

# Chapter 1

## Background and Overview

### Creation of the Iowa Climate Change Advisory Council

#### Iowa Senate File 485

The Iowa General Assembly enacted Senate File 485 in 2007 and House File 2571 in 2008. This legislation created the Iowa Climate Change Advisory Council (ICCAC) which consists of twenty-three (23) voting members appointed by the Governor, and serve three-year staggered terms. The Council is also comprised of four (4) non-voting, ex-officio members from the General Assembly.

As specified in Iowa Code section 455B.851, “The council shall submit the greenhouse gas emission reduction proposals to the governor and the general assembly by January 1, 2009.” The proposals include the following:

- After consideration of a full range of policies and strategies, including the cost-effectiveness of the strategies, the Council shall develop multiple scenarios designed to reduce statewide greenhouse gas emissions, including one scenario that would reduce such emissions by fifty percent and ninety percent by 2050.
- The Council shall also develop short-term, medium-term, and long-term scenarios designed to reduce statewide greenhouse gas emissions and shall consider the cost-effectiveness of the scenarios.
- The Council shall establish 2005 as the baseline year for purposes of calculating reductions in statewide greenhouse gas emissions

#### ICCAC’s Response

In fulfillment of the requirements of this legislation ICCAC held eight meetings over the last fifteen months. Additionally, the Council formed five technical Subcommittees (SCs) to assist the Council in formulating options. These SCs met numerous times between the ICCAC meetings. As a result the Council has prepared this Report which includes the following key outcomes and options:

- The Iowa Greenhouse Gas (GHG) Emissions Inventory and Forecast has been prepared which outlines baseline conditions as of 2005<sup>1</sup> and projected emissions through 2025 if no changes to the business as usual reference case are made. These projections were prepared in close consultation with the Iowa Department of Natural Resources (IDNR) and many Council and Sub-Committee members offered specific recommended improvements during its development. ICCAC recommends that the GHG Emissions Inventory and Forecast be updated annually.

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<sup>1</sup> Year 2005 was selected as the base year for the GHG reduction scenarios and cost-effectiveness analysis because emissions inventory data are more complete for year 2005 than for previous years.

- Approval of a comprehensive package of multi-sector policy options to reduce GHG emissions and address related energy and commerce issues in Iowa. ICCAC approved 56 policy options for inclusion in this Final Report. The ICCAC Members present and voting approved 32 of these policy options unanimously, approved 11 more with a super-majority vote (support of 80% or more of the members present and voting ), and 13 additional options with a simple majority supporting it. One option failed to gain ICCAC approval. Explanations of objections are included in Appendices F through J of this Report, which contain detailed accounts of the ICCAC's options.
- Evaluation of the direct costs and direct cost savings of the policy options in Iowa. The ICCAC analyzed quantitatively the direct costs or cost savings of 37 of its 56 policy options. Although the total net cost associated with the 37 policies analyzed is estimated at about \$ 4.8 billion between 2009 and 2020, the weighted-average cost-effectiveness of the 37 policies is estimated to be approximately \$8.80/tCO<sub>2</sub>e reduced. Many of the policies are estimated to yield significant cost-saving opportunities for Iowans. Other policies will incur net costs.
- The Council developed two GHG Reduction Scenarios. One scenario was specified by the enabling legislation to achieve a 50% reduction from the baseline year [2005] by 2050. The Council developed a second GHG reduction scenario to achieve a 90% GHG reduction below the 2005 baseline year by 2050. The Council chose 2012 and 2020 as its short-term and mid-term intervals, respectively. For a 50% reduction by 2050 scenario the Council recommends a 1% reduction by 2012 and an 11% reduction by 2020. For the 90% reduction scenario the Council recommends a 3% reduction by 2012 and a 22 % reduction by 2020. The ICCAC based its options on its review of the potential overall emission reduction estimates (as compared to the GHG emissions inventory and forecast) for 38 of 56 policy Options for which emission reductions were quantified, and its review of goals and targets adopted by several other states. Of the 56 policy Options, 38 were analyzed quantitatively to have a cumulative effect of reducing emissions by about 20 million metric tons of carbon dioxide equivalent (MMtCO<sub>2</sub>e) in 2012 and 105 (MMtCO<sub>2</sub>e) in 2020. Together, if the 38 quantified policy options and the recent federal and state actions (or their functional equivalent) are successfully implemented, the 2020 emission reduction scenario based on results of analysis of ICCAC proposals conducted through the ICCAC and Subcommittee process is achievable.
- In addition, the ICCAC recommends that the state report biennially to the Governor and the state legislature on the state's progress in reducing GHG emissions under these scenarios.

## **Recent Actions**

### **GHG Reductions Associated With Recent Federal Actions**

The federal Energy Independence and Security Act of 2007 (EISA) 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 ICCAC process, sufficient information was identified (e.g., implementation schedules) to estimate GHG emission reductions associated with implementing the Corporate Average Fuel Economy requirements and energy efficiency requirements for new appliances and lighting associated with the EISA's Title IV (Energy Savings in Buildings and Industry) and Title V (Energy Savings in Government and Public

Institutions) requirements in Iowa. The GHG emission reductions projected to be achieved by these actions are shown in Figure 1-1. Table 1-1 provides the numeric estimates underlying Figure 1-1.

### **Recent State Actions**

Iowa has recently embarked on statewide energy efficiency programs in response to concerns about energy costs. The state is implementing two energy efficiency initiatives under Executive Orders 6 and 41. Executive Order 6<sup>2</sup> by Governor Culver establishes a Green Government Initiative in Iowa that is targeted at three areas (buildings, materials and biofuels). Several Task Forces have been established to address the specific areas. Executive Order 41<sup>3</sup> by Governor Vilsack requires that all state agencies reduce energy consumption in state buildings. The estimated reductions associated with each of these efforts is also incorporated into Figure 1-1 and Table 1-1.

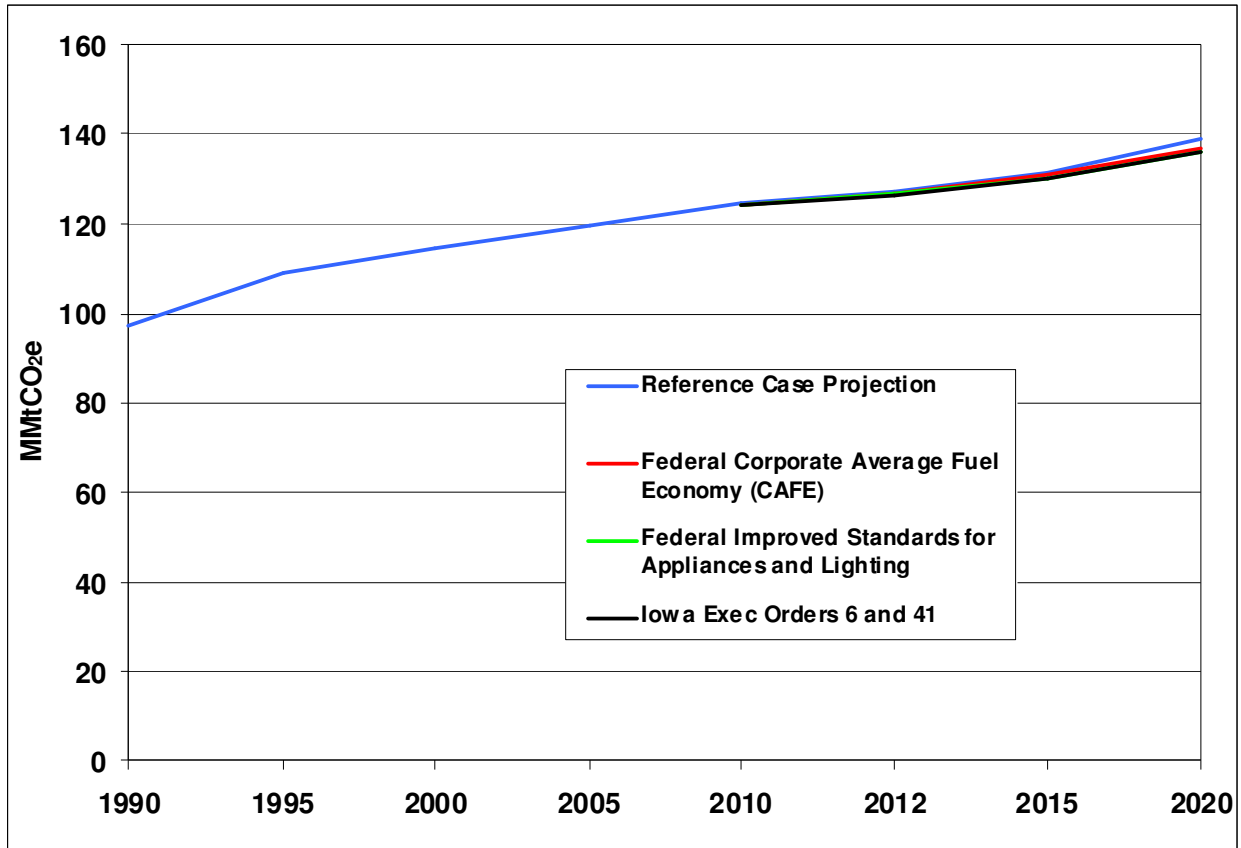
Together, these federal and state requirements are estimated to reduce gross GHG emissions for all sectors combined in Iowa by about 3.4 MMtCO<sub>2</sub>e (a 2.4% reduction) from the business-as-usual emissions in 2020.

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<sup>2</sup> State of Iowa, Executive Department. Executive Order Number Six, February 21, 2008 Available at <http://publications.iowa.gov>

<sup>3</sup> State of Iowa, Executive Department. Executive Order Number Forty-one. April 22, 2005. Available at [http://publications.iowa.gov/2619/1/EO\\_41.pdf](http://publications.iowa.gov/2619/1/EO_41.pdf)

**Figure 1-1. Estimated emission reductions associated with the effect of recent federal and state actions in Iowa (consumption-basis, gross emissions)**



MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent.

**Table 1-1. Estimated emission reductions associated with the effect of recent federal and state actions in Iowa (consumption-basis, gross emissions)**

Sector / Recent Action	GHG Reductions (MMtCO <sub>2</sub> e)		GHG Emissions (MMtCO <sub>2</sub> e)	
			Business as Usual	With Recent Actions
	2012	2020	2020	2020
<b>Energy Efficiency and Conservation (EEC)*</b>				
Federal Improved Standards for Appliances and Lighting Requirements	0.23	1.13	29.7	28.6
Iowa Executive Orders 6 and 41	0.21	0.29		28.3
<b>Transportation and Land Use (TLU)</b>				
Federal Corporate Average Fuel Economy (CAFE) Requirements	0.26	1.93	27.2	25.2
<b>Total (EEC + TLU Sectors)</b>	0.70	3.35	56.9	53.5
<b>Total (All Sectors)</b>			139.1	135.7

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent.

\*EEC in this report specifically addresses residential, commercial and industrial (RCI) fuel use.

## The ICCAC Process

The ICCAC began its deliberative process at its second meeting on December 17, 2007 following an organizational meeting via teleconference on October 18, 2007. ICCAC met a total of seven times, with the final decisional meeting held on November 10, 2008, followed by a conference call on December 10, 2008 for review of this report. About 75 additional teleconference meetings of ICCAC's five supporting Subcommittees were also held to identify and analyze various potential policy actions in advance of the ICCAC's November 10, 2008 final decisional meeting.

The five SCs considered information and potential options in the following sectors:

- Energy Efficiency and Conservation (EEC);
- Clean and Renewable Energy (CRE);
- Transportation and Land Use (TLU);
- Agriculture, Forestry, and Waste Management (AFW); and
- Cross-Cutting Issues (CC) (i.e., issues that cut across the above sectors).

The Center for Climate Strategies (CCS) provided facilitation and technical assistance to the ICCAC and each of the SCs, based on a detailed proposal approved by the ICCAC. The SCs consisted of ICCAC members and selected additional members. Members of the public were invited to observe and provide input at all meetings of the ICCAC and SCs. The SCs served as advisers to the ICCAC and helped generate initial options on Iowa-specific policy options to be added to the catalog of existing states actions; priority policy options for analysis; draft proposals on the design characteristics and quantification of the proposed policy options; specifications and assistance for analysis of draft policy options (including best available data sources, methods and assumptions); and other key elements of policy option proposals, including related policies and programs, key uncertainties, co-benefits and costs, feasibility issues, and potential barriers to consensus. Where members of a SC did not fully agree on options to the ICCAC, the summary of their efforts was reported to the ICCAC as a part of its consideration and actions. The ICCAC then made its decisions after reviewing the SCs' proposals, including modifications as deemed appropriate in their judgment.

The ICCAC process employed a model of informed self-determination through a facilitated, stepwise, fact-based, and consensus-building approach. The process was facilitated by CCS, an independent, expert facilitation and technical analysis team. It was based on procedures that CCS has used in a number of other state climate change planning initiatives since 2000, but was adapted specifically for Iowa. The ICCAC process sought but did not mandate consensus, and it explicitly documented the level of ICCAC support for policies and key findings through a voting process established in advance, including barriers to full consensus where they existed on final consideration of proposed actions.

The 56 policy options (out of more than 300 potential options considered) adopted by the ICCAC and presented in this report were developed through a stepwise approach that included: (1) expanding a list existing states actions to include additional Iowa-specific actions; (2) developing a set of "priority for analysis" options for further development; (3) fleshing these

proposals out for full analysis by development of “straw proposals” for level of effort, timing and parties involved in implementation; (4) developing and applying a common framework of analysis for options, including sector specific guidance and detailed specifications for options that include data sources, methods and key assumptions; (5) reviewing results of analysis and modifying proposals as needed to address potential barriers to consensus; (6) finalizing design and analysis of options to remove barriers to final agreement; and (7) developing other key elements of policy proposals such as implementation mechanisms, co-benefits, and feasibility considerations. At the final three meetings of the process, policy options with at least majority support (defined as less than half of those present objecting) from ICCAC members present were adopted by the ICCAC and included in this report. The SCs’ options to the ICCAC were documented and presented to the ICCAC at each ICCAC meeting. All of the ICCAC and SC meetings were open to the public and all materials for and summaries of the ICCAC and SC meetings were posted on the ICCAC Web site ([www.iaclimatechange.us](http://www.iaclimatechange.us)). A detailed description of the deliberative process is included in Appendix B.

## Analysis of Policy Options

With CCS providing facilitation and technical analysis, the five SCs submitted options for policies for ICCAC consideration using a “policy option template” conveying the following key information:

- Policy Description
- Policy Design (Goals, Timing, Parties Involved)
- Implementation Mechanisms
- Related Policies/Programs in Place
- Type(s) of GHG Reductions
- Estimated GHG Reductions and Net Costs or Cost Savings
- Key Uncertainties
- Additional Benefits and Costs
- Feasibility Issues
- Status of Group Approval
- Level of Group Support
- Barriers to Consensus

In its deliberations, the ICCAC reviewed, modified, and reached group agreement on various policy options. The final versions for each sector, conforming to the policy option templates, appear in Appendices F through J and constitute the most detailed record of decisions of the ICCAC. Appendix E describes the methods used for quantification of the 38 policy options that were analyzed quantitatively. The quantitative analysis produced estimates of the GHG emission reductions and direct net costs (or cost savings) of implementation of various policies, in terms of both a net present value from 2009 to 2020 and a dollars-per-ton cost (i.e., cost-effectiveness). The key methods are summarized below.

**Estimates of GHG Reductions:** Using the projection of future GHG emissions (see below) as a starting point, 38 policy options were analyzed by CCS to estimate GHG reductions attributable to each policy in the individual years of 2012 and 2020 and cumulative reductions over the

period 2009–2020. The estimates were prepared in accordance with guidance by the appropriate SC and the ICCAC, which later reviewed the estimates and, in some cases, directed that they be revised with respect to such elements as goals, data sources, assumptions, sensitivity analysis, and methodology. Many policies were estimated to affect the quantity or type of fossil fuel combusted; others affected methane or CO<sub>2</sub> sequestered. Among the many assumptions involved in this task was identification of the appropriate GHG accounting framework—namely, the choice between taking a “production-based” approach versus a “consumption-based” approach to various sectors of the economy.<sup>4</sup>

**Estimates of Costs/Cost Savings:** The analyses of 37 policy options included estimates of the direct cost of those policies, in terms of both net costs or cost savings during 2009–2020 and a dollars-per-ton cost (i.e., cost-effectiveness). Following is a brief summary of the approach used to estimate the costs or cost savings associated with the policy options:

- *Discounted and annualized costs or cost savings*—Standard approaches were taken here. The net present value of costs or cost savings was calculated by applying a real discount rate of 5%. Dollars-per-ton estimates were derived as an annualized cost per ton, dividing the present value cost or savings by the cumulative GHG reduction measured in tons. As was the case with GHG reductions, the period 2009–2025 was analyzed.
- *Cost savings*— Total net costs or savings were estimated through comparison of monetized costs and savings of policy implementation over time, using discounting. These net costs could be positive or negative; negative costs indicated that the policy saved money or produced “cost savings.” Many policies were estimated to create net financial cost savings (typically through fuel savings and electricity savings associated with new policy actions).
- *Direct vs. indirect effects*—Estimates of costs and cost savings were based on “direct effects” (i.e., those borne by the entities implementing the policy).<sup>5</sup> Implementing entities could be individuals, companies, and/or government agencies. In contrast, conventional cost-benefit analysis takes the “societal perspective” and tallies every conceivable impact on every entity in society (and quantifies these wherever possible).

**Additional Costs and Benefits:** The ICCAC options were guided by four decision criteria that included GHG reductions and monetized costs and cost savings of various policies, as well as other potential co-benefits and costs (e.g., social, economic, and environmental) and feasibility considerations. The SCs were asked to examine the latter two in qualitative terms where deemed important and quantify them on a case-by-case basis, as needed, depending on need and where data were readily available.

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<sup>4</sup> A production-based approach estimates GHG emissions associated with goods and services produced within the state, and a consumption-based approach estimates GHG emissions associated with goods and services consumed within the state. In some sectors of the economy, these two approaches may not result in significantly different numbers. However, the power sector is notable, in that it is responsible for large quantities of GHG emissions, and states often produce more or less electricity than they consume (with the remainder attributable to power exports or imports).

<sup>5</sup> “Additional benefits and costs” were defined as those borne by entities other than those implementing the policy option. These indirect effects were quantified on a case-by-case basis, depending on magnitude, importance, need, and availability of data.

**Implementation Mechanisms:** The analysis for each option (see Appendices F through J) of the ICCAC includes guidance on the policy instruments or “mechanisms” that were prescribed or assumed for the policy action. This includes a range of potential mechanisms including, for instance, funding incentives, codes and standards, voluntary and negotiated agreements, market based instruments, information and education, reporting and disclosure, and other instruments. In some cases, the recommended instruments are precise. In other cases, they are more general and envision further work to develop concrete programs and steps to achieve the goals recommended by the ICCAC.

## Iowa GHG Emissions Inventory and Reference Case Projections

In April 2008, CCS completed a draft GHG emissions inventory and reference case projection to assist the ICCAC and SCs in understanding past, current, and possible future GHG emissions in Iowa, and thereby inform the policy development process.<sup>6</sup> The ICCAC and SCs reviewed, discussed, and evaluated the draft inventory and projections methodologies, as well as alternative data and approaches for improving the draft inventory and projections. The final report incorporating comments provided by the Subcommittees that were approved by the ICCAC at their September 2008 meeting and incorporated into the final report during October, is available at: [http://www.iaclimatechange.us/Inventory\\_Forecast\\_Report.cfm](http://www.iaclimatechange.us/Inventory_Forecast_Report.cfm). At the 7th ICCAC meeting in November 2008 the Council received the final I-F Report<sup>7</sup> and agreed to file and forward it to the Governor and Legislature.

The inventory and reference case projections included detailed coverage of all economic sectors and GHGs in Iowa, including future emission trends and assessment issues related to energy, the economy, and population growth. It is important to note that the emission estimates reflect the GHG emissions associated with the electricity sources used to meet Iowa’s demands, corresponding to a consumption-based approach to emissions accounting. Another way to look at electricity emissions is to consider the GHG emissions produced by electricity generation facilities in the state—a production-based method. The study covers both methods of accounting for emissions, but for consistency, all total results are reported as consumption-based.

As illustrated in Figure 1-2, under the reference case projections, Iowa’s gross GHG emissions continue to grow steadily, climbing to about 148 MMtCO<sub>2</sub>e by 2025, 52% above 1990 levels. This equates to a 1.1% annual rate of growth from 2005 to 2025. Relative to 2005, the share of emissions associated with electricity consumption and the transportation sector both increase slightly to 32% and 20%, respectively, in 2025. The share of emissions from the industrial processes and fossil fuel industry sectors is projected to increase to 6% and 3%, respectively, by

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<sup>6</sup> Center for Climate Strategies. *Draft Iowa Greenhouse Gas Inventory and Reference Case Projections, 1990–2025*. Prepared for the Iowa Climate Change Advisory Council. April, 2008. Available at: [http://www.iaclimatechange.us/Inventory\\_Forecast\\_Report.cfm](http://www.iaclimatechange.us/Inventory_Forecast_Report.cfm)

<sup>7</sup> Center for Climate Strategies. *Final Iowa Greenhouse Gas Inventory and Reference Case Projections, 1990–2025*. Prepared for the Iowa Climate Change Advisory Council. October, 2008. Available at:

[http://www.iaclimatechange.us/Inventory\\_Forecast\\_Report.cfm](http://www.iaclimatechange.us/Inventory_Forecast_Report.cfm). See pages 13 and 14 of this report for a list of the the revisions that the ICCAC made to the inventory and reference case projections; these revisions are also identified at the end of Chapter 2 of the ICCAC final report.

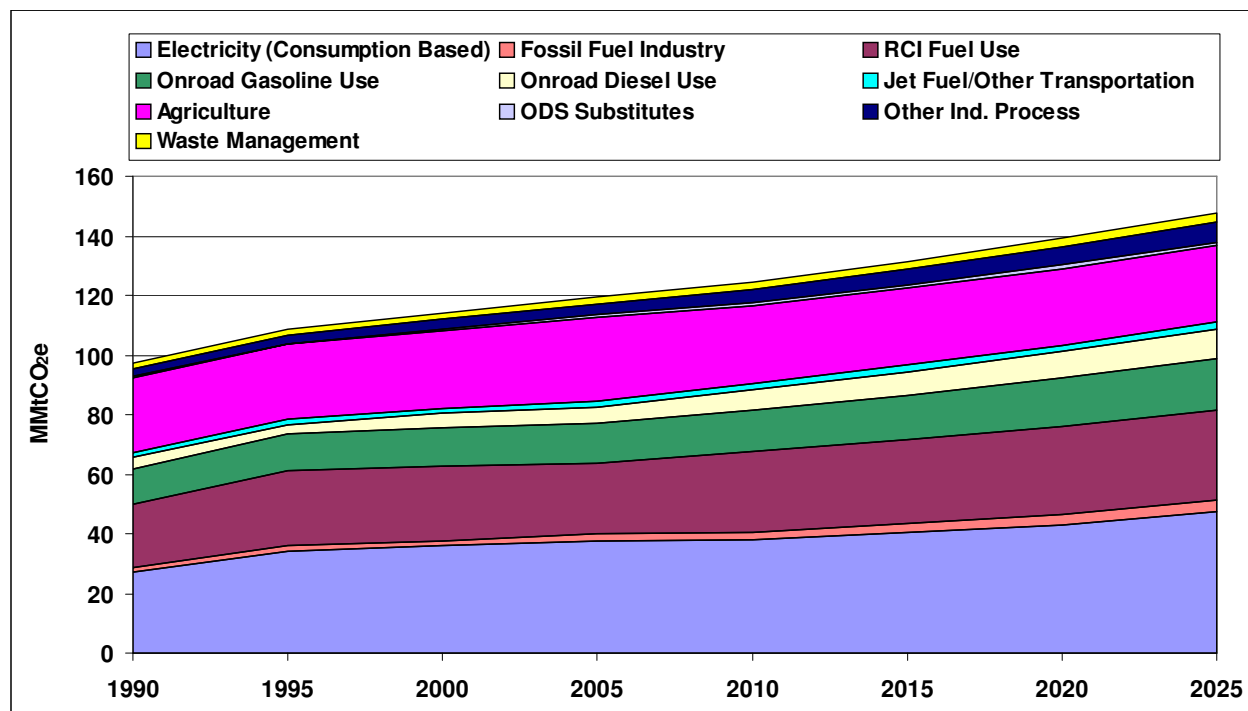
2025. The share of emissions from the residential commercial and industrial and commercial (RCI) fuel use sector and the waste management sector is projected to remain the same at about 20% and 2%, respectively, of Iowa's gross GHG emissions in 2025. The agriculture sector is the only sector in Iowa whose emission share in 2025 is projected to decrease from its emission share in 2005 (from 23% in 2005 to 17% in 2025).

Emissions associated with electricity consumption are projected to be the largest contributor to future GHG emissions growth, followed by emissions associated with the transportation sector. Other sources of emissions growth include the RCI fuel use sector and the increasing use of HFCs and PFCs as substitutes for ozone-depleting substances in refrigeration, air conditioning, and other applications. The agriculture sector is the only sector in which emissions are projected to decrease from 2005 to 2025. Figure 1-3 depicts the 2005 distribution of sources in Iowa compared to the United States (U.S.) .

Estimates of carbon sinks within Iowa's forests, including urban forests and land use changes as well as agricultural soils, have also been included in this report. The current estimates indicate that about 27 MMtCO<sub>2</sub>e were stored in Iowa soils, forests and agricultural biomass in 2005. This leads to *net* emissions of 92 MMtCO<sub>2</sub>e in Iowa in 2005, an amount equal to 1.4% of total US net GHG emissions.

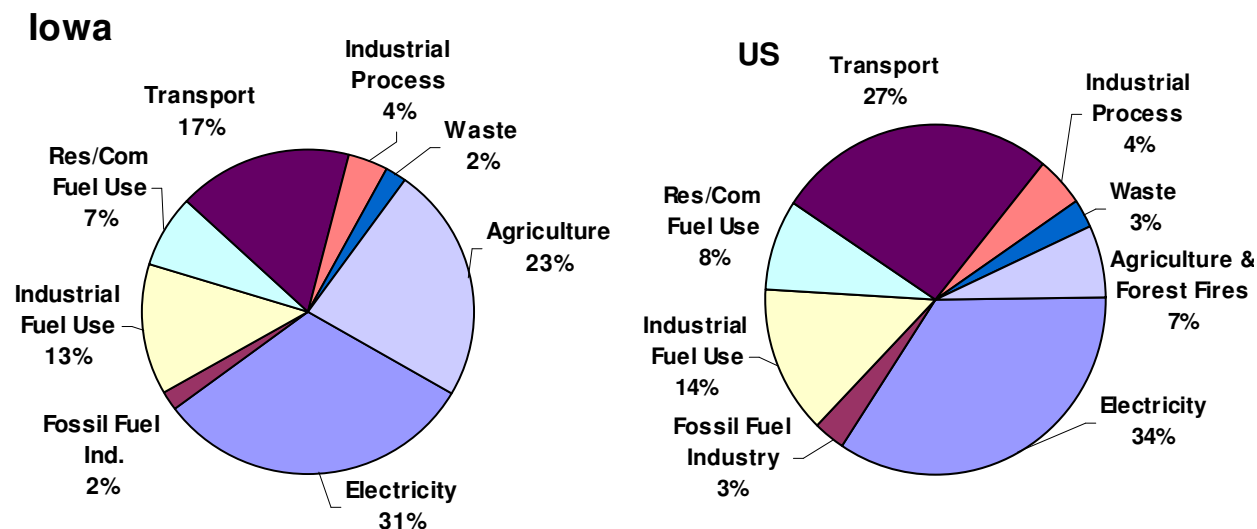
While Iowa's estimated emissions growth rate presents challenges, it also provides major opportunities. Key choices regarding technologies and infrastructure can have a significant impact on emissions growth in Iowa. The ICCAC's options document the opportunities for the state to reduce its GHG emissions, while continuing its strong economic growth by being more energy efficient, using more renewable energy sources, and increasing the use of cleaner transportation modes, technologies, and fuels.

**Figure 1-2. Gross GHG emissions by sector, 1990–2025: historical and projected (consumption-based approach) business as usual / base case**



MMTCo<sub>2e</sub> = million metric tons of carbon dioxide equivalent; RCI = direct fuel use in residential, commercial, and industrial sectors; ODS = ozone-depleting substance; Ind. = industrial.

**Figure 1-3. Gross GHG emissions by sector, 2005: Iowa and U.S.**



### ICCAC Policy Options (Beyond Recent Actions)

The ICCAC recommended 56 policy options. The ICCAC Members present and voting approved 32 of these recommended policy options unanimously, approved 11 more with a super-majority vote (support of 80% or more of the members present and voting), and 13 additional options

with a simple majority supporting it. One option failed to gain ICCAC approval. Explanations of objections are included in Appendices F through J of this Report, which contain detailed accounts of the ICCAC's options.

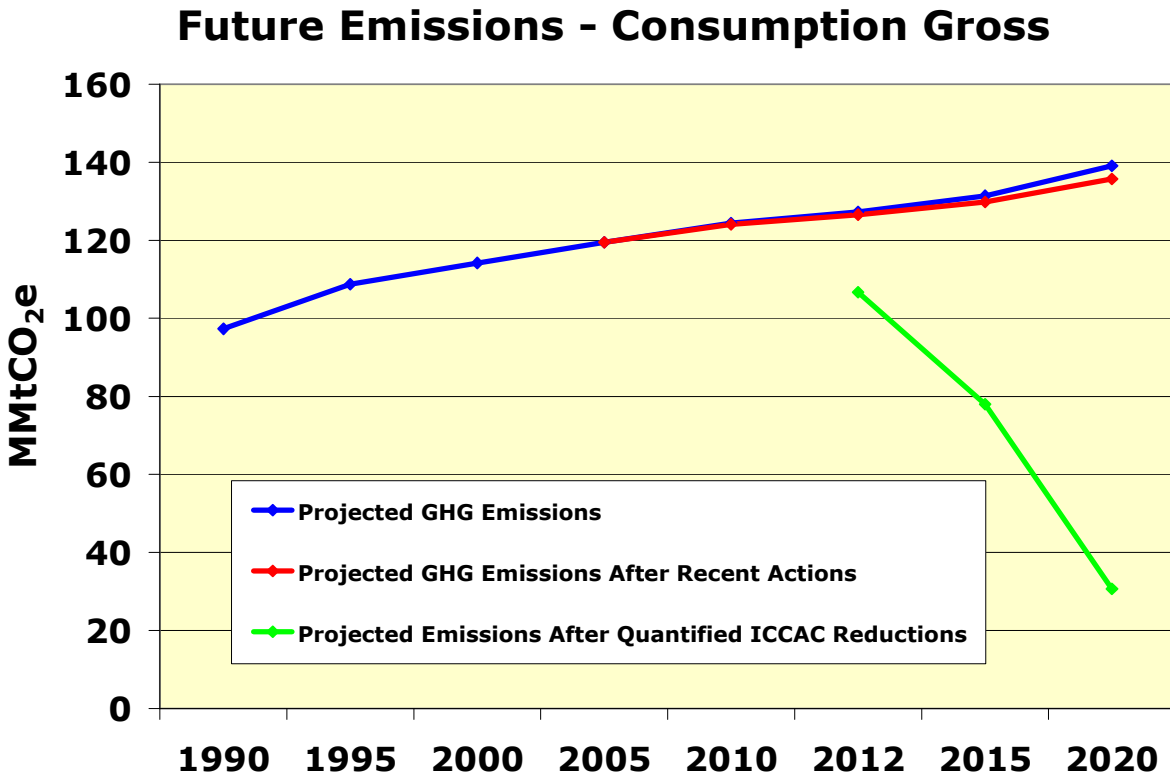
Of the 56 policy options, 38 were analyzed quantitatively to have a cumulative effect of reducing emissions by about 20 million metric tons of carbon dioxide equivalent (MMtCO<sub>2</sub>e) in 2012 and 105 (MMtCO<sub>2</sub>e) in 2020.

Figure 1-4 presents a graphical summary of the potential cumulative emission reductions associated with the recent federal actions and the 38 policy options relative to the business-as-usual reference case projections. Table 1-2a provides the numeric estimates underlying Figure 1-4 for the 50% reduction by 2050 scenario and Table 1-2b provides the same estimate for the 90% reduction scenario by 2050. In Figure 1-4:

- The blue line shows actual (for 1990, 1995, 2000, and 2005) and projected (for 2010, 2012, 2015 and 2020) levels of Iowa's gross GHG emissions on a consumption basis. (The consumption-based approach accounts for emissions associated with the generation of electricity in Iowa to meet the state's demand for electricity)
- The red line shows projected emissions associated with recent federal and state actions that were analyzed quantitatively.
- The green line shows projected emissions if all of the ICCAC's 38 options that were analyzed quantitatively with respect to their GHG reduction potential are implemented successfully and the estimated reductions are fully achieved. (Note that other ICCAC options would have the effect of reducing emissions, but those reductions were not analyzed quantitatively, so are not reflected in the green line.)

For the policy options offered by the ICCAC to yield the levels of estimated emission reductions shown in Table 1-3, they must be implemented in a timely, aggressive, and thorough manner. Table 1-4 depicts the final policy options of the Council and their associated GHG reductions and costs/ savings for each sector.

Figure 1-4. Annual GHG emissions: reference case projections and ICCAC options (consumption basis, gross emissions)



MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; GHG = greenhouse gas; ICCAC = Iowa Climate Change Advisory Council.

Table 1-2a. Annual emissions: reference case projections and impact of ICCAC options (consumption basis, gross emissions) 50% GHG reduction Scenario by 2050

	Consumption Basis – Gross Emissions						
	1990	2000	2005	2010	2012	2015	2020
Projected GHG emissions	97.3	114.2	119.5	124.4	127.3	131.4	139.1
Reductions from recent actions			0.0	0.3	0.7	1.6	3.3
Projected GHG emissions after recent actions*			119.5	124.1	126.6	129.8	135.7
GHG reduction scenarios recommended by ICCAC					118.8	N/A	106.3
Total GHG reductions from ICCAC policies					19.9	51.8	105.1
Difference between ICCAC scenarios and reductions *					12.1	N/A	75.7
Projected emissions after quantified ICCAC reductions					106.7	78.0	30.6

GHG = greenhouse gas; ICCAC = Iowa Climate Change Advisory Council; N/A = not applicable.

Reductions from recent actions include the Energy Independence and Security Act of 2007, Title III. GHG reductions from Titles IV and V of this Act have not been quantified because of the uncertainties in how they will be implemented. It is expected that Titles IV and V measures will overlap with EEC policies. Projected annual emissions also include reductions from recent actions. Existing utility energy efficiency programs are not included in the existing action analysis because they are impounded in the utility load growth forecasts used in the Iowa Inventory and Forecast. \* Difference = Row 4- row 7)

**Table 1-2b. Annual emissions: reference case projections and impact of ICCAC Options (consumption basis, gross emissions) 90% GHG reduction Scenario by 2050**

	Consumption Basis – Gross Emissions						
	1990	2000	2005	2010	2012	2015	2020
Projected GHG emissions	97.3	114.2	119.5	124.4	127.3	131.4	139.1
Reductions from recent actions			0.0	0.3	0.7	1.6	3.3
Projected GHG emissions after recent actions*			119.5	124.1	126.6	129.8	135.7
GHG reduction scenarios recommended by ICCAC					115.3	N/A	93.5
Total GHG reductions from ICCAC policies					19.9	51.8	105.1
Difference between ICCAC scenarios and reductions *					8.6	N/A	62.9
Projected emissions after quantified ICCAC reductions					106.7	78.0	30.6

GHG = greenhouse gas; ICCAC = Iowa Climate Change Advisory Council; N/A = not applicable.

Reductions from recent actions include the Energy Independence and Security Act of 2007, Title III. GHG reductions from Titles IV and V of this Act have not been quantified because of the uncertainties in how they will be implemented. It is expected that Titles IV and V measures will overlap with EEC policies. Projected annual emissions also include reductions from recent actions. Existing utility energy efficiency programs are not included in the existing action analysis because they are impounded in the utility load growth forecasts used in the Iowa Inventory and Forecast. \* Difference = Row 4- row 7)

**Table 1-3. Summary by sector of estimated impacts of implementing all of the ICCAC options (cumulative reductions and costs/savings)**

Sector	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2009–2020 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)
	2012	2020	Total 2009–2020		
Energy Efficiency and Conservation	1.1	8.5	42.8	–\$1,057	–\$25
Clean and Renewable Energy	5.8	48.0	233.5	\$5,921	\$25
Transportation and Land Use	1.6	11.1	55.0*	–\$2,219	–\$59
Agriculture, Forestry, and Waste Management	11.3	37.4	233.0	\$2,139	\$9.2
Cross-Cutting Issues	Non-quantified, enabling options				
<b>TOTAL (includes all adjustments for overlaps)</b>	<b>19.9</b>	<b>105.1</b>	<b>564.3*</b>	<b>\$4,785</b>	<b>\$8.8</b>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

The values in this table do not include the effects of recent actions. Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings associated with the policy options.

\* Deduct total TLU-6 2009-2020 reductions [17.7MMt] from 55.03 total = 37.3, before calculating cost/ton for TLU Options. Total Reductions for calculation of cost-effectiveness:  $564.3 - 17.7 = 546.6$ . [ $\$4.785 / 546.6 = \$8.8/t$ ]

Within each sector, values have been adjusted to eliminate double counting for policies or elements of policies that overlap. In addition, values associated with policies or elements of policies within a sector that overlap with policies or elements of policies in another sector have been adjusted to eliminate double counting. Appendix F (for the EEC sectors), Appendix G (for the CRE sectors), Appendix H (for the TLU sectors), and Appendix I (for the AFW sectors) of this report provide documentation of how sector-level emission reductions and costs (or cost savings) were adjusted to eliminate double counting associated with overlaps between policies.

**Table 1-4. Energy Efficiency and Conservation Policy Options**

Policy No.	Policy Option	CO <sub>2</sub> Reduction 2012	CO <sub>2</sub> Reduction 2020	Total 2009–2020	Net Present Value 2009–2020 (Million \$)	Cost/Ton (\$/tCO <sub>2</sub> e)	Level of Support
EEC-1	Consumer Education Programs	<i>Not quantified</i>					Unanimous
EEC-2	Demand-Side Management (DSM) / Energy Efficiency Programs for Natural Gas	0.08	1.24	5.43	–\$191.77	–\$35.29	Super-majority (4 Obj.)
EEC-3	Financial Mechanisms for Energy Efficiency	1.62	6.11	36.81	–\$805.05	–\$21.87	Super-majority (1 Obj.)
EEC-4	Improved Building Codes for Energy Efficiency	0.05	0.40	1.89	–\$46.27	–\$24.44	Super-majority (5 Obj.)
EEC-5	Incentive Mechanisms for Achieving Energy Efficiency	0.35	3.29	16.33	–\$350.79	–\$21.48	Unanimous
EEC-6	Promotion and Incentives for Improved Design and Construction in the Private Sector	0.00	0.12	0.46	–\$11.36	–\$24.57	Super-majority (1 Obj.)
EEC-7	Training and Education for Builders and Contractors	<i>Not quantified</i>					Unanimous
EEC-8	Focus on Specific Residential Market Segments	0.09	0.98	4.83	–\$122.53	–\$25.37	Unanimous
EEC-9	Midwestern Governors Association Energy Security and Climate Stewardship Platform	0.13	4.13	17.14	–\$375.69	–\$21.92	Majority (9 Obj.)
EEC-10	Energy Management Training/Training of Building Operators	0.10	1.29	5.48	–\$129.49	–\$23.63	Super-majority (1 Obj.)
EEC-11	Rate Structures and Technologies To Promote Reductions	0.04	0.21	1.20	–\$25.73	–\$21.45	Unanimous
EEC-12	Demand-Side Management (DSM) / Energy Efficiency Programs for Electricity	0.39	4.38	20.33	–\$444.81	–\$21.88	Super-majority (4 Obj.)
EEC-13	Government Lead by Example: Improved Design, Construction, and Energy Operations in New and Existing State and Local Government Buildings	0.08	0.36	1.97	1.04	0.53	Majority (6 Obj.)
EEC-14	More Stringent Appliance Efficiency Standards	0.94	2.20	17.33	–\$708.15	–\$40.85	Super-majority (2 Obj.)
	<b>Sector Total After Adjusting for Overlaps</b>	<b>1.1</b>	<b>8.6</b>	<b>43.2</b>	<b>–\$1,064.5</b>	<b>–\$24.7</b>	
	<b>Reductions From Recent Actions: EISA (2007) and Executive Orders #6 and 41</b>	<b>0.44</b>	<b>1.42</b>	<b>9.19</b>			
	<b>Sector Total Plus Recent Actions</b>	<b>1.6</b>	<b>10.0</b>	<b>52.3</b>			

CO<sub>2</sub> = carbon dioxide; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent; Obj. = objection(s); EISA = Energy Independence and Security Act of 2007.

Negative values in the Net Present Value and the Cost/Ton (cost-effectiveness) columns represent net cost savings.

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

**Table 1-4 (continued). Clean and Renewable Energy Policy Options**

Policy No.	Policy Option	CO <sub>2</sub> Reduction 2012	CO <sub>2</sub> Reduction 2020	Total 2009–2020	Net Present Value 2009–2020 (Million \$)	Cost/ton (\$/tCO <sub>2</sub> e)	Change in Generation Cost in 2020 \$/MWh*	Level of Support
CRE-1	Education	<i>Not quantified</i>						Unanimous
CRE-2	Technology Initiatives, Including Renewables	4.7	33.4	192.6	\$5,653	\$29.4	\$25.7	Super-majority (3 Obj.)
CRE-3	MGA Cap-and-Trade, Including Offsets To Promote Renewables	<i>Not quantified</i>						Majority (5 Obj.)
CRE-4	Decarbonization Fund	2.2	11.4	74.1	\$316	\$4.3	\$3.1	Super-majority (2 Obj.)
CRE-5	Performance Standards (50% Reduction by 2050)	4.9	11.4	95.4	\$2,650.6	\$27.8	\$7.3	Super-majority (3 Obj., 1 Abst.)
CRE-6	Voluntary GHG Commitments	<i>Not quantified</i>						Unanimous
CRE-7	Policies Related to Nuclear Power	0.0	9.7	9.7	\$268	\$27.6	\$4.5	Majority (5 Obj.)
CRE-8	Support for Grid-Based Renewable Energy & Development (MGA Target of 20% of retail sales by 2020)	0.0	2.3	4.3	\$93.4	\$21.8	\$1.5	Unanimous
CRE-9	Transmission System Upgrading	<i>Not quantified</i>						Unanimous
CRE-10	R&D for Emerging Technologies and Corresponding Incentives	<i>Not quantified</i>						Unanimous
CRE-11	Distributed Generation / Co-Generation	0.0	0.1	0.5	\$14	\$29.1	\$0.1	Super-majority (1 Obj.)
CRE-12	Combined Heat and Power	0.3	2.1	13.6	-\$564.3	-\$41.4	\$0.0	Unanimous
CRE-13	Pricing Strategies To Promote Renewable Energy and/or CHP	1.2	5.6	35	\$1,128	\$32.1	\$4.7	Super-majority (3 Obj.)
	<b>Sector Total After Adjusting for Overlaps</b>	<b>6</b>	<b>48</b>	<b>233</b>	<b>\$5,921</b>	<b>\$25</b>		
	<b>Reductions From Recent Actions</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>		
	<b>Sector Total Plus Recent Actions</b>	<b>6</b>	<b>48</b>	<b>233</b>	<b>\$5,921</b>	<b>\$25</b>		

CO<sub>2</sub> = carbon dioxide; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent; \$/MWh = dollars per megawatt-hour; Obj. = objection(s); MGA = Midwestern Governors Association; Abst. = abstention; GHG = greenhouse gas; R&D = research and development; CHP = combined heat and power.

Negative values in the Net Present Value and the Cost/Ton (cost-effectiveness) columns represent net cost savings.

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

**Table 1-4 (continued). Transportation and Land Use Policy Options**

Policy No.	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2009–2020 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2012	2020	Total 2009–2020			
TLU-1	Smart Growth Bundle with Transit	0.076	0.242	1.53	–\$377	–\$245	Unanimous
TLU-1a	Expand and Improve Transit Infrastructure	0.004	0.026	0.127	\$7.2	\$57	Majority (5 objections)
TLU-2	GHG Impacts for State and Local Capital Funding	<i>Quantified as part of TLU-1 and TLU-1a</i>					Unanimous
TLU-4	Support Passenger Rail Service in Iowa	N/A	0.008	0.026	\$15	\$597	Majority (7 objections)
TLU-5a	Adopt Best Workplaces for Commuters in Iowa	0.02	0.02	0.21	\$18	\$84	Majority (6 objections)
TLU-5b	Distributed Workplace Models	<i>Non-quantified, qualitative Option</i>					Unanimous
TLU-6	Light-Duty Vehicles Fuel Efficiency Incentives	0.44	3.65	17.70	N/Q	N/Q	Super-majority (objections)
TLU-7	Fuel Efficient Operations for Light-Duty Vehicles	0.11	0.65	3.41	–\$306.9	–\$90	Unanimous
TLU-8	New Vehicle Standards (Tailpipe GHG and Fuel Economy)	N/A	0.8	4.1	–\$246	–\$60	Unanimous
TLU-9	Freight Strategies (Truck and Rail)	0.39	0.63	5.9	\$30	\$5	Super-majority (1 obj.)
TLU-10	Fuel Strategies (20% Low Carbon Fuel Standard)	0.60	5.11	22.03	–\$1,359	–\$62	Unanimous
	<b>Sector Total After Adjusting for Overlaps and Synergies</b>	<b>1.64</b>	<b>11.14</b>	<b>55.03*</b>	<b>–\$2,218.50</b>	<b>–\$59*</b>	
	<b>Reductions From Recent Actions (Federal CAFE Requirements)</b>	<b>0.26</b>	<b>1.93</b>	<b>9.39</b>	<b>Not Quantified</b>		
	<b>Sector Total Plus Recent Actions</b>	<b>1.9 (8.3)</b>	<b>13.07 (48)</b>	<b>64.42</b>	<b>N/A</b>	<b>N/A</b>	

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent; N/A = not applicable; N/Q = not quantified; LRR = low rolling resistance; BAU = business as usual.

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

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

\* Deduct total TLU-6 2009-2020 reductions [17.7MMt] from 55.03 total = 37.3, before calculating cost/ton for TLU Options.