



**Residential, Commercial, and Industrial (RCI)
Technical Working Group**

Option No.	GHG Reduction Policy Option Name	GHG Reductions (MMtCO ₂ e)			Net Present Value (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total (2008–2025)			
RCI-5	Program to reduce emissions of non-fuel, high-global-warming-potential GHGs:	0.02	0.05	0.5	-\$2	-\$5	Approved

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

Policy Description

High Potential GHGs include the hydrofluorocarbons (HFCs) perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). The HFCs and PFCs are classes of chemical species rather than individual species. The United States is a signatory to the International Convention on Climate Change and is required to report emissions of these gases annually. The intent of this proposal is to address those gases reported by EPA pursuant to that convention, excluding CO₂, methane, N₂O, and gases controlled by the Montreal Protocol, http://www.ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch02.pdf

Some of the HPGHGs have a global warming effect up to 23,000 times the impact of CO₂. For example, a pound of sulfur hexafluoride is equal to the global warming impacts of 11 tons of CO₂.

In many cases, the cost of reducing these gases can be very low. Thus, an overall percentage reduction of GHGs (including CO₂) will be more cost-effective if this subject is effectively addressed at an early date.

The major sources include

- Air conditioning (mobile),
- Refrigerants,
- Aerosols,
- Foam insulations,
- Aluminum smelting,
- Electric power systems,
- Semi conductor manufacture,
- Solvents,
- Fire extinguishers, and
- Aerosol products.

In many cases alternative substances or methods are available. Also the maintenance and disposal of equipment or building materials, which contain these substances, can be a large source of emissions. EPA's website on this subject (<http://www.epa.gov/highgwp/projections.html>) states: "EPA is actively working to reduce emissions of high GWP gases given their potency and long atmospheric lifetimes. Through a set of voluntary partnerships, EPA and industry are making substantial progress in reducing emissions by developing and implementing cost-effective improvements to industrial processes."

For example EPA held a seminar to instruct utilities on proper methods of decommissioning equipment containing SF₆. EPA has established voluntary partnerships in the electrical,

aluminum, Semi conductor and magnesium industries. In addition, EPA has published list of acceptable substitutes for ozone depleting substances, which are controlled by the Montreal Protocol, <http://www.epa.gov/ozone/snap/index.html>

EPA's web site also contains extensive information on the costs of control at <http://www.epa.gov/highgwp/projections.html>

See also the "Meeting Report of the Joint IPCC/TEAP on Options for the Limitation of Emissions of HFCs and PFCs." Petten, May 1999.

Slide 83 of the First Meeting of the MCCAG demonstrates a dramatic growth in the emission of these substances, absent some remedial measures.

Policy Design

1. Elimination of Emissions of High Potential Global Warming Gases (HPGWGs) at Reasonable Cost

The MCCAG recommends that the Minnesota Pollution Control Agency undertake a rulemaking process to identify uses and emission sources of HPGWGs, and to eliminate the use of such gases where that can be done at a reasonable cost.

- The rulemaking process should include an initial scoping process to determine
 - which industries are the subject of an EPA voluntary partnership, or some other voluntary program, or EPA regulation resulting in reasonable measures to reduce emissions of HPGWGs.
 - In those industries which are the subject of an EPA voluntary partnership, or some other program, which of the companies in Minnesota in those industries have taken reasonable measures to reduce their emissions of HPGWGs.
 - On the basis of the scoping process, MPCA should determine which industries should be exempted from the rulemaking process, because all reasonable reductions in emissions of HPGWGs that can be accomplished at reasonable costs are being accomplished voluntarily. Individual companies not participating in such industry programs would not be exempted, nor would industries or companies where reductions of emissions which are possible at reasonable costs are not being achieved.
 - To the extent that tradable credits result from the rulemaking process for reductions in emission, PCA should develop a mechanism to provide such credits for companies that have reduced such emissions voluntarily.
- The rulemaking process of the MPCA would:
 - Require the elimination of such gases, on a phased basis, where this can be done at a zero or negative cost.
 - Require the elimination or reduction of such gases by the use prudent managerial practices, process changes, and improved technology or by substitution of other substances, or other means, where the cost of CO₂ equivalent reduction can be accomplished at a reasonable cost.

- The reasonable cost per ton of CO₂ equivalent reduction should be established by the agency in the rule making process, taking into account the availability of alternatives, but should not be less than \$15 per CO₂ equivalent ton, or 25% of the average costs of control of all greenhouse gases per CO₂ equivalent ton across all sectors and sources, whichever is greater, as determined by the agency.

2. Promotion and Funding for Process Optimization

- Where the elimination of HPGWGs can be undertaken at a reasonable cost, that should be accomplished through the rulemaking process where it has not been done voluntarily through the EPA programs or otherwise. In other cases the state should provide funding and incentives for the reduction and phase out of HPGWGs, through tax incentives. and funding for programs which offer education and technical assistance.
- <http://www.epa.gov/highgwp/sources.html> EPA Web site on voluntary programs in several industries.

3. Use of Lower Impact Alternatives for Coolants, Refrigerants, Aerosols, Solvents, and Insulation

- Again, where substitutes can be used at a reasonable cost, that should be done, pursuant to the rulemaking described above if not voluntarily. Where substitutes are not available at reasonable costs, the state should undertake to reduce the use and emissions of HPGWGs through incentives, and through the funding of programs that can provide technical assistance.
- <http://www.epa.gov/ozone/snap/> EPA's Web site on

Implementation Mechanisms

Minnesota Pollution Control Agency.

Legislative action to provide tax incentives, and funding for technical support and assistance.

Technical support through MNTAPP or similar entities.

Related Policies/Programs in Place

MNTAPP technical assistance program.

Type(s) of GHG Reductions

Reductions from avoided emissions of High Potential GHGs.

Estimated GHG Reductions and Net Costs or Cost Savings

Data Sources:

- "U.S. High GWP Gas Emissions 1990–2010: Inventories, Projections, and Opportunities for Reductions", June 2001 (available at <http://www.epa.gov/highgwp/projections.html>)
- Population projections from the Minnesota State Demographic Center, <http://www.demography.state.mn.us/documents/MinnesotaPopulationProjections20052035.pdf>

- National population projections from the US Census Bureau, available at <http://www.census.gov/population/projections/SummaryTabA1.xls>
- California staff Analysis of Proposed Early Action for Climate Change Mitigation in California, 2007, HFC for mobile air conditioning available at <http://www.arb.ca.gov/cc/ccea/hfc-mac/documents/hfcdiy.pdf>.

Quantification Methods: See Annex 1

Key Assumptions: See Annex 2

Key Uncertainties

Costs of achieving reductions

Additional Benefits and Costs

None

Feasibility Issues

TBD

Status of Group Approval

Approved

Level of Group Support

Approved

Barriers to Consensus

None

Annex 2:

RCI-5. Program to reduce emissions of non-fuel, high-global-warming-potential GHGs

GENERAL ASSUMPTIONS

Assumed start year for the option

2009

Implementation ramp-up schedule

1

1	Linearly up to maximum by 2025 (default)
2	User-defined ramp-up period

Real discount rate

5%

Cost effectiveness threshold (2005\$/tCO2e avoided)

\$15.0

Inflation rate

1

1	Use	2.50%
2	User-defined	

Global warming potential

HFC-134a	1,300
SF-6	23,900

SF6 - ELECTRIC TRANSMISSION

Mitigation cost (recycling) (2005\$/tCO2e)

1

1	EPA assumption (default)	-9.31
2	User-defined	

Maximum mitigation reduction potential (recycling)

1

1	EPA assumption (default)	10%
2	User-defined	

Mitigation cost (leak detection) (2005\$/tCO2e)

1

1	EPA assumption (default)	6.56
2	User-defined	

Maximum mitigation reduction potential (leak detection)

1

1	EPA assumption (default)	20%
2	User-defined	

HFC and PFC - SEMICONDUCTORS

HFC and PFC mitigation cost (NF3 remote clean technology) (2005\$/tCO2e)

1	
1	EPA assumption (default) 5.20
2	User-defined

HFC and PFC maximum mitigation reduction potential (NF3 remote clean technology)

1	
1	EPA assumption (default) 9%
2	User-defined

HFC and PFC mitigation cost (point of use plasma) (2005\$/tCO2e)

1	
1	EPA assumption (default) 11.63
2	User-defined

HFC and PFC maximum mitigation reduction potential (point of use plasma)

1	
1	EPA assumption (default) 7%
2	User-defined

HFC and PFC mitigation cost (thermal destruction) (2005\$/tCO2e)

1	
1	EPA assumption (default) 42.42
2	User-defined

HFC and PFC maximum mitigation reduction potential (thermal destruction)

1	
1	EPA assumption (default) 19%
2	User-defined

HFC and PFC mitigation cost (catalytic destruction) (2005\$/tCO2e)

1	
1	EPA assumption (default) 10.84
2	User-defined

HFC and PFC maximum mitigation reduction potential (catalytic destruction)

1	
1	EPA assumption (default) 21%
2	User-defined

HFC mitigation cost for refrigerants (distributed system) (2005\$/tCO2e)

1	
1	EPA assumption (default) -8.17
2	User-defined

HFC - REFRIGERANTS (not including mobile air conditioning)

HFC maximum mitigation reduction potential (distributed system)

1	
1	EPA assumption (default) 4%
2	User-defined

HFC mitigation cost (Ammonia secondary loop system) (2005\$/tCO2e)

1	
1	EPA assumption (default) 19.74
2	User-defined

HFC maximum mitigation reduction potential (Ammonia secondary loop system)

1	
1	EPA assumption (default) 4%
2	User-defined

HFC mitigation cost (HFC secondary loop system) (2005\$/tCO2e)

1	
1	EPA assumption (default) 20.18
2	User-defined

HFC maximum mitigation reduction potential (HFC secondary loop system)

1	
1	EPA assumption (default) 1%
2	User-defined

SF-6 - SOLVENTS

SF-6 mitigation cost (alternative solvents) (2005\$/tCO2e)

1	
1	EPA assumption (default) 0.26
2	User-defined

SF-6 maximum mitigation reduction potential (alternative solvents)

1	
1	EPA assumption (default) 30%
2	User-defined

SF-6 mitigation cost (NIK replacements) (2005\$/tCO2e)

1	
1	EPA assumption (default) 4,118
2	User-defined

SF-6 maximum mitigation reduction potential (NIK replacements)

1	
1	EPA assumption (default) 3%
2	User-defined

SF-6 mitigation cost (Retrofit options) (2005\$/tCO2e)

1	
1	EPA assumption (default) 78.64
2	User-defined

SF-6 maximum mitigation reduction potential (Retrofit options)

1	
1	EPA assumption (default) 2%
2	User-defined