

Chapter 3

Residential, Commercial, and Industrial Sectors

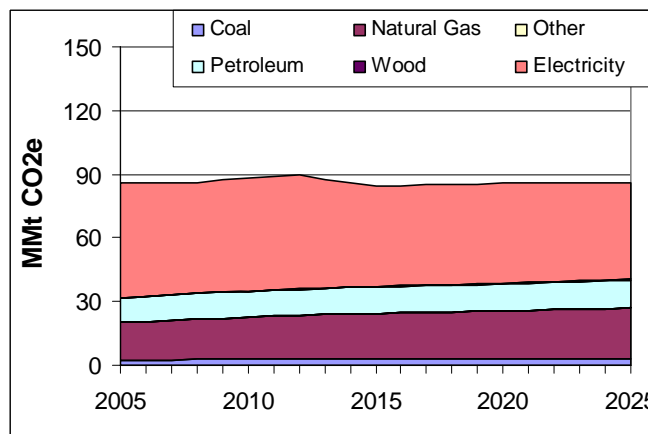
Overview of Sectoral Greenhouse Gas Emissions

The residential, commercial, and industrial (RCI) sectors were responsible for 23% of Minnesota’s greenhouse gas (GHG) emissions of carbon dioxide equivalent (CO₂e) in 2005. Direct emissions of GHGs from the RCI sectors result principally from the on-site combustion of natural gas, oil, and coal plus non-energy sources of GHG emissions, the release of CO₂ and fluorinated gases (e.g., perfluorocarbons [PFCs]) during industrial processing, the use of sulfur hexafluoride (SF₆) in the utility industry, and the leakage of hydrofluorocarbons (HFCs) from refrigeration and related equipment.

Considering only the direct emissions that occur within buildings and industries, however, ignores the fact that virtually all electricity sold in Minnesota is consumed as the result of activities in the residential, commercial, and industrial sectors. If the emissions associated with producing the electricity consumed in Minnesota are considered, RCI activities are associated with 58% of the state’s gross GHG emissions in 2005. The state’s future GHG emissions therefore will depend heavily on future trends in the consumption of electricity and other fuels in the RCI sectors.

Figure 3-1 shows projected RCI GHG emissions by fuel type, and illustrates the large fraction of RCI emissions associated with electricity use. RCI emissions associated with electricity and natural gas use are expected to remain relatively stable between 2005 and 2020, thanks in large part to aggressive conservation and renewable energy policies enacted in 2007. Though reduced from a level of 63% in 2005, the GHG emissions share associated with electricity use is still projected to account for over 50% of total RCI GHG emissions in 2025.

Figure 3-1. Projected RCI GHG emissions by fuel type in Minnesota, 2005 to 2025



MMtCO₂e – million metric tons carbon dioxide equivalents

Key Challenges and Opportunities

The principal means to reduce RCI emissions in Minnesota include improving energy efficiency, substituting for electricity and natural gas with lower-emission energy resources (such as wind, solar water heating, photovoltaics, and biomass), reducing industrial-sector process (non-energy) emissions, increasing distributed (consumer-sited) electricity generation based on combined heat and power, and various strategies to decrease the emissions associated with electricity production (see Chapter 4, Energy Supply, for the latter).

The state's aggressive Conservation Improvement Program enacted in 2007, relative to some other states, tempers this challenge but also retains strong opportunities to reduce emissions through programs and initiatives to improve the efficiency of buildings, appliances, and industrial practices. Minnesota's robust population and economic growth, and its evident and growing commitment to carry out significant GHG emissions reductions, places pressure on communities and businesses in Minnesota to make urgent decisions to put in motion changes that will continue to lead to GHG emission reductions. A key challenge lies in the design and implementation of strategies that address State goals and thus ensure that new buildings and industries take full advantage of opportunities to reduce emissions.

Overview of Policy Recommendations and Estimated Impacts

The MCCAG recommends a set of nine new policies and three existing actions for the RCI sector offering the potential for significant GHG emission reductions. A summary of results is shown in Table 3-1. All policy recommendation totals are relative to the underlying assumption that electricity use in Minnesota proceeds with the recently legislated Conservation Improvement Program (CIP).

Table 3-1. Summary results for energy supply policy recommendations and existing actions

| Policy No. | Policy Recommendation | GHG Reductions (MMtCO ₂ e) | | | Net Present Value (Million \$) | Cost-Effectiveness (\$/tCO ₂ e) | Level of Support |
|------------|---|--|--------------|-------------------|--------------------------------|--|------------------|
| | | 2015 | 2025 | Total (2008–2025) | | | |
| RCI-1 | Maximize Savings From the Utility Conservation Improvement Program (CIP)* | <i>Quantified as a "Recent Action"</i> | | | | | Enacted |
| RCI-2 | Improved Uniform Statewide Building Codes | 0.004 | 0.005 | 0.077 | –\$44 | –\$576 | Unanimous |
| RCI-3 | Green Building Guidelines and Standards Based on <i>Architecture 2030</i> | 0.62 | 0.94 | 11.1 | –\$296 | –\$27 | Unanimous |
| RCI-4 | Incentives and Resources to Promote Combined Heat and Power (CHP) | 0.96 | 4.95 | 33.1 | \$125 | \$3.8 | Unanimous |
| RCI-5 | Program to Reduce Emissions of Non-Fuel, High-Global-Warming-Potential GHGs | 0.02 | 0.05 | 0.5 | –\$2 | –\$5 | Unanimous |
| RCI-6 | Non-Utility Strategies and Incentives to Encourage Energy Efficiency and Reduce GHG Emissions | 0.25 | 1.30 | 8.3 | –\$307 | –\$37 | Unanimous |
| RCI-7 | Conservation Improvement-Type Program for Propane and Fuel Oil Efficiency | 0.05 | 0.05 | 0.7 | –\$21 | –\$28 | Unanimous |
| RCI-8 | Energy Performance Disclosure | <i>Not quantified</i> | | | | | Unanimous |
| RCI-9 | Promote Technology-Specific Applications to Reduce GHG Emissions | <i>Not quantified</i> | | | | | Unanimous |
| RCI-10 | Support Strong Federal Appliance Standards and Require High State Standards in the Absence of Federal Standards | 0.8 | 1.4 | 15.3 | –\$1,895 | –\$124 | Unanimous |
| | Sector Total After Adjusting for Overlaps (RCI, Non-Electricity) | 0.76 | 0.69 | 10.41 | –\$464 | –\$44.6 | |
| | Sector Total After Adjusting for Overlaps (Integrated RCI and ES for Electricity) | 1.56 | 7.34 | 51.06 | –\$1,098 | –\$21.5 | |
| | Reductions From Recent Actions | 6.50 | 15.50 | 143.4 | –\$8,454 | –\$59.0 | |
| | <i>New Commercial Building Code</i> | 0.18 | 0.21 | 3.16 | –\$1.8 | –\$0.6 | |
| | <i>Sustainability Guidelines (New State Buildings)</i> | 0.22 | 0.46 | 4.72 | –\$1.7 | –\$0.4 | |
| | <i>10% Savings in State Buildings</i> | 0.09 | 0.11 | 1.75 | –\$0.9 | –\$0.5 | |
| | RCI-1: New CIP* | 6.01 | 14.72 | 133.8 | –\$8,449 | –\$63.2 | |
| | Sector Total Plus Recent Actions | 8.82 | 23.53 | 204.9 | –\$10,016 | –\$48.9 | |

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

Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings associated with the recommendations. Totals in some columns may not add to the totals shown due to rounding.

Only the results of options included in the final tabulation of GHG reductions and costs are shown in this table. For discussion of any sensitivity analyses undertaken, please see the discussion in the RCI Appendix F, Annex 1.

* The CIP considered here is based on the CIP requirements (i.e., 1.5% energy savings goal) included in the Next Generation Energy Act of 2007; therefore, the emission reductions and cost savings estimated are included under "recent actions."

These options include efforts to improve the energy and GHG profile of buildings (RCI-2, RCI-3), increase the penetration of combined heat and power (RCI-4), reduce emissions from industrial process of strong heat-trapping gases (RCI-5), efficiency/conservation improvement of selected industries (RCI-6, RCI-7), strengthened appliance efficiency standards (RCI-10) and support for energy disclosure and new GHG-reducing technologies (RCI-8, RCI-9). All but the last set of options have been able to be quantified, resulting in substantial reductions from the RCI sectors.

After accounting for overlaps, the RCI mitigation option recommendations, combining fuel and electricity results, yield an annual GHG emission reduction from reference case projections of about 8.7 MMtCO_{2e} in 2025 and cumulative reductions of 61.5 MMtCO_{2e} from 2007 through 2025, at a net savings of approximately –\$1.6 billion through the year 2025 on an NPV basis. The weighted average cost of saved carbon for all RCI measures is –\$25.4/tCO_{2e} avoided.

The MCCAG has also analyzed a set of three existing actions for the RCI sectors that will contribute to achieving long-term GHG emission reductions in the State. These include a new commercial building code, sustainability guidelines for new state buildings, achieving energy savings of 10%, and, of course, the recently enacted Conservation Improvement Program that calls for annual savings equal to 1.5% of annual retail energy sales of electricity. Starting with the CIP, each of these existing actions contribute to substantial GHG emission reductions over the period through 2025, totaling just nearly 134 MMtCO_{2e}. Notably, Minnesota’s existing actions lead to cumulative GHG reductions that are over double those achieved by the recommendation mitigation options.

Overall, the RCI existing actions yield an annual GHG emission reduction from reference case projections of about 15.5 MMtCO_{2e} in 2025 and cumulative reductions of about 143 MMtCO_{2e} through 2025, at a net cost of approximately –\$8.5 billion through the year 2025 on an NPV basis. The weighted average cost of saved carbon for the energy supply measures is –\$59/tCO_{2e}, a net savings.

Residential, Commercial, and Industrial (RCI) Policy Descriptions

RCI-1 Maximize Savings From the Utility Conservation Improvement Program (CIP)

The Next Generation Energy Act establishes an energy policy goal for the State of Minnesota to achieve annual savings equal to 1.5% of annual retail energy sales of electricity and natural gas. At least 1% of these sales should come directly through energy conservation improvement programs and rate design. The additional 0.5% of savings can come indirectly through energy codes and appliance efficiency standards, programs designed to transform the market or change consumer behavior, energy savings resulting from efficiency improvements to the utility infrastructure and system, and other activities to promote energy efficiency and energy conservation. These savings are based on the average of the last 3 years of sales for the utility.

RCI-2 Improved Uniform Statewide Building Codes

Building energy codes specify minimum energy efficiency requirements for new buildings or for existing buildings undergoing a renovation. Given the long lifetime of most buildings, amending state building codes to include minimum energy efficiency requirements and periodically updating energy efficiency codes will provide long-term GHG emission reductions.

RCI-3 Green Building Guidelines and Standards Based on *Architecture 2030*

This option seeks to promote, incentivize, or adopt green building guidelines and standards for the reduction of carbon emissions for all commercial and residential buildings consistent with *Architecture 2030* targets. The option would require state and local government agencies including school districts to adopt required building guidelines and standards for the reduction of carbon emissions for all new public buildings consistent with *Architecture 2030* targets, leading to 90% reduction by 2025.

RCI-4 Incentives and Resources to Promote Combined Heat and Power (CHP)

Combined heat and power (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 transmission and distribution losses associated with moving power from central power stations that are located far away from where the electricity is used.

RCI-5 Program to Reduce Emissions of Non-Fuel, High-Global-Warming-Potential GHGs

High-global-warming-potential greenhouse gases (HGWP GHGs) are classes of chemicals, some of which have a global warming impact thousands of times that of CO₂. They have a number of commercial and industrial uses. Often substitutes are available. This option recommends that the Minnesota Pollution Control Agency undertake a rulemaking process to identify uses and emission sources of HGWP GHGs and to eliminate the use or escape of such gases where that can be done at a reasonable cost, defined as less than or equal to \$15/tCO₂e.

RCI-6 Non-Utility Strategies and Incentives to Encourage Energy Efficiency and Reduce GHG Emissions

This option calls for the implementation of cost-effective non-utility strategies and incentives for industrial processes in manufacturing and commercial facilities that complement (but not duplicate) utility-based programs to reduce greenhouse gas (GHG) emissions through energy efficiency (E2) and adoption of renewable energy technologies.

RCI-7 Conservation Improvement-Type Program for Propane and Fuel Oil Efficiency

This option calls for the implementation of cost-effective programs to reduce propane and fuel-oil use; target rebates to overcome market barriers; maximize convenience to program participants; capture overall system efficiencies, not just equipment efficiencies; joint efforts to achieve market transformation; ongoing research, evaluation and analysis; complement government, utility and non-utility efficiency programs; and seek to remove any disincentives or regulatory barriers to energy efficiency.

RCI-8 Energy Performance Disclosure

This option calls for utilities to provide an energy performance disclosure to parties owning any public, commercial or residential property, preferably in an electronic format. It is recommended that this information be made available by the property owner to the prospective buyer or renter to allow for energy efficiency and environmental impacts to be an integral part of the decision to buy or rent.

RCI-9 Promote Technology-Specific Applications to Reduce GHG Emissions

This option calls for promotion through incentives, technology-specific applications that reduce GHG emissions in categories such as space heating, lighting, water heating, and plug loads. The option includes a recommendation for a process to determine and clarify which applications work best in reducing GHG emissions, and to clearly communicate the fact that reducing energy use does not always proportionally reduce emissions.

RCI-10 Support Strong Federal Appliance Standards and Require High State Standards in the Absence of Federal Standards

This option calls for the implementation of State appliance efficiency standards for appliances not covered by federal standards or where higher-than-federal standard efficiency requirements are appropriate. Appliance efficiency standards reduce the market cost of energy efficiency improvements by incorporating technological advances into base appliance models, thereby, thereby creating economies of scale. Minnesota should adopt appliance efficiency standards at the state level not covered by federal standards.