



www.kyclimatechange.us

Brief Descriptions of Catalog of Items Residential, Commercial, and Industrial Technical Work Group

This document provides brief descriptions of the policy options contained in the corresponding Technical Work Group (TWG) Catalog of State Policy Actions. The catalog and these brief descriptions will be developed more fully during the climate planning process in Kentucky.

RCI-1. ENERGY EFFICIENCY PROGRAMS, FUNDS, AND GOALS

1.1 Utility Demand-Side Management (DSM) Programs for Electricity

This policy option focuses on increasing investment in electricity demand-side management (DSM) programs through programs run by utilities or others, energy efficiency funds, and/or energy efficiency goals. These options are typically termed DSM activities, and may be designed to work in tandem with other strategies that can also encourage efficiency gains.

The policy design includes two key and linked dimensions: achievable/desirable energy savings and policy/administrative mechanisms to achieve these savings. In order to implement expanded DSM programs, a number of mechanisms should be considered. Candidate mechanisms include revising existing statutes to enable utility investments in energy efficiency at the levels indicated above, to consider as potentially eligible programs that are cost-effective, taking into account the valuation of carbon dioxide (CO₂) emissions. Policy and administrative mechanisms that might be applied include regulator-verified savings targets, public benefit charges, portfolio standards, energy trusts, integrated resource planning, performance-based incentives, decoupling of rates and revenues, and appropriate rate treatment for efficiency. Elements that might be considered in designing this option include:

- Implementation/administration by utilities (including municipal utilities and cooperatives), state agencies, or third-party actors.
- Subsidized energy audits for homeowners, businesses, and industries.
- Incentives for specific technologies, potentially including (but not limited to) lighting, water heating, plug-in loads, networked personal computer management, power supplies, motors, pumps, boilers, customer-side transformers, water use reduction, and ground-source heat pumps.
- Energy efficiency reinvestment funds.
- Increased information on utility bills or through in-home energy devices for customers to understand their energy use through more real-time information.

- Low-cost financing or payback mechanisms for homeowners, businesses, and industries to use to fund energy efficiency improvements.

This policy may be broad in focus, or it can focus on specific market segments. Complementary policies include appliance recycling/pick-up programs. Measures supporting this option might include consumer education, performance contracting, and energy end-use surveys.

1.2 Utility Demand-Side Management (DSM) Programs for Natural Gas, Propane, and Fuel Oil

This option has most of the same attributes and options for design elements and implementation as option RCI-1.1 (Utility Demand-Side Management (DSM) Programs for Electricity), but focuses on increasing investment in DSM programs related to the use of natural gas, propane or liquefied petroleum gas (LPG), and fuel oil, through programs run by utilities or others, energy efficiency funds, and/or energy efficiency goals.

1.3 Non-Utility Demand-Side Management (DSM) Programs for Electricity (Munis, Co-ops, etc.)

This option has most of the same attributes and options for design elements and implementation as option RCI-1.1 (Utility Demand-Side Management (DSM) Programs for Electricity), but focuses on municipal utilities and cooperatives. Organizations that fall under this category that have regulatory authority could also pursue other options, such as stricter building codes or other policy actions that could affect the demand for electricity. These options are discussed further in other sections, such as RCI-2 (Utility Demand-Side Management (DSM) Programs for Natural Gas, Propane, and Fuel Oil).

1.4 Energy Efficiency Funds (e.g., Public Benefits Funds) Administered by State Agency, Utility, or Third Party (e.g., Energy Trust)

A public benefits charge (sometimes called a systems benefits charge) is a fee assessed on utility customers based on their use of energy in a given time period. With deregulation in many states, the utility commissions often lost the ability to require energy efficiency and/or low-income programs of the electric utilities. The result in many states was the development of a public benefits charge, which is a non-bypassable charge on electric bills. The funds collected are then used to provide energy efficiency and/or low-income programming.

1.5 Regional Market Transformation Through Alliances, Technology Development Programs, and Education

Market transformation alliances use voluntary efforts, typically implemented by non-utility organizations, to encourage greater uptake by consumers (residential, commercial, and industrial, as well as the professionals who service energy-using equipment) of cost-effective energy efficiency technologies and practices. A market transformation program is designed to create a situation where the bulk of the private market automatically adopts or incorporates technologies or techniques that result in improved energy efficiency. The goal of a market transformation and technology development program is to put energy efficiency technologies and practices into a position where

they are demanded by the public, chosen by builders and manufacturers, and provided by retailers and contractors.

Methods of transformation can be different for each technology or technique, but often revolve around public and private review of quality and effectiveness, including partnerships between government agencies, retailers, manufacturers, and nongovernmental organizations. Market transformation programs can be statewide or regional.

Market transformation also seeks to ensure sufficient supplies of technologies and practitioners to meet the subsequent increased demand for energy efficiency.

Potential elements of a market transformation program include:

- Specific measures, such as ground-source heat pumps, solar water heater/photovoltaic (PV), or other important technologies.
- Support for commercialization of promising technologies.
- Bulk-purchasing programs (public/private) or arrangements with retailers.

Consumer education is a significant supporting measure for market transformation programs.

1.6 Reduced-Cost or Free Residential Energy Audits

This option includes providing residential-sector energy technical assistance (energy audits) to identify and recommend options for reducing fossil energy and electricity use, and for reducing non-energy emissions of greenhouse gases (GHGs). A combination of incentives, expertise, and information to implement recommended options could be included in the policy to encourage residential customers to follow up on audit recommendations. For example, tying the free or reduced-cost audit to implementing some of the auditor’s recommendations could encourage residents to make recommended changes.

An alternative, or supplemental, approach to residential energy audits and retrofits is the concept of “green raising,” akin to traditional community barn-raising efforts. “Green raising” refers to a community drive to increase home energy efficiency in multiple houses, using “neighbor power” to educate and prepare homeowners, culminating in a neighborhood workday and celebration. These initiatives typically identify and train neighborhood volunteers to contact residences in the neighborhood to ask for their interest in a home energy audit and to invite them to participate in a green-raising event. Volunteers distribute free information, including a home energy efficiency menu, and link households up with a professional energy audit, energy-efficient products ideas, and loan and rebate opportunities. A green-raising event may include a mobile “store” of energy-efficient products (weatherization kits, compact fluorescent light bulbs [CFLs], light-emitting-diode [LED] lighting, smart power strips, etc.) that have been pre-ordered or that can be purchased; audit and insulation demonstrations; a team of volunteers available to go door-to-door to assist interested residents with installation of CFLs, weatherization kits, or other energy-saving items; and food and

entertainment. Green-raising initiatives typically require modest resources, primarily to cover material costs and potentially a paid coordinator position.

1.7 Reduced-Cost Energy Audits or Technical Assistance for Commercial Businesses

This option includes providing commercial-sector energy technical assistance (energy audits) to identify and recommend options for reducing fossil-fuel energy and electricity use, and for reducing non-energy emissions of GHGs. Technical assistance could focus on energy-efficient opportunities related to lighting, heating, ventilation and air conditioning (HVAC), and refrigeration, among other end uses. A combination of incentives, expertise, and information to implement recommended options could be included in the policy to encourage businesses to follow up on audit recommendations. For example, tying the free or reduced-cost audit to implementing some of the auditor's recommendations could encourage businesses to make recommended changes.

1.8 Reduced-Cost Energy Audits or Technical Assistance for Industry Sectors

This option includes providing industrial-sector energy technical assistance (energy audits) to identify and recommend options for reducing fossil energy and electricity use, and for reducing non-energy emissions of GHGs. Technical assistance could focus on energy-efficient opportunities related to lighting, HVAC, process heating and cooling (steam, drying/curing, etc.), compressed air, and motors and drives, among other end uses. A combination of incentives, expertise, and information to implement recommended options could be included in the policy to encourage the operators of industrial-sector facilities to follow up on audit recommendations. For example, tying the energy audit cost to implementing some of the auditor's recommendations could encourage the facility to make recommended changes.

1.9 Low-Cost Loans for Energy Efficiency Improvements

This option typically refers to revolving low-interest loan fund(s) for energy efficiency investments in distribution service areas that are not covered by similar existing utility programs.

1.10 Saving Energy, Savings Sales Tax

This option refers to a sales tax exemption for energy-efficient products, including CFLs, highly efficient electric heat pump water heaters, natural gas water heaters, natural gas furnaces, etc.

1.11 Reduce Energy Use by 10% or More in State-Owned Buildings

Recognizing that governments should "lead by example," this option provides targets to improve energy efficiency in existing state and local government buildings, as well as for new construction and major renovations of government buildings.

1.12 Encourage Integrated Lean Manufacturing and Energy Use Reduction Technical Assistance to Industrial and Commercial Facilities

There is increasing recognition that Lean manufacturing improvement approaches, being widely adopted by businesses across the nation, can substantially improve energy efficiency when energy

use is explicitly considered in the context of Lean methods. Lean manufacturing, based on the Toyota Production System, refers to a collection of business process improvement methods that are designed to identify and eliminate non-value-added activity. The U.S. Environmental Protection Agency (EPA) has prepared a toolkit for improving energy efficiency through Lean manufacturing (<http://www.epa.gov/lean/energytoolkit/index.htm>). Several states, including California, Maine, and Washington, have launched Lean & Energy Use Reduction technical assistance initiatives that involve partnerships between the state National Institute of Standards and Technology Manufacturing Extension Partnership Lean service providers, other Lean Six Sigma service providers, and environmental agencies' technical assistance providers.

This action could entail coordination and/or cross-training of existing technical assistance providers, provision of subsidized technical assistance to businesses, business-to-business mentoring programs, or sector-targeted (e.g., aerospace) initiatives that seek to encourage diffusion of Lean Six Sigma and energy use approaches.

1.13 Develop Investment Tax Credits for Energy Efficiency Improvements in Industrial or Commercial Facilities

This option refers to providing income tax credits for the investment in energy efficiency improvements in industrial or commercial facilities. These tax credits could also be grouped with other tax incentives, such as property tax exemptions.

1.14 Inverted Block Rates to Encourage Energy Efficiency

Inverted block rates for electricity and natural gas use provide affordable base usage rates for consumers. However, because these rates increase with increasing consumption, they provide a built-in incentive for energy conservation and energy efficiency.

See also, RCI-5.4 (Tiered [Increasing-Block] Rates for Electricity and Natural Gas Use).

Tiered or inverted block rates must take into account area circumstances. In vacation areas, for example, tiered rates could assist vacation-home owners disproportionately at the expense of local residential ratepayers.

RCI-2. BUILDINGS AND FACILITIES

2.1 Improved Building Codes for Energy Efficiency

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, amending state and/or local building codes to include minimum energy efficiency requirements and periodically updating energy efficiency codes could provide long-term GHG savings. Implementation of building energy codes, particularly when much of the building occurs outside of

urban centers, can require additional resources. Potential elements of a policy that includes building codes are:

- Require high-efficiency appliances in new construction and retrofits.
- Train building code and other officials in energy code enforcement.

Potential measures supporting this option can include consumer education, improved enforcement of building codes, training for builders and contractors, and development of a clearinghouse for information on and to provide access to software tools to calculate the impact of energy efficiency and solar technologies on building energy performance. Building codes could also be supported by such models as ENERGY STAR's [Building Design Guidance](#), which is a strategic approach for improving energy performance in the building design process.

2.2 Training of Building Code and Other Officials in Energy Code Enforcement

This option refers to an education and outreach program for building inspectors to encourage incorporation in inspection protocols of energy efficiency and GHG emission reduction considerations.

2.3 Improved Design and Construction, "Government Lead by Example"

Recognizing that governments should "lead by example," this option provides targets to improve the energy efficiency of existing state and local government buildings, existing buildings being renovated, and new buildings under construction. The proposed targets are much higher than code standards for new state-funded and other government buildings. Potential elements of this policy include:

- Requiring that energy efficiency be a criterion in procurement of energy-using equipment and systems, and in the improvement in operation of buildings and other facilities.
- Requiring audits of energy performance and operations of state and other government buildings (in tandem with an audit program). Audit results could be used to target and prioritize investments in improving government building energy efficiency. Improvement and review of efficiency goals over time, and development of flexibility in contracting arrangements to encourage integrated energy-efficient design and construction.
- Recommending that the infrastructure for implementation (meters, bookkeeping systems, staff, etc.) be established as soon as possible.
- Requiring state bulk purchase of appliances and equipment with higher-than-standard energy efficiency for public facilities.
- Establishing "retained savings" policies, whereby government agencies can retain funds saved by reducing energy bills and apply them to further energy efficiency/renewable energy investments or other uses.

- Joining the [ENERGY STAR for State Government Program](#) and taking the [ENERGY STAR Challenge](#) to reduce overall energy use by the state government, with a focus on energy use in state-owned buildings.

Potential supporting measures for this option include training and certification of building-sector professionals and performance contracting/shared savings, as well as surveys of government energy and water use, energy benchmarking, measurement, and tracking programs for municipal and state buildings.

2.4 Increased Use of Blended Cement (Substituting Fly Ash or Other Pozzolans for Clinker)

This option promotes the use of blended cement in buildings and other applications. For example, substituting fly ash or other pozzolans for clinker—the chief ingredient of cement—reduces CO₂ emissions associated with clinker production from limestone. The Coal Combustion Products Partnership (C²P²) program is one national initiative that is seeking to encourage this type of activity (<http://www.epa.gov/c2p2/>). C²P² is a cooperative effort of EPA, the American Coal Ash Association, the Utility Solid Waste Activities Group, the U.S. Department of Energy (DOE), the U.S. Department of Agriculture–Agricultural Research Service, the U.S. Federal Highway Administration, and the Electric Power Research Institute to help promote the beneficial use of coal combustion products (CCPs) and the environmental benefits that result from their use. A key goal of C²P² is to increase the use of CCPs as a supplementary cementitious material in concrete by 50%, from 12.4 million tons in 2001 to 18.6 million tons in 2011, thereby decreasing GHG emissions from avoided cement manufacturing by approximately 5 million metric tons.

2.5 Support for Energy-Efficient Community Planning: "Smart Growth"

“Smart growth” aims to create communities that, among other attributes, are livable, are 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), and preserving open spaces. For additional information about smart growth, see, for example: http://www.epa.gov/smartgrowth/about_sg.htm.

2.6 Promotion of and Incentives for Improved Design and Construction (e.g. LEED,¹ Green Buildings) in the Private Sector

This policy provides incentives and targets to induce the owners and developers of new and existing buildings to improve the efficiency of the use of energy and other resources 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

¹ Leadership in Energy and Environmental Design; see U.S. Green Building Council, <http://www.usgbc.org>.

encourage the improvement and review of energy use goals over time, and flexibility in contracting arrangements to promote integrated energy- and resource-efficient design and construction.

Additional potential elements of this option include:

- Target new, renovated, and/or existing buildings (retrofits).
- Set a cap on consumption of energy per unit area of floor space for new buildings.
- Encourage building commissioning and recommissioning, including energy tracking and benchmarking.
- Provide incentives, in the form of tax credits, DSM program support, financing incentives (such as “green mortgages”), or other inducements for retrofit of existing residential and commercial buildings.
- Encourage the use of alternative and local building materials and practices.

Potential supporting measures for this option include training and certification of building professionals, consumer and primary/secondary education, performance contracting/shared savings arrangements, and setting up a clearinghouse for information on and access to software tools to calculate the impacts of energy efficiency and solar technologies for buildings.

2.7 Feebate Program to Encourage Energy Efficiency in Building Design

This option refers to setting up a “feebate” program to encourage energy efficiency in building design. The concept of a “feebate” has typically been considered as a mitigation option in the transport sector, but is essentially any government program designed to reduce energy use and pollution by levying a fee on fuel-inefficient devices/facilities and offering a rebate on fuel-efficient devices/facilities.

2.8 Incentives for Retrofit of Existing Residential, Commercial, Institutional, and Industrial Buildings

This policy provides incentives and targets to induce the owners of existing homes to improve the efficiency of the use of energy and other resources, along with provisions for raising targets periodically. This policy can include elements to encourage the improvement (e.g., renovation) and review of energy use goals over time of existing dwellings.

2.9 Training and Education for Builders and Contractors (e.g., Heating, Ventilation, and Air Conditioning, Sizing, Duct Sealing)

This option refers to an education and outreach program for building professionals to encourage incorporation of energy-efficiency and GHG emission-reduction considerations. Examples include:

- Programs to train builders and contractors on proper heating and air conditioning sizing and installation.

- Mandates that state boards of licensing for building professionals include in licensing exams knowledge of the improved building codes and building energy performance requirements reflected in various policy options.
- Code training and technical assistance programs for builders and architects.

2.10 Energy Management Training/Training of Building Operators

Energy management training provides administrative and technical training for energy managers, school officials, building operators, and others responsible for energy-efficient facility operation. This policy could include:

- Training commercial building energy managers, for example, by making use of the building operator training and certification program developed in the Pacific Northwest. For more information on this program, see: <http://www.betterbricks.com/DetailPage.aspx?ID=294>.
- Training industrial energy and facility managers in techniques for improving the efficiency of their steam, process heat, pumping, compressed air, motors, and other systems, perhaps dovetailing with DOE in this area.

2.11 Energy Efficiency in State and Local Government Buildings

Develop standards and/or directives for all government buildings to achieve energy efficiency targets.

2.12 Require New Government Buildings to Meet LEED Gold Certification or Equivalent

This option would require new government buildings or buildings undergoing major renovations to comply with the LEED Gold certification requirements or some equivalent certification standard. It may be necessary for this option to focus explicitly on the energy use-reduction aspects of the LEED standards, as LEED certification includes aspects that are not directly related to GHG emission reductions. It is anticipated that LEED version 3.0 (to be released in 2009) will include modifications that more heavily weight GHG emission reduction points. For more information on LEED, see: <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>.

2.13 Create Incentives and Targets for Retrofit of Existing Commercial or Industrial Buildings

This policy provides incentives and targets to induce the owners of existing commercial and industrial buildings and facilities to improve the efficiency of the use of energy and other resources in those buildings, along with provisions for raising targets periodically. This policy could include elements to encourage the improvement and review of energy use goals over time, and target renovated and/or existing buildings. Incentives for this policy could be similar to DSM programs mentioned in RCI-1 (Utility Demand-Side Management (DSM) Programs for Electricity).

2.14 Develop a Modified Cap-and-Trade Program for Commercial Buildings

Under this option, commercial buildings would be required to report their base year GHG direct and indirect emissions. The base year would be determined by the state. Commercial buildings would

need to comply with state-approved GHG measurement protocols that develop an accurate, complete, consistent, and transparent GHG emissions inventory, such as inventories developed according to [The Climate Registry](#) or EPA's mandatory GHG reporting rule. This will provide a verified set of GHG emissions data from commercial buildings, supported by a robust accounting and verification infrastructure.

The state would set a GHG emission reduction target as measured against the base year GHG emissions and the compliance period. Commercial buildings would be required to meet the established GHG emission reduction target in one of two ways: (1) implement energy efficiency measures to reduce GHG emissions, or (2) purchase carbon offset credits from a state-approved cap-and-trade system. Commercial buildings that do not meet the GHG emission reduction target by the end of the compliance period would pay a penalty in the form of a noncompliance fee on their utility bills.

2.15 Building Commissioning and Recommissioning, Including Energy Tracking and Benchmarking

Building commissioning is the process of improving the operation and maintenance of building systems to meet operational needs while using only as much energy as necessary. Recommissioning may be needed in existing buildings for several reasons. For example, they may need to meet a higher level of performance today than when first built; energy prices may be significantly higher when they were first built and the opportunity for savings may exist; and in many buildings such as schools there is increased attention to indoor air quality and ventilation. This option would explore how commissioning and recommissioning could be incorporated into existing retrofitting and approval processes.

2.16 Explore Advanced Metering Technologies That Can Monitor Energy Usage and Allow Homeowners and Managers to Adjust Energy Use Remotely

Advanced metering technologies, such as those produced by members of Zigbee Alliance (<http://www.zigbee.org>), allow customers to better understand their energy use and to remotely adjust the energy use of available appliances, heating, cooling, and lighting. This option would look at exploring or encouraging implementation of these kinds of technology in government, commercial, industrial, and residential buildings.

2.17 Require Solar-Ready Building Infrastructure and Require Solar Hot-Water Systems in New Buildings

This option would require new buildings to have infrastructure that will allow easy installation of solar power and water systems. It could also require solar hot-water systems for residential, commercial, and industrial hot-water supply.

RCI-3. APPLIANCE STANDARDS

3.1 Expansion of State-Level Appliance Efficiency Standards

Appliance efficiency standards reduce the market cost of energy efficiency improvements by incorporating technological advances into base appliance models, thereby creating economies of scale. Appliance efficiency standards can be implemented at the state level for appliances not covered by federal standards, or where higher-than-federal standard efficiency requirements are appropriate.² Regional coordination in state appliance standards can help avoid concerns that retailers or manufacturers may (1) resist supplying equipment to one state that has advanced standards, or (2) focus sales of lower-efficiency models on a state with less stringent efficiency standards.

Potential elements of an appliance efficiency standards policy include:

- Establishing and enforcing higher-than-federal state-level appliance and equipment standards (or standards for devices not covered by federal standards).
- Joining with other states in adopting higher standards.
- Requiring high-efficiency appliances in new construction and retrofits.

Consumer education (RCI-4) is a potential supporting measure for this option.

3.2 Support for Higher Federal Appliance Efficiency Standards

This policy option involves advocating for the development and implementation of higher federal-level appliance efficiency standards.

3.3 Require High-Efficiency Appliances in New Construction and Retrofits

This policy option involves a requirement for the use of high-efficiency appliances in new construction and major retrofits of residential and commercial buildings.

RCI-4. EDUCATION AND OUTREACH

4.1 Consumer Education Programs

The ultimate effectiveness of emission reduction activities depends in many cases on providing information and education to consumers regarding the energy and GHG emission implications of consumer 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. Public education and outreach efforts should integrate with

² In recent years, Arizona, Oregon, and Washington, among other states, adopted state standards for several appliances. This led to the inclusion of standards for these appliances in the federal Energy Policy Act of 2005.

and build upon existing outreach efforts involving climate change and related issues in the state. Ultimately, public education and outreach will be the foundation for the long-term success of all of the mitigation actions proposed, as well as those that may evolve in the future.

The green-raising efforts discussed in RCI-1.6 (Reduced-Cost or Free Residential Energy Audits) represent a specific door-to-door education campaign approach for raising awareness of energy efficiency and money-saving opportunities among households. The development of accessible materials, videos, and other educational information can support these efforts. Support for program management and coordination activities can also help to ensure that outreach efforts are effectively planned and implemented.

4.2 Energy Efficiency School Curriculum

The long-term effectiveness of emission reduction activities depends on providing information and education not only to present consumers, but to future consumers as well. This policy option involves the education of primary and secondary school students regarding the energy and GHG emission implications of consumer and societal 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 young citizens. As with adult consumers, public education and outreach efforts should integrate with and build upon existing outreach efforts involving climate change and related issues.

4.3 Truth-in-Advertising Campaigns

Truth-in-advertising campaigns target advertising of energy-consuming products to ensure that factual and accurate information regarding GHG emission implications is provided to consumers.

4.4 In-Home Energy Displays

A number of energy use display units are available to provide customers with readily accessible, real-time (or near-real-time) information about their energy use. Though such units have been deployed in relatively small numbers, multiple studies and experience with prepayment programs (where the number of devices in use is more significant) demonstrate that in-home display devices can help catalyze customer energy conservation, with savings ranging from 4% to 20%. The costs of display units have been an obstacle to mass deployment. However, increased attention to demand response and advanced metering infrastructure in the United States and in energy conservation for emission reductions in Canada has spurred recent interest.

4.5 Create a High-Tech Research and Development Center That Focuses on Renewable Energy and Energy Efficiency

This policy option would create a prominent high-tech research and development center that focuses on renewable energy, methane recovery, energy efficiency, and industrial processes. This center would be a collaborative enterprise of state and local governments, nearby universities, and local business interests, and would offer innovative research and technical solutions to governments and businesses. Renewable energy research includes wind, geothermal, solar, biofuel, and other sources.

Industrial processes should have particular focus on industries that have GHG-intensive industrial processes, such as cement, ammonia and urea, carbon black production, nitric acid production, and substitutes for ozone-depleting substances. New methane-recovery technologies in the agricultural sector could have a significant impact on gross GHG emissions. This center could also work with state university engineering departments to create a curriculum focusing on the discipline of energy efficiency engineering. Topics could include comparative analysis of various process and equipment designs, as well as execution of performance simulations on various systems to determine the lowest operating and life-cycle costs.

4.6 Information and Technical Support for a Broad Spectrum of Climate Change Actions

This policy option would supply information about the broad spectrum of climate change actions that can reduce GHG emissions and save energy. Provide technical support for implementation of these actions.

RCI-5. PRICING AND PURCHASING

5.1 Green Power Purchasing for Consumers

Green power purchasing comprises a variety of consumer-driven strategies to increase the production and delivery of low-GHG power sources, above and beyond levels achieved through Renewable Portfolio Standards and other mandatory programs.

Possible elements of green power programs include:

- A definition of what power sources qualify as green power sources by a relevant authority.
- Regulatory encouragement for utilities to develop green power tariff structures.
- Implementation of “environmental disclosure”—regulatory requirements that power sources and emissions data be reported in consumer utility bills.
- State goals or mandates for green power purchases, or for the renewable fraction of standard purchased electricity, that would apply to all nonfederal government buildings, including local government buildings, public schools, and public universities. This could also be a part of state “lead-by-example” programs.
- Promotion by the state and/or other entities of voluntary green power purchases through provision of information and promotional materials.

5.2 Net Metering for Distributed Generation

This policy option involves the consideration and adoption by state regulatory authorities of rate designs, coupled with the necessary metering technology, that promote reduction in GHG emissions by encouraging consumers to install distributed generation (DG) systems—especially those based on renewable fuels—and combined heat (and/or cooling) and power (CHP) systems that offer the opportunity to improve the overall efficiency of fuel use and reduce GHG emissions.

Potential elements of this option include:

- Review existing net-metering policies, including policies that affect electricity consumers who install on-site CHP or DG fueled with renewable or fossil fuels. Consider the impact of nitrogen oxides (NO_x) and power factor requirements on net metering and the availability of information for small customers.
- Review rate issues, including decoupling of utility revenues from kilowatt-hour sales, and consider a specific focus on the impacts of rate design on GHG emissions. This could include an exploration of the impacts of time-of-use rates on GHG emissions.
- Review and consider utility and other technical rules related to the interconnection of consumer-sited power sources to the electricity grid to ensure that they offer equitable treatment of potential DG hosts, while providing adequate safeguards for the public and for power sector workers.

5.3 Time-of-Use Rates

Time-of-use rates typically price electricity higher at times of higher power demand, and thus better reflect the actual cost of generation. Though these rates may or may not have a significant impact on total GHG emissions, they affect on-peak power demand and, thus, both the need for peaking capacity and fuel for peaking plants.

5.4 Tiered (Increasing-Block) Rates for Electricity and Natural Gas Use

Tiered (increasing-block) rates for electricity and natural gas use provide affordable base usage rates for consumers. However, because these rates increase with increasing consumption, they provide a built-in incentive for energy conservation and energy efficiency.

See also, RCI-1.14 (Inverted Block Rates).

Tiered or inverted block rates must take into account area circumstances. In vacation areas, for example, tiered rates could assist vacation-home owners disproportionately at the expense of local residential ratepayers.

5.5 Bulk-Purchasing Programs for Energy Efficiency or Other Equipment (Public or Private Sector)

Bulk purchasing of appliances and equipment with higher-than-standard energy efficiency by public agencies, and similar bulk-purchase programs in the private sector, is a policy option that can augment or be a part of DSM, market transformation, or state lead-by-example programs. In this option, a government agency or nongovernmental organization purchases large quantities of energy-efficient products (e.g., high-efficiency refrigerators, office equipment, or solar water heaters) and/or services (e.g., home weatherization services) at a low bulk price. The organization then either uses the purchased items and services internally, or resells them at an attractive price to other buyers. Bulk-purchase programs can help to develop markets for energy-efficient or low-GHG goods and services more rapidly than would otherwise occur.

Potential elements of this option could include:

- Municipal or state government programs, possibly including training in the use of existing bulk-purchasing tools.³
- Programs for schools.
- Private-sector programs (possibly in coordination with market transformation programs).

5.6 Incentives and Research for Conversion to Low-Carbon and Renewable Energy Sources

This policy option could include a broad array of potential financial, technical, training, support, policy, and/or regulatory assistance to entities considering conversion to lower carbon energy sources or renewable energy sources. This option dovetails and could overlap with several other policy options.

5.7 Establish Minimum Energy Performance Criteria for State Procurement of Appliances and Equipment

This policy option would explore the establishment of minimum energy performance and related in the procurement of appliances and equipment by the state. Such a program would potentially institute minimum standards for procurement, establish procurement goals as appropriate, issue guidance, monitor compliance, identify benefits and costs incurred, and cooperate with similar efforts on a national level. Appropriate staff or contract resources necessary to meet the needs of this option would need to be identified.

RCI-6. CUSTOMER-SITED DISTRIBUTED ENERGY AND COMBINED HEAT AND POWER (CHP)

6.1 Incentives for Renewable Energy Systems at Residential, Commercial, and Industrial Sites

Distributed electricity generation sited at residences and commercial and industrial facilities, and powered by renewable energy sources (typically solar, but also wind, small hydroelectric power sources, or biomass or biomass-derived fuels), displaces fossil-fueled generation and avoids electricity transmission and distribution (T&D) losses, thereby reducing GHG emissions. This policy can also encourage consumers to switch from using fossil fuels to renewable fuels in such applications as water, process, and space heating, as well as to supply new energy services using fuels that produce low or no GHG emissions.

³ For example, the ENERGY STAR bulk-purchasing tool—developed by the U.S. Department of Energy, in collaboration with the U.S. Department of Housing and Urban Development and the U.S. Environmental Protection Agency—is designed to make it easy to comparison shop for energy-efficient products. The tool provides a simple way to obtain bids on ENERGY STAR-qualified products, such as appliances, compact fluorescent light bulbs, and light fixtures.

Increasing the use of renewable energy applications in homes, businesses, and institutions can be achieved through a combination of regulatory changes and financial incentives. Potential elements of this option include:

- Solar roofs (roofing materials with built-in solar PV cells, or solar PV panels erected on roofs).
- Solar water-heating and space-heating systems.
- Wind-power systems, particularly for rural areas.
- Biomass-fired generation, space-, or water-heating systems.
- Programs targeted at specific customer sectors (residential, commercial, industrial), or specific markets within sectors.
- Tax credits, and/or utility or other incentives to lower the first cost of distributed energy systems to users.

Potential supporting measures for this option include training/certification of installers/contractors, net metering and other pricing arrangements, interconnection standards, and creation/support of markets for biomass fuels.

6.2 Incentives and Resources to Promote Combined Heat and Power (CHP, Co-generation Units)

CHP systems reduce fossil fuel use and GHG emissions, both through the improved efficiency of the CHP systems, relative to separate heat and power technologies, and by avoiding T&D losses associated with moving power from central power stations located far from where the electricity is used. Potential elements of this option include:

- Promotion of the use of natural gas-fired CHP systems.
- Promotion of the use of biomass-fired CHP systems.
- Creation/expansion of markets for, and incentives designed to promote implementation of, CHP units in capacities suitable for residential, commercial, and industrial users.
- Provision of tax benefits, attractive financing arrangements, and other incentives to promote CHP technologies.

Potential supporting measures for this option include training/certification of installers/contractors, net metering and other pricing arrangements, establishment of clear and consistent interconnection standards, and creation/support of markets for biomass fuels.

6.3 Efficient Transformers on the Customer Side of the Meter

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 produce lower losses throughout the period of usage. When combined with incentives, the electricity saved by such qualified energy-efficient transformers typically has a 3-year payback period.

6.4 Incentives and Resources for Passive Solar Heating

This option involves providing incentives for incorporating passive solar design in building construction. Passive solar heating applications represent a cost-effective means of providing heat to buildings. When included in initial building design, these applications add negligible costs to the overall cost of a building, yet result in reduced operational costs and equipment demand. Passive solar heating is a conventional, well-understood technology that is reliable, mechanically simple, and economically viable.

6.5 White Roofs, Rooftop Gardens, and Landscaping (Including Shade Tree Programs)

High summer roof temperatures increase the need for more electricity for air conditioning. Incentives for white roofs, rooftop gardens, and landscaping can lower electricity demand.

6.6 Focus on Specific End Uses and Consumer Products and Technologies

Policies focusing on specific energy end uses and technologies can target window air conditioning units, lighting, water heating, phantom loads, networked personal computer management, power supplies, motors, pumps, boilers, and others. Consumer products programs may include education, incentives, retailer training, and marketing and promotion.

6.7 Passive Solar Heating Design

Passive solar heating systems are encouraged and supported in this policy option. Basic design elements, such as southern orientation, double- and triple-paned windows, and thermal mass are incorporated to take maximum advantage of three-season sunshine. Buildings are shaded from summer sun to avoid overheating. The sun's energy is used to provide space heating and heat storage to offset fossil fuel-based heating systems. These systems can be independent or backed up by active solar heating systems or traditional space-heating systems.

6.8 Passive Solar Hot-Water Heating

Solar hot-water systems are generally used with conventional water heaters. These systems use the sun's energy either to heat water directly or to heat a fluid, such as antifreeze, that indirectly heats the water through a heat exchanger and stores the solar-heated water for use as needed. A conventional water heater provides any additional heating that might be necessary. Solar hot-water systems are typically mounted on a south-facing roof, a south-facing outside wall, or on the ground facing south to take greatest advantage of the sun's rays.

6.9 Appliance Recycling/Pick-Up Programs

Emissions associated with improper disposal of discarded appliances can be reduced by facilitating appliance recycling and disposal. This policy may be considered in tandem with RCI-1.1 (Utility Demand-Side Management (DSM) Programs for Electricity) and other policies that affect appliance turnover.

6.10 Metering Technologies for Load Management and Choice

Advanced and smart metering include energy use display units to provide customers with readily accessible, real-time (or near-real-time) information about their energy use. Though such units have been deployed in relatively small numbers, multiple studies and experience with prepayment programs (where the number of devices in use is more significant) demonstrate that in-home display devices can help catalyze customer energy conservation, through choice and direct action with savings ranging from 4% to 20%. The costs of display units have been an obstacle to mass deployment. However, increased attention to demand response and advanced metering infrastructure in the United States and in energy conservation for emission reductions in Canada has spurred recent interest.

RCI-7. NON-ENERGY GHG EMISSIONS (HFCS, PFCS, SF₆, CO₂ PROCESS EMISSIONS)

7.1 Voluntary Industry-Government Partnerships

Voluntary agreements with industries can be used to reduce the emissions of process gases that have high global warming potential (GWP—a measure of the potential impact of different gases on climate in terms of CO₂-equivalent (CO₂e) emissions). Voluntary programs and public-private partnerships could be implemented statewide, or can provide support to programs at the local or county level.

7.2 Promotion and Funding for Leak Reduction/Capture, Recovery, and Recycling of Process Gases

The state engages in promotion and funding for leak reduction/capture, recovery, and recycling of process gases with high GWP.

7.3 Promotion and Funding for Process Changes/Optimization

Promotion and funding for process changes/optimization can be used to reduce the use and emissions of process gases with high GWP.

7.4 Use of Alternative Gases (Other HFCs, Hydrocarbon Coolants/Refrigerants, etc.)

A number of the energy services provided by gases used in the RCI sectors can be met through the use of different gases. Substitutes exist for air conditioning and refrigeration. Moving to less carbon-intensive gases/technology combinations in some end uses can be achieved through a combination of promotion and incentive programs, market creation, and expansion.

RCI-8. GREENHOUSE GAS EMISSIONS-SPECIFIC GOALS AND POLICIES**8.1 Support for Switching to Less Carbon-Intensive Fuels (Coal and Oil to Natural Gas or Biomass)**

A number of the energy services provided by fuel use in the RCI sectors can be met through the use of different fuels. Prime examples are water and space heating, as well as industrial process heat, which can be provided by burning coal, oil, gas, biomass, and perhaps hydrogen, or by using electricity or solar heat. Alternatives also exist for air conditioning, where absorption air conditioning units using heat from combustion of fuels or from solar heat can substitute for electric units. Moving to less carbon-intensive fuel/technology combinations in some end uses can be achieved through a combination of promotion and incentive programs, and market creation/expansion (for biomass fuels or for equipment not common in the market, for example).

8.2 Industry-Specific Emissions Cap-and-Trade Program

A cap-and-trade system is a market mechanism in which GHG emissions are limited or capped at a specified level, and capped entities can trade permits (a permit is an allowance to emit one ton of CO₂e). In principle, trading lowers the overall costs of meeting a given emission target, as participants with lower costs of compliance can choose to overcomply and sell their additional reductions to participants for whom compliance costs are higher.

Among the important considerations with respect to a cap-and-trade program are: the sources and sectors to which it would apply (“upstream” at the fuel extraction or import level versus “downstream” at points of fuel consumption); whether electricity is dealt with from a load-based or generation-based perspective; the level and timing of the cap; how allowances would be distributed (e.g., via grandfathering and/or auctioning) and how new market entrants would be accommodated; what, if any, offsets would be allowed; over what region the program would be implemented (e.g., nationally, regionally); which GHGs are covered; whether price caps (e.g., safety valves) and/or floors are included; whether there is linkage to other trading programs; whether banking and/or borrowing among time periods is allowed; whether early-reduction credits are allowed; what, if any, incentive opportunities may be included; use of revenues from permit auctions; and provisions for encouraging energy efficiency, if any. The principal example of a GHG cap-and-trade system in the United States is the Northeast States’ Regional Greenhouse Gas Initiative: <http://www.rggi.org/>. For the RCI sectors, a cap-and-trade program could be considered primarily for large industrial sources of GHGs or could include other sectors as well.

8.3 Negotiated Emissions or Energy Savings Agreements

Government agencies could work with industrial and other large users of energy (and/or of GHG process gases) to encourage those organizations to set emission reduction targets. This option may be implemented through a combination of financial and other incentives, public-private partnerships and agreements, provision of information and technical assistance, and other methods.

Organizations that use large amounts of energy (electricity, gas, or other fuels) and/or are responsible for large volumes of direct GHG emissions would be encouraged to set and pursue their own emission reduction targets. The organizations participating in such a program would typically be large industrial plants, although in some cases large commercial or governmental organizations and facilities might also participate. Reductions in GHG emissions can be achieved in the industrial sector through energy efficiency, process changes, and/or switching to the use of less carbon-intensive fuels to provide key energy services. Providing tools and information for residents, businesses, and communities to inventory GHG emissions and to use inventory results to set reduction targets can also be an element of this option.

8.4 Local Government Program for Voluntary Emission Targets by Businesses

Local governments could work with industrial and other large users of energy in their jurisdictions to encourage those organizations to set emission reduction targets above targets that are in effect throughout the rest of the state. This option could be implemented through a combination of financial and other incentives, public–private partnerships and agreements, provision of information and technical assistance, recognition, and other methods.

8.5 Provide Tools and Information for Residents, Businesses, and Communities to Perform GHG Inventories

Tools can be in the form of Web-based calculators (of which several are available) that walk users through their contributions to GHG emissions, or provide information that can assist residents, businesses, and communities to evaluate and act upon their GHG inventory results.

8.6 Carbon Tax

Economists hold that we get less of what we tax; if so, it would theoretically make sense to tax carbon emissions. This policy option would explore whether application of this theory would make sense in the state, and if so, how it might be implemented (e.g., by offsetting and reducing other state taxes). There is some precedent for carbon taxes in U.S. municipalities and Canadian provinces, but no U.S. statewide carbon tax has been adopted to date.

RCI-9. OTHER

9.1 Government Agency Requirements and Goals (Including Procurement)

Recognizing that governments should “lead by example,” this option would reduce energy-consuming government agency services. This option sets energy efficiency goals and is consistent with option RCI-1.11 (Reduce Energy Use by 10% or More in State-Owned Buildings).

9.2 State Building Carbon-Neutral Requirement

Carbon-neutral building incorporates the following features:

- Encourages the consideration of the overall building life cycle for carbon-neutral impacts, including siting, site preparation, construction materials and techniques, and construction debris disposal. A higher level of life-cycle assessment would include carbon impacts of occupancy as well.
- Integrates development considerations, such as transportation, water, wastewater, food, and energy supply.
- Points developer/builders toward overall low-impact designs that use local materials to minimize embodied energy.
- Includes reforestation, agriculture, or other sequestration methods for offsetting any net positive emissions.

9.3 Municipal Energy Management

Under this type of policy, the state could initiate and provide funding for municipal energy management systems, as well as audits of energy performance and operations of local government buildings. Audit results could be used to target and prioritize investments in improving government building energy efficiency.

9.4 Statewide Effort to Retrofit Existing Buildings (Residential, Commercial, Public, and Industrial) for Energy Efficiency

This policy provides incentives and targets to induce the owners of existing buildings to improve the efficiency of their use of energy and other resources, along with provisions for raising targets periodically. This policy can include elements to encourage the improvement and review of energy use goals over time, and target renovated and/or existing buildings.

9.5 Focus on Energy Efficiency Efforts on Specific Market Segments (Low-Income Housing, Small and Medium Enterprises, etc.)

Energy efficiency programs, funds, or goals can focus on specific market segments, such as existing homes (weatherization), new construction, apartments, low-income residential, and small and medium businesses. Targeting specific market segments can also be an effective component of a regional market transformation alliance.

9.6 Energy Efficiency Reinvestment (Revolving Loan) Funds

This policy option involves the set-up of a fund from which grants are made available to organizations implementing energy-saving projects through internal loans from the fund. The project loan is repaid at a percentage of annual energy savings, and once it is repaid the organization continues to benefit from ongoing energy savings. As repayments are recycled back into the fund, they are available for reinvestment, thereby creating a self-sustaining pot of funds for further energy efficiency projects.

9.7 Industrial Energy Audits

This policy option would conduct energy audits of industrial facilities to identify energy efficiencies that could be implemented.

9.8 Focus on Industrial Ecology/By-product Synergy

States can engage in outreach activities and voluntary partnerships with industry to promote implementation of industrial ecology, using innovation and systems-based analysis to reduce GHG emissions, and by-product synergy, in which waste streams from one industry or process are used as a resource to another.