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## Memo

**To:** Minnesota Climate Change Advisory Group

**From:** The Center for Climate Strategies

**CC:** Minnesota Department of Commerce  
Minnesota Pollution Control Agency  
Minnesota Technical Work Group Members

**Subject:** Preparation for the Eighth Meeting of the Minnesota Climate Change Advisory Group Meeting

**Date:** January 24, 2008

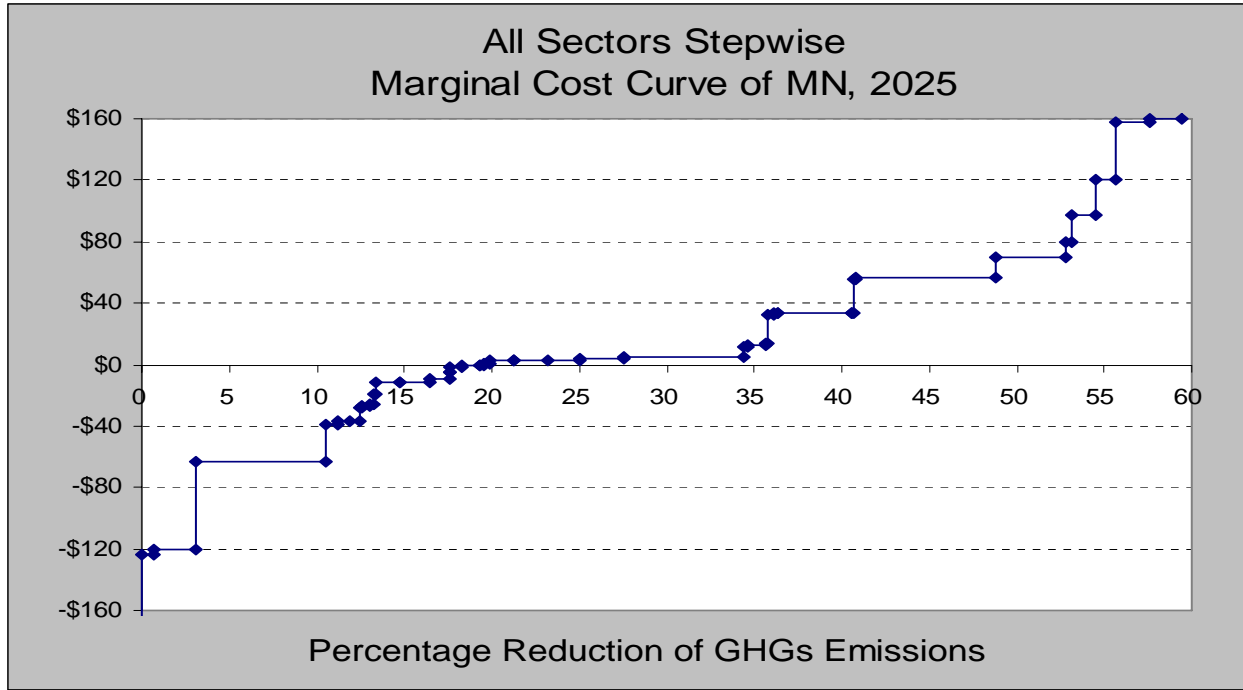
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At the eighth and final meeting of the Minnesota Climate Change Advisory Group (MCCAG) on Thursday, January 24, 2008 the MCCAG will complete its review and final approval of draft pending policy options. We also will review and approve final updates to the statewide inventory and forecast of emissions.

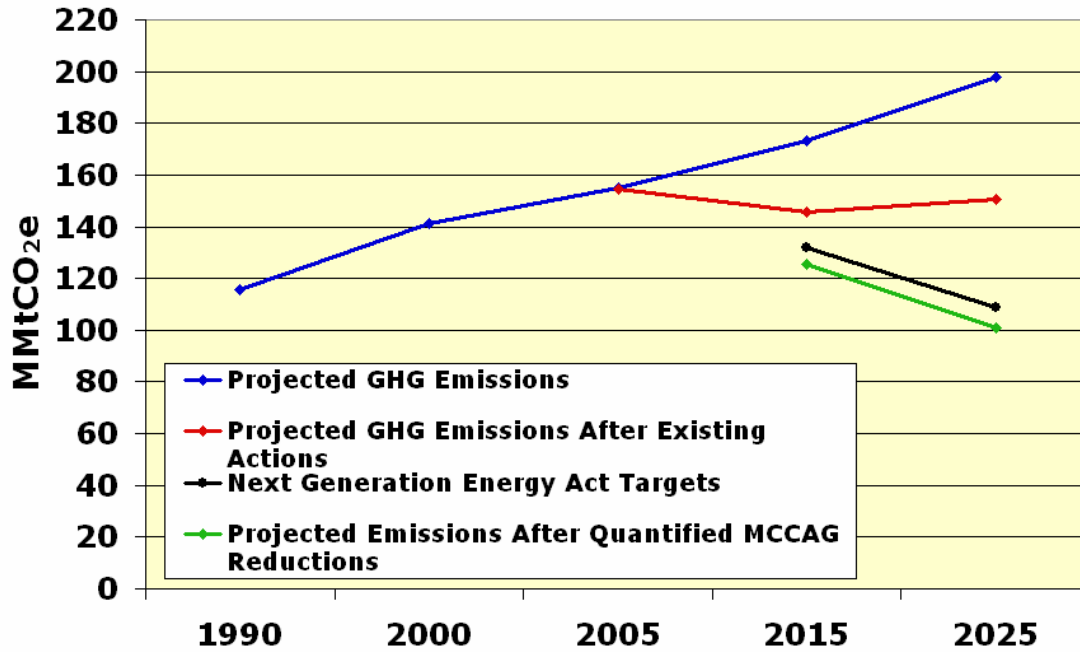
As preparation for our eighth meeting, please review the draft policy options below and other background documents posted to the project website at: [www.mnclimatechange.us](http://www.mnclimatechange.us). Please note and review the summary of results below, as well as updates to the detailed policy options templates posted to the project website.

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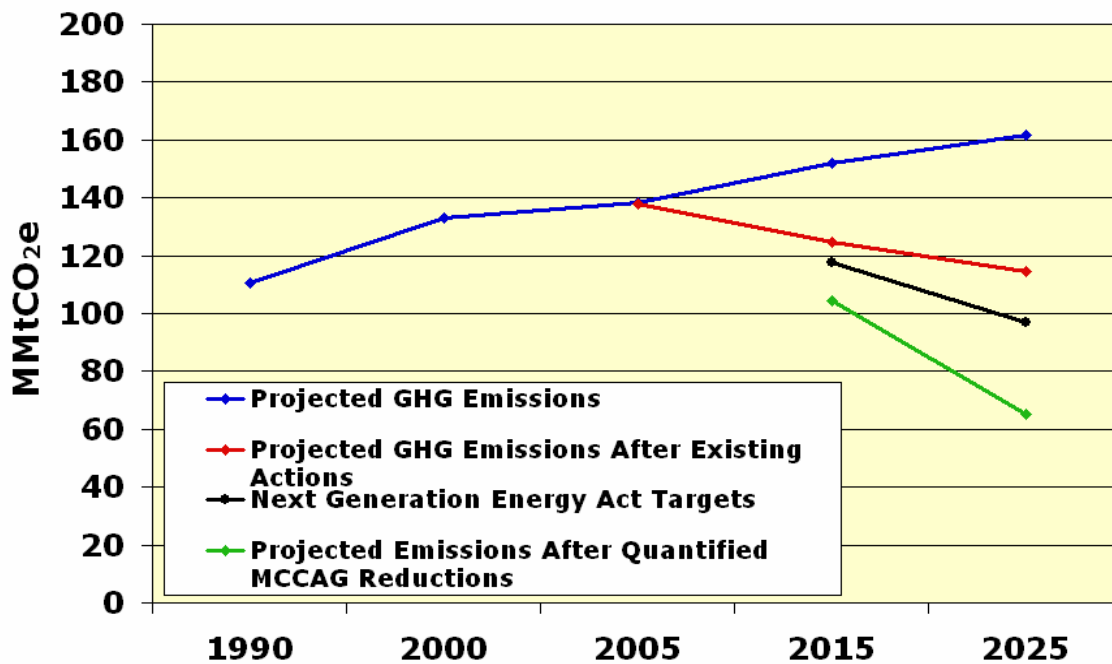
**Draft MN GHG Supply Curve (Completed & Pending Options)**



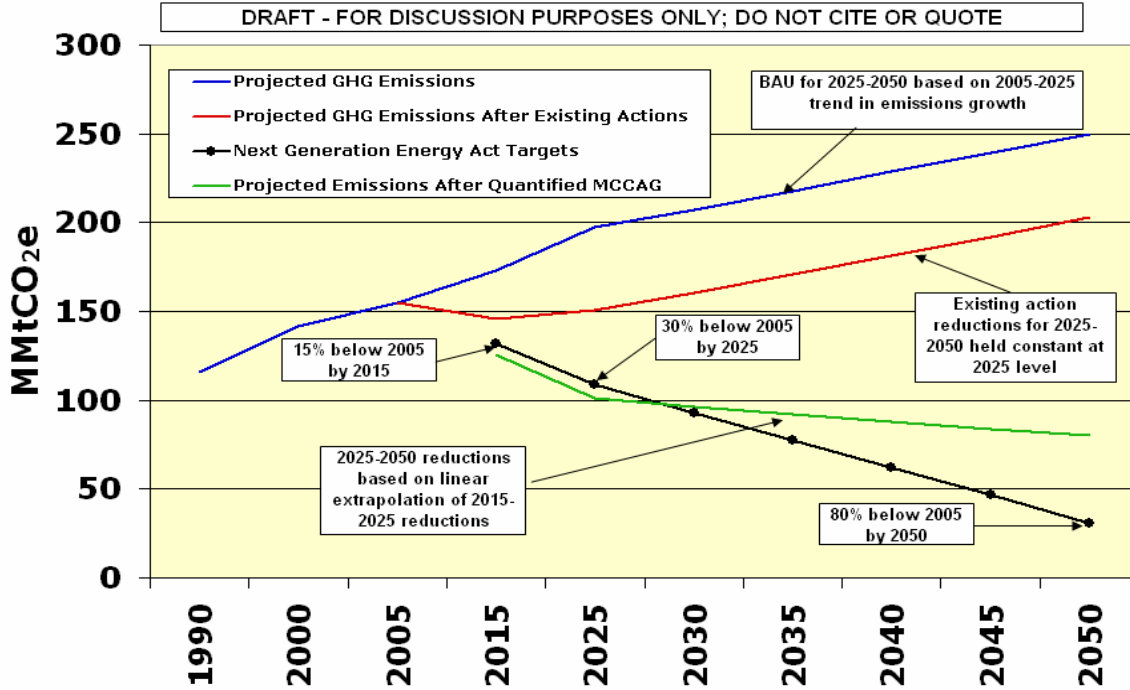
### Future Emissions - Consumption Gross



### Future Emissions - Production Gross



## Future Emissions - Consumption Gross



### Draft MCCAG Results

Consumption Basis - Gross / Net Emissions					
	1990	2000	2005	2015	2025
Projected GHG Emissions	115.7	141.4	155.0	173.0	197.6
Reductions from Existing Actions	0.0	0.4	0.4	27.3	47.0
Projected GHG Emissions After Existing Actions			154.6	145.8	150.6
Next Generation Energy Act Targets (NGEA)				131.8	108.5
Total GHG Reductions from MCCAG				20.1	49.5
Difference Between MCCAG Reductions & NGEA Targets				-6.2	-7.4
Projected Emissions After Quantified MCCAG Reductions				125.6	101.1
Production Basis Gross / Net Emissions					
	1990	2000	2005	2015	2025
Projected GHG Emissions	110.7	133.0	138.2	151.9	161.7
Reductions from Existing Actions	0.0	0.4	0.4	27.3	47.0
Projected GHG Emissions After Existing Actions			137.8	124.6	114.7
Next Generation Energy Act Targets (NGEA)				117.5	96.7
Total GHG Reductions from MCCAG				20.1	49.5
Difference Between MCCAG Reductions & NGEA Targets				-13.0	-31.5
Projected Emissions After Quantified MCCAG Reductions				104.4	65.2

**Table 1.**  
**Residential, Commercial, and Industrial**  
**Summary List of Draft Pending Policy Options**

Option No.	GHG Reduction Policy Option Name	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2015	2025	Total (2008–2025)			
RCI-1	Maximize Savings From the Utility Conservation Improvement Program (CIP)						
RCI-1	1.5% savings level	6.0	14.7	133.8	-\$8,449	-\$63.2	Enacted
RCI-1b	2.0% savings level	<i>Not quantified</i>					Pending
RCI-2	Improved Uniform Statewide Building Codes	0.004	0.005	0.077	-\$44	-\$576	Complete
RCI-3	Green Building Guidelines and Standards Based on <i>Architecture 2030</i>	0.62	0.94	11.1	-\$296	-\$27	Complete
RCI-4	Incentives and Resources to Promote Combined Heat and Power (CHP)	0.96	4.95	33.1	\$125	\$3.8	Complete
RCI-5	Program to Reduce Emissions of Non-Fuel, High-Global-Warming-Potential GHGs	0.02	0.05	0.5	-\$2	-\$5	Complete
RCI-6	Non-Utility Strategies and Incentives to Encourage Energy Efficiency and Reduce GHG Emissions	0.25	1.30	8.3	-\$307	-\$37	Complete
RCI-7	Conservation Improvement-Type Program for Propane and Fuel Oil Efficiency	0.05	0.05	0.7	-\$21	-\$28	Pending
RCI-8	Energy Performance Disclosure	<i>Not quantified</i>					Complete
RCI-9	Promote Technology-Specific Applications to Reduce GHG Emissions	<i>Not quantified</i>					Complete
RCI-10	Support Strong Federal Appliance Standards and Require High State Standards in the Absence of Federal Standards	0.8	1.4	15.3	-\$1,895	-\$124	Complete
	<b>Sector Total After Adjusting for Overlaps (RCI, non-electricity)</b>	<b>0.56</b>	<b>-0.23</b>	<b>4.8</b>	<b>-\$639</b>	<b>-\$133</b>	
	<b>Sector Total After Adjusting for Overlaps (Integrated RCI and ES for electricity)</b>	<b>1.48</b>	<b>6.91</b>	<b>48.4</b>	<b>-\$915</b>	<b>-\$19</b>	
	<b>Reductions From Recent Actions*</b>	<b>10.7</b>	<b>20.9</b>	<b>150.8</b>	<b>-\$8,449</b>	<b>-\$63.2</b>	
	<b>Sector Total Plus Recent Actions</b>	<b>12.7</b>	<b>27.8</b>	<b>204.0</b>	<b>-\$10,003</b>	<b>-\$49.0</b>	

Note: Negative numbers represent cost savings.

\* NPV and Cost-effectiveness values are for CIP only.

**Table 2.  
 Energy Supply  
 Summary List of Draft Pending Policy Options**

	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2008–2025 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2015	2025	Total (2008–2025)			
ES-1	Generation Performance Standard						
	GPS affects unplanned capacity additions only	0.0	0.0	0.0	\$0	0.0	Pending
	Sensitivity analysis—GPS affects all capacity additions	The impact of the GPS depends to a large extent on assumptions regarding resources that would be displaced by the RES and CIP. Sensitivity analysis could be conducted should the CCAG conclude that the GPS affects planned capacity additions.					
ES-3	Efficiency Improvements, Re-powering and other Upgrades to Existing Plants						
	Biomass co-firing	0.2	0.4	4.2	\$48	\$12	Complete
	Natural gas re-powering	2.3	2.3	29.9	\$3,599	\$120	Complete
ES-4	Transmission System Upgrading, Including Reducing Transmission Line and Distribution System Loss						
	Electric transmission and distribution upgrades	Un-quantified					Complete
	Natural gas transmission and distribution upgrades	0.2	0.4	3.9	–\$92.2	–\$26.1	Complete
ES-5	Renewable and/or Environmental Portfolio Standard	7.7	15.7	133	\$7,502	\$56.4	Enacted
ES-6	Nuclear Power Support and Incentives						
	Installation of a nuclear power station after 2025	0	0	0	\$0	\$0	Pending
	Installation of a nuclear power station in 2020	0	8.0	47.8	\$3,355	\$70	Pending
ES-8	Advanced Fossil Fuel Technology Incentives, Support or Requirements, including Carbon Capture and Storage						
	New IGCC with carbon capture and storage	0.00	3.66	21.96	\$3,506	159.7	Pending
	New IGCC without carbon capture and storage	0.0	0.5	3.2	\$1,953	\$606.5	Pending
	Retrofitting existing coal stations with carbon capture and storage	0.0	2.8	16.7	\$1,623	\$97.2	Pending
	New IGCC with 1% biomass co-firing and carbon capture and storage	0.00	3.71	22.25	\$3,515	\$158.0	Pending
ES-12	Distributed Renewable Energy Incentives and/or Barrier Removal	0.021	0.023	0.37	29.1	78.1	Pending

	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2008–2025 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2015	2025	Total (2008–2025)			
	<b>Sector Total After Adjusting for Overlaps</b>	<b>0.41</b>	<b>4.4</b>	<b>30.0</b>	<b>\$3,463</b>	<b>\$115</b>	
	<b>Reductions From Recent Actions</b>	<b>15.2</b>	<b>24.5</b>	<b>274.1</b>	<b>---</b> *	<b>---</b> *	
	<b>Sector Total Plus Recent Actions</b>	<b>15.6</b>	<b>28.9</b>	<b>304.1</b>	<b>\$3,463</b>	<b>\$115</b>	

Notes:

1. All option totals are relative to the underlying assumption that electric expansion in MN proceeds with the recently legislated Conservation Improvement Program, Renewable Energy Standard and all planned additions including the Mesaba and Big Stone 2 stations.

2. During its September 27, 2007 meeting, the MCCAG agreed to move ES-2 (Improve the GHG Profile of Biofuels and Fossil Fuels [e.g., Low Carbon Fuel Standard, Biofuel Production]) to the TLU TWG which is now being addressed under TLU-3 (Low GHG Fuel Standard).

3. See Annex 3 for details of the calculation of sector total after adjusting for overlaps.

4. Negative numbers represent cost savings.

\* Costs associated with the RES are more than offset by the cost savings associated with the CIP. Costs associated with the Metro Emissions Reduction Project and Biomass for Electricity existing actions have not been estimated.

**Table 3.  
 Transportation and Land Use  
 Summary List of Draft Pending Policy Options**

Policy Option		GHG Reductions* (MMtCO <sub>2</sub> e)			Net Present Value 2008–2025 (Million \$)	Cost-Effective-ness (\$/tCO <sub>2</sub> e)	Level of Support	
		2015	2025	Total 2008–2025				
<b>TLU Area 1: Reduce VMT</b>		VMT goal to be established based on VMT implied by selected strategies.						
TLU-1	Improved Land-Use Planning and Development Strategies	0.7	1.9	14.9	Net savings	Net savings	Complete	
TLU-2	Expand Transit, Bicycle, and Pedestrian Infrastructure	0.1	0.3	3.0	\$0	\$0	Complete	
TLU-5	Climate-Friendly Transportation Pricing/Pay as You Drive	1.1	2.1	20.9	-\$1	-\$1	Pending	
TLU-7	“Fix-it-First” Transportation Investment Policy and Practice	Not quantified					Pending	
TLU-9	Workplace Tools To Encourage Carpooling, Bicycling, and Transit Ridership	0.3	0.4	4.5	Large net savings	Large net savings	Complete	
TLU-14	Freight Mode Shifts: Intermodal and Rail	NA					Pending	
<b>TLU Area 2: Reduce carbon per unit of fuel</b>								
TLU-3	Low-GHG Fuel Standard (Overlap With AFW-7)	1.7	3.6	36.2	Not quantified		Pending	
<b>TLU Area 3: Reduce carbon per mile and/or per hour</b>								
TLU-4	Infrastructure Management	0.04	0.1	0.7	Not quantified		Complete	
TLU-6	Adopt California Clean Car Standards	0.74	1.16	13.1	-\$263	-\$39	Pending	
TLU-11	Heavy-Duty Idle Reduction	NA					\$4 at \$2.40/gal -\$66 at \$3.40/gal	Pending
TLU-12	Mobile Source Emissions Reduction	0.4	0.4	6.1	Not quantified		Pending	
TLU-13	Reduce Maximum Speed Limits	0.4	0.4	6.1	NA	\$50 at \$2.40/gal -\$19 at \$3.40/gal	Pending	
<b>Sector Total After Adjusting for Overlaps</b>		<b>4.7</b>	<b>9.3</b>	<b>91.2</b>	<b>TBD</b>	<b>TBD</b>		
<b>Reductions From Recent Actions</b>		<b>1.4</b>	<b>1.5</b>	<b>20.2</b>	<b>0.0</b>	<b>0.0</b>		
<b>Sector Total Plus Recent Actions</b>		<b>6.1</b>	<b>10.8</b>	<b>111.4</b>	<b>TBD</b>	<b>TBD</b>		

Notes:  
 All GHG reduction numbers will change if the MCCAG approves the use of the new VMT baseline.  
 Negative numbers represent cost savings.

**Table 4.  
Agriculture, Forestry, and Waste Management  
Summary List of Draft Pending Policy Options**

	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2008–2025 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2015	2025	Total 2008–2025			
AFW-1	Agricultural Crop Management						Complete
	A. Soil Carbon Management	0.72	1.3	15	–\$34	–\$2	
	B. Nutrient Management	0.79	1.3	15	–\$543	–\$37	
AFW-2	Land Use Management Approaches for Protection and Enrichment of Soil Carbon						Complete
	A. Preserve Land	0.15	0.44	3.7	\$120	\$33	
	B. Reinvest in Minnesota–Clean Energy (RIM-CE)	0.09	0.19	1.8	\$59	\$34	
	C. Protection of Peatlands & Wetlands	<i>Not Quantified</i>					
AFW-3	In-State Liquid Biofuels Production						Pending
	A. Ethanol Carbon Content	1.8	2.2	27	–\$242	–\$9	
	B. Fossil Diesel Displacement	0.03	0.19	1.4	\$74	\$55	
	C. Gasoline Displacement						
	50% Displacement (original)	4.6	14	114	\$563	\$5	
	35% Displacement	2.8	9	73	\$336	\$5	
	20% Displacement	1.0	4.5	33	\$109	\$3	
AFW-4	Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production	1.3	3.8	31	\$102	\$3	Complete
AFW-5	Forestry Management Programs to Enhance GHG Benefits						Complete
	A. Forestation	0.55	2.2	17	\$218	\$13	
	B. Urban Forestry	1.2	2.7	26	–\$295	–\$12	
	C. Wildfire Reduction	<i>Not Quantified</i>					
	D. Restocking	2.1	8.4	65	\$2,187	\$33	
	E. Forest Health and Enhanced Sequestration	<i>Not Quantified</i>					
AFW-6	Forest Protection—Reduced Clearing and Conversion to Non-Forest Cover	2.2	2.7	34	\$101	\$3	Complete
AFW-7	Front-End Waste Management Technologies						Pending
	A. Source Reduction	0	3.6	20	\$59	\$3	
	B. Recycling	3.1	3.4	45	–\$512	–\$11	
	C. Composting	0.07	0.08	1.0	\$15	\$14	
AFW-8	End-of-Life Waste Management Practices						Pending
	A. Landfilled Waste Methane	0.07	0.73	4.4	\$5.7	\$1	
	B. Residuals Management	0.52	0.63	8.1	\$650	\$80	
	C. WTE Preprocessing	0.37	0.84	7.9	\$257	\$32	
	<b>Sector Total After Adjusting for Overlaps*</b>	<b>13.0</b>	<b>29.1</b>	<b>275</b>	<b>\$1,890</b>	<b>\$7</b>	
	<b>Reductions From Recent Actions</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	
	<b>Sector Total Plus Recent Actions</b>	<b>13.0</b>	<b>29.1</b>	<b>275</b>	<b>\$1,890</b>	<b>\$7</b>	

Note: Negative numbers represent cost savings.

**Table 5.  
 Cross-Cutting Issues  
 Summary List of Draft Pending Policy Options**

Option No.	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value 2008–2025 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Status of Option
		2015	2025	Total 2008-2025			
CC-1	GHG Inventories, Forecasting, Reporting, and Registry	<i>Not Quantified</i>					Complete
CC-2	Statewide GHG Reduction Goals and Targets	<i>Not Quantified</i>					Pending
CC-3	State and Local Government GHG Emissions (Lead-by-Example)	<i>Not Quantified</i>					Complete
CC-4	Public Education and Outreach	<i>Not Quantified</i>					Complete
CC-7	Participate in Regional and Multi-State GHG Reduction Efforts	<i>Not Quantified</i>					Complete
CC-8	Encourage the Creation of a Business-Oriented Organization to Share Information and Strategies, Recognize successes, and Support Aggressive GHG Reduction Goals	<i>Not Quantified</i>					Complete
CC-9	Dedicate Greater Public Investment to Climate Data and Analysis	<i>Not Quantified</i>					Complete
CC-10	Facilitate the Development of an Effective Carbon Credit System for MN	<i>Not Quantified</i>					Coordinate w/ Cap and Trade TWG
	Sector Total After Adjusting for Overlaps	<i>Not Quantified</i>					
	Reductions From Recent Actions	<i>Not Quantified</i>					
	Sector Total Plus Recent Actions	<i>Not Quantified</i>					

**Table 6.**  
**Cap and Trade (C&T)**  
**Summary List of Draft Pending Policy Options**

Option No.	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value (Million \$)	Cost-Effective-ness* (\$/tCO <sub>2</sub> e) 2025	Permit Price <sup>†</sup> (\$/tCO <sub>2</sub> e) 2025	Level of Support
		2015	2025	Total (2008–2025)				
C&T-1 Cap and Trade Program	MGA Partners C&T – no RES/CIP in the baseline		77.44			-\$28.97	\$21.84	Pending
	MGA Partners C&T – with both RES/CIP in the baseline		52.20			-\$22.07	\$22.91	
	MGA Partners C&T – with only RES in the baseline		65.07			-\$29.45	\$24.03	
	MGA Partners+Observers C&T – no RES/CIP in the baseline		77.84			-\$28.71	\$22.48	
	MGA Partners+Observers C&T – with both RES/CIP in the baseline		52.37			-\$21.93	\$23.23	
	MGA Partners+Observers C&T – with only RES in the baseline		65.05			-\$29.46	\$23.99	
	MGA plus WCI Partners C&T – no RES/CIP in the baseline		79.53			-\$27.59	\$25.19	
	MGA plus WCI Partners C&T – with both RES/CIP in the baseline		53.52			-\$20.93	\$25.51	
	MGA plus WCI Partners C&T – with only RES in the baseline		66.00			-\$28.68	\$25.81	
	MGA and WCI Partners+Observers C&T – no RES/CIP in the baseline		83.04			-\$25.24	\$30.96	
	MGA and WCI Partners+Observers C&T – with both RES/CIP in the baseline		56.38			-\$18.42	\$31.28	
	MGA and WCI Partners+Observers C&T – with only RES in the baseline		68.92			-\$26.25	\$31.53	
C&T-2	MN-Only C&T – no RES/CIP in the baseline (merged into C&T-1)		83.53			-\$24.35	\$28.58	Pending
	MN-Only C&T – with both RES/CIP in the baseline (merged into C&T-1)		61.78			-\$7.03	\$32.38	
	MN-Only C&T – with only RES in the baseline (merged into C&T-1)		78.27			-\$20.63	\$38.00	
C&T-3	National C&T (merged into C&T-1)				Not Quantified			Pending
C&T-4	Carbon Tax				Not Quantified			Pending
C&T-5	Market Advisory Group (Formerly CC-11)				Not Quantified			Pending

Option No.	Policy Option	GHG Reductions (MMtCO <sub>2</sub> e)			Net Present Value (Million \$)	Cost-Effectiveness* (\$/tCO <sub>2</sub> e) 2025	Permit Price <sup>†</sup> (\$/tCO <sub>2</sub> e) 2025	Level of Support
		2015	2025	Total (2008–2025)				
C&T-6	Regional and Multi-State GHG Reduction Efforts (Formerly CC-7)	Not Quantified						Pending
C&T-7	Carbon Credit System for Minnesota (Formerly CC-10)	Not Quantified						Pending

Note: Negative numbers represent cost savings.

Note: MGA C&T partners include Illinois, Iowa, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba; MGA C&T observers include Indiana, Ohio, and South Dakota; WCI partners include Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba; WCI observers include Colorado, Idaho, Montana, Nevada, and Wyoming. To run simulations including both MGA and WCI states in 2025, the C&T Technical Work Group (TWG) used 2020 marginal cost curves for WCI states for 2025. The emission cap for both MGA and WCI states (or provinces) is assumed to be 30% below the 2005 level in 2025.

\* This represents the average cost per ton of carbon dioxide equivalents (tCO<sub>2</sub>e) mitigated/sequestered for Minnesota.

† This represents the marginal cost of the last tCO<sub>2</sub>e mitigated/sequestered, and applies to all states involved in a trading arrangement.

**The results thus far are still not finalized. Draft results given here may be changed after final quantitative results from AFW, TLU, ES, and RCI TWGs are factored in.**