassable charge on electric bills. The funds collected are then provided to a third party to provide energy efficiency programming, or can support implementation of a revolving-loan payment, establishment of a micro-loan program, and tax incentives. Energy audits should be included to aid in assessing needs and tracking progress toward improvement.

At least 33% of Arkansas' population has an income of less than \$30,000/year, of which 20%–30% is spent on utility bills. There are currently not enough weatherization or energy conservation programs in place to reduce the economic burden on this population or to have a scalable impact on mitigating the GHG emissions produced by these homes. Providing traditional financing options for low-income homeowners will not meet their needs or achieve any meaningful scale.

The need exists for identifying these homeowners; educating them about, and the opportunity for, energy audits; and financing the implementation of energy-efficient measures with a shared savings approach.

There would be multiple benefits to develop an employer-driven, local economic impact initiative that reaches out to employees (scalable), connecting them to trained energy auditors (provided by public benefit funds), and to create a Program-Related Investment (PRI) fund (revolving energy fund) to finance moderate energy efficiency measures for employees (builds employee retention and adds benefits). The resulting energy savings would be split between the employee's monthly payroll deduction (paid into the PRI) and the employee, manifested in the lower utility bill. Employers would be provided the incentive to create the PRI with either a state tax credit or the right to "bank" or capture the aggregated annual CO₂ savings from their employees.

Manufactured (mobile) homes account for approximately 27% of residential structures in Arkansas. Mobile homes and temporary dwellings (hunting camps, boat houses) are exempt from compliance with the Arkansas Energy Code and fall under U.S. Department of Housing and

Urban Development (HUD) regulation. These homes are factory-made and can more easily implement efficiency improvements. ENERGY STAR has a program for energy-efficient manufactured homes.

In Schweitzer et al.'s (2003) review of 20 major energy audits, the audits accounted for less than 4% of program spending on conservation, yet resulted in an estimated 18% of cost and energy savings. Audits are one of the lowest-cost conservation measures available to utilities and non-utility programs and form a core element of DSM programs.

Policy Design

Goals:

Low-Income Pilot Program

- Fund a Low-Income Pilot Program in rural Arkansas counties that targets weatherization of the counties' low-income population, working with the local economic development office, Arkansas community action agencies, industries, and manufacturers.
- Beginning year one of the program, double the estimated 1,200 homes a year that are currently receiving weatherization assistance to 2,400 homes. Each year for the next 5 years, increase the number of homes receiving weatherization, until by 2015 10,000 homes are being retrofitted annually. At the 10,000 homes per year weatherization rate in 2015, by 2025 138,000 homes would be weatherized, which is 78% of 2008 eligible units (assumes no new, eligible, low-income residences over the 2010–2025 period).
- Ultimately, target 90% of the low-income homeowner population (approximately 178,000 residences in 2008) who are eligible for federal weatherization assistance.
- Expand available funding per residence from the current level (approximately \$2,800) to be able to upgrade major appliances, such as furnaces.
- Target energy efficiency improvements of 33% per upgraded residence.
- Increase these targets annually until the low-income target is achieved, and then target weatherization in homes that are above the federal weatherization eligibility level.

New Manufactured Housing

- Require that the incentive program for manufactured housing purchased in or shipped to Arkansas be ENERGY STAR-qualified or have other equivalent energy-efficient, third-party certification.
- Ensure that these units are at least 30% more energy efficient than comparable available manufactured housing.
- Through the incentives, increase the penetration of energy-efficient manufactured housing to 75% of new manufactured housing sales by 2025.

Other

- Add a minimum of 75–100 new certified auditors, which are green collar jobs.

- Expand energy audit programs for all sectors, and increase them annually until 100% saturation is achieved.

Timing:

Low-Income Pilot Program

- 2009–10—Launch a Low-Income Pilot Program in select rural counties through public-private partnerships.
- 2009–10—Build the state's capacity of certified energy auditors/raters; identify and prequalify subcontractors statewide.
- July 2010—Fund a program manager and adequate staff to begin statewide implementation of the goal 2,400 homes.
- 2010 and beyond—Increase funding to meet annual targets.

Manufactured Homes

- Begin in 2010 an incentive program for ENERGY STAR-Qualified Manufactured Housing or other equivalent efficient third-party certification.

Other

- Expand energy audit programs by 2010. Make the annual increase 10% of the audited stock.

Implementing Parties: Commercial and industrial energy users in the private and public sectors (including those responsible for mixed-use projects), nongovernmental organizations, public agencies, utilities, building design and construction professionals, lenders, the Arkansas Chapter of the U.S. Green Building Council.

Implementation Mechanisms

Offer low-cost loans or incentives to consumers for weatherization programs, including weatherstripping and insulation improvements. These could include “weatherization kits” like those being offered to low-income residents in Chicago to improve their building energy efficiency and reduce energy expenditures.

Related Policies/Programs in Place

Energy Efficiency, Conservation, and DSM Programs—The current rate design for electric and gas utilities links a significant amount of the utilities' revenues to the amount of electricity or natural gas sold. Consequently, the utilities' revenues may be reduced with the introduction of energy efficiency, conservation, and DSM programs that reduce the amount of electricity or natural gas sold. To encourage the utilities to offer and promote these programs, the APSC should adopt rate designs and cost recovery mechanisms that are necessary and in the public interest, to decouple the recovery of the utilities' revenues from the amount of electricity or natural gas sold. Further, the APSC should identify appropriate incentives that are necessary and in the public interest, to further encourage the utilities to offer energy efficiency, conservation, and DSM programs.

Federal Weatherization Program

HUD Code for Manufactured Homes—HUD 1976 Federal Manufactured Home Construction and Safety Standards Acts, commonly known as the "HUD Code."

ENERGY STAR-Qualified Manufactured Homes

Arkansas Weatherization Program—This program has an approximate cost of \$4,369,266. The program is modeled after the existing U.S. Department of Energy weatherization assistance program that is currently administered by the Arkansas Department of Human Services and the Arkansas Community Action Agencies. The program, which targets the most energy-inefficient homes, is designed to provide weatherization assistance for approximately 2,500 homes over the initial 2-year period ending December 31, 2009. Approved measures include attic insulation, floor insulation, wall insulation, duct insulation, duct sealing, window sealing, window replacement, furnace and air conditioner tune-up and replacement, lighting, and smart thermostats. The program pays up to 50% of the cost of a home energy audit and up to 50% of the cost of weatherization measures up to a maximum of \$1,500 per home.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-8. Estimated GHG reductions and costs of or cost savings from RCI-6

Quantification Factors	2015	2025	Units
GHG emission reductions	0.15	0.78	MMtCO ₂ e
Net present value	-\$15.4	-\$117.6	\$ Million
Cumulative GHG reductions	0.46	5.13	MMtCO ₂ e
Cost-effectiveness	-\$33.62	-\$22.93	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources: See RCI-1.

- U.S. Department of Energy, Energy Information Administration. "2001 Residential Energy Consumption Survey: Household Energy Consumption and Expenditures Tables." Table CE1-3c: Total Energy Consumption in U.S. Households by Household Income, 2001." Available at: http://www.eia.doe.gov/emeu/recs/recs2001/ce_pdf/enduse/ce1-3c_hhincome2001.pdf.
- Martin Schweitzer, Donald W. Jones, Linda G. Berry, and Bruce E. Tonn. *Estimating Energy and Cost Savings and Emissions Reductions for the State Energy Program Based on*

Enumeration Indicators Data. ORNL/CON-487. Oak Ridge National Laboratory. January 2003. Available at: <http://www.ornl.gov/~webworks/cppr/y2001/rpt/116341.pdf>.

Quantification Methods: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- Federally eligible housing units eligible for the energy efficiency package consumed an average of 9800 KWh/year in 2010, and consumption grows at 1.1%/year.
- Beginning year 1 of the program, 2,400 homes a year receive weatherization assistance each year for the next 5 years. The number of homes receiving weatherization increases until 10,000 homes are being retrofitted annually by 2015.
- Energy efficiency improvements are 33% per upgraded residence.
- The costs and benefits of expanding energy audits are not quantified.
- Estimated based on relative usage of electricity and gas by sector. Ratio of electricity savings to gas savings (BBtu/GWh):
 - Residential sector—101.4%.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

Additional Benefits and Costs

Statewide increases in the green renovation construction market lead to increased economic development.

Older manufactured housing is typically very energy inefficient, and the state should consider ways to improve energy efficiency for these homes.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

RCI-7. Green Power Purchasing for Consumers

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 RPS and other mandatory programs. These sources include solar, wind, geothermal, biogas, biomass, and low-impact hydroelectric. Green power purchasing programs provide consumers with information about alternative green sources of energy they can select, rather than the traditional, more carbon-intensive sources.

As of April 2008, the leading green power program in the country had a customer participation rate of over 20%, but green power accounted for 4.6% of its load (NREL, 2008). This implies that participating customers were purchasing green power for less than 25% of their total electricity consumption, or else only small electricity users were participating. Therefore, this policy not only provides incentives for participation, but also encourages large-scale purchases so that customers may use green power to offset their entire electricity consumption.

Policy Design

Goals:

- By 2025, this voluntary program incentivizes one of four residential customers to participate in green power purchasing programs, and those who do participate purchase up to 25% of their total electricity use from renewable resources.
- Develop a mechanism that strongly encourages utilities purchasing this power to develop green power in Arkansas.

Timing: Consumers participate in green power purchasing programs beginning in 2010, achieving the 25% goal linearly by 2025.

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

Implementation Mechanisms

Arkansas will implement programs to provide consumers the option to purchase green power.

According to Bird et al. (2007), the premium paid by consumers for green power declined from \$34.80/MWh to \$21.20/MWh between 2000 and 2006. In 2025, the green power premium estimated under this policy for Arkansas is closer to \$10.

Related Policies/Programs in Place

Green Power Purchasing for Consumers—In the near future, the Electric Cooperatives of Arkansas plan to introduce a green power purchasing option for customers. It will be initially based on available hydropower credits. Additionally, the generation portfolios of several utilities include hydropower, and the generation portfolios of two electric utilities include wind generation.

Net Metering Service—Pursuant to Ark. Code Ann. 23-18-601 *et seq.*, the APSC adopted net metering rules (see http://www.apscservices.info/rules/net_metering_rules.pdf). Net metering permits customers to provide all or part of their monthly electricity needs through generating facilities powered by renewable resources. The maximum size is 25 kW for residential customers and 300 kW for other customers. Customers are able to offset their usage and receive a credit for any excess generation delivered to the electric utility during a 12-month period.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-9. Estimated GHG reductions and costs of or cost savings from RCI-7

Quantification Factors	2015	2025	Units
GHG emission reductions	0.19	0.60	MMtCO ₂ e
Net present value	\$2.7	\$60.7	\$ Million
Cumulative GHG reductions	0.69	4.75	MMtCO ₂ e
Cost-effectiveness	\$3.90	\$12.79	\$/tCO ₂ e

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

Data Sources: See RCI-1.

- Lori Bird, Leila Dagher, and Blair Swezey. *Green Power Marketing in the United States: A Status Report*, (Tenth Edition). National Renewable Energy Laboratory. Technical Report NREL/TP-670-42502. December 2007. Available at: <http://www.eere.energy.gov/greenpower/resources/pdfs/42502.pdf>.
- National Renewable Energy Laboratory. "NREL Highlights Leading Utility Green Power Programs: Pricing Programs Give Consumers Clean Power Choices." April 22, 2008. Available at: <http://www.nrel.gov/news/press/2008/348.html>.

Quantification Methods: See RCI-1.

Key Assumptions:

- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- One-in-four (25%) residential electricity consumers purchases green power by 2025. Of these participating customers, renewable energy purchases equal 25% of their electricity needs.
- Green power purchasing starts at 1.2% in 2010 and rises linearly each year to meet the target of 25% by 2025.
- The renewable energy mix supplied to the program is 75% wind, 15% biomass, 5% hydro, and 5% municipal solid waste or landfill gas.

- In 2025, the additional cost of renewables is approximately \$9.50 above business-as-usual generation sources.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional GHG reductions at a reduced cost are not included in the cost analysis

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

RCI-8. Nonresidential Energy Efficiency

Policy Description

This policy recommendation removes regulatory impediments and modifies utility rates to remove financial barriers to combined heat and power (CHP). 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 and water heating, 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.

There are significant opportunities for CHP plants in Arkansas. Fully 47% of industrial natural gas use in the South Census region is used for process heating or cooling that might be suitable for CHP (U.S. DOE/EIA, 2002).

Industrial and commercial facilities served by 480-volt, three-phase power from a utility typically use dry-type transformers to distribute power internally at lower voltages, such as for lighting and plug power. Efficient transformers are able to reduce T&D losses throughout the period of use. When combined with incentives, the electricity saved by such energy-efficient transformers typically has a 3-year payback period. The Energy Policy Act of 2005 set a standard for National Electrical Manufacturing Association (NEMA) TP-1 low-voltage distributors, effective 2007. Standards for medium- and high-voltage distributors have been ruled to have no significant impact on the environment.²² While federal standards have increased the efficiency of transformers, the RCI TWG recommends that Arkansas consider adopting incentives to encourage transformers that can efficiently handle nonlinear (variable) loads from digital equipment and lighting. The RCI TWG has not quantified the costs and benefits from such an incentive policy.

Policy Design

Goals:

- Install additional CHP and waste heat recovery technical potential on 25% of new boiler installations of a minimum size rating consistent with a reasonable payout in the state.
- Encourage efficient transformers where options for improved energy efficiency are available.

Timing: Achieve goals by 2010.

Implementing Parties: APSC.

²² U.S. Environmental Protection Agency, "Finding of No Significant Impact: Energy Conservation Program for Commercial Equipment, Distribution Transformers." *Federal Register* November 9, 2007;72(217):63563-63564. Available at: <http://www.epa.gov/fedrgstr/EPA-AIR/2007/November/Day-09/a22004.htm>.

Implementation Mechanisms

For utilities subject to the authority of the APSC, the APSC should review any allocations that are subsidies coming from ratepayers and ensure that there is not inappropriate cross-subsidization between classes of consumers. For utilities (e.g., municipal utilities) that are not subject to the authority of the APSC, the governing body for the utility should review any allocations that are subsidies coming from ratepayers and ensure that there is not inappropriate cross-subsidization between classes of consumers.

Related Policies/Programs in Place

EPA Combined Heat and Power Partnership—This voluntary program seeks to reduce the environmental impact of power generation by promoting the use of CHP. The partnership works closely with energy users, the CHP industry, state and local governments, and other clean energy stakeholders to facilitate the development of new projects and to promote their environmental and economic benefits.²³

Energy Policy Act of 2005—EPA Act 2005 set a standard for NEMA TP-1 low-voltage distributors, effective 2007. Standards for medium- and high-voltage distributors have been ruled to have no significant impact on the environment (see <http://www.epa.gov/fedrgstr/EPA-AIR/2007/November/Day-09/a22004.htm>).

Incentives and Resources To Promote CHP (a.k.a. Cogen)—The APSC established cogeneration rules several years ago (see http://www.apscservices.info/rules/cogeneration_rules.pdf).

Support for Switching to Less Carbon-Intensive Fuels (Coal and Oil to Natural Gas or Biomass)—Ark. Code Ann. 23-18-701 *et seq.* requires electric utilities to consider clean energy resources as a part of any resource plans. (See the APSC's "Resource Planning Guidelines for Electric Utilities" at: http://www.apscservices.info/rules/resource_plan_guid_for_elec_06-028-R_1-7-07.pdf). As a part of the utilities' resource planning, they must consider clean energy sources. The APSC is empowered to encourage or require utilities to consider clean energy sources. Two electric utilities have purchased wind-generating facilities that are included in the generation portfolios of those companies.

Additionally, Southwestern Electric Power Company has constructed a natural gas-fired generating plant and plans to construct another one. Arkansas Electric Cooperative Corporation has purchased an existing natural gas-fired generating plant and is in the process of constructing a natural gas-fired generating plant. And Entergy and Oklahoma Gas & Electric each is in the process of acquiring a natural gas-fired generating plant.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

²³ U.S. Environmental Protection Agency. Combined Heat and Power Partnership. Available at: <http://www.epa.gov/chp/>.

Estimated GHG Reductions and Costs or Cost Savings

Table G-8. Estimated GHG reductions and costs of or cost savings from RCI-8

Quantification Factors	2015	2025	Units
GHG emission reductions	0.43	0.95	MMtCO ₂ e
Net present value	\$106	\$583	\$ Million
Cumulative GHG reductions	1.51	8.56	MMtCO ₂ e
Cost-effectiveness	\$70.10	\$68.09	\$/tCO ₂ e

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

Data Sources:

- Bruce Hedman. "CHP Market Review." Presented at Southeast Planning Session on July 6, 2005. Available at: http://www.chpcenterse.org/pdfs/EEA-Southeast_Planning_session_7-6-05.pdf.
- U.S. Environmental Protection Agency, Combined Heat and Power Partnership. *Catalog of CHP Technologies*. Introduction, p. 7. Available at: <http://www.epa.gov/CHP/basic/catalog.html>.
- Kim Crossman. "Woody Biomass to CHP—Characteristics, Costs, and Performance of Commercially Available Technologies." Presented to the Society of American Foresters on October 26, 2007. Available at: www.fpl.fs.fed.us/tmu/2007safconvention/2007safconvention--crossman.ppt
- APSC. "Resource Planning Guidelines for Electric Utilities." Available at: http://www.apscservices.info/rules/resource_plan_guid_for_elec_06-028-R_1-7-07.pdf.
- U.S. Department of Energy, Energy Information Administration. U.S. Department of Energy, Energy Information Administration. *Assumptions to the Annual Energy Outlook 2008: With Projections for 2030*. Table 4: Growth Rates for Total Energy Use by Sector. DOE/EIA-0554(2008). June 2008. Available at: <http://www.eia.doe.gov/oiaf/aeo/assumption/>.
- U.S. Department of Energy, Energy Information Administration. "2002 Energy Consumption by Manufacturers—Data Tables." Table 5.7—End Uses of Fuel Consumption, March 8, 2005. Available at: <http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html>.

Quantification Methods: See RCI-1.

Key Assumptions:

- Technical potential for CHP in Arkansas in 2005 is 660 MW for commercial and 1120 MW for industrial facilities. This serves as an estimate for CHP retrofit capacity, which is implemented linearly for 15 years.
- Each year, 25% of new thermal demand is installed with CHP.
- The avoided CO₂ emissions are assumed to be Arkansas average emission intensities over the 2010–2025 period, estimated at 0.58 tCO₂/MWh in 2009.

- The fuel for new commercial CHP is 100% gas; for new industrial and advanced biofuel refineries, the fuel is 33% coal, 33% gas, and 33% biomass.
- The program deploys only 30% of estimated technical CHP potential for commercial, industrial, and advanced biofuel refineries in the state over the life of the program.
- T&D losses are 8.1%.²⁴
- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.
- Avoided capacity charges for commercial CHP are: ancillary service charge—\$0.28/kW/month; facility capacity – distribution charge—\$1.65/kW/month; on-peak demand charge—\$1.90/kW/month; system usage charge—\$0.35/kWh.
- New commercial and industrial CHP grows at 1.4% and 1.5%, respectively, over the 2006–2020 period.²⁵
- Biofuels processing CHP supply is derived from the assumption that biofuel produced in the state will be 15% of total transportation fuel by 2025, and that waste heat will be captured in 25% of these sites to generate electricity.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional GHG reductions at a reduced cost are not included in the cost analysis.

Estimating the costs of CHP into the distant future is tentative, because cost estimates are highly sensitive to natural gas prices, the cost of avoided power, and the assumption about the CO₂ intensity of displaced electricity.

Effectively addressing the efficiency of nonlinear (variable) power loads (e.g., computers, fluorescent lighting) remains a consideration under the new standards.”

Additional Benefits and Costs

This analysis does not consider CHP benefits from avoided costs of backup power systems.

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional CO₂ reductions at a reduced cost, are not included in the cost analysis.

²⁴ U.S. Department of Energy, Energy Information Administration. "Arkansas Electricity Profile." DOE/EIA-0348. 2006. Available at: http://www.eia.doe.gov/cneaf/electricity/st_profiles/arkansas.html.

²⁵ U.S. Department of Energy, Energy Information Administration. U.S. Department of Energy, Energy Information Administration. *Assumptions to the Annual Energy Outlook 2008: With Projections for 2030*. Table 4: Growth Rates for Total Energy Use by Sector. DOE/EIA-0554(2008). June 2008. Available at: <http://www.eia.doe.gov/oiaf/aeo/assumption/>.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

RCI-9. Support for Energy-Efficient Communities, Including Smart Growth

Policy Description

Smart growth dictates how the state will invest its money in community development, either by regulating local land-use decisions or by providing incentives to influence those decisions. Existing building, zoning codes, and business schedules often work against smart growth development. In the context of GHG emissions, smart growth policies can serve to revitalize and reuse commercial sites and will help preserve critical natural resources and farmland.

Improved community planning aims to create communities that are, among other attributes, livable, designed for reduced use of energy both within homes and businesses and in the transport sector, and have a reduced environmental impact relative to typical developments. Variants on the smart growth concept exist, but many call for clustering living units with easy access (often walking distance) to shops, schools, and entertainment and recreational facilities; incorporating elements of energy-efficient design and renewable energy in buildings; sharing energy facilities between buildings (for example, district heating systems); preserving open spaces, providing shared office space—especially in those buildings with higher energy efficiencies; and instituting alternative work schedules, telework options, and carpooling. Telework is an employment arrangement where an employee works or "telecommutes" remotely from home or a satellite office, part or all of the time. (See <http://wfnetwork.bc.edu/topic.php?id=4>.)

These concepts—improved building energy performance, innovative working arrangements, and community planning—offer significant synergies for Arkansas. This policy suggests a combination of incentives and targets to induce the owners and developers of buildings and the communities in which they are located to produce and operate buildings and communities that produce markedly lower GHG emissions than existing buildings and communities.

Policy Design

Goals:

- By 2009, provide resources for local jurisdictions to examine and rewrite their outdated state and local codes to accommodate for smart growth initiatives in community planning and development. Implementing smart growth policies is expected to reduce (per-unit) energy consumption, GHG emissions, infrastructure costs, and new construction by 30% by 2030.
- Design all new buildings, developments, and major renovations to meet the targets in RCI-4a and RCI-4b.
- Identify the link between GHG reductions and land-use planning decisions, as well as the reduction potential and targets for Arkansas.
- Create incentives to encourage smart growth by meeting Built Green Community certification or the LEED-ND (LEED for Neighborhood Development) gold level, with minimum energy and location criteria. Encourage compact and transit-oriented, mixed-use

development within urban growth areas that results in reduced vehicle miles traveled and GHG emissions and encourages walking and biking.

- Improve planning to reduce sprawl modeled after the "California Communities Climate Action Plan" and others.
- Promote consideration of location as part of a building's GHG footprint.
- Encourage state and local governments and private firms to adopt telework policies to reduce building and transportation-related GHG emissions. Commission a study on the effects of alternative work schedules similar to West Virginia House Resolution #34 and others.
- Limit sprawl by enabling transfer of development rights, revitalizing communities through developed land, and building reuse incentives, and institute a variety of conservation measures for woodlands and wetlands.
- Support locally owned shops, restaurants, and farmers' markets to help local businesses and family farms remain profitable, thus strengthening the local economy and protecting rural legacy and lands.

Timing: See above.

Implementing Parties: State and local governments, developers and builders, private firms, land-use planners.

Implementation Mechanisms

- Initiate a study of the potential impacts of a compressed work week and the option of telecommuting on cost and energy savings to the state and its employees, and the impact of a foreshortened work week on access to essential government operations.
- Implement executive, legislative, and administrative changes to enhance the integrated design of communities, energy systems, and transport systems.

Related Policies/Programs in Place

Many states have instituted telework legislation and executive orders. See Jessica Jackson-Yoo. "Telework." February 2008. Boston College Sloan Work and Family Research Network. Available at: http://wfnetwork.bc.edu/topic_extended.php?id=4&type=3&area=All.

Utah state government's mandatory four-day operations schedule.²⁶

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

²⁶ Larry Copeland. "Most State Workers in Utah Shifting to 4-Day Week." *USA Today*. July 1, 2008. Available at: http://www.usatoday.com/news/nation/2008-06-30-four-day_N.htm.

Estimated GHG Reductions and Costs or Cost Savings

This policy is a qualitative study recommendation. GHG reductions and costs or cost savings for Arkansas were not calculated for this recommendation, but are calculated under other policy recommendations. Smart growth planning quantification was performed under Transportation and Land use policy recommendation TLU-4 (Smart Growth, Pedestrian and Bicycle Infrastructure), which assumes higher population density tracts due to policies of 35% compared to 10% under business as usual. This results in fewer vehicle miles traveled and lower GHG emissions. See <http://www.arclimatechange.us/TLU.cfm> for the TLU policy description.

GHG reductions and costs or cost savings for Arkansas from high-performance building policies are quantified under RCI-4a and RCI-4b.

A report for the Consumer Electronics Association estimates that each commuter with a one-way commute length of 17 miles who telecommutes three times a week saves nearly 200 gallons of gasoline per year.²⁷ Energy reductions and GHG mitigation are maximized with organizational support for telecommuting, reducing incremental floor space requirements and appliance energy consumption.

Data Sources: Not applicable.

Quantification Methods: Not applicable.

Key Assumptions: Not applicable.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional GHG reductions at a reduced cost are not included in the cost analysis.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

²⁷TIAX, LLC. "The Energy and Greenhouse Gas Emissions Impact of Telecommuting and e-Conference." Prepared for the Consumer Electronics Association. July 2007. page 28. Available at: http://www.ce.org/Energy_and_Greenhouse_Gas_Emissions_Impact_CEA_July_2007.pdf.

RCI-10. Energy-Savings Sales Tax

Policy Description

This policy recommendation refers to a sales tax exemption for energy-efficient products, such as CFLs; geothermal heat pumps; highly efficient (> 14.4 SEER [seasonal energy efficiency ratio]) heat pump systems (auxiliary heat may be supplied by electricity or natural gas); and ENERGY STAR-certified water heaters, refrigerators and freezers, clothes washers and dryers, and dishwashers. Establishing a market signal that rewards lower-carbon purchase decision making provides consumers an incentive to improve their energy efficiency and reduce their adverse impacts on climate.

The list of energy efficiency measures that this policy recommendation applies to contains the same measures that utility energy efficiency programs typically pursue. Utility programs assume that some portion (usually $\sim 25\%$) of the capital costs of the efficiency measure is paid for by the participant. Thus, this policy recommendation reduces the purchase price (capital cost) of energy-efficient goods by consumers by the amount of the sales tax. However, these costs are then paid for by the state, rather than consumers.

The effect of the sales tax exemption on the purchase of energy-efficient products is a function of the price elasticity of demand. As the price of the efficient products decreases, the demand for these products increases. Price elasticity of demand for electricity in the short run is close to -0.20% and in the long run is closer to -0.50% (U.S. EIA, 2003). If the policy eliminates all taxes (estimated at 6%), this would lead to a 2% – 5% increase in demand.

Policy Design

Goals: Implement a sales tax exemption for all consumers on energy-efficient equipment, including (but not limited to) CFLs; geothermal heat pumps; highly efficient heat pump systems; and ENERGY STAR-certified products, including water heaters, refrigerators and freezers, clothes washers and dryers, and dishwashers.

Timing: Implement the sales tax exemption by 2010.

Implementing Parties: Retail businesses and consumers.

Implementation Mechanisms

Tax exemptions for eligible measures would need to be approved by the appropriate jurisdictions, and tax relief mechanisms at the point of sale would need to be developed.

Related Policies/Programs in Place

Act 120 of the 1st Extraordinary Session of 1983 exempts Gross Receipts Tax and Other State Excise Tax on the first 500 kWh of electricity per month for low- and moderate-income residential customers with incomes at or below \$12,000/year. (No Web link available.)

Compact Fluorescent Light Bulb Replacement Program—Offered by Entergy Arkansas, Inc., Oklahoma Gas and Electric Company, and Southwestern Electric Power Company, this program provides coupons of \$1–\$4 to apply toward the purchase of CFLs. The energy savings from a single CFL will most likely outweigh the cost of the entire energy efficiency and conservation programs for an average residential customer. The cost of the program is approximately \$820,000.

Type(s) of GHG Reductions

CO₂, CH₄, and N₂O emissions are reduced by avoided electricity generation from fossil fuel sources.

Estimated GHG Reductions and Costs or Cost Savings

Table G-9. Estimated GHG reductions and costs of or cost savings from RCI-10

Quantification Factors	2015	2025	Units
GHG emission reductions	0.02	0.11	MMtCO ₂ e
Net present value	–\$2.5	–\$32.7	\$ Million
Cumulative GHG reductions	0.02	0.69	MMtCO ₂ e
Cost-effectiveness	–\$47.24	–\$47.37	\$/tCO ₂ e

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 rows represent net cost savings.

Data Sources:

- Arkansas Department of Finance and Administration, Office of Excise Tax Administration. "Sales Tax Rates." Available at: http://www.state.ar.us/dfa/excise_tax_v2/et_su_rates_state.html_excel_file_city_county_list_07_2008.xls.
- U.S. Department of Energy, Energy Information Administration. "Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models." 2003. Available at: <http://www.eia.doe.gov/oiaf/analysispaper/elasticity/>.

Quantification Methods: See RCI-1.

Key Assumptions:

- This policy recommendation reduces consumer costs of energy efficiency measures and thus increases deployment. The assumed increase in deployment is a linear function of the estimated tax level. Low tax levels are expected to have little impact on purchasing decisions. High taxes and subsequent tax holidays will have a greater impact on consumers' buying energy-efficient equipment.
- The assumed state tax rate is 6%, which is the amount used to estimate the increased purchases from the tax holiday.

- Energy efficiency deployment under RCI-2b is used for baseline demand. The measures deployed under this policy recommendation are assumed to be similar to those deployed under RCI-2b. RCI-10 leads to additional energy efficiency deployment, due to reduced participant capital costs. By 2025, this policy results in a cumulative reduction of 0.4% of annual sales.
- The price elasticity of demand for energy-efficient products is the same as the estimated price elasticity of demand for electricity in EIA (2003). The short-run price elasticity of demand for energy-efficient products begins at -0.2% in 2010 and increases linearly to the long-run elasticity of -0.5% in 2025.
- For levelized costs of energy efficiency measures and avoided costs of energy, see RCI-1.

Key Uncertainties

The quantification of costs and benefits of energy efficiency only includes technologies that are currently commercialized. New technologies, such as building-integrated solar PV panels, LED lighting, etc., that might lead to additional GHG reductions at a reduced cost are not included in the cost analysis.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (1 objection).

Barriers to Consensus

One member does not believe this policy recommendation will result in net cost savings.

Annex G-1

Methodology for Calculating Existing Actions to Reduce Energy Consumption

The policy recommendations for the RCI sectors are affected by both state and federal policies that incentivize or mandate more efficient use of energy. The federal Energy Independence and Security Act of 2007 was signed into law in December 2007. This law contains several requirements that will reduce GHG emissions as they are implemented over the next few years. During the GCGW process, sufficient information was identified (e.g., implementation schedules) to estimate GHG emission reductions associated with implementing energy efficiency requirements for new appliances and lighting in Arkansas under Title III of the EISA.

- For the residential sector emissions reductions were estimated for: external power supply efficiency standards, residential boilers, furnace fan standard process, regional standards for furnaces, central air conditioners, and heat pumps, standby mode for electrical appliances, energy standards for home appliances, efficient light bulbs, incandescent reflector lamp efficiency standards.
- For the commercial sector emissions reductions were estimated for: external power supply efficiency standards, standby mode for electrical appliances, efficient light bulbs, incandescent reflector lamp efficiency standards, regional standards for furnaces, central air conditioners, and heat pumps, walk-in coolers and walk-in freezers, electric motor efficiency standards, and metal halide lamp fixtures.
- For the industrial sector emissions reductions were estimated for: efficient light bulbs, regional standards for furnaces, central air conditioners, and heat pumps, incandescent reflector lamp efficiency standards, electric motor efficiency standards, and metal halide lamp fixtures.

The net effect of these reductions was estimated at 1,900 GWh of electricity and 1,200 BBtu of natural gas savings in Arkansas by 2025. The associated GHG reductions for these savings are projected to be 0.9 MMtCO₂e for the year 2025 using the RCI TWG CO₂ methodology. Note, however, that GHG emission reductions associated with the Title IV (Energy Savings in Buildings and Industry) and Title V (Energy Savings in Government and Public Institutions) requirements of the federal Energy Independence and Security Act of 2007 have not been quantified because of the uncertainties in how they will be implemented. It is expected that the Title IV and Title V requirements will overlap with some of the RCI policy recommendations, especially RCI-2b, RCI-3a, RCI-3b, RCI-4a, and RCI-4b.

Arkansas has also started energy efficiency programs to reduce energy consumption within the state. The Arkansas Public Service Commission has authorized quick-start programs of approximately \$18,530,924 for the initial 2-year period ending December 31, 2009. Municipal and cooperative electric utilities are also currently pursuing energy efficiency programs. To estimate the effects of these actions, APSC authorized utility spending is extrapolated statewide as cooperative and municipal program data was not available. Using the TWG assumption of \$34/MWh and \$5.00/BBtu for electric and gas efficiency costs, estimated statewide electric efficiency deployment in 2009 is 181 GWh of electricity and 1,200 BBtu of natural gas. These

actions are expected to reduce Arkansas GHG emissions by .2 MMtCO₂e in 2009 using the RCI TWG CO₂ methodology. These estimates assume that utilities' regulated by APSC account for three quarters of electricity sold in the state and program spending is split equally between electricity and natural gas. The electricity reduction is removed from RCI-2b, and the natural gas reduction is split into thirds and is removed equally from RCI-1, RCI-4a, and RCI-4b.