

Progress in Addressing Climate Change

REPORTS TO THE MINNESOTA LEGISLATURE

JANUARY 2009

Biennial Greenhouse Gas Emissions Reduction Report

and

Annual GHG Legislative Proposal Report

Minn. Stat. 216H.07, subd. 3 and 4

SUBMITTED BY

MINNESOTA DEPARTMENT OF COMMERCE

AND

MINNESOTA POLLUTION CONTROL AGENCY

TABLE OF CONTENTS

	Page
I. STATUTORY BACKGROUND	1
II. INTRODUCTION	2
III. BIENNIAL GHG EMISSIONS REDUCTION PROGRESS REPORT	4
IV. ANNUAL GHG LEGISLATIVE PROPOSAL REPORT	12
A. Implementation Status of the MCCAG Recommendations	12
B. Policy Recommendations	24
V. APPENDIX & NARRATIVE OF SECTOR PROGRESS	1
A. Residential, Commercial and Industrial Energy Demand	1
B. Energy Supply	12
C. Transportation and Land Use Sector	18
D. Agriculture, Forestry, and Waste Management	26
E. Cross-Cutting Issues	34
F. Cap-and-Trade	39

I. STATUTORY BACKGROUND

Minn. Stat. §216H.07 was enacted by the Minnesota legislature during the 2008 session. It addresses attainment of the greenhouse gas reduction timetable in Minn. Stat. §216H.02 and outlines a process for reporting progress in reducing greenhouse gas (GHG) emissions and for recommending policies to achieve the statutory emissions reduction timetable. This report by the commissioners of the Department of Commerce (Commerce) and the Pollution Control Agency (MPCA) to the chairs of the legislative committees with primary policy jurisdiction over energy and environmental issues is submitted to fulfill reporting requirements under both Minn. Stat. §216H.07, subd. 3 and subd. 4. The report outlines the most recent GHG emissions data relative to the 2005 GHG emission reduction baseline; the level necessary to achieve the reductions timetable in Minn. Stat. §216H.02; and any legislative proposals determined necessary to achieve these reductions.

Minn. Stat. 216H.07, Subd. 3. Biennial reduction progress report.

By January 15 of each odd-numbered year, the commissioners of commerce and the Pollution Control Agency shall jointly report to the chairs and ranking minority members of the legislative committees with primary policy jurisdiction over energy and environmental issues the most recent and best available evidence identifying the level of reductions already achieved and the level necessary to achieve the reductions timetable in section 216H.02. The report must be in easily understood nontechnical terms.

Minn. Stat. 216H.07, Subd. 4. Annual legislative proposal.

The commissioners of commerce and the Pollution Control Agency shall annually by January 15 provide to the chairs of the legislative committees with primary policy jurisdiction over energy and environmental issues proposed legislation the commissioners determine appropriate to achieve the reductions. The legislation must be based on the principles in subdivision 5. If the commissioners determine no legislation is appropriate, they shall report that determination to the chairs along with an explanation of the determination.

Minn. Stat. 216H.07, Subd. 5. Reduction principles.

Legislation proposed under subdivision 4 must be based on the following principles:

- (1) the greenhouse gas emissions-reduction goals specified in section 216H.02, subdivision 1, must be attained;
- (2) the reductions must be attained on a schedule that keeps pace with the reduction timetable required by section 216H.02, subdivision 1;
- (3) conservation, including ceasing some activities, doing some activities less, and doing some activities more energy efficiently, is the first choice for reduction;
- (4) public education is a key component;
- (5) all levels of government should lead by example;
- (6) strategies that may lead to economic dislocation should be phased in and should be coupled with strategies that address the dislocation; and

- (7) there must be coordination with other federal and regional greenhouse gas emissions-reduction requirements so that the state benefits and is not penalized from its reduction activities.

II. INTRODUCTION

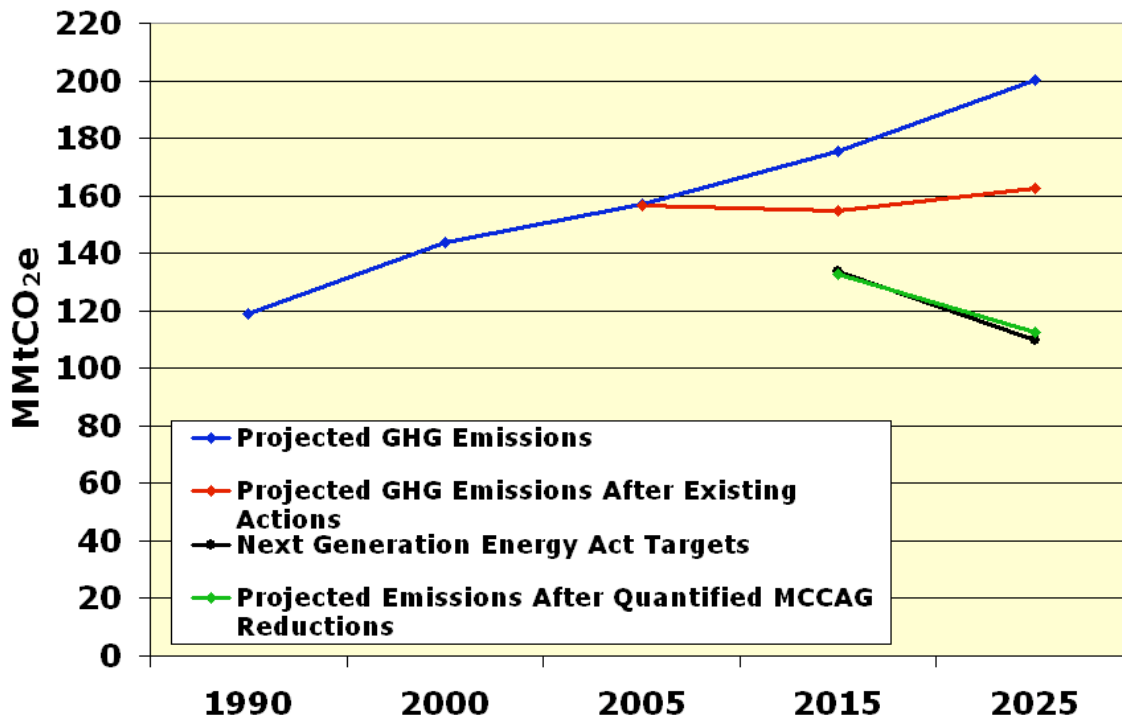
The State of Minnesota is a leader in addressing climate change, with strong legislation supporting actions taken by state and local government entities, educational institutions at every level, our business leaders, and many community and non-profit organizations. While climate change is a long-term global problem and our efforts must continue for years to come, our state is taking action now.

Minnesota Greenhouse Gas Reduction Plan

The Minnesota Climate Change Advisory Group (MCCAG) completed developing the framework of a comprehensive, long-term plan to reduce Minnesota's emissions of GHGs earlier this year, submitting its final report to the Minnesota Legislature in April 2008. The plan demonstrates how Minnesota could achieve the statutory GHG emission reduction goals. The report is the culmination of the work of more than 100 Minnesotans who were members of the MCCAG and the six Technical Work Groups that supported the MCCAG.

The MCCAG approved 46 policy recommendations to reduce GHG emissions. In addition, the MCCAG estimated the potential impact of the state's participation in cap-and-trade programs under several different scenarios. Through a quantitative analysis, MCCAG determined that with implementation of the recommendations, combined with recent actions already in place to reduce emissions, it would be possible to achieve the 2015 GHG reduction goal. See MCCAG Ex. 4.

MCCAG Ex.- 4 Annual GHG emissions: reference case projections and MCCAG recommendations (consumption-basis, gross emissions)



The recommended actions of the MCCAG’s final report are grouped into six sectors:

- (1) Residential, Commercial and Industrial Energy Demand;
- (2) Energy Supply;
- (3) Transportation and Land Use;
- (4) Agriculture, Forestry, and Waste;
- (5) Cross-Cutting (including education, forecasting, reporting, and multi-state efforts);
and
- (6) Cap and Trade.

The MCCAG recommendations should be viewed as a living document that will require adjustment and adaptive management over time. Also, many, if not most, of the recommendations are high-level, and require additional research, study, analysis and discussion before they can be fully developed into ready-to-implement policy. It should also be noted that the MCCAG analysis determined that many of the recommendations would have a lower cost to Minnesotans if implemented at the national or regional level. The important work of the MCCAG has successfully demonstrated that it is possible to achieve the state’s emission reduction goals and identifies the most significant areas in which to focus additional efforts.

Significant progress has been made in each sector since MCCAG issued its final report in April 2008, and there are activities underway throughout the state that relate to nearly every one of the policy recommendations. The major “success stories” are summarized below. A listing of the

MCCAG recommendations and a brief description of current and planned activities is in section IV A of this report. For a more complete description of the implementation progress, please see Appendix– Sector Progress.

The full MCCAG Final Report is available at www.mnclimatechange.us.

III. BIENNIAL GHG REDUCTION PROGRESS REPORT

Between 2005 and 2006, greenhouse gas emissions from Minnesota sources declined by about 2 million CO₂-equivalent (CO₂-eq.) short tons. Emissions totaled an estimated 152 million tons in 2006. This is shown in Figure 1 below in the context of a GHG emissions trend since 1990. The Next Generation Energy Act sets a 15 percent emission reduction goal from 2005 levels. Based on Figure 1 (repeated in Tabular form in Table 1), after one year of tracking emissions, Minnesota is roughly on track to meeting legislative goals.

Figure 1

Progress Toward the Next Generation Energy Act GHG Reduction Goals

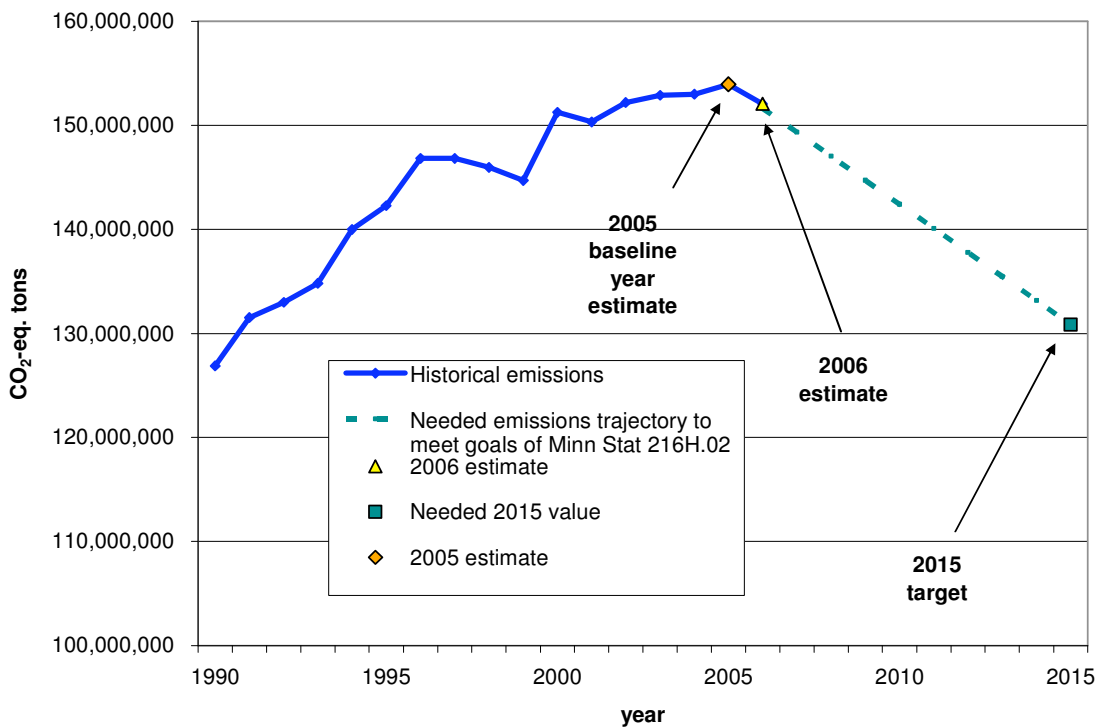


Table 1

	Inventory Estimates	Next Gen Targets
year	million CO ₂ -eq. tons	million CO ₂ -eq. tons
1990	126.9	
2000	151.3	
2005	154.0	
2006	152.2	
2015 target		130.9

No estimates are presented for 2007. A two- to three-year lag in the availability of the underlying data limits the estimates given here to 2006 and before. A brief discussion of how the emissions data was determined follows. A more detailed technical report concerning the emissions inventory will be available from the MPCA in a few weeks.

To develop these estimates, the MPCA relied upon its GHG emission inventory system, which tracks emissions within the geographical boundaries on the state. As specified by the Next Generation Energy Act, the estimates shown in Figure 1 and Table 1 also include those emissions associated with the net import of electricity from other states and Canadian provinces. Only those GHGs that are named in the Next Generation Energy Act are treated.

Emissions are specified in CO₂-equivalent tons. A CO₂-equivalent ton is the equivalent emission of any GHG that results in a 100-year integrated effect on the climate equal to the emission of 1 ton of CO₂ from fossil fuel combustion. It is a standardized measure of climatic impact.¹

Emissions are estimated for all years from 1970 to 2006. The 36-year trend is shown in Figure 2. With a few exceptions, the methods used to develop these estimates derived from the following sources: Intergovernmental Panel on Climate Change, *2006 Guidelines for National Greenhouse Gas Inventories* (2006); U.S. EPA, *Sources and Sinks of Greenhouse Gases in the US, 2006* (2008); The Climate Registry, *General Reporting Protocol* (2008); and U.S. EPA, *Climate Leaders, Inventory Guidance* (2008). The methods used to develop GHG inventories have undergone substantial change in the last two years. In the results shown in Figures 1 and 2 and Table 1, emissions for all years prior to 2006 were back-calculated to reflect these methodological changes.

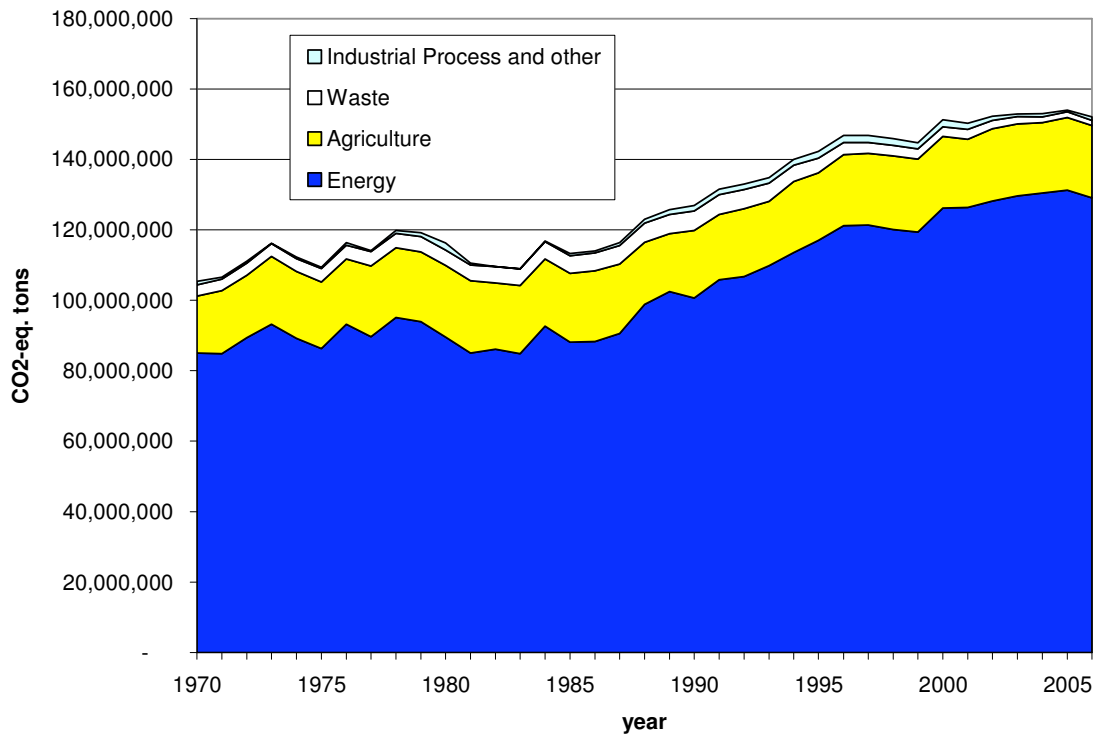
Emissions associated with the net import of electricity were estimated using a nine-state/province average for emissions per MWH of power generated. These states and provinces included: Wisconsin, Iowa, South Dakota, North Dakota, Manitoba, Nebraska, Missouri, Kansas and Wyoming. Losses in transmission and distribution were considered in evaluating GHG emissions from net electricity imports.

¹ CO₂-equivalences were calculated in the estimated shown in the Figures and Tables using the global warming potentials presented in the fourth IPCC scientific assessment of 2006.

Except net electricity imports, only GHG emissions that occur within the geographical boundaries of the state are included. The emissions associated with jet fuel used in commercial aircraft departing from Minnesota airports are a notable exception to this rule. For this inventory, all jet fuel loaded in Minnesota was accounted for in these data.

Figure 2

Greenhouse Gas Emissions from Minnesota by Major Activity, 1970-2006



GHG emissions from Minnesota sources peaked in 2005 at 154 million CO₂-eq. tons. Of this, about 80 percent is associated with fossil fuel combustion or the production and transportation of finished fuels like refined petroleum products (see Figure 2). As noted above, between 2005 and 2006 GHG emissions declined about 2 million CO₂-eq. tons. The observed reduction in emissions between 2005 and 2006 is broken out by economic sector in Table 2 below.

Table 2

Sector of the Economy	Change in emissions (million CO₂-eq. tons)	Principal source of change
Commercial sector	-0.7	energy use
Residential sector	-0.4	energy use
Industrial sector	-0.2	energy use
Agriculture	-0.2	soil nutrient management
Waste sector	-0.1	landfills
Transportation	-0.8	passenger cars, aviation
Electric power generation	+0.6	energy use

In general, the precision of the data from energy use – the energy, industrial and transportation sectors - is relatively accurate. The data from other sources- waste and agriculture, for example – is less precise. This is in part due to scientific uncertainty regarding the complex processes associated with emissions from such sectors. There are a number of issues relating to how GHG emissions should be tracked and what should be included in the inventory. The MPCA is committed to work with other departments, scientists and stakeholders to continually improve the GHG emissions inventory and tracking system.

Major Action Affecting GHG Emissions

As indicated above, Minnesota is roughly on track to meet the 2015 GHG reduction goal. There are several actions that have or will play a particularly significant role in helping to reduce the state’s GHG emissions, including the Conservation Improvement Program, the Renewable Energy Standard, the Metropolitan Emission Reduction Project, and the Midwest Governors Association Greenhouse Gas Accord. The impact these actions have on GHG emissions are as follows:

❖ **Conservation Improvement Program (CIP).** The Next Generation Energy Act of 2007 revised the state’s CIP statute to set an annual energy savings goal for all electric and gas utilities beginning in 2010. Previously the CIP program required that energy utilities dedicate a portion of their revenues for projects that reduce the consumption of electricity and natural gas. The new program sets an energy savings goal equal to 1.5 percent of the utility's annual retail energy sales in Minnesota. Each utility’s goal is based on an average of the weather normalized retail sales over the previous three years.

Utilities recover funds spent on CIP by adding an adjustment or surcharge to the rates that they charge their customers. To encourage customers to implement energy efficiency and conservation measures, utilities typically provide customers with rebates and other financial incentives to purchase energy-efficient products, such as efficient lighting, furnaces, air compressors, and motors. Large industrial customers may realize substantial energy savings by working with their utility on large process improvements, which can result in a reduction in the energy intensity of a manufacturing process. Utilities have been developing CIP plans to meet

the new energy savings goal by 2010. Additional benefits that may be realized by the increased emphasis on energy savings include stronger markets, and supply and distribution networks for energy efficient products.

The Department of Commerce’s Office of Energy Security (OES) is assisting utilities to identify which efficiency measures produce the most cost effective energy savings and calculate those energy savings in a consistent and accurate manner. OES has hired a consultant to assess how energy savings are determined for many standard efficiency measures, many of which are implemented by utilities and energy service companies around the nation. The estimated energy savings for these measures can vary widely, depending on climate, facility type, and end use of a measure. The OES project will identify the most reliable estimated savings for Minnesota utilities to use in their CIP projects. In addition, OES will convene ongoing stakeholder workgroups to revise the calculations as necessary and to add new measures as they become available.

The new CIP programs will increase the emphasis on Measurement and Verification (M&V) activities. In 2008, OES established M&V protocols for all utilities, which require that utility projects with first year savings of 1,000,000 kWh of electricity or 20,000 MCF of natural gas undergo specific M&V activities to ensure that the savings are being realized. To keep M&V costs at a reasonable level relative to the savings achieved, M&V is required only if the costs associated with M&V are less than 10 percent of projected first year savings.

The CIP program, before the 2007 statutory change, already has had a significant impact on CO₂ emissions, as the following tables indicate. The energy savings in Tables 3a and 3b represent annual energy savings, which then accumulate over the life of the project. The new CIP is expected to enhance these results:

Tables 3a and 3b. Electric and gas CIP incremental savings in 2006 and 2007.

Table 3a. Electric CIP Incremental Savings in 2006 and 2007

	Energy Savings (kWh)	CO₂ Savings (tons)
2006	411,998,552	360,499
2007	463,542,698	405,600
Total	875,541,250	766,099

Table 3b. Gas CIP Incremental Savings in 2006 and 2007

	Energy Savings (MCF)	CO₂ Savings (tons)
2006	2,095,047	126,750
2007	1,917,144	115,987
Total	4,012,191	242,737

Low-income program spending requirements were changed from a three-year average of utility low-income spending to one that is based on spending a percentage of residential gross operating revenues. Electric utilities must spend at least 0.1 percent of their gross operating revenue from residential customers in the state on low-income programs until 2010, and at least 0.2 percent after 2010. Gas utilities must meet the 0.2 percent minimum requirement as well.

❖ **Renewable Energy Standard (RES).** The MCCAG report points out that the new renewable energy standard (RES), Minn. Stat. §216B.1691, is one of the major factors contributing to Minnesota’s ability to meet the legislature’s GHG reduction timetable. The 2007 RES legislation reflects a refinement of Minnesota renewable policy dating back several years.

In 2001, the legislature included several provisions to promote the development and use of renewable energy in Minnesota. The most significant of these provisions was the Renewable Energy Objective (REO) in Minn. Stat. § 216B.1691). The 2001 REO required each utility to make a good faith effort to generate at least 1 percent of its power from an eligible renewable energy source by 2005, and to increase this amount to 10 percent by 2015.

The legislature amended the REO in 2003, to make the REO a requirement for Xcel to invest in another 300 megawatts of wind energy capacity (above amounts required by the legislature in 1994) by 2010. In addition, the legislation required the Minnesota Public Utilities Commission (PUC) to establish criteria to determine whether utilities were making the required good faith effort to achieve the REO. The legislation also authorized the PUC to establish a renewable energy credits trading program for the REO so that utilities could purchase certified renewable energy credits rather than generate or procure the renewable energy directly.

The 2007 legislature significantly changed the law by enacting legislation that:

- created a renewable energy standard (RES) beginning in 2010;
- modified the state's existing non-mandated renewable-energy objective;
- required the PUC to establish a trading system for renewable credits; and
- amended the definition of “eligible energy technology.”²

By 2010, a utility should make a good faith effort to generate or procure seven percent of its retail electric sales from an eligible energy technology. The standard for Xcel requires that eligible renewable electricity account for 30 percent of total retail electricity sales by 2020. Of the 30 percent renewables required of Xcel in 2020, at least 25 percent must be generated by wind-energy systems, and the remaining 5 percent by other eligible technologies. The standard for other Minnesota utilities requires that eligible renewable electricity account for 25 percent of retail electricity sales to retail customers (and to retail customers of a distribution utility to which the one or more of the utilities provides wholesale service) in Minnesota by 2025. The RES schedules are as follows:

<u>Xcel</u>	<u>Other Minnesota Utilities</u>
15 percent by 12/31/2010	12 percent by 12/31/2012
18 percent by 12/31/2012	17 percent by 12/31/2016
25 percent by 12/31/2016	20 percent by 12/31/2020
30 percent by 12/31/2020	25 percent by 12/31/2025

One of the tools for implementation of the RES is through the Midwest Renewable Energy Tracking System (M-RETS. The M-RETS is discussed in ES-5.)

² The definition is “electricity generated by solar, wind, hydroelectric facilities less than 100 megawatts (MW), hydrogen and biomass, which includes landfill gas, anaerobic digestion, and municipal solid waste.”

❖ **Metropolitan Emissions Reduction Project (MERP).** Xcel Energy's MERP has been the single largest source of GHG reductions in the state to date. Older coal-combustion electric generation facilities are a major contributor to GHG emissions. Three of these facilities, the Riverside Plant in Minneapolis, the High Bridge plant in St. Paul, and the Allen S. King plant located on the St. Croix River south of Stillwater, are involved in MERP.

In 2001, the Minnesota legislature enacted Minn. Stat. § 216B.1692, authorizing utilities to recover the costs of an upgrade to a large existing electric generating power plant through rate increases if the plant upgrade meets certain conditions. The MERP project was implemented because the PUC allowed Xcel to recover the cost of the project. Cost recovery can be a deciding factor in incentivizing clean energy projects.

In the spring of 2002, Xcel filed a petition with the PUC to upgrade the three existing power plants under § 216B. 1692, in fulfillment of a voluntary commitment made to the Izaak Walton League, as part of Xcel's merger proceeding before the Commission in 2000.³ The PUC ultimately approved this proposal in December 2003. Throughout the approval process, the OES supported MERP with the goal of striving to reduce both the total amount of emissions from electric generation, and the emissions per kilowatt-hour consumed in Minnesota.

MERP is one of the largest energy-related projects undertaken in Minnesota. Xcel will shut down and dismantle the two coal-fired power plants in the Twin Cities - Riverside and High Bridge - and replace them with new natural gas-fired facilities. The project also increases the previous capacity of those plants by approximately 300 megawatts. MERP also includes the installation of new state-of-the-art pollution control equipment and facility refurbishment. The demolition and construction involved with MERP carries a price of approximately \$1 billion. Work on the three plants is on track to meet the proposed 2010 completion date⁴:

- The Allen S. King Plant was the first of the three MERP projects completed. The plant was returned to service in July 2007 and has been regularly dispatched to meet system needs since May 2008.
- The High Bridge combined cycle natural gas facility was the second of the three MERP projects completed and was placed into operation in May 2008, after successfully passing emissions testing.
- Unit 7, one of the three operating units at the Riverside coal plant, was retired in September 2008. According to Xcel, the new Riverside combined cycle natural gas facility is progressing well and is on scheduled for a May 2009 commercial operation date.

GHGs from Minnesota's coal-fired units have declined since peaking in 2003. GHG reductions associated with MERP are not yet reflected in the inventory process, because all of the changes due to MERP occur after 2006, the most recent GHG inventory year. MERP projects will be a

³ Xcel Energy's MERP petition in Docket E002/M-02-633 was enabled by 2003 Minnesota Laws, Special Session Chapter 11, Article 3.

⁴ See Xcel's October 1, 2008 MERP update to the MPUC in Docket E002/M-02-633.

factor in continued reductions in GHGs from Minnesota coal-fired electrical generating units, but the magnitude of the reduction will rely on the use of the new High Bridge and Riverside combustion turbines. Based on Xcel's preliminary data for High Bridge's combustion turbines submitted to EPA's acid rain emissions tracking program, the two new combustion turbines will emit about 50 percent less CO₂ for each megawatt generated from gas than from the coal plant the combustion turbine replaces. Facility changes at King do not yet appear to lower the CO₂ emissions rate.

❖ **Midwest Governors Association Greenhouse Gas Reduction Accord.** In November 2007, the Midwestern Governors Association (MGA) held the Midwest Energy Security and Climate Stewardship Summit (Summit) which resulted in six Midwest Governors and the Premier of Manitoba signing the *Midwestern Greenhouse Gas Reduction Accord* (Midwestern Accord). Under the Midwestern Accord, members agree to:

1. Establish greenhouse gas reduction targets and timeframes consistent with MGA member states' targets;
2. Develop a market-based and multi-sector cap-and-trade mechanism to help achieve those reduction targets;
3. Establish a system to enable tracking, management and crediting for entities that reduce GHG emissions; and
4. Develop and implement additional steps as needed to achieve the reduction targets, such as a low-carbon fuel standards and regional incentives and funding mechanisms.

In addition to the Midwestern Accord, eight members of the MGA signed the *Energy Security and Climate Stewardship Platform for the Midwest* (Stewardship Platform), which lists the following Midwest regional goals to transition the region to a lower carbon energy economy:

1. Energy Efficiency Improvements – Meet at least 2 percent of regional annual retail sales of natural gas and electricity through energy efficiency improvements by 2015, and continue to achieve an additional 2 percent in efficiency improvements every year.
2. Bio-based Products and Transportation – Have 50 percent of the region's transportation fuels come from renewable resources by 2025.
3. Renewable Electricity – Obtain at least 30 percent of the region's electricity from renewable resources by 2030.
4. Advance Coal and Carbon Capture and Storage – By 2020 all new coal gasification and coal combustion plants will capture and store CO₂ emissions.

Member MGA states signed six additional resolutions. The resolutions establish a Carbon Management Infrastructure Partnership, a Midwestern Bio-based Product Procurement Program, a Transmission Adequacy Initiative, a working group to pursue a collaborative, multi-jurisdictional transmission (including renewable energy corridors) across the Midwest, a

Bioenergy Permitting collaborative, and an initiative to develop a low-carbon energy transmission infrastructure. For more details on these MGA actions, please see the Green Solutions Act report on the Midwestern Accord submitted by the OES and MPCA.

IV. ANNUAL GREENHOUSE GAS LEGISLATIVE PROPOSAL REPORT

A. SUMMARY: MCCAG UPDATE

The following is a brief summary of activities underway to help implement the 46 MCCAG policy recommendations as well as information regarding any expected federal action.

Only limited attempts have been made so far to quantify the GHG emission reductions due to existing actions. In the future, attempts will be made to develop more information regarding GHG emission reductions from specific activities.

MCCAG Policy Number	Climate Mitigation Actions RESIDENTIAL, COMMERCIAL & INDUSTRIAL	Estimated Annual GHG Reduction Potential (MMtCO2e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
RCI-1	Maximize savings from the utility conservation improvement program (CIP)	Quantified as "recent action"			Utility CIP plan review process: 2 IOUs approved; 110 municipals & 6 generation and transmission coops in review (representing 45 distribution coops); 6 remaining IOUs will file in June 09.	Entire program was revamped through 2007 Next Gen Act. No new legislation anticipated until revised program results evaluated.
RCI-2	Improved uniform statewide building codes	0.004	0.00051	0.077	New residential bldg code 2007; new energy codes 2008 (eff. 2009). DOLI is now authorized to enforce standards statewide	None at this time; New ASHRAE commercial code with 30% improvement due in 2010.
RCI-3	Green building guidelines and standards based on Architecture 2030	0.62	0.94	11.1	2008 MN legislation focuses on state govt. buildings; SB2030 implementation plan due to Leg. July 09	None at this time; anticipate updates after review of implementation plan.
RCI-4	Incentives and resources to promote combined heat and power (CHP)	0.96	4.95	33.1	Under new CIP legislation, utilities can use up to 5% to install distributed energy projects, including CHP.	Will assess effectiveness of new actions before deciding if new legislation should be considered.
RCI-5	Program to reduce emissions of non-fuel, high-global-warming potential GHGs	0.02	0.05	0.5	See separate MPCA report on high-GHG-warming potential GHGs.	Separate MPCA high-GHG-potential report contains policy recommendations.
RCI-6	Non-utility strategies and incentives to encourage energy efficiency and reduce GHG emissions	0.25	1.3	8.3	A number of voluntary efforts, such as MnTAP projects and OES federal EE programs, already exist; anticipate new federal stimulus dollars will enhance efforts	Ascertain scope of federal stimulus funds, where funds can fit.

MCCAG Policy Number	Climate Mitigation Actions RESIDENTIAL, COMMERCIAL & INDUSTRIAL	Estimated Annual GHG Reduction Potential (MMtCO2e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
RCI-7	Conservation improvement-type of program for propane and fuel oil efficiency	0.05	0.05	0.7	OES to propose a pilot CIP low-income project: conservation measures provided by electric utility in propane/fuel oil heated home.	Evaluate results of CIP pilot; additional legislation may not be necessary.
RCI-8	Energy performance disclosure	Not Quantified			No existing programs identified in MN requiring energy disclosure at time of home sale; mixed results in other states	Need to look at this concept after the MN real estate market recovers.
RCI-9	Promote technology-specific applications to reduce GHG emissions	Not Quantified			New federal stimulus funding could finance this recommendation more fully; state agencies are using new technology in operations as appropriate	Assess need for additional state legislation after looking at impact of new federal funds.
RCI-10	Support strong federal appliance standards and require high state standards in the absence of federal standards.	0.8	1.4	15.3	Although Congress enacted stricter stds in 2005, many items like some electronics, ice makers, pool heaters, transformers, etc. are not covered. For many of these, a multi-state group (CA, CT, RH, OR, and WA) is assessing and adopting state level stds	Recommend that legislation be enacted to adopt standards for certain products that are not covered by national standards thus unrestricted by federal law.

MCCAG Policy Number	Climate Mitigation Actions ENERGY SUPPLY	Estimated Annual GHG Reduction Potential (MMtCO2e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
ES-1	Generation Performance Standard (GPS)	0	0	0	PUC has authority to address GPS in an individual certificate of need case and/or power purchase agreement if facts of case support.	U.S. EPA is likely to propose national emission standards under the Clean Air Act; no legislation requested at this time.
ES-3	Efficiency improvements, re-powering and other upgrades to existing plants	1.8	3	33.3	Some upgrade and repowering projects are underway or proposed, and reviewed on a case-by-case basis.	No legislation requested at this time. Emission reduction rider has provided incentives for projects underway.
ES-4	Transmission system upgrading, including reducing transmission line and distribution system loss	0.2	0.4	3.9	OES is reviewing transmission requests to recommend up-sizing to mitigate losses. New CIP allows utility infrastructure upgrades.	No legislation needed.
ES-5	Renewable and/or environmental portfolio standard	Quantified as "recent action"			See report summary; significant progress in implementing renewable energy standard occurred in 2008.	Additional legislation is not requested at this time. Utilities continue to focus significant effort to achieving the RES
ES-6	Nuclear power support and incentives	Recomm. for further study			Current legislation prohibits development of additional nuclear facilities in MN	Recommend repeal of nuclear prohibition to allow for consideration of cleaner, Next Generation nuclear technology
ES-8	Advanced fossil fuel technology incentives, support or requirements, including carbon capture and storage.	Recomm. for further study			There is an advanced fossil fuel project currently under consideration; high cost, environmental issues, and risk assessment are current concerns.	No legislation will be considered until evaluation by Midwest Governors Association is completed.

MCCAG Policy Number	Climate Mitigation Actions ENERGY SUPPLY	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
ES-10	Voluntary GHG targets	Not quantified			A number of public and private entities have set GHG targets, such as Cargill, UMN Morris, Met Council, MPCA and many others.	Investigate incentives to encourage voluntary reporting.
ES-12	Distributed renewable energy incentives and/or barrier removal	0.021	0.023	0.37	Phase II distributed renewable energy study is now underway. A number of incentive programs, such as Xcel's RDF and NextGen Funding, support this item.	Recommend reviewing results of the Phase II study before deciding whether legislation is considered.
ES-13	Technology-based approaches, including R&D, fuel cells, energy storage, distributed renewable energy, etc.	Not quantified			The RDF and NextGen funds support this recommendation, but much funding is needed; federal funds may become available. An MGA study is also underway.	Recommend evaluating MGA study and seeing if federal funding is available next year before considering legislation.

MCCAG Policy Number	Climate Mitigation Actions TRANSPORTATION & LAND USE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
TLU Area 1:	Reduce VMT					
TLU-1	Improved land-use planning and development strategies	0.7	1.9	14.9	Efforts underway, i.e. Met Council Development Framework, Livable Communities grants, Open Space Protection.	Will need to better assess the effectiveness of existing efforts to design effective legislation.
TLU-2	Expand transit, bicycle, and pedestrian infrastructure	0.1	0.3	3	Northstar and Central Corridor LRT are examples of expansion; MnDOT and Met Council administer funds supporting this rec	Existing authority appears adequate; expanding programs is cost-intensive.
TLU-5	Climate-friendly transportation pricing/pay-as-you-drive	1.1	2.1	20.9	Several states have enacted legislation supporting pay-as-you-drive insurance pricing	Recommend evaluating effectiveness of programs in other states before considering legislation.
TLU-7	"Fix-it-First" transportation investment policy and practice	Not quantified			This is the de-facto policy of MnDOT, Met Council, and county agencies; new federal infrastructure dollars can enhance actions	No legislation requested; policy is already being followed
TLU-9	Workplace tools to encourage carpooling, bicycling, and transit ridership	0.3	0.4	4.5	Many programs at all levels in public and private sectors.	Legislation does not appear necessary; better reporting and evaluation mechanisms for existing efforts would be helpful.
TLU-14	Freight mode shifts: intermodal and rail	N/A			Met Council, MnDOT, and MN Freight Advisory Committee promote regional freight	Legislation not requested at this time.
TLU Area 2:	Reduce Carbon per Unit of Fuel					

MCCAG Policy Number	Climate Mitigation Actions TRANSPORTATION & LAND USE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
TLU-3	Low-GHG Fuel Standard	1.7	3.6	36.2	Mn is a leader in the use of renewable fuels due to E10, B2, and E85. E20 and B20 laws are enacted. A Low Carbon Fuel Standard Study is underway at the UMN to be completed in Oct. 2009	Recommend continuing efforts to increase the use of and reduce the carbon intensity of transportation fuels. Minnesota should investigate infrastructure needs for supporting electric vehicles.
TLU Area 3:	Reduce Carbon per Mile and/or per Hour					
TLU-4	Infrastructure management	0.04	0.1	0.7	MnDOT and Met Council administer federal funds supporting infrastructure management; additional new fed funding can enhance these actions.	Recommend seeing whether additional federal funds are available in this area before deciding if legislation should be considered.
TLU-6	Adopt California clean car standards	0.74	1.16	13.1	We anticipate EPA will propose new federal clean car standards.	Evaluate upcoming federal regulations.
TLU-12	Voluntary fleet emission reductions	0.4	0.4	6.1	A number of voluntary efforts ongoing, such as Project Green Fleet, MPCA Small Business Loans, and many public and private clean fleet and clean fuel actions;	Recommend evaluating effectiveness of state fleet emission reductions before deciding if legislation should be considered.
TLU-13	Reduce maximum speed limits	0.4	0.4	6.1	No activity.	Legislation not requested at this time.

MCCAG Policy Number	Climate Mitigation Actions AGRICULTURE, FORESTRY & WASTE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
AFW-1	Agricultural crop management				Dept. of Ag has several land mgmt programs supporting sustainable soil practices	Existing authority appears adequate; additional support would be needed to expand efforts.
	A. Soil carbon management	0.72	1.3	15	See above	See above
	B. Nutrient management	0.79	1.3	15	See above	See above
AFW-2	Land use management approaches for protection and enrichment of soil carbon				Mn Terrestrial Carbon Sequestration Initiative and Task Force, a UMN study requested by the Legislature (MN Sess. Laws 2007 Ch. 2, Sec. 35) has assessed the potential for terrestrial carbon sequestration in Mn and developed recommendations .	Expanding existing programs will require additional support. Continue to evaluate terrestrial sequestration science and policy options.
	A. Preserve land	0.15	0.44	3.7	See above	See above
	B. Reinvest Minnesota - clean energy	0.09	0.19	1.8	BWSR completed the RIM-CE program study earlier this year and is in implementation phase	RIM-CE is only recently underway; no additional legislation requested at this time
	C. Protection of peatlands and wetlands	Not quantified			Existing law protects both peatland and wetland areas; DNR's Wildlife Management Area program also protects wetland wildlife habitat.	Expansion of existing programs to protect additional peatland and wetland has not been evaluated to date.

MCCAG Policy Number	Climate Mitigation Actions AGRICULTURE, FORESTRY & WASTE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
AFW-3	In-state liquid biofuels production				The state is working actively on B20, E20, and E85 expansion. Also low carbon fuel study is underway at the UMN to be completed by Oct. '09	Legislative funding for in-state biofuels has been provided in recent years. No legislation beyond continued funding support is requested.
	A. Ethanol carton content	1.8	2.2	27	See above	See above
	B. Fossil Diesel displacement	0.03	0.19	1.4	See above	See above
	C. Gasoline 35 percent displacement	2.8	9.1	73	See above	See above
AFW-4	Expanded use of biomass feedstocks for electricity, heat, or steam production	1.3	3.8	31	NextGen Energy Act grant programs support biomass energy activities	No new legislation requested at this time
AFW-5	Forestry management programs to enhance GHG benefits				DNR is the state's lead agency in this area	Recommend fuller evaluation of existing programs and cost-effectiveness of GHG reductions from expanded or modified actions before considering new legislation.
	A. Forestation	0.55	2.2	17	DNR assists private landowners in establishing forest cover	See above
	B. Urban Forestry	1.2	2.7	26	Existing programs include DNR Relief and sustainable land practice actions	Additional support would be needed to expand efforts.
	C. Wildfire reduction	Not quantified			DNR is the state's lead agency in this area	See above
	D. Restocking	2.1	8.4	65	Forest land managers, including DNR, have restocking programs after harvest.	See above

MCCAG Policy Number	Climate Mitigation Actions AGRICULTURE, FORESTRY & WASTE	Estimated Annual GHG Reduction Potential (MMtCO2e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
	E. Forest health and enhanced sequestration	Not quantified			DNR research, monitoring, and assistance to others to protect forest health and prevent pest and disease outbreaks.	See above
AFW-6	Forest protection - reduced clearing and conversion to non-forest cover	2.2	2.7	34	DNR 2008 bonding proposal included \$9 million for Forest Legacy Easements; other DNR programs support forest conservation easements	Additional support would support enhanced activity in this area
AFW-7	Front-end waste management technologies				Solid waste multi-stakeholder group process recently underway to recommend changes to waste system. A number of front-end efforts at state and local level	Solid waste stakeholder group process should be completed before any new legislation is considered. Continue support for county recycling programs.
	A. Source reduction	0	3.6	20	MPCA and counties have source reduction programs in place; measurement of results is difficult	See above
	B. Recycling	3.1	3.4	45	Expansion of recycling programs necessary to achieve MCCAG goals	See above; continued SCORE support.

MCCAG Policy Number	Climate Mitigation Actions AGRICULTURE, FORESTRY & WASTE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
	C. Composting	0.29	0.41	4.9	Composting demo project (combined yard waste and compost site) shows potential for cost-effective expansion of organics collection	See above; also should evaluate results of composting demo project before considering new legislation
AFW-8	End of life waste management practices				Waste-to-energy expansion and landfill methane capture and recovery for energy are MPCA strategic goals	See above
	A. Landfill methane recovery	0.07	0.73	4.4	See above	See above
	B. Residuals management	0.52	0.63	8.1	See above	See above
	C. WTE preprocessing	0.37	0.84	7.9	See above	See above

MCCAG Policy Number	Climate Mitigation Actions CROSS-CUTTING ISSUES	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
CC-1	GHG Inventories, Forecasting, Reporting and Registry	Not Quantified			See GHG Emission Reduction Progress section of this report. MPCA, DNR, and Met Council will report GHG emissions as The Climate Registry reporting members. U.S.EPA is due to propose rules for GHG reporting.	MPCA should continue to develop an emissions inventory system.
CC-2	Statewide GHG Reduction Goals and Targets	Not Quantified			See RES summary in main report and Appendix ES 10	No new legislation requested at this time
CC-3	State and Local Government GHG Emissions (Lead-by-Example)	Not Quantified			Many examples of state and local government lead-by-example in reducing greenhouse gases. See Appendix.	State departments should continue to lead the way.
CC-4	Public Education and Outreach	Not Quantified			Much activity, including Eco-Experience, Living Green Expo, and other public and private efforts	Recommend continued support for outreach and education efforts.
CC-7	Participate in Regional and Multistate GHG Reduction Efforts	Not Quantified			See Midwest Governors Association report filed separately	See MGA report filed separately for recommendations

MCCAG Policy Number	Climate Mitigation Actions CROSS-CUTTING ISSUES	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
CC-8	Encourage the Creation of a business-oriented organization to share information and strategies. Recognize successes, and support aggressive GHG reduction goals.	Not Quantified			Minnesota Chamber of Commerce Energy Smart program was launched in Fall 2008	New program underway. No legislation requested at this time.
CC-9	Dedicate greater public investment to climate data and analysis	Not Quantified			DNR, OES, MPCA will continue efforts to measure and analyze improved data. MPCA, DNR, Met Council are founding reporters in The Climate Registry	No legislation requested; additional support will allow expanded efforts.

MCCAG Policy Number	Climate Mitigation Actions CAP & TRADE	Estimated Annual GHG Reduction Potential (MMtCO ₂ e)			Progress Status	Legislative Recommendation
		2015	2025	Total (2008–2025)		
C&T-1 through C&T-6	Cap and Trade Recommendations	Not Quantified			Cap and trade issues are being addressed through studies undertaken through the Midwest Governors Association	No legislation is requested until the MGA studies are completed.

B. SPECIFIC POLICY RECOMMENDATIONS

- The OES should continue to aggressively pursue implementation of the Conservation Improvement Program and the Renewable Energy Standard.

- Minnesota should pursue incentives to reduce GHG emissions from transportation fuels, including implementation of E20, E85, B20 and NextGen biofuels goals.
- Minnesota should advocate for federal regulations to reduce GHG emissions from motor vehicles.
- Minnesota should investigate infrastructure needs for supporting electric vehicles.
- Minnesota should continue to actively participate in the Midwestern Greenhouse Gas Reduction Accord process which is exploring the concept of an effective cap and trade program that works for the Midwest, while advocating for a national GHG reduction program.
- Minnesota should continue efforts identified by the Minnesota Terrestrial Carbon Sequestration Initiative Task Force to identify scientifically sound, efficient, and cost effective methods to achieve GHG emission reductions through land management activities, technological advances, and other practices.
- The MPCA should continue the development of a comprehensive GHG emissions and tracking inventory system that can be appropriately integrated with any future GHG mandatory reporting rules expected from U.S. EPA next year and consistent with the regional cap and trade program requirements described above.
- Minnesota should lift the statutory ban on new nuclear energy facilities to allow for consideration of next generation nuclear technology to meet future energy needs.
- Minnesota should consider the adoption of appliance standards for certain applications where federal standards do not exist.
- Minnesota should investigate new models for community development of renewable energy that promote local ownership and green buying opportunities.
- Minnesota State agencies should continue and expand existing efforts to coordinate their green jobs and clean technologies promotional activities.
- Minnesota should adopt Green Jobs Investment Initiatives including implementation of Green JOBZ, investment tax credits for green job growth and small businesses green job projects, and conservation credits for bio-methane, solar and other renewable energy projects.
- Minnesota should coordinate climate change actions with green job initiatives to maximize job creation in Minnesota.
- Leading by example, Minnesota State agencies should continue efforts to develop sustainability plans incorporating existing executive orders, current statutory requirements for state agencies, and new strategies to reduce greenhouse gas emissions along with a system for reporting on accomplishments.

V. APPENDIX — SECTOR PROGRESS

RESIDENTIAL, COMMERCIAL AND INDUSTRIAL ENERGY DEMAND 58 percent of the state's gross GHG emissions in 2005 result from electricity consumed by Minnesota's residents, businesses and industries.

The residential, commercial, and industrial (RCI) sectors were associated with 58 percent of the state's gross GHG emissions in 2005, according to the MCCAG Report.⁵ This figure includes 23 percent of Minnesota's direct GHG emissions in 2005 – primarily from the on-site combustion of natural gas, oil, and coal. The remainder is indirect emissions, i.e., energy used by a home or business produced by a utility. The MCCAG report emphasizes that future GHG emission trends will be heavily influenced by the use of electricity in the RCI sectors.

The MCCAG recommended a set of ten new policies and existing actions for the RCI Sector, offering the potential for 8.82 MMtCO₂e (million metric tons carbon dioxide equivalent) of emission reductions. (Note: The new CIP requirements passed by the legislature in 2007 account for approximately 6.1 of the 8.82 MMtCO₂e of the total reductions.) The MCCAG also calculated that the RCI recommendations could be implemented at a negative cost, which means that there are significant cost savings associated with these policies and actions through the year 2025.

Minnesota is making substantial progress in a number of areas to achieve the energy savings identified in the MCCAG report. While quantification of the actual GHG reductions achieved is difficult and will require additional work, the significant successes in this area are highlighted here.

Maximize Savings from Utility Conservation Improvement Programs (RCI 1)

See Conservation Improvement Program (CIP) update in Section IV.A of this report. At this time, new CIP plans have been approved for 2 investor-owned utilities, with CIPs for 110 municipal utilities and six cooperative utilities under review. The remaining 6 investor-owned utilities will file new CIPs in June 2009. In addition, the Next Generation Act also authorizes the Department of Commerce to assess Minnesota utilities up to \$3.6 million annually for applied research and development projects of general applicability that identify new technologies or strategies to maximize energy savings, improve effectiveness of energy conservation programs, or document carbon dioxide reductions from energy conservation programs.

Improve Uniform State Building Codes (RCI 2)

The Department of Labor and Industry (DOLI) adopted Minnesota-specific amendments in July 2007 to the International Residential Code (IRC) and International Building Code (IBC). The 2006 IRC Ch. 11 (energy code) amendments are consistent with the RCI 2 recommendation. The new Minnesota Commercial Energy Code is based on ASHRAE 91.1-2004. Also, new

⁵ See MCCAG Report, Ch. 3, p. 3-1.

commercial and residential energy codes will be implemented beginning in late 2008. HF 3574 passed this year, authorizing DOLI to enforce the state building code statewide. This was an MCCAG recommendation in RCI-2.

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

There is considerable activity in the state involving the design and construction of green buildings. A significant recent effort is “Minnesota Greenstar,” sponsored by the Minnesota Pollution Control Agency (MPCA). Minnesota Greenstar is a green building standard and certification program for both existing and new homes. It was designed specifically for Minnesota, giving builders and remodelers the tools to excel, and providing homeowners the knowledge with which to compare the performance of their homes. Greenstar is a whole systems approach applying five key concepts: energy efficiency, resource efficiency (including durability), indoor environmental quality, water conservation, site and community. These concepts are applied to eight components of the traditional building process, such as siting, building envelope and systems, mechanical, electrical and lighting, and plumbing. Third-party verification is fundamental to the rating system and assures homeowners that the new home or remodeling project performs as designed. The rating system is supported by a mandatory education program for architects, designers, builders, and remodelers.

The Solar Decathlon Team of the University of Minnesota (UMN) is challenged to design, engineer, and construct a fully functioning, highly energy-efficient, completely solar-powered house. As one of twenty international teams invited by the U.S. Department of Energy (U.S. DOE) to compete in the 2009 Solar Decathlon in Washington, D.C., this is the first and only Minnesota team to participate in the competition. The Solar Decathlon challenges 20 college teams from around the globe in 10 contests to design, build, and operate the most livable, energy-efficient, and completely solar-powered house. Solar Decathlon houses must power all the home energy needs of a typical family using only the power of the sun. The UMN’s entry, “ICON Solar House,” is a collaborative effort among many students, faculty, staff, and industry partners. While the objective is to integrate solar power with innovative architectural and interior design, the house will be built to accommodate Minnesota’s extreme climate and for potential marketability.

The Minnesota Housing Finance Agency (Minnesota Housing) actively promotes green building standards in its housing programs. Minnesota Housing has adopted the national Green Communities criteria, which includes a sustainability policy that prioritizes energy efficiency and the efficient use of land. The energy efficiency and siting aspects of the Green Communities criteria are required for new construction projects funded with any Minnesota Housing financing.

Minnesota Housing continued its emphasis on green and sustainable design standards in 2008 by requiring adoption of most Green Communities criteria in its qualified allocation plan (the process for allocating tax credits to housing projects). The agency’s Community Revitalization Fund (CRV) criteria, a component of the Economic Development and Housing Challenge program, were also changed in 2008 to require newly constructed homes to achieve Energy Star Builder’s Option Package standards or a Home Energy Rating Systems (HERS) index of 80. Newly constructed homes funded through the CRV process are subject to participation in an

Energy Efficiency Technical Assistance and Verification Program. This is currently funded by Minnesota Housing and administered by the Center for Sustainable Building Research (CSBR) at the UMN. At the end of 2008, Minnesota Housing submitted to HUD its plan for the use of the federal Neighborhood Stabilization Program (NSP) funding. The plan includes the intent that any new construction or rehabilitation work funded with Minnesota Housing's NSP allocation must comply with the Green Communities criteria.

Green Communities Success. Last year, the Southwest Minnesota Housing Partnership (SWMHP) rehabilitated the Viking Terrace Apartments, setting aside four units for homeless families. The project was chosen as one of the pilot projects of the Minnesota Green Communities program, which provided a \$150,000 grant to help offset the costs of a geothermal system. Other green building elements include enhanced insulation of the building envelope; ENERGY STAR appliances; energy-efficient lighting; water-conserving appliances and fixtures; whole-unit ventilation system; low-VOC paints, sealants, and adhesives; recycled content materials such as carpet; and onsite recycling of demolition and construction materials. The geothermal heating and cooling system retrofit cost \$480,000, or almost 10 percent of the overall development cost. SWMHP expects the systems to boost heating efficiency by at least 32 percent and cooling efficiency by 28 percent or more, lowering operating costs by more than a third.

The Rural Renewable Energy Alliance (RREAL) addresses rural poverty with solar heating, promoting energy independence, reducing greenhouse gas emissions and breaking down the financial and informational barriers to the widespread use of solar energy. By delivering solar heat to low-income families on public energy assistance, RREAL endeavors to make solar energy accessible to people of all income levels. RREAL's solar contracting program offers residential and commercial solar electric, solar hot water and solar air heat systems to the public and private sector, including grid-interactive solar electric (PV) systems, battery-based stand-alone solar electric systems, solar domestic water heat systems, and solar space heating systems.

The Department of Administration (Admin) and the Department of Commerce Office of Energy Security (OES) have been working with consultants to complete, maintain, and improve the Buildings, Benchmarks, and Beyond (B3) sustainable guidelines and benchmarking database. Improvements that will bring buildings to carbon neutrality by 2030 will be folded into the current sustainable building guidelines.

A number of municipalities are exhibiting leadership in energy efficiency, clean energy, and sustainability. One example of local leadership can be found in Elk River. A utility-scale wind turbine, built in 2001, serves as a demonstration of renewable sources of energy. GRE uses fuel produced from municipal solid waste to generate power for approximately 30,000 homes. Elk River Municipal Utilities installed a landfill gas electric generating plant at the Elk River Landfill in 2002. This facility currently serves 15 percent of the community's needs. Elk River is home to the first gold LEED-certified library in the State, and one of the few gold LEED-certified school buildings in the country. Several municipal buildings are heated and cooled with geothermal heat pumps.

The MPCA Green Buildings program works with designers, builders, architects, remodelers, building suppliers, and others to build capacity, increase expertise, and incorporate green building practices into their work.

Green Buildings Create Green Jobs. Eco-Home at Hawk Ridge is a solar model home demonstrating energy efficiency, renewable energy, and green building features. The home demonstrates how to build low-energy, high performance homes with attention to conservation, health, and the environment. The project features site-sensitive passive solar design with a high-performance thermal envelope, a grid-tied solar PV array, a solar domestic hot water system, and a solar hybrid heating design. The Eco Home project had a positive impact on the local economy. Women in Construction, involved in the Eco Home project, landed five jobs with similar aspects after the first month the Eco Home was on the market. This model home demonstrates that solar integrated buildings can be developed, and that the market is interested in affordable solutions.

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

Despite some barriers to CHP projects, such as the cost of standby power, there are several exciting projects moving forward in the state. One innovative CHP project is Koda Energy, a partnership between the Shakopee Mdewakanton Sioux Community and Rahr Malting Co., facilitated by Xcel Energy, to build and operate a CHP plant fueled by agricultural byproducts and grown energy crops. Koda Energy is also exploring options for burning native prairie plants and biosolids. In January 2009, Koda Energy will start up the boilers in the new CHP biomass facility located on the Rahr Malting campus in Shakopee. The plant will generate electricity and heat using agricultural byproducts from the malting process, waste trees and eventually biomass energy crops. Obtaining biomass feedstock at a price feasible to break even has been a major issue, with temporary solutions in place until more permanent ones can be developed. Experts from the UMN are assisting with identifying appropriate sites in the area for a new type of crop--energy crops such as native grasses or other plants that could be harvested, dried and burned inside the plant to turn its gigantic turbine blades. They also are identifying the co-benefits that these crops would provide, such as prevention of agricultural runoff, so benefits could be bundled to increase their value and attract farmers to invest in energy crops.

Electrical power generated by the facility, expected to average 18,130 kW (gross), with net power generated at approximately 19.5 kW, will be used by Koda Energy and sold onto the grid initially. Rahr Malting will also use waste heat from the generation in their malting process. Waste from malting and food processing will be used primarily to generate electricity. Other raw materials like wood chips, biosolids, and switchgrass will also be burned. Agreements are already in place between Koda Energy and General Mills which will provide oat hulls from the processing of cereals like Cheerios from the Coon Rapids facility. Other contracts for additional raw materials are being negotiated.

Another biomass CHP project, at Northern Excellence Seed, a producer-owned grass seed company in Williams, Minnesota, has temporarily stalled to sort through options for interconnection. Northern Excellence Seed is in the process of installing a first of its kind, 100-kilowatt gasifier capable of burning seed chaff and straw that hasn't been pelletized. This project

is facing the particularly difficult challenge likely to confront any new CHP technologies in Minnesota – how a company can afford to pay for the power it will need during the time when a brand new energy technology (serial number 1) is being installed, set up and optimized. Northern Excellence Seed needs the ability to use the utility's generation resources on a "firm" basis while their new system gets set up, tested and optimized, which for a new technology can easily take a full year. Once the CHP system is performing to specification, Northern Excellence Seed will have performance data to base future power need decisions, which should be considerably less than during the testing and optimization period needed for new technologies.

The cost of standby power to a customer depends on their needs. If customers only want the ability to sell their power to the utility, they do not pay for the utility's generation. However, some customers, such as Northern Excellence Seed, need the ability to use the utility's generation resources on a "firm" basis – i.e., they need access to power, possibly during their own peak and their utility's peak time, until their own generation technology is fully installed and optimized. Customers like Northern Excellence Seed are required to pay for that service the same as other customers. These rates can be almost as much as the full prices of electric service because a utility has to build the required amount of energy into its planning process.

The Minnesota Public Utilities Commission (PUC) addressed this issue in the Distributed Generation (DG) workgroup. The PUC determined that DG customers must pay for the costs they impose on the electric utility system to ensure that other customers did not have to subsidize DG customers. Because the PUC has recently ruled on this issue, attempting to address service rates for DG projects through the PUC may not be an effective option. But there are other alternatives for promoting CHP. One promising alternative is output-based regulations (OBR), which encourage efficiency and renewable energy as air pollution control measures. OBR establishes performance criteria that allow efficiency and renewable energy to compete on equal footing with other methods of reducing emissions, such as combustion and add-on controls.

Traditionally, boilers and power generators have been regulated on an input basis, with emission limits established on a unit of pollutant emitted per unit of fuel input basis (e.g., pounds per million British thermal units [lb/MMBtu]). This approach relies on the application of pollution control devices to reduce emissions and does not explicitly recognize the efficiency of the process in converting fuel input into a useful output. Establishing emission limits on an output basis—units of pollutant per unit of useful output (e.g., pounds per megawatt-hour [lb/MWh])—recognizes efficiency improvements as pollution prevention. Several states, including Connecticut, Massachusetts, and Indiana, have used OBR for certain particulate emissions.⁶

⁶Connecticut has promulgated an OBR for nitrogen oxides (NO_x), particulate matter, carbon monoxide, and carbon dioxide (CO₂) from small distributed generators (less than 15 megawatts [MW] capacity), including CHP. The regulation values the efficiency of CHP based on the emissions that are avoided by not having separate electric and thermal generation. Indiana has created a set-aside of allowance allocations for energy efficiency and renewable energy in its NO_x trading program. Indiana allocates 1,103 tons of NO_x allowances each year for projects that reduce the consumption of electricity or energy other than electricity, or generate electricity using renewable energy. Massachusetts has used OBR in its NO_x cap-and-trade program to allocate emission allowances to affected sources (generators greater than 25 MW). This approach provides a significant economic incentive for CHP within the emissions cap. Massachusetts also has a multi-pollutant emission regulation (DOC) (NO_x, sulfur dioxide, mercury, CO₂) for existing power plants, which uses an output-based format for conventional emission limits.

Northern Excellence Seed and companies like it that are pursuing CHP have another option. Rather than use the electricity that they generate, they can sell it through a power purchase agreement to a generation utility and continue to purchase all of the electricity they use from their local utility. The difference in price can be considerable. A company typically pays about eight cents per kilowatt for their firm electric service but may only receive approximately half that amount for the electricity that it sells.

Other updates on other CHP projects include: Minnesota Power is trying to allow more steam to be routed through its turbines via steam efficiency improvements. The New Ulm Public Utilities Commission is studying upgrades and biomass fuel for its existing district heating system. The Metropolitan Council (Met Council) has implemented fluidized bed incineration at the Metro Plant. Met Council also completed a study of heat recovery potential in 2008 and plans to install a non-condensing auxiliary turbine/generator, hopefully in the next two years. A new heat exchanger at Met Council's Seneca (Eagan) plant was already installed to recover heat from the discharge water of the incinerator scrubbers.

Reduce Emissions of Non-fuel, High-Global-Warming Potential GHG emissions (RCI 5)

Beginning October 1, 2008, Minn. Stat. §216H.11 requires annual reporting to the MPCA of emissions or leakage of greenhouse gases with high global warming potential. A high-GWP gas manufacturer must report annually the amount of each high-GWP gas sold to a purchaser in this state. Also, any purchaser of 500 metric tons or more CO₂- equivalent of a high-GWP gas must report annually the amount of each gas purchased and the purpose for which the gas was used. The MPCA will submit a report to the legislature on these emissions early in 2009.

Non-Utility Strategies to Encourage Energy Efficiency and Reduce Greenhouse Gas Emissions. (RCI 6)

The MCCAG identified several strategies to strengthen voluntary efforts to promote energy efficiency. Specifically mentioned was the Minnesota Technical Assistance Program (MnTAP) an important partner in achieving voluntary GHG reductions in the industrial sector. The MnTAP program is funded by MPCA and works with Minnesota industries and other partners to promote energy efficiency technologies, such as waste heat recovery, combined heat and power, improved boiler efficiency, and improved curing technologies. MnTAP has been working with utilities and industry experts to identify industrial energy efficiency opportunities, including compressed air, steam, pumps and fans, motors, and process heat. MnTAP site visits and intern program from 2004 through 2007 resulted in documented pollution prevention of over 1.25 million pounds of waste and conservation of 75 million gallons of water. In 2008, MnTAP projects resulted in industry savings of 13,421,469 million kWh and 684,064 therms, with corresponding carbon dioxide emission reductions of 37 million pounds annually. These projects also reduced 686,800 pounds of waste and emissions, saving 75.6 million gallons of water, and \$3 million.

An example of the significant potential energy savings in the industrial sector is illustrated by MnTAP's work with Rock-Tenn at its St Paul facility. MnTAP helped the company identify energy savings opportunities and recommended an insulation project for 20,000 feet of steam and condensate lines. The company agreed to implement MnTAP's recommendation, funding the project over two budget cycles with help from an Xcel Energy rebate. Rock-Tenn is now saving \$171,000 annually in reduced energy costs.

Another significant energy-savings project in Minnesota's industrial sector is Mulroy's Auto Body of Minneapolis, which is saving 50 percent on energy costs after installing a process control "Economizer" that places its paint booth in "sleep mode" when the spray gun is not in use. The project has a 2.3 year payback and received an Xcel Energy rebate due to shop-wide energy savings.

An excellent voluntary program to save energy and reduce GHG emissions in Minnesota schools is Schools for Energy Efficiency[®] (SEE), a comprehensive program to help K-12 schools save energy and money by changing behavior throughout the district. SEE provides a multi-year plan with training, utility tracking, and support for implementation by the school districts. The program focuses on an integrated approach, working with operations staff to make changes in how they run their buildings, and the habits of teachers, staff, and students in how they use the energy in their buildings. The goals of the program are to:

- Reduce annual energy use 10 percent;
- Achieve recognition through ENERGY STAR[®] for building and organizational improvements;
- Engage students and staff.

Over 500 schools from Minnesota, New Jersey, and Louisiana have participated in SEE, realizing an average annual energy savings of 12 percent and \$13 million in utility cost avoidance in only four years. Minnesota school districts lead the nation with 13 ENERGY STAR Leader awards for continuous improvement in energy efficiency district-wide - only 43 districts in the nation have received this award. In addition, over 100 buildings in the program are also eligible to qualify for or have received the ENERGY STAR label, ranking their facility in the top 25 percent most energy-efficient in the nation. The SEE schools have reduced greenhouse gas emissions by 247 million pounds of CO₂, equivalent to the annual emissions of 20,588 passenger vehicles or emissions from the electricity use of 14,889 homes.

Minnesota Housing's Home Improvement Loan Programs, which include the Rehabilitation Loan Program and the Fix-Up Fund/Community Fix-Up Fund, encourage the use of rehab loans for energy efficient improvements for rental and ownership housing. The Governor recently announced \$10 million in low-interest loan funds for the Fix-Up Fund to assist micro-energy and conservation projects, such as home-based solar, geothermal, next-generation windmills, and energy conservation. These loans are intended to address energy audit findings and encourage renewable energy sources and energy efficient products when Fix-Up Funds are used.

OES administers a number of programs that promote energy efficiency, including:

1. Energy best practices training; Industrial Assessment Centers and Plant-wide Assessment Audit programs; High Performance Buildings; and Zero Energy Buildings Initiatives.
2. The Rebuild America Program creates partnerships with local governments, schools, universities, public and private businesses and housing agencies to conserve energy in buildings.
3. The Weatherization Assistance Program (WAP) also helps low income households with energy conservation measures.
4. The 2008 Public Buildings Enhanced Energy Efficiency Program will use an existing \$8 million revolving account under the former Energy Investment Loan Program, to fund renewable energy, energy efficiency or energy conservation capital improvement projects for public buildings.
5. The Rental Energy Loan Fund provides financial assistance to owners of residential rental properties to increase the energy efficiency of their buildings. The fund is run by the Center for Energy and Environment's Financial Resources and is sponsored by OES.
6. Low interest loans are available to municipalities for energy conservation investments in public buildings.

Iron Ore Cooperative Energy Savings Program – The DNR has provided \$1.4 million in collaborative research funds with the state's taconite processing industry to improve production efficiency. Seventeen projects were funding in FY08-09, with most projects investigating process engineering questions that will result in lower direct energy costs, higher production for a given energy input, or improved pellet quality that will lower energy demands in downstream blast furnaces.

DNR and MPCA will begin to assess GHG emissions as part of the environmental review processes.

CIP-Type Program for Propane and Fuel Oil Efficiency (RCI 7)

OES is assessing a change to the CIP program that would allow electric utilities to implement low-income conservation improvement projects that result in savings of propane or fuel oil, fuels that are not currently covered by the statewide conservation program. Such a change would expand the current CIP program so that electric utility customers that use propane or fuel oil for thermal energy would have an opportunity to participate in efficiency programs that address those fuels. Electric utilities would be allowed to claim the energy savings from these efforts as achievements under their program activities.

This program change would give electric utilities more opportunities to spend low-income dollars in areas that have high concentrations of delivered fuels customers. Furthermore, it would simplify the program implementation for weatherization service providers, which would not have to separate those measures that result in electricity savings from measures that result in both electricity and fuel savings. The energy savings by fuel type would be tracked within the

software programs that are currently being used by weatherization service providers; those savings would be given to the electric utilities, which would report the fuel savings as kWh back to OES. Weatherization activities that provide building shell improvements would be one of the primary measures that this program would address, and would ultimately result in the customer realizing an overall reduction in the homes energy expenditures.

Energy Performance Disclosure (RCI 8)

There are several examples of current state programs or initiatives involving energy performance disclosure:

- Florida has separate statutory requirements pertaining to existing and new homes. Prospective purchasers of existing homes must be given a brochure explaining the advantages of getting a home energy rating. Builders of new homes must obtain an "energy performance level display card" for each home, provide it upon request to prospective purchasers, and include it as an addendum to the sales contract.
- Kansas requires that prospective buyers of new homes (including multifamily buildings of four units or fewer) receive an energy efficiency disclosure form. The law mandating this disclosure was recently updated to require compliance with the 2006 International Energy Conservation Code.
- Maine enacted an energy efficiency disclosure requirement for rental properties in 2006. A disclosure form must be posted in properties being offered for rent, and landlords must obtain tenants' signatures on the form. The statute also created "suggested" (non-mandatory) efficiency standards for rental units.
- California's Energy Commission recommended that by 2010, California should begin requiring the disclosure of home energy ratings when a house is sold. Before 2010, the Energy Commission should work with the real estate industry to develop and implement a program for time-of-sale information disclosure, including an informational booklet about home energy efficiency. In addition, the Energy Commission should conclude the Home Energy Rating System rulemaking and ensure that the infrastructure for the time-of-sale requirement is sufficiently in place. Legislative action was recommended.
- Several utilities in California have voluntary programs intended to encourage buyers of existing homes to obtain a home energy rating at the same time as they have an inspection performed on a property. For example, San Diego Gas & Electric's current "EnergyWise Realtor" program trains realtors on the benefits of energy ratings and provides incentives for recommending them to clients.

The Home Energy Rating System (HERS) is a relative energy use index. A HERS Index of 100 represents the energy use of the "American Standard Building" and an Index of 0 (zero) indicates that the proposed building uses no net purchased energy (a Zero Energy Building). A set of rater

recommendations for cost-effective improvements that can be achieved by the rated building is also produced through a HERS index. HERS seems to be the most widely accepted industry standard for home energy ratings, accredited through RESNET (Residential Energy Services Network), a national standards making body for building energy efficiency rating systems.

California has a HERS program which through a Public Resources Code provides the Energy Commission with the authority and responsibility to establish a statewide home energy rating program which would have the following elements:

- Consistent, accurate, and uniform utility ratings based on a single statewide rating scale;
- Reasonable estimates of potential utility bill savings, and reliable recommendations on cost-effective measures to improve energy efficiency;
- Training and certification procedures for home raters and quality assurance procedures to promote accurate ratings and to protect consumers;
- Procedures to establish a uniform reporting system for information on residential dwellings; and
- Labeling procedures that meet the needs of home buyers, homeowners, renters, the real estate industry, and mortgage lenders.

The California Energy Commission is responsible for implementing California's HERS program and is in the rulemaking process.

Several cities have considered enacting such an energy performance disclosure requirement at the local level. The Montgomery County Council in Maryland passed a bill last April 2008 that is intended to ensure that home buyers are informed of a home's energy performance before sale and to help them take advantage of financing and other options that are available at the time of sale and financing. That bill became effective on January 1st, 2009.

Minnesota Housing has a pilot program to evaluate multifamily developments and is working with tenants and utilities to obtain energy performance data to enable an accurate assessment of energy performance of newly constructed buildings using the Green Communities criteria.

Minnesota Housing also requires builders/developers to provide an occupant's manual as well as homeowner and new resident orientation that explains the intent, benefits, use and maintenance of green building features in affordable housing developments.

Voluntary energy disclosure programs are gaining ground in Minnesota. One example of such a program is Minnesota GreenStar, discussed earlier in RCI 3. GreenStar is designed for Minnesota's climate and provides a building standard and certification program for both existing and new homes that promotes healthy, durable, high performance homes. MN GreenStar identifies appropriate energy efficiency measures for Minnesota builders and remodelers and provided homeowners the knowledge to compare the performance of their homes.

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

In addition to the actions identified under RCI 6, agencies are promoting technology-specific applications. For example, OES will encourage the use of solar thermal in CIP where applicable. Similarly, DNR is beginning to implement distributed generation wind and solar and evaluating potential mechanisms to expand deployment.

In the “green technology” area, MPCA has implemented power management functions for desktop computers and monitors, saving 632,000 kWh per year, and nearly \$50,000 in energy. In 2009, the MPCA will explore strategies for server virtualization, virtual desktop computers and server room cooling efficiency to gain additional energy savings.

Support Stronger Federal Appliance Standards and Require High State Standards In Absence of Federal Standards (RCI 10)

In 1979, California was the first state to initiate appliance efficiency standards for a number of products. As other states followed suit, the federal government, with support from appliance manufacturers, enacted the National Appliance Energy Conservation Act (EPCA) of 1987, establishing minimum efficiency standards for twelve household appliances. In 1992, the Energy Policy Act (EPAct) expanded coverage into the field of water by setting standards for water flow rates of certain plumbing products. By law, the U.S. DOE must upgrade all standards to the maximum level of energy efficiency that is technically feasible and economically justified. These federal standards preempt a state from setting different standards for the applicable appliances but allow states to set their own standards for appliances not covered by the EPAct.

California, Connecticut, Oregon, Rhode Island and Washington have formed a Multi-State Appliance Standards Cooperative to adopt appliance standards for products such as chillers, gas and oil space heaters, and reach-in coolers that are not covered under federal law. The Cooperative funds experts to assess and coordinate appliance efficiency information and monitor shipments so that only eligible appliances are sent to these states.

In 2006, Andrew deLaski, Executive Director of the Appliance Standards Awareness Project estimated the energy saving that could be achieved in Minnesota if the state set standards on fifteen appliances that are not currently regulated. These appliances include bottle water dispensers, commercial boilers and food holding cabinets, some consumer electronics, transformers, pool heaters, pumps and spas, residential furnaces and boilers not currently covered, and walk-in refrigerators and freezers. Mr. deLaski estimated that Minnesota could save about 214 GWh of electricity and 449 Million CF of natural gas annually from one year of sales if these fifteen appliances were to meet the standards that California recommends. He also estimates that energy savings would grow to 1,082 GWh of electricity and 3906 Million CF of natural gas by 2020.

The Minnesota Legislature has the authority to adopt energy efficiency standards for appliances and equipment not covered by EPAct. Members of the Legislature were provided background information and a copy of the Standards Awareness Project report during the 2008 session, but no action was taken during that session due to the desire to see how fast the DOE would move to

upgrade standards. OES will work with the Legislature on upgrading appliance efficiency standards in areas that the federal government is not advancing.

ENERGY SUPPLY

35 percent of the state's gross GHG emissions in 2005 result from electricity generation; one-third of these emissions come from electricity imported into Minnesota.

Overall, emissions from Minnesota's energy supply sector are expected to decrease by approximately 16 percent from 2005 base year levels of 54 million metric tons (MMt) of carbon dioxide equivalent (CO_{2e}) to about 45 MMtCO_{2e} by 2025.⁷ These GHG reductions result in large part from Xcel Energy's MERP and from legislation passed in 2007 creating a new Renewable Energy Standard (RES) and significantly modifying the state's Conservation Improvement Program (CIP). The RES and CIP statutory changes have created two of the most advanced programs in the United States, and OES has been working closely with utilities and other parties to ensure that the profound changes required by the legislature are achieved.

Generation Performance Standard (ES 1)

The MCCAG described a Generation Performance Standard (GPS) as a mandate that would establish a stringent per-unit emission rate below 1,110 pounds of CO₂ per MWh for new baseload generation. After much discussion, the MCCAG voted to exempt two proposed facilities, Big Stone 2 and Mesaba Energy from the GPS. Because of the enabling legislation's treatment of the two proposed plants, as well as unresolved procedural issues facing the facilities (i.e., the plants have yet to complete all state and federal regulatory processes, materials acquisitions, and financing required to begin construction), the MCCAG recommended further study of the potential for a GPS in Minnesota.

Additionally, the U.S. Environmental Protection Agency transition team for the new administration is signaling that they are very much considering developing regulations under existing authority of the federal Clean Air Act to address GHG emissions from such sources.

Efficiency Improvements, Repowering and Other Upgrades to Existing Plants (ES 3)

Recent legislative changes to Minnesota's utility CIP program provide utilities with the ability to pursue several new types of utility infrastructure projects that have the potential to augment energy capacity within the state by reducing system and transmission losses. The Next Generation Energy Act of 2007 revised the CIP statute (Minnesota Statute § 216B.241) to set an annual energy savings goal of 1.5 percent of the utility's annual retail energy sales in Minnesota for each electric and gas utility beginning in 2010. That statute also allows utilities to count a certain portion of energy savings resulting from the utilities' own infrastructure upgrade projects approved by the PUC or certain waste heat recovery projects and count those savings towards the utility's energy savings goal. Utilities can also recover costs for infrastructure improvements such as high performance conductors, microgrids, superconductors, advanced control systems,

⁷ See MCCAG Report, Ch. 4, p. 4-1.

voltage source converters, dynamic voltage control systems and wide area measurement systems. Utilities are now able to voluntarily implement cost effective upgrades that have the potential to provide large incremental gains in capacity.

Transmission System Upgrading, Including Reducing Transmission Line and Distribution System Loss (ES 4)

As mentioned in ES 3, a number of utilities are assessing advancements in transmission and distribution systems that can have a major impact on system efficiency. A Minnesota example of such advanced technologies is a new type of electric conductor (i.e., power pole wire.) This new conductor, invented and manufactured by 3M, is able to operate at higher heat rates. This ability allows the conductor to transmit more power than similarly sized traditional conductors without sagging. Conductor sagging is an endemic industry challenge. Conductor sagging into trees, for example, can cause outages or even safety hazards; in fact, sagging is one of the causes of a recent major Eastern Seaboard blackout. In addition to increased power transmission, 3M's conductor can be stretched over longer spans, thus cutting down on the number of transmission towers required in an area. Fewer transmission towers reduce the environmental impact of the powerline. Xcel Energy has installed and energized 3M's new aluminum conductor composite reinforced (ACCR) overhead conductor on a 10-mile line that is an integral part of the electricity grid in the Upper Midwest. This was the first commercial application of the ACCR. With all of the advantages of this new conductor comes one big barrier--this new product currently is many times the cost of traditional conductor.

OES is also focusing on using its existing transmission facilities and right of ways more efficiently by studying and advocating for efficient, cost-effective upgrading, upsizing (i.e., from 115kV to 230kV sized transmission) or double circuiting of proposed transmission in current and future regulatory proceedings.

Renewable and/or Environmental Portfolio Standard (ES 5)

Minn. Stat. §216B.1691 requires a Renewable Energy Standard (RES) beginning in 2010 for Xcel Energy and 2012 for all other utilities. Utilities must obtain 25 percent of their Minnesota retail sales from renewable sources by 2025 (Xcel Energy must obtain 30 percent by 2025).

The statute also requires the PUC to adopt a tracking and trading system for Renewable Energy Credits (RECs) to track compliance with the RES requirement. OES represented Minnesota in a multi-State consortium to create the Midwest Renewable Energy Tracking System (M-RETS) as the system for tracking and trading RECs. The PUC approved M-RETS for this purpose in October 2007 and required all utilities to make a substantial and good faith effort to register renewable generation assets by March 1, 2008. M-RETS is now operational.

Nuclear Power Support and Incentives (ES 6)

The need to achieve GHG reductions requires a re-evaluation of the role for nuclear generation of electricity. There are various advanced nuclear technologies in development today that have innovative strategies to address questions regarding plant and waste safety, security and storage.

Although such new technologies currently exist or will come into being in the near future, testing and approval by the Nuclear Regulatory Commission must be obtained before any technologies may be marketed in the United States.

The GHG emissions associated with generating electricity with nuclear power are less than those produced by similarly sized baseload coal fired power plants, making nuclear power an attractive option for gleaning large reductions in GHG emissions. Because nuclear energy offers a high carbon reduction potential, it may become one of the state's more important strategies for electricity production if other low carbon electricity strategies such as efficiency and renewables are not able to meet the state's goals.

The industry is responding to many questions currently facing nuclear power. Countries with nuclear plants are working together to improve the economics, safety and proliferation resistance of advanced reactor–fuel cycle systems. Research and development efforts for the current fleet of nuclear power technologies are focused on making plants simpler to operate, inspect, maintain and repair. In the near term, most new nuclear plants are likely to be built on proven systems while incorporating approved technological advances and often economies of scale.

The focus on GHG reduction has also renewed discussions regarding the reprocessing of spent nuclear fuel. A nuclear generating facility only uses a portion of the energy contained in the fuel. Because of the energy remaining in unprocessed spent nuclear fuel, it must be stored in a secure facility for many years. Reprocessing spent fuel could be used to generate electricity, making more efficient use of available nuclear fuel. At this time, the United States has a moratorium on spent-fuel reprocessing because of security questions.

Lastly, some small to medium sized nuclear technologies are currently in development and are based on new, innovative designs that show great promise in addressing both the safety and security questions, while keeping costs low. Such plants would be built as complete modular units for efficient on-site installation, and could be repaired or replaced faster and more efficiently leading to less downtime for the plant plus potentially lower costs because of economies of scale. Other advantages foreseen for smaller units are easier financing, greater suitability for areas lacking robust high-voltage transmission systems.

Advancing Fossil Fuel Technology Incentives, Support or Requirements, Including Carbon Capture and Storage (ES 8)

The MCCAG indicated that for coal to play a significant role in Minnesota's energy future, mitigating GHG emissions from coal plants is an important issue that requires further study. Researchers are creating technologies to capture carbon emissions and then store (or even potentially re-use) the captured emissions. There are a number of such technologies in testing at existing coal-fired plants around the world. To date, no technology has shown itself to be the "silver bullet" to mitigate carbon emissions from coal plants.

In anticipation of likely federal action requiring the mitigation of GHG emissions, OES has begun including estimated cost ranges for GHG emission mitigation in regulatory proceedings for fossil fuel-based pertaining to proposed electric generating facilities using fossil fuels. Such regulatory processes

include electric supply and demand forecasting in integrated resource planning and assessing the need for and alternatives to proposed fossil-fuel generation facilities in certificates of need. Also during certificates of need proceedings for fossil-fueled generation facilities, physical space and other allowances may be ordered in the planning and construction of the plant to facilitate the addition of carbon capture and storage facilities once a viable technology is available.

Voluntary GHG Targets (ES 10)

A number of voluntary GHG reduction actions described in other MCCAG policy updates, (i.e. RCI 3, RCI 6, CC 3) are being implemented to reduce agency carbon emissions. Other examples of such actions that include establishing specific voluntary GHG targets include the MPCA's recent revision of its strategic plan to include several goals relating to decreased GHG emissions, both from its own operations and from the emissions of sectors that the agency works to influence, such as green buildings, waste management, and local government operations. MPCA has set a goal to reduce its own GHG emissions by at least 15 percent by 2015. Similarly, Met Council has a goal to reduce the fossil fuels purchased by 15 percent (2006 to 2010) and intends to achieve this goal through lighting, recommissioning, and possibly renewable energy projects. OES supports voluntary GHG reductions, and many entities in Minnesota, including several utilities, have set GHG reduction goals and taken voluntary actions to reduce their GHG emissions.

MPCA's St. Paul office purchased green power (wind) to match employee commitments for their own green power purchases, and has increased monthly purchases from 37,500 kWh monthly to 165,000 kWh monthly (about 16 percent of energy used since November 2006, totaling nearly 1.4 million kWh.) The MPCA's Brainerd office purchases 100 percent green power. MPCA's leased space in Mankato Place has a combined solar panel power system and advanced daylighting system resulting in a 23 percent reduction in electrical power consumption. The skylight system eliminates 80 percent of the electricity normally required for electric lighting and the roof-top solar panels provide six percent of the annual electricity consumed by tenants.

There are many other important examples of voluntary GHG reduction efforts. For example, thirty-two Minnesota cities have signed on to the Mayor Climate Protection Agreement and pledge to reduce carbon emissions to seven percent below 1990 levels. Also, Great River Energy adopted an unprecedented plan to acknowledge and address climate change that includes a five-point plan to ensure a sustainable energy resource approach. They also constructed the first gold certified LEED building in Minnesota at their new headquarters in Maple Grove and developed a program to help customers build LEED certified buildings. In 2008, Xcel Energy announced a resource plan that entails actions to reduce carbon dioxide emissions by twenty-two percent from 2005 levels by 2020, a GHG reduction of six million tons, while promising to maintain system reliability. Other utilities are participating in the GHG goal reduction pledged by their mayors or have developed climate change positions with educational outreach component for their customers. Some utilities even provide carbon calculators and encourage their customers to calculate their carbon foot print and take action to reduce it. Although many of these efforts are not quantifiable, they are an important part the effort in Minnesota to reduce GHG emissions.

Distributed Renewable Energy Incentives and/or Barrier Removal (ES 12)

Minn. Stat. §16B.32, subd. 1a, enacted in 2008, requires a state agency that prepares a predesign for a new building must consider meeting at least two percent of the energy needs of the building from renewable sources (wind and solar) located on the building site. The predesign must include an explicit cost and price analysis of complying with the two-percent requirement compared with the present and future costs of energy supplied by a public utility from a location away from the building site and the present and future costs of controlling carbon emissions. If the analysis concludes that the building should not meet at least two-percent of its energy needs from renewable sources located on the building site, the analysis must provide explicit reasons why not.

Xcel Energy's Renewable Development Fund (RDF) provides grants to renewable energy research projects. Funded by Xcel Energy's customers, up to \$10.9 million annually has been earmarked for Renewable Energy Production Incentives (REPI), and \$7.5 million per year in 2008-09 for Next Generation funding, with \$500,000 available per year for non-specified grants. OES provides engineering expertise on the Board that reviews grant applications. The PUC approves the Board's awards.

OES administers several renewable energy incentive programs:

1. Incentive payments for qualified on-farm biogas recovery, hydropower and wind energy for electricity.
2. A solar-electric (PV) rebate program, funded by Xcel Energy, to buy down the upfront costs of grid-connected solar-electric (PV) systems.
3. The Rural Wind Energy Revolving Loan program to fund wind energy feasibility and transmission interconnection studies for community-based energy developments (C-BEDs), providing loans of up to \$100,000 per project at an interest rate of no more than 1.5 percent. This program begins operation in 2008.
4. A \$1.2 million fund for the renewable hydrogen initiative, including \$750,000 for a hydrogen roadmap, and the remaining amount available for grants.

Technology-based Approaches, Including R&D, Fuel Cells, Energy Storage, and Distributed Renewable Energy Technologies (ES 13)

Minnesota's Next Generation Energy Act of 2007 not only revised the state's CIP statute to set an annual energy savings goal for electric and gas utilities, but also gave the OES the authority to assess utilities for research and development projects that further the ability of utilities to reach their 1.5 percent energy conservation goal. Over the last year, OES has met with utilities and other stakeholders to get input on the types of projects that utilities think would be most beneficial to identifying new energy savings programs to assist in meeting the energy conservation goal. OES issued its first request for proposals in April 2008 to fund research into specific types of new conservation measures, including conservation potential assessments, technology pilot projects, and programs targeted at influencing consumer behavior. OES received 42 proposals with requests for more than \$10 million and matching funds of over \$5 million. From these projects, OES selected 10 proposals for \$1.65 million in available funding.

This new authority provides an ability to fund new projects aimed at assessing new promising efficiency technologies and strategies and communicate the results to Minnesota utilities so they can assess the costs and impacts that the technology could have if applied in their service territory.

The Next Generation Energy Board was established as part of the Next Generation Energy Act of 2007 to develop next generation energy and biofuels policy, and make recommendations to the Governor and Legislature about how the state can invest its resources to most efficiently achieve energy independence, agricultural and natural resources sustainability, and rural economic vitality. In the first round of Next Generation Energy grants eight technology projects were selected on a competitive base from twenty-eight proposal submissions to be awarded funding. Nearly \$3 million in funding was awarded and included were projects to develop cellulosic ethanol processes, to use waste biomass for process heat and electricity, develop best practices for energy crops such as prairie grasses and install the first community scale biomass gasifier of its type in Minnesota. (For more information about these eight projects, see AFW 3)

In 2007, the Minnesota Legislature established more permanent funding for UMN's Institute for Renewable Energy and Environment (IREE). The funding was increased to \$5 million annually beginning in fiscal year 2009. The funds are provided through Xcel Energy's Renewable Development Fund. IREE is making significant investments in cutting-edge research to find solutions to the world's most pressing environmental problems. IREE has quickly become a central part of Minnesota's energy conservation and renewable energy economy. In the past five years, the program has helped to mobilize scientists, students and technicians from seven colleges, four campuses and three research centers at the UMN. IREE provides funding in the following six areas:

- Bioenergy and Bioproducts, including algae, catalysis and next-gen feedstocks;
- Solar, including solar thermal energy and photovoltaics;
- Wind, Hydro and Geothermal Power;
- Conservation and Efficient Energy Utilization;
- Hydrogen Production, Storage and Utilization;
- Policy, Economics and Ecosystems.

Many of IREE's funded projects are projects to develop, test or scale up energy related technologies developed by University researchers. UMN researchers are also collaborating with the region's leading experts to find practical, economical and sustainable solutions to today's energy challenges.

OES also provides engineering expertise on the Review Board of the Renewable Development Fund (see ES 12.) Finally, as mentioned earlier, a number of agencies are actively supporting clean energy technologies. For example, Housing has funded multifamily developments with geothermal. The Met Council has a methane/micro-turbine demo project at its Empire facility and is working with the UMN on an algae research project. DNR will continue testing emerging building and vehicle technologies for applicability to its operations.

TRANSPORTATION AND LAND USE SECTOR

The Transportation sector accounts for about 25 percent of the state's GHG emissions. Vehicle miles traveled have been growing more rapidly in Grater Minnesota than in the Metro area.

The transportation sector emitted about 37.2 million metric tons of carbon dioxide equivalent [MMtCO_{2e}] in 2005, approximately 25 percent of Minnesota's gross greenhouse gas (GHG) emissions. The MCCAG Report also points out that GHG emissions associated with Minnesota's transportation sector increased by 8.5 MMtCO_{2e} between 1990 and 2005, accounting for about 22 percent of the state's net growth in gross GHG emissions in this period.⁸

From 1990 through 2005, GHG emissions from transportation fuel use have risen steadily at an average rate of about 1.7 percent annually. VMT since 1990 have increased statewide by 45 percent. This is one of the fastest growth rates in the nation, far outpacing the state population growth of 19 percent in the same period. VMT were essentially flat during 2004–2006, however. As a result, the Metropolitan Council and MnDOT traffic modelers recently adopted a forecast of statewide VMT growth of 0.9 percent annually, a substantial decrease from historic rates. If this slower rate of growth continues, the MCCAG concluded that it will substantially slow the rate of increase in GHG emissions from Minnesota's transportation sector.

The MCCAG organized GHG emission reduction opportunities in the transportation sector into three areas:

- Reduce the number of miles driven.
- Reduce carbon per unit of fuel (cleaner fuels).
- Reduce carbon per mile and/or per hour (improved vehicle efficiency).

Our progress in these areas is discussed below.

Area 1: Reduce the number of miles driven

Improved Land Use Planning and Development Strategies (TLU 1)

One of the most important ways to reduce vehicle miles driven is through improved land use planning and development. The Met Council has several programs designed to improve land use and decrease GHG emissions:

- The "Development Framework" strives to protect and enhance the region's natural resources by encouraging land use patterns that cluster development in walkable transit-oriented centers along transportation corridors. The framework directs communities to (i) approve and permit reinvestment projects that make cost effective use of infrastructure and increase density and (ii) adopt ordinances to accommodate growth and use land and infrastructure efficiently.

⁸ See MCCAG Report, Ch. 5, p. 5-1.

- The Livable Communities grant program encourages cities to implement the Development Framework. Met Council also requires communities in their comprehensive plan updates to provide sufficient land for their affordable housing needs, based in part on proximity to transit.
- The Open Space Protection actions includes a Regional Parks Plan to grow the regional system from 54,000 acres to 70,000 acres by 2030 and add 700 miles of trails connecting the parks in the system, and a new Regional Parks Foundation to accelerate acquisition of park land in the metropolitan area.
- The Livable Communities Demonstration Account provides funds to local development or redevelopment projects that achieve connected, efficient land-use patterns. Grant criteria now include energy and GHG reduction.

The MPCA has two projects that focus on physical development and land use in the state. The first project is a partnership with the Northern Counties Lakes Collaborative and 1000 Friends of Minnesota to develop a conservation design scorecard to be used by local governments as they evaluate development proposals in rural Minnesota. Resulting land use outcomes driven by use of the scorecard will include more contiguous, less spread-out and lower-energy consuming infrastructure. The second project, just begun with the MN Department of Health, aims to help Community Health Boards use the metrics of sustainable urbanism being codified into the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) rating system, a new national standard for designing complete, compact and connected communities that fosters lower energy use and healthier citizens.

Minnesota Housing has a priority under its Economic Development and Housing Challenge program (Challenge) for housing that is accessible to jobs and services through integrated transportation and transit options. Under the Green Communities criteria, which is a set of green building standards adopted by the agency, all new construction must comply with siting and location requirements that are intended to reduce vehicle miles traveled.

Expand Transit, Bicycle, and Pedestrian Infrastructure (TLU 2)

Several major new projects to expand transit in the Metro area are underway.

By the end of 2009, commuters using the I-35W - Cedar Avenue corridor to downtown Minneapolis will be able to:

- Board bus rapid transit (BRT) from one of several new and existing park-and-ride lots along Cedar Avenue in Dakota County.
- Ride an express bus from three new park-and-ride lots in the I-35W corridor.
- Experience quicker boarding, disembarking and passage through downtown Minneapolis with additional bus lanes on both Marquette and Second avenues.

In addition, motorists will be able to drive in a dynamically priced, high-occupancy-toll (HOT) lane on I-35W from Burnsville to 46th Street in Minneapolis. The HOT lane will shift onto a dynamically priced shoulder lane north into downtown during congested periods. Carpools and buses will use the HOT lanes free of charge. (See TLU 5.)

Planning for a proposed Southwest LRT line continues to advance. This project will serve the southwestern suburbs of the Metro and connect to other rail lines (Hiawatha, Central, and Northstar) and high-frequency bus routes in downtown Minneapolis, providing access to the UMN, Minneapolis-St. Paul Airport, Mall of America, the State Capitol, and downtown St. Paul. A Draft Environmental Impact Statement (DEIS) is being prepared, with completion anticipated in 2009. The DEIS, conducted by the Hennepin County Regional Railroad Authority, in partnership with the Federal Transit Administration, will select a single light rail route, as well as identify and address the impacts of LRT on the communities it passes through.

Work on these improvements and other projects are now accelerating. In mid-May, the Minnesota Legislature approved \$50 million in state funds to match a \$133 million federal Urban Partnership Agreement (UPA) grant awarded to the region in August 2007.

MnDOT administers the Public Transit Participation Program, providing financial assistance for public transit services in Greater Minnesota through a fixed share funding formula (M.S. 174.24). These funds may be combined with funds from the Federal Non-urbanized Area Formula Program (Section 5311). MnDOT administers the federal Safe Routes to School program, designed to improve the conditions and quality of bicycling and walking to school. In 2008, 27 school projects throughout Minnesota were awarded \$2 million.

Met Council reports that between 2003 and 2008, regional transit ridership grew nearly 20 percent, from 74.9 million rides to 89.3 million rides. The region is on-track to meet the goal of doubling transit ridership in the 2030 Transportation Policy Plan (TPP).

Met Council receives millions of dollars in federal surface transportation funds for alternative transportation, transportation enhancements, and transportation management programs and projects. Nearly 300 projects have been funded through this source in the past decade. Current projects include adding bus lanes to a reconstruction project in Minneapolis; adding bus rapid transit on Cedar Avenue in Minneapolis; and adding transit capacity along the I-35W corridor. MnDOT is also funding congestion-relief projects through the federally funded Urban Partnership Agreement, including a dynamic priced lane and other congestion relief measures.

Northstar Commuter Rail will begin service in late 2009 between Big Lake and downtown Minneapolis, providing commuters and businesses along one of the fastest growing transportation corridors in Minnesota a smart, convenient and safe transportation option. Metro Transit will operate the trains, which will share existing BNSF Railway tracks with freight trains between Big Lake and downtown Minneapolis.

The **Central Corridor LRT project** will run along University and Washington avenues to connect downtown St. Paul and downtown Minneapolis through the State Capitol complex, Midway area and UMN. While construction is a few years away, the Met Council recently

submitted its application for federal approval to enter final design on the 11-mile line. It will serve a projected weekday ridership of more than 42,000 by 2030.

Both MnDOT and DNR support alternative transportation. MnDOT provides planning and design assistance for bicycle and pedestrian facilities. DNR provides significant infrastructure development for hiking and biking. Many state trails can be used for commuting. DNR also provides grants to communities for the development of bicycle trails, many of which provide alternatives to driving.

MPCA is partnering with an inter-agency SMARTFLEET group, Metro Transit, and the St. Paul Smart-Trip program to reduce the VMT of its staff commuting to the MPCA's St. Paul office.

Climate-Friendly Transportation Pricing/Pay-as-You-Drive (TLU 5)

While most examples of congestion pricing are overseas, Minneapolis and four other cities in the United States are evaluating this technique. In August 2007, the U.S. Department of Transportation selected five metropolitan areas to initiate congestion pricing demonstration projects under the Urban Partnerships Congestion Initiative, with \$1 billion of federal funding. MnDOT is funding several congestion-relief projects with \$133.3 million, its share of the Urban Partnership Agreement, including conversion of the I-35W HOV lanes to HOT (high occupancy toll) lanes and implementing Priced Dynamic Shoulder Lanes. The existing HOV lanes along I-35W between I-494 and Burnsville Parkway will be converted to HOT lanes by fall 2009. On northbound I-35W, dynamic priced shoulder lanes will be implemented north of 46th Street. By 2011, the northbound HOT lane will be expanded south to the I-35W/I-35E split in Lakeville. The HOT lane will be extended from I-494 to 46th Street.

OES is working with Admin to explore the possibility of contracting with Hour Car or another car sharing organization. Hour Car allows drivers in the Twin Cities to "rent" hybrid-electric and other high-mileage vehicles by the hour, along with a low monthly fee, at various locations in the metro area. The program is run by the Neighborhood Energy Consortium and was launched in June of 2005 with the aid of an MPCA grant. Hour Car has recently installed a solar recharging station at the Mississippi Market in Saint Paul and will be installing a second one at the 46th Street Light Rail Station in Minneapolis. The energy economy of these plug-in electric hybrid vehicles is approximately 3-6 miles per kWh or 100 plus miles per gallon.

Pay-as-you-drive insurance (PAYD) can also be an important tool for reducing vehicle miles traveled. With PAYD automobile insurance, the cost is dependent upon vehicle usage, particularly distance traveled. The PAYD insurance premium is calculated dynamically, typically according to the amount you drive. Mileage can be based on the odometer reading, data collected from the vehicle, or a GPS monitor. PAYD can have drawbacks, depending on the tracking method. For example, simple odometer readings provide distance but do not distinguish between safe and unsafe driving behavior, the major concern for insurers. GPS tracking can raise privacy issues. But a number of devices have been developed to solve that these problems.

One type of insurance that tracks both distance and some safety characteristics is MyRate, an insurance program developed by Progressive Insurance. MyRate is currently available in Alabama, Kentucky, Louisiana, Michigan, Minnesota, Maryland, New Jersey and Oregon. Driving data is transmitted to the company using an on-board telematic device. The device connects to a car's OnBoard Diagnostic port and transmits speed, time of day and number of miles the car is driven. The device also protects privacy because it does not collect location information. But even with a telematic device, manual procedures are still needed. The device must be removed periodically and hooked to the driver's computer to upload the data. This manual process can be a barrier to drivers.

“Fix-it-First” Transportation Investment Policy and Practice (TLU 7)

This MCCAG policy recommendation is consistent with existing agency practices. MnDOT's first investment priority is the preservation of existing systems. The agency concentrates investments on the replacement and repair of bridges, pavement preservation, and legislatively mandated highway expansion, as well as safety and targeted lower cost bottleneck removal projects. Similarly, Policy 3 of the Met Council's 2030 TPP directs the Council to first ensure preservation of existing highways and transit system before building new or expanded facilities. Highway investments include provisions for alternative modes such as transit.

Workplace Tools for Carpooling, Bicycling, and Transit Ridership (TLU 9)

Most agencies contribute to transit vouchers, transit pass tax credit, employee pre-tax discount transit passes, commuter choice and commuter benefit programs, and they promote ride-share activities. Met Council's Go Greener and Regional Rideshare programs coordinate and encourage non-single-occupancy-vehicle commuting in the region and state. Further, under the Met Council's proposed 2030 plan, the Council will continue to take a leadership role in coordinating transit options in the workplace.

The DNR is reducing workplace mileage through telecommunications technologies such as video conferencing. The MPCA is also making an intensive effort to reduce both employee miles traveled and employee commuter mileage. MPCA staff agency-wide will travel an estimated 2.6 million miles per year in FY08 for work activities. The agency seeks to reduce vehicle miles traveled through more efficient routing of work trips (using GIS and other technologies), carpooling, and increasing video/web conferencing capabilities. MPCA staff located in St. Paul commute an estimated 1.2 million miles to work, based on a recent survey. Efforts to decrease commuter trip miles include additional communication and access relating to transit, rideshare, biking/walking, and telework. MPCA's partners in this effort included an inter-agency SMARTFLEET group, Metro Transit, and the St. Paul Smart-Trip program.

Freight Mode Shifts; Intermodal and Rail (TLU 14)

Several agencies are involved in promoting regional freight transportation by rail. Met Council works with MnDOT and the Minnesota Freight Advisory Committee to maintain an effective regional freight transportation system, including intermodal terminals in the Twin Cities. These entities coordinate on efficient, effective freight movements. MnDOT administers the Minnesota

Rail Service Program (MRSI) Program, which awards loans and grants to rail users and rail carriers to rehabilitate deteriorating rail lines, improve rail-shipping opportunities, and maintain abandoned rail corridors for future transportation use.

Area 2: Reduce Carbon per Unit of Fuel

Low GHG Fuel Standard (TLU 3)

This MCCAG recommendation continues to show promise for GHG reductions and has regional interest. The Great Plains Institute has funded a study at the UMN to investigate how a Low Carbon Fuel Standard (LCFS) could work in the Midwest. That study should be completed soon and is expected to be considered by the Midwestern Governors Association (MGA). To drill down further into how this could work in Minnesota, OES has issued a grant contract with the UMN to look at Minnesota specific issues relative to a LCFS. That Minnesota specific study should be completed in October 2009. In addition, U.S. EPA is developing national rules for a Renewable Fuel Standard, and it will be important to see the specifics of EPA's proposal so that a Minnesota LCFS can be consistent with a national standard. EPA's proposed rule is behind schedule and should have been released by now.

Area 3: Reduce Carbon per Mile and/or per Hour

Infrastructure Management (TLU 4)

The Met Council supports the use of federal Congestion Mitigation and Air Quality (CMAQ) funds to improve traffic flow in high-congestion areas. The Council also supports continued corridor transit studies, refining system-wide bus operations, and investigating new technologies, including signal priority and preemption.

As mentioned earlier, the federally funded Urban Partnership Agreement supports MnDOT projects to relieve congestion on I-35W, such as dynamic priced lanes. MnDOT's Traffic Management Center has installed changeable message signs, additional cameras and other state of the art equipment to assist the traveling public with safe and efficient travel and transport.

Minnesota Housing encourages development of affordable housing near transit and existing services. Its Green Communities program includes "smart site" location and requires development to occur within specific distances to allowable services. The list of eligible services was expanded to reflect services allowed under comparable green and energy efficient certification programs such as LEED.

Adopt California Clean Car Standards (TLU 6)

Several legislative committees held hearings to discuss legislation that would adopt California Clean Car standards in Minnesota. The U.S. EPA transition team for the Obama Administration is signaling that they will develop regulations under existing authority of the federal Clean Air Act to address GHG emissions from mobile sources.

Voluntary Fleet Emission Reductions (TLU 12)

There are a number of examples of actions to voluntarily reduce fleet emissions. The largest and most highly visible is Project Green Fleet, a voluntary collaboration involving MPCA, the Minnesota Environmental Initiative, school districts, businesses, and nonprofit organizations to reduce emissions by installing diesel oxidation catalysts on trucks and buses. The U.S. EPA recognized Project Green Fleet as a national model for improving air quality, awarding it the EPA's Clean Air Excellence Award in the Community Action category on May 28, 2008. To date, Project Green Fleet has made possible the installation of retrofits on nearly 1,000 buses that transport tens of thousands of school children throughout Minnesota.

Another example of a highly successful voluntary program is the MPCA's Small Business Environmental Improvement Loan program, which offers low-interest loans to small trucking companies and independent truckers to purchase Auxiliary Power Units (APUs) and other idle reduction devices. During mandatory driver rest periods, long haul trucks can idle for up to 10 hours. A typical diesel engine uses one gallon of fuel for every hour of idle time. By comparison, an APU runs the heat/air conditioning and small appliances in a cab using only 0.20 gallons per idle hour. Each APU installation can result in an annual reduction of 11.5 tons of CO₂, while saving over 1,000 gallons of fuel per year. Last year, the MPCA awarded 18 loans to install 29 APUs, which will avoid an estimated 334 tons of CO₂ and save 29,800 gallons of diesel fuel in 2008. Since the APU loan program began in 2006, MPCA has awarded a total of 66 loans to install 99 APUs.

There are many other examples of voluntary actions to reduce vehicle emissions. MnDOT is participating in several voluntary partnerships:

- MnDOT is partnering with Mankato State University to retrofit two existing hybrid vehicles to plug in hybrid electric vehicles (PHEV).
- MnDOT is working on a federally-funded on-road diesel vehicle retrofit project with Hennepin County, Ramsey County and the cities of St. Paul and Minneapolis.
- MnDOT is using 2 percent biodiesel and is working with Ford Motor Company on a B-20 program.

Met Council has a "Go Greener" initiative and as of January 2009 has integrated 67 hybrids into its fleet. That number will grow to 75 by 2011. All buses (879) operate on Biodiesel blends up to 10 percent in the winter and biodiesel blends up to 20 percent in the summer. New buses are also equipped with LED interior lighting. Met Council also is moving to E85 cars where possible.

MPCA increased its use of E85 purchases from 14.5 percent in 2006 to 25.3 percent from January-September 2007, ranking MPCA 6th out of 42 agencies reporting. MnDOT and DNR have increased their use of alternative fuels and are using higher blend bio-diesel. DNR recently negotiated a warranty on 80 new GMC pickups that will for the first time cover use of B-20 fuel blends. DNR is also expanding the use of electric vehicles in State Parks and testing alternative forms of electric neighborhood vehicles for in-park use, replacing 1/2 ton and 3/4 ton pick up trucks used for utility work within state parks.

MnDOT also continues to meet the requirements of the 1992 Energy Policy Act's (EPAct), Alternative Fuel Transportation Program, which requires state agencies with larger fleets to have a certain percentage of alternative fuel vehicles when adding vehicles to their fleets. In FY 05-FY07, MnDOT purchased 243 light duty E-85 vehicles and 175 heavy duty trucks equipped with diesel oxidation catalysts. In addition, many state and local governments are actively reducing GHG vehicle emissions by using cleaner fuels, buying more hybrid, flex-fuel, and all-electric vehicles.

To promote cleaner vehicles, OES administers a \$1 million fund to develop plug-in hybrid and other automotive technology demonstrations (green manufacturing) and \$150,000 in grants for electric vehicle demonstrations.

Those driving in the state capital area lately may have noticed an electric plug-in white truck, outfitted with silver metal tool compartments built into the bed. This electric vehicle is being used by the state capital grounds maintenance crew as one of a number of electric vehicles being introduced in our state. The DNR now has 14 Global Electric Motorcars (GEM) and 2 E-Ride neighborhood electric vehicles they are using for housekeeping and maintenance chores in the parks.

The City of Minneapolis is purchasing two neighborhood plug-in electric vehicles that will be used by city housing, licensing and environmental inspectors. The city has intentions of eventually installing solar recharging stations for these vehicles so there are 'zero emissions' both during generation of the renewable electricity and its use.

Reduce maximum speed limits. (TLU 13)

Minn. Stat. § 169.14 provides MnDOT with the responsibility to establish speed limits on all public roadways throughout the state. Speed limits for many roads are established in § 169.14, subd. 2. There are two ways speed limits are set in Minnesota. This first is by using the speed limits established in statute for specific roadways. For example, interstate speed limits are 70 mph outside of city limits and residential speed limits are 30 mph. See § 169.14 for a listing of statutory speed limits. A statutory change is necessary to set a lower limit on interstates, expressways, and other roads covered by Section 169.14. The second method for establishing speed limits is through a regulatory process. When it is believed that a statutory speed limit is not reasonable or safe for the roadway characteristics, the commissioner of transportation can conduct an engineering and traffic investigation to establish either a higher or lower speed limit than the statutory speed limit. Typically, these studies involve lowering the statutory speed limit of 55 mph. MnDOT follows prescribed procedures established by the Institute of Transportation Engineers and practiced throughout the nation. This procedure determines the reasonable and appropriate speed for the roadway being studied; MnDOT then issues what is called a Regulatory Speed Limit for that particular section of roadway.

AGRICULTURE, FORESTRY, AND WASTE MANAGEMENT

The total contribution to carbon dioxide equivalent (CO₂e) net emissions from the Agriculture, Forestry, and Waste sectors in 2005 was 30 million metric tons (MMt) or about 19 percent of the State's total.

The agriculture, forestry, and waste management (AFW) sectors contribute about 30 million metric tons (MMt) of Minnesota's current GHG emissions, or about 19 percent of the State's total in 2005.⁹ Of this total, agricultural emissions, including methane (CH₄) and nitrous oxide (N₂O) emissions from enteric fermentation, manure management, agriculture soils, and agriculture residue burning, are estimated to be about 22 MMtCO₂e. The waste management sector accounts for approximately 4 percent of Minnesota's total gross emissions.

The contribution of the forestry sector is a more complicated question. Forestland emissions refer to the net carbon dioxide (CO₂) flux from forested lands in Minnesota, which account for about 32 percent of the state's land area. Forests both emit CO₂ and remove CO₂ from the atmosphere. The MCCAG's review of available information suggested that Minnesota forests emitted an average of 3.3 MMtCO₂e per year from 1990 to 2003, primarily the result of conversion of forest land to non-forest land. The MCCAG emphasized that on a per acre basis, forests are a net sink for carbon, not a source.¹⁰

The MCCAG identified six primary opportunity areas in the AFW sector for mitigation of GHG emissions:

- **Agricultural crop management:** implement programs that provide incentives to growers to use cultivation practices that build soil carbon and reduce nutrient consumption.
- **Agricultural land use management approaches that protect and enrich soil carbon:** Develop and implement incentive programs to protect crop lands from conversion to developed use, and to prevent conversion of lands now in conservation programs to conventional tillage. MCCAG also recommended developing and implementing incentive programs to convert lands with a recent history of annual crop production to perennial crops in order to build additional soil carbon.
- **Production of liquid biofuels,** such as ethanol from crops, crop residue, forestry residue, municipal solid waste, and biofuel from crop seed oils, can produce significant reductions in GHG emission when used to offset consumption of fossil fuel. Converting existing in-state ethanol production processes to run on renewable fuels will also result in significant GHG reductions.
- **Expanded use of forest and agricultural biomass** from residue can reduce GHG emissions by offsetting fossil fuel consumption used to produce electricity or heat/steam.

⁹ See MCCAG Report, Ch. 6, p. 6-1.

¹⁰ See MCCAG Report, Ch. 6, pp. 6-1 and 6-2.

- **Enhancement/protection of forest carbon sinks** through programs including reforestation, restocking of forests, protection of existing forests, urban tree programs, and other forest health actions will preserve existing carbon sinks.
- **Changes in municipal solid waste management practices** to achieve significant GHG reductions by enhancing source reduction, recycling and composting practices. Also, for waste remaining after these “front-end” practices, emphasize GHG-friendly “end-of-life” practices, including enhanced landfill gas collection and use and pre-processing of waste sent to waste-to-energy facilities.

Agricultural Crop Management (AFW 1); Land Use Management Approaches for Protection and Enrichment of Soil Carbon (AFW 2)

The Minnesota Department of Agriculture (MDA) administers several land management programs that provide incentives for landowners to engage in agricultural practices that will reduce GHG emissions:

- 1) The Sustainable Agriculture Demonstration Grant and Sustainable Agriculture Loan programs provide funds to individuals and groups for sustainable agriculture research or demonstration projects; projects that involve energy production such as wind, solar, on-farm energy such as methane, and biomass; and adoption of more sustainable farming systems.
- 2) The MDA’s Best Management Practices loan program provides low interest financing to farmers and rural landowners to implement practices that prevent water pollution through conservation practices.
- 3) MDA assists landowners in the development of rotational grazing plans to reduced runoff and soil erosion, reduce pesticide and fertilizer use, and promote carbon sequestration.

DNR manages 5.5 million acres of natural resource lands directly, and works with other public and private landowners on many more acres. DNR encourages the use of the Forest Resource Council (FRC)'s Biomass Harvest Guidelines in all woody biomass harvests. The agency also supports research on the effects of forest practices on soil carbon and sequestration of carbon in forest soils.

DNR also promotes carbon management as part of its land management programs and will increasingly integrate carbon management into the range of values for which it manages lands. DNR activities include:

- 1) Working to increase CRP acres, encourage tree planting, including hybrid poplar, and incorporate harvesting and pre-commercial thinning that increases carbon storage.
- 2) The Prairie Bank program purchases conservation easements from owners of native prairie to preserve the state’s remaining native prairie areas.

- 3) Several DNR grant programs provide local communities and organizations with resources for park land acquisition and natural resource protection.
- 4) Technical and financial assistance and other incentives for private land owners to achieve natural resource goals and productive conservation strategies, including converting annual row-crop acres to perennial woody bioenergy crops, and protecting and restoring wetland basins.
- 5) The Minnesota Duck Recovery Plan calls for ultimately restoring 2 million acres of grassland and wetlands in western and southern Minnesota.
- 6) The Wildlife Management Area program attempts to protect disappearing waterfowl habitat, including wetlands.
- 7) The Peatland Protection Act (M.S. 84.035-84.036) established 18 peatland scientific and natural areas that protect 170,000 acres of state peatland from development. Any peat mining operation in excess of 40 acres requires a permit. DNR is also developing management plans to protect at-risk state- and county-managed peat lands, and support research on land management activities that affect peat land carbon sequestration.
- 8) DNR FireWise and related grant programs provide resources to local government to reduce the risk of wildfire and improve wildfire response capacity at the local level.

The Board of Water and Soil Resources (BWSR), with technical support from the UMN, completed its report on The Reinvest in Minnesota – Clean Energy program in February 2008. Minn. Stat. §103F.518 established the RIM - Clean Energy program, which directs BWSR to acquire easements of at least 20 years on lands for growing native perennial bioenergy crops.

In-state Liquid Biofuels Production (AFW 3)

One of the most significant state actions to accelerate the development of state biofuels is the Next Generation Energy Grant program. In November, Governor Pawlenty announced the awarding by the Next Generation Energy Board of nearly \$3 million in funding for eight projects, including cellulosic ethanol production, an anaerobic digester technology for hog manure, and using turfgrass to produce electricity.¹¹ The Next Generation Energy Board was

¹¹ The eight project funded by the NextGen Energy Board in November are:

- a. Central Minnesota Ethanol Partnership, Little Falls - \$910,000 for the development of Minnesota's first commercial scale cellulosic ethanol plant, awarded to a joint venture between the Central Minnesota Ethanol Cooperative, SunOpta BioProcess, and Bell Independent Power Corporation. The grant will fund the final stage of a study to determine the feasibility of building a commercial scale cellulosic ethanol plant that would be co-located with the existing Central Minnesota corn ethanol plant.
- b. The UMN's Department of Forestry was awarded \$100,000 to study the sustainability of the state's approximately 16 million acres of forests that will supply wood for biomass energy. The project will provide key information for public officials and private investors about the supply of woody biomass in order to ensure sound policy and investment decisions.
- c. The Chippewa Valley Ethanol Company, Benson was awarded \$700,000 to use farm or woodland biomass to power plant operations, replacing up to 90 percent of its current dependence on natural gas. The technology will also allow the facility to eventually transition from corn-based ethanol production to cellulosic ethanol production.
- d. The Rick Neuvirth Farm in Elkton, MN was awarded \$220,000 for anaerobic digester technology that uses methane gas produced from manure or other waste materials to generate electricity. This technology helps livestock facilities meet their energy needs and reduce operating costs while improving air quality and

established as part of the Next Generation Energy Act of 2007. The board develops next generation energy and biofuels policy, and makes recommendations to the Governor and the Legislature about how the state can invest its resources to most efficiently achieve energy independence, agricultural and natural resources sustainability, and rural economic vitality.

Other actions promoting the use of biomass include a joint project by the Met Council and the UMN to research the potential to create renewable energy from algae grown on wastewater. (See RCI 9) Met Council is also buying flex fuel vehicles where possible and adding E85 pumps at both the Metro plant and regional maintenance facility. Its fleet is using B10 as much as possible and planning to try B20. OES administers a \$1.5 million grant program to expand the use of E85.

The MDA sustainable agriculture grant and loan programs (see AFW-2 above) support biofuels production. The MDA is also working with Minnesota State University Mankato, the UMN, MPCA, and the Renewable Fuels Association to reach the goal that Minnesota's gasoline contain a 20 percent ethanol blend by 2013.

Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production (AFW 4)

DNR collaborates on projects to demonstrate and assess biomass harvest and use for energy purposes, such as a prairie hay harvest for UMN Morris and woody biomass harvest for District Energy of St. Paul. DNR supports the Forest Resource Council's Biomass Harvesting Guidelines and works with other partners to develop sustainable practices to harvest underused forest biomass. DNR also provides technical assistance and cost-share incentives for community forest maintenance practices that provide woody biomass (see AFW-3).

The St. Paul Rock Tenn paper recycling facility is currently generating its own process and heating steam and some of its electricity using on-site boilers burning natural gas or no.6 fuel oil. On the recommendation of the legislatively-established Rock Tenn Community Advisory

reducing odors. Anaerobic digester technology has proven to be very successful on dairy farms, but it has yet to be implemented in swine operations in Minnesota. The Neuvirth farm plans to use anaerobic digester technology to generate nearly 100 percent of the swine farm's energy needs.

- e. Northern Excellence Seed in Williams, MN will receive \$200,000 to demonstrate the viability of burning waste biomass such as grasses to produce electricity, which will bring the state closer to commercializing small-scale gasification technology and use of turfgrass biomass to produce electricity.
- f. The Minnesota Valley Alfalfa Producers were awarded \$400,000 to demonstrate a promising approach called "pelletizing," in which a variety of biomass materials are processed into uniform sized pellets that can be more easily stored and transported. One of the challenges facing biomass-to-energy technology is how to efficiently store and transport various raw materials such as crop waste, grasses and woodland biomass.
- g. Central Lakes College Ag Center in Wadena will receive \$100,000 to evaluate the production feasibility and energy content of five perennial energy crops, including four native prairie plants. The project is a partnership between a MnSCU campus, local farmers and UMN faculty in evaluating switchgrass, intermediate wheatgrass, Survivor false indigo, prairie cordgrass and miscanthus. The project will demonstrate best management practices for growing and harvesting the grasses for use as cellulosic energy crops.
- h. The University of Minnesota, Morris was awarded \$50,000 to assist in the development of a contract with a biomass producer and establish a model for biomass production. The UMN Morris is now in the process of installing a biomass gasifier to serve as the campus heating plant and help reduce campus energy costs.

Panel, Rock Tenn, in partnership with the St. Paul Port Authority, is currently negotiating with one or more agriculture product processing facilities to produce biogas from process residues to offset the natural gas burned at the St. Paul facility.

OES administers a \$500,000 grant program for on-farm biogas recovery capital projects. The Met Council optimizes use of sludge at Metro plant for steam production. Met Council is also working with the UMN on algae/pollution reduction research. The research is investigating the feasibility of capturing and converting oils from algae into biodiesel fuels and recovering other byproducts and reducing pollution by growing algae in a continuous process on wastewater. Met Council also has a methane/micro-turbine demonstration project at the Empire plant, a project to reduce aeration energy, and is studying other possible on-site renewable projects and off-site wind (with counties).

Forestry Management Programs to Enhance GHG Benefits (AFW 5)

DNR has secured sustainable forest management certification on all state forest lands and is actively involved in forestry management programs that have GHG benefits. DNR intends to increase sequestration where appropriate and incorporate carbon sequestration objectives into future plans:

- *Forestation:* DNR provides technical assistance to private landowners seeking to establish forest cover on private lands. The agency is working to establish 100,000 acres of new forest on private lands; DNR is also acquiring 100,000 acres of non-forest land on which to establish and maintain working forest.
- *Urban Forestry:* DNR provides financial and technical assistance to community forestry programs. In addition, the DNR has for a number of years, depending upon fund availability, administered the ReLeaf Program, an urban forestry cost share program, to help communities build their capacity to sustainably manage their tree resources, while improving and enhancing the benefits those resources provide. These benefits including energy conservation, carbon sequestration, and mitigating storm damage. Funding for ReLeaf was recently cut, but DNR hopes to restore the program if new funds are available. DNR's goal is to increase urban tree cover by 15 percent by 2025 and 30 percent by 2050.
- *Restocking:* DNR and other forest land managers restock forests after harvest. DNR is working to address stocking rate issues as resources allow. DNR also stocks 35,000 acres of state-managed forestlands that are currently not optimally stocked.
- *Forest Health:* DNR expends considerable resources on forest health issues, such as monitoring for and treating pest and disease outbreaks; providing technical assistance to private landowners through Stewardship Plans and other means to ensure sound forest management and health on private lands; and evaluating the effects on carbon sequestration of current forest management plans and silvicultural practices.

Forest Protection – Reducing Clearing and Conversion to Non-Forest Cover (AFW 6)

DNR works with industrial forest landowners and others to secure large scale conservation easements that will prevent the fragmentation and conversion of these lands. The agency's 2008 bonding proposal included \$9 million for Forest Legacy Easements. DNR will acquire an additional 250,000 to 500,000 acres of working forest conservation easements on corporate forestlands in northern Minnesota by 2030 (its focus is on large tracks of several tens of thousands of acres), and an additional 20,000 to 30,000 acres of working forest conservation easements on private forestlands in southern Minnesota by 2030. DNR intends to create and fund a forest easement stewardship program that ensures long-term monitoring and enforcement of acquired conservation easements. The agency is also promoting the enrollment of private forestland ownership in the Sustainable Forestry Incentives Act.

Terrestrial Carbon Sequestration (AFW 1, 2, 3, 4, 5, and 6)

One effort that involves many of the above agricultural and forestry options is the Minnesota Terrestrial Carbon Sequestration Initiative (TCS). TCS was initiated by the UMN for research, education, and outreach on biophysical, economic, and market aspects of terrestrial carbon sequestration in Minnesota. Terrestrial carbon sequestration is the capture and storage of atmospheric CO₂, a potent greenhouse gas, in plants and soils. Numerous land management practices that are well-known for conserving soils, water quality, and wildlife habitat (e.g., conservation tillage, use of perennial and cover crops, reforestation and afforestation, and wetland and grassland management) also sequester carbon. Determining optimal strategies for increasing carbon sequestration in Minnesota's landscape could promote increased sustainability of diverse ecosystems and – by adding a potentially valuable commercial product (sequestered carbon credits) – could promote rural economic opportunities.

The Minnesota Terrestrial Carbon Sequestration Initiative released a report, "*The Potential for Terrestrial Carbon Sequestration in Minnesota*" (Anderson et al., 2008 <http://wrc.umn.edu/outreach/carbon/index.html>), which analyzed the existing scientific literature to determine potential rates of carbon sequestration related to land use and land practice changes; the potential areas of land existing in broad land use categories; and the role of current state policies and programs on carbon sequestration potentials. Based on this information, analysts also developed several scenarios to illustrate the potential magnitude of terrestrial carbon gains resulting from broad adoption of land management changes associated with (1) biofuel production; and (2) a diversified strategy including afforestation, increased stocking of understocked forests, and conversions of cropland to perennial vegetation. These scenarios resulted in rough estimates that terrestrial carbon sequestration could reduce net greenhouse gas emissions in the state by approximately 3 – 6 million metric tons annually, a modest but worthwhile contribution to the state's GHG reduction efforts.

This report focused on land use/management practices for which empirical research data exists, were applicable to large areas of Minnesota and practices, would result in relatively high carbon sequestration rates, and had high confidence about the validity of the carbon sequestration rates. The practices with the highest potential for Minnesota include afforestation (conversion of annual row crops to forest or to short rotation woody crops), prairie pothole restoration,

conversion of annual row crops to perennial grasslands, conversion of turfgrass to urban woodlands, and enhanced forest stocking.

In 2008 TCS drafted a report in response to a legislative request (MN Session Laws 2007 Ch. 2, § 35) that identified a network of monitoring sites that could be used to measure the impact of long-term, large-scale factors on the terrestrial carbon sequestration capacity. TCS also identified targeted long-term demonstration projects to measure the impact of deliberate sequestration practices. TCS's plan encompasses the practices it had previously identified as most promising to the state and includes methods that would minimize the costs for these projects. One of the primary goals is to develop, monitor and verify the amount of carbon that Minnesota's most promising land use and management practices can sequester to prepare Minnesota projects for eligibility as off-sets under a GHG cap and trade protocol. Departments are reviewing the reports and assessing appropriate next steps.

**Front-End Waste Management Technologies (AFW 7);
End-of-Life Waste Management Practices - Methane Recovery; Residuals Management;
Waste-to-Energy Pre-Processing (AFW 8)**

Waste reduction, recycling, and composting organic wastes (such as food, yard, and paper) are very effective at reducing GHG emissions. The MCCAG recommendations in this area call for a significant change to the current waste management system in the State, setting a goal of 0 percent increase in waste generation per capita by 2020 and a reduction of 3 percent in waste generation per capita by 2025, as well as significant increases in the rates of recycling and composting. The combined "front-end" waste management elements could produce GHG savings of almost 70 MMtCO_{2e} by 2025. These include avoided landfill GHG emissions, as well as avoided product/package lifecycle GHG emissions through source reduction and recycling.

Improved end-of-life waste management practices can also yield GHG benefits. Waste-to-energy (WTE) facilities already in existence in Minnesota generate 100 MW of electricity and 150,000 lb/hour of steam for heating and cooling and use by other industries. Achieving the MCCAG goals, particularly with landfill gas collection and pre-processing of waste sent to WTE facilities can yield an estimated 0.6 MMtCO_{2e} by 2025.

A major effort is underway to implement the MCCAG's waste management policy recommendations AFW 7 and 8. In February 2008, the MPCA announced in its biennial Solid Waste Policy Report to the legislature that it would convene a multi-stakeholder group to address long term policy needs that can help meet the MCCAG solid waste management goals. The initial plan is to focus on the four major population areas that encompass 17 counties where approximately 70 percent of the solid waste in the state is generated. The stakeholder group will look at potential reductions from all types of solid waste, not exclusively what has been managed as mixed municipal solid waste. The stakeholder group process is now underway and will identify specific actions necessary to reach the MCCAG goals, such as legislation, incentives, and market forces, and evaluate the likelihood of success from various approaches.

The following MPCA activities support front-end waste management:

1. Recycle More Minnesota Campaign, a joint effort of MPCA and the Recycling Association of Minnesota, has a goal of increasing the state's recycling rate to 50 percent through educational and social marketing efforts.
2. Source reduction was identified by MCCAG as one of the more cost effective GHG reduction strategies. MPCA's office paper and junk mail reduction program seeks to reduce office paper waste and unwanted mail, lower printing costs, and promote purchase of recycled-content papers. MPCA staff already use 50 percent less paper than an average commercial office building, and the agency is attempting to reduce at least another 10 percent, through printing reduction software, capture and re-use of "second chance" paper, and increasing distribution of documents and invoicing through e-commerce.
3. MPCA is implementing the 2007 Electronics Recycling Act, which requires the collection and recycling of video display devices in the residential sector. MPCA also has Product Stewardship initiatives to recycle carpet and paint.
4. MPCA is working to reduce waste in the grocery and restaurant sectors, looking at bag reduction, energy efficiency, food diversion and alternatives to traditional waste hauling contracts. The agency is also promoting reduction of food waste in restaurants and the collection of restaurant and grocery store waste to be used as food for hogs and for other recovery options.
5. The agency set a goal to achieve a 50 percent reduction of phone directories and a minimum 80 percent recycling rate in 2009, which would eliminate 6,500 tons of paper and keep an additional 5,200 tons per year out of the disposal stream. This would achieve almost half of the reduction goal for phone books set by MCCAG for 2025.
6. MPCA is proposing a recycling goal of 80 percent for beverage containers by January 1, 2012. Recycling 80 percent of beverage containers in 2006 would have yielded over 855,000 MMtCO₂e and saved 10.9 trillion BTUs of energy.
7. MPCA proposes recycling an additional 25 percent (179,000 tons per year) from the commercial-industrial waste sector. In 2006, this material had a market value of \$43 million and an embedded energy content of 10 trillion BTUs.

In 2009, the MPCA's Closed Landfill Program will explore opportunities for wind turbines at certain sites, diesel emission retrofits and idling reduction from heavy equipment at construction sites (particularly those located near residential areas), and further opportunities for energy production from methane gas. The MPCA also earmarked \$60,000 for grants to county solid waste facilities for research to identify solutions to reduce the generation of waste, improve recycling and organic recovery opportunities, and to conduct feasibility studies for landfill gas to energy facilities at county owned landfills.

The Department of Administration's State Resource Recovery Program is intended to promote waste reduction and recycling in Minnesota government. It has targeted programs to reduce office paper waste; reduce the costs and materials associated with publication design and printing; promote reuse of materials and commodities; and recycle paper, cans, glass and plastic. Currently there is a recycling challenge involving state buildings.

CROSS-CUTTING ISSUES

Cross-cutting issues are those that cut across multiple or all sectors; they typically enable or support other GHG mitigation activities or actions. Most cross-cutting policies are not readily quantifiable in terms of GHG reductions and cost-effectiveness calculations. The seven recommendations unanimously approved by the MCCAG, however, are likely to contribute to GHG emission reductions and enhance the economic benefits described for other policy recommendations that were quantified.¹²

GHG Inventories, Forecasting, Reporting, and Registry (CC 1)

The MPCA is the lead agency responsible for GHG inventory, forecast, and reporting functions. The most recent inventory and forecast are included as part of this report, which is submitted as required by Minn. Stat. §216H.07, subd. 3. Please see Section III of this report.

Under the Omnibus or Consolidated Appropriations Act of FY 2008, H.R. 2764, the U.S. Environmental Protection Agency (EPA) was required to promulgate a draft GHG emissions reporting rule by September 2008, and a final rule by June 2009. EPA is behind schedule, but it is expected that the agency will move forward with this rule in 2009.

The MPCA, Met Council, and DNR have joined The Climate Registry (TCR) as reporting members who will have third-party verified reporting of their GHG emissions. These agencies are joined by twelve other Minnesota entities who will report GHG emissions as members of TCR.

DNR has begun developing a process to identify appropriate methods to account for GHG flows from natural resource lands. DNR is also developing carbon accounting protocols for natural lands; initially it will focus on forestlands and grasslands and adapting existing urban forestry carbon accounting protocols.

Statewide GHG Reduction Goals and Targets. (CC 2)

The MCCAG endorsed the GHG reduction goals and renewable energy goals established in the Next Generation Energy Act of 2007 (S.F. No. 145). The state's progress in implementing the GHG reduction goals is discussed in Section III of this report. Progress in achieving the RES established in the statute is discussed in the update in Section IV of this report and in this appendix.¹³

¹² See MCCAG Report, Ch. 7, p. 7-1.

¹³ See, *i.e.*, ES 1 and ES 6.

State and Local GHG Emissions (Lead-by-Example) (CC 3)

The MCCAG recommended that state and local governments demonstrate that reductions in GHG emissions can be achieved through implementing changes to their own operations, as well as providing incentives and encouraging GHG reductions by others. The MCCAG specifically noted the work that the Interagency Pollution Prevention Advisory Team (IPPAT) had done in saving energy, and recommended that IPPAT would be an appropriate tool for reporting on the progress of state agencies towards GHG reduction goals.

The IPPAT members have discussed the MCCAG recommendations and identified several areas that offer the greatest opportunity for IPPAT to develop effective action strategies. These include buildings (green buildings/energy efficiency); transportation fleets; purchasing and contracting; renewable fuels; source reduction; recycling; and composting. The most recent IPPAT report, which includes energy related actions by IPPAT members, is available at <http://www.pca.state.mn.us/oea/lc/ippat.cfm>.

There are several executive orders that relate to energy and sustainability. To assist agencies in “leading the way,” these Executive Orders relating to the environment and sustainability are being consolidated into three main areas reflecting significant climate change recommendations: building/energy, fleet management, and pollution prevention (including waste management and environmentally preferable procurement). Each of these areas already has an existing inter-agency team that will be charged with creating sustainability plans for implementation by all agencies. These sustainability plans will incorporate existing executive orders, current statutory requirements for state agencies, and new strategies to reduce GHG emissions, along with a system for reporting on accomplishments. The first sustainability plans for each area are to be completed by May 2009 and provide a means for continual strategy development for “leading the way.”

Other examples of agency leadership in this area include the following. Several agencies have formed sustainability teams, including OES, DNR, Met Council and the MPCA. The Minnesota Retired Engineers Technical Assistance Program (RETAP), a program funded by the MPCA, provides free, confidential, non-regulatory pollution prevention, waste reduction and energy use reduction assistance to Minnesota businesses, industries, and institutions. RETAP recently established a Climate Change Corps focused specifically on helping local governments and schools reduce their carbon footprint.

The OES headquarters, the Golden Rule Building in St. Paul, is an Energy Star certified building. The Minnesota Department of Natural Resource (DNR) is working with MnDOT to test and demonstrate LED lighting at the Grand Portage State Park Visitor Center parking lot. Bids will be let in fall 2008.

MPCA’s leased office space in Mankato has a combined solar panel power system and advanced daylighting system, resulting in a 23 percent reduction in electrical power consumption. The skylight system eliminates 80 percent of the electricity normally required for electric lighting and the roof-top solar panels provide six percent of the annual electricity consumed by tenants.

MPCA has funded and supported two projects this year that help cities and counties lower their carbon footprint. The first project, in partnership with the League of Minnesota Cities, is development of a voluntary green cities program to identify, support and recognize implementation of a set of sustainable development best practices focusing on energy conservation that lead cities beyond compliance and encourage a culture of innovation. The Legislature asked for a report on this effort and will discuss it during the 2009 session. The second project funds an update of the state's *Model Ordinances for Sustainable Development*, first developed in 2000 under legislative direction. Rewritten with an eye toward energy use reduction, model language covers a diverse set of topics including growth management, neighborhood design, infrastructure, green buildings, and economic development.

Met Council is pursuing possible renewable energy demonstration projects, including a wind initiative with counties and solar energy through state contract (RFP being developed). It is also discussing with Xcel Energy a renewable project at a wastewater site.

DNR has an active energy management program and is expanding the level of resources and commitment to energy management. The agency has invested resources to develop base line data from its facilities, and DNR is working to develop a more comprehensive energy management information system that will allow more effective and targeted investment of capital.

DNR will continue to identify, test and implement more efficient technologies in its operations. For example, Nerstrand State Park replaced incandescent display lighting with LED lighting. In addition, DNR is developing its first zero-emission energy building by coupling a small wind turbine with a ground source heat pump at Camden State Park.

Public Education and Outreach (CC 4)

The state has a long history of environmental education, and the MCCAG recommended building upon current efforts to educate and encourage all sectors within Minnesota to take action.

OES and the MPCA support two large events that reach thousands of Minnesotans each year. The Eco Experience at the State Fair is a collaborative partnership with 119 partner organizations in 2008; approximately 350,000 people visited this year. This year, all 10 topic areas in the building included information about conservation, efficiency and renewable energy, and climate change. The second event is the Living Green Expo, a family-friendly event offering products and educational resources to inspire people to lead healthier and more sustainable lives that improve our environment and quality of life. The largest show of its kind in the state, the Living Green Expo attracted a record crowd of more than 25,000 people last year. They visited more than 250 exhibits of products, services, and information, along with workshops on a variety of sustainability and green living topics.

A \$100,000 grant from the U.S. EPA to the MPCA and the Will Steger Foundation focused on climate change outreach, education and adaptation and mitigation actions in the Great Lakes Region. The grant helped to support a tour by Will Steger of four Midwestern states that

highlighted regional leadership from a cross-generational perspective and the strategies, and policies already in place at the regional, state, local level that reduce harmful GHG emissions. On the tour, Will Steger provided his eyewitness account of the impacts of global warming to the Arctic and the Great Lakes, and examples of citizen solutions.

The Environmental Education Advisory Board (EEAB), the state board that guides the direction of environmental education in Minnesota, has resources available to promote environmental literacy in the climate change and energy areas. A recent effort by the EEAB is the Environmental Learning in Minnesota (ELM) Grant Program, which supports opportunities for Minnesota citizens, particularly students, to engage in real world environmental learning experiences. The ELM grant program is a collaboration between the EEAB and the Minnesota Association for Environmental Education (MAEE), a non-profit professional association whose mission is to "support and advance environmental education in Minnesota."

DNR is evaluating where climate change mitigation and adaptation strategies can be integrated with broader outreach and education efforts including its web site, printed material, staff presentations, and interpretive displays at state parks and other DNR facilities.

Participate in Regional and Multistate GHG Reduction Efforts (CC 7)

The State of Minnesota is a member of the Midwestern Greenhouse Gas Reduction Accord (the "Accord") signed by the Midwest Governors Association (MGA) in November 2007. *See* Section III of this report. In 2008, an Advisory Group was formed and directed to establish targets for emissions reductions in the region, and to design a regional cap-and-trade program. The Advisory Group has developed preliminary recommendations which include proposed emission reduction targets, recommended sectors and fuels that would be covered by a cap and trade program, principles for managing allowances and offsets, addressing adverse impacts of climate change, mandatory GHG emission reporting, enforcement and compliance, and other issues. The advisory group is now modeling the impact of achieving different emission reduction targets and timelines. In addition, the UMN is preparing a report on governance options for a regional cap and trade program for the MGA, as well as a study on potential cap and trade revenue. For more details on these MGA actions, please see the Green Solutions Act report on the Midwestern Accord submitted by the OES and MPCA.

Encourage the Creation of a Business-Oriented Organization to Share Information and Strategies, Recognize Successes, and Support Aggressive GHG Reduction Goals (CC 8)

This recommendation is moving forward rapidly. Energy Smart, a program of the Minnesota Chamber of Commerce, is a statewide initiative designed to help businesses save money by taking advantage of conservation programs and increasing energy efficiency in their buildings and operations. The program will connect businesses with current Conservation Improvement Programs (CIPs) offered by the state's utilities and other resources that can analyze a company's energy usage, efficiency upgrade options, potential cost savings and available financial incentives. Energy Smart is intended to provide businesses with the information and tools needed to make informed choices about their energy use and efficiency upgrade options. Energy Smart is a pilot alternative CIP project for 2008-09, and is funded by the state's four largest utilities --

Xcel Energy, Minnesota Power, Otter Tail Power, and Interstate Power and Light. Energy Smart is focusing first on the St. Cloud business community, and potentially one or two additional areas, to launch this new effort.

In addition, there is substantial interest nationally and in Minnesota in GHG reduction and low carbon energy development projects. The Minnesota Terrestrial Carbon Sequestration Initiative formed a subcommittee to assess and recommend strategies that would lead to investment in terrestrial sequestration projects such as reforestation, prairie restoration and peatland protection within the state. Another related funding need was for the monitoring that is necessary to provide the proper data on a specific land use practice that would bring benefit to Minnesota's environment, such as restoring wetlands, to verify its sequester carbon rates, a process needed to certified that practice for carbon credit eligibility.

Working with one of the world's foremost experts in financing, Dr. Dileep Rao of the Carlson School of Management, the group proposed the formation of a Fund that could help finance the transformation to a low carbon economy in a way that would move Minnesota into a position to take advantage of a GHG marketplace that included offsets for terrestrial carbon sequestration practices. The Fund would take a flexible and comprehensive approach to working with investors and contributors to finance a wide range of new technologies and greenhouse gas reduction activities in the state. The Fund would be organized as a non-profit, public interest organization, capable of providing both technical and financial expertise on energy and sequestration projects. Dr. Rao developed a structure for the Fund with recommendation for development of a business plan as the next step. Funding for development of a business plan is currently being sought.

Dedicate Greater Public Investment to Climate Data and Analysis (CC 9)

This MCCAG recommendation involves developing a plan for periodically assessing the recent and projected impacts of climate change on Minnesota natural resources and economic activity. There are several areas of activity to note here.

The MPCA has dedicated staff resources towards preparing the state emission inventory and forecast that is contained in Section III of this report. There are several other examples of climate-related database improvements: (1) State trout stream thermal data is now being stored in a new MPCA/DNR database. (2) The MPCA is updating precipitation intensity and duration data under a grant from LCCMR and other partners; the states are now partnering with the National Oceanic and Atmospheric Administration on this project. (3) The MPCA and DNR are developing an extensive river and stream flow monitoring network with continuous temperature recording. (4) The MPCA has greatly expanded the tracking of ice-in and ice-out dates through the cooperation and assistance of over one thousand citizen volunteers.

As mentioned earlier, DNR, Met Council, and MPCA have committed to reporting third-party verified GHG emission data for their operations as members of The Climate Registry.

DNR has additional actions relating to climate data and analysis, including:

1. The DNR State Climatologist Office collects climate data; expanded funding would allow data gaps to be filled, such as restoring discontinued stream gauge monitoring and adding humidity and solar radiation monitoring sites.
2. The agency is investing in climate change monitoring, including the Sentinel Lake Program.
3. DNR has completed baseline ecological data collection through the County Biological Survey Program, and is updating its existing baseline by initiating a second round of CBS survey work.
4. The agency will develop a program for monitoring changes in tree species' abundance and productivity, and the potential for pest and invasive species in response to changing climate.

CAP-AND-TRADE

The MCCAG report contains several recommendations relating to the topic of cap-and-trade. Unlike most of the policies studied by MCCAG, cap-and-trade is not tied to a specific sector or emissions reduction measure. It is a system by which the sources within covered sectors find and achieve the lowest-cost emissions reduction investments. Cap-and-trade also provides a means of ensuring that total emissions from all covered sources will not exceed the government set limit, or cap.¹⁴

The work of the Midwest Greenhouse Gas Reduction Accord stakeholder group is progressing but is not yet complete. The model rule, originally expected at the end of 2008, is now expected sometime after September 2009. The UMN is undertaking several of these studies, including a Governance Study that will be transmitted to the legislature under a separate cover. OES and the MPCA are filing a separate report to the Legislature on the status of the implementation of the Midwestern Greenhouse Gas Reduction Accord, including cap-and-trade. More detailed information on cap-and-trade issues can be found in that report.

A mandatory GHG reporting system, also a part of the priority recommendation, has been under review by the Minnesota Pollution Control Agency. The Agency has been waiting to see U.S. EPA's mandatory GHG reporting rule, originally due September 2008 but still delayed, before deciding if and how to proceed with a separate state requirement. Special legislative authorization to establish mandatory GHG emissions reporting is not required to move ahead with a regulation.

¹⁴ See MCCAG Report, Ch. 8, p. 8-1.