EPA Efforts to Reduce Emissions of Non-CO2 Gases

Presentation for the UNFCCC Mitigation Workshop on Non-CO2 Gases
December 7, 2007

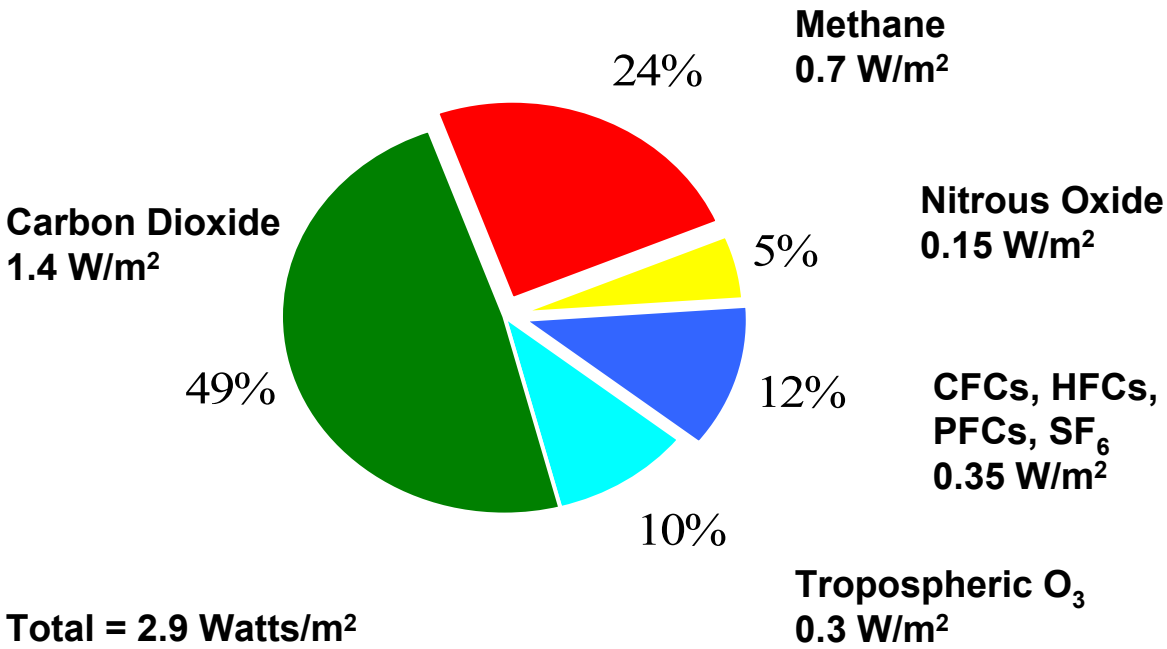
Climate Change Division
Office of Atmospheric Programs

Overview

- Importance of the Non-CO2 GHGs
- US Emissions and Mitigation Options
- EPA Efforts to Reduce Non-CO2 Gases
  - High GWP Gases
  - Methane
- Global Opportunities: The Methane to Markets Partnership
- Concluding Thoughts

Non-CO2 Gases Play an Important Role

Anthropogenic Emissions of Non-CO2 Gases have been important contributors to an enhanced Greenhouse Effect Since Pre-Industrial Times

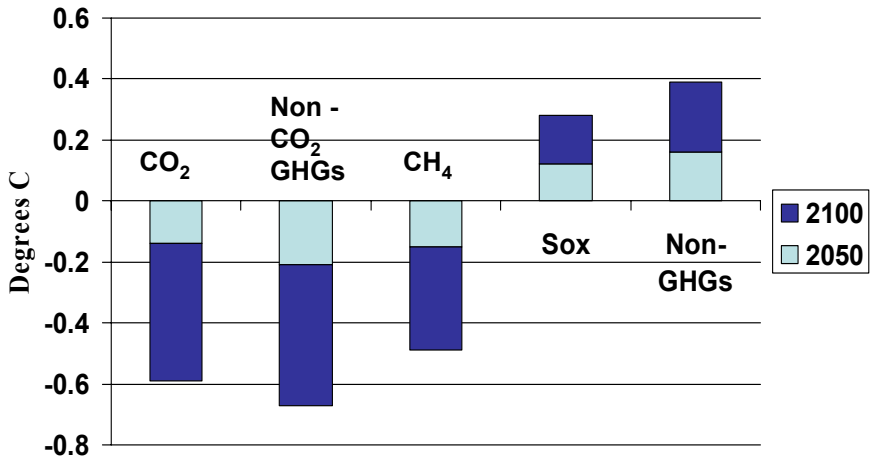


Non-CO2 Reductions Offer Important Climate and Economic Benefits

- Near-term Climate Benefits
  - *"Looking to likely emissions over the next half century, it is also the case that feasible reductions in emissions of methane and other non-CO_2 gases can make a contribution to slowing global warming that is as large or even larger than similar reductions in CO_2 emissions." - MIT, 2003*

- Mitigation cost are lower than for energy-related CO2

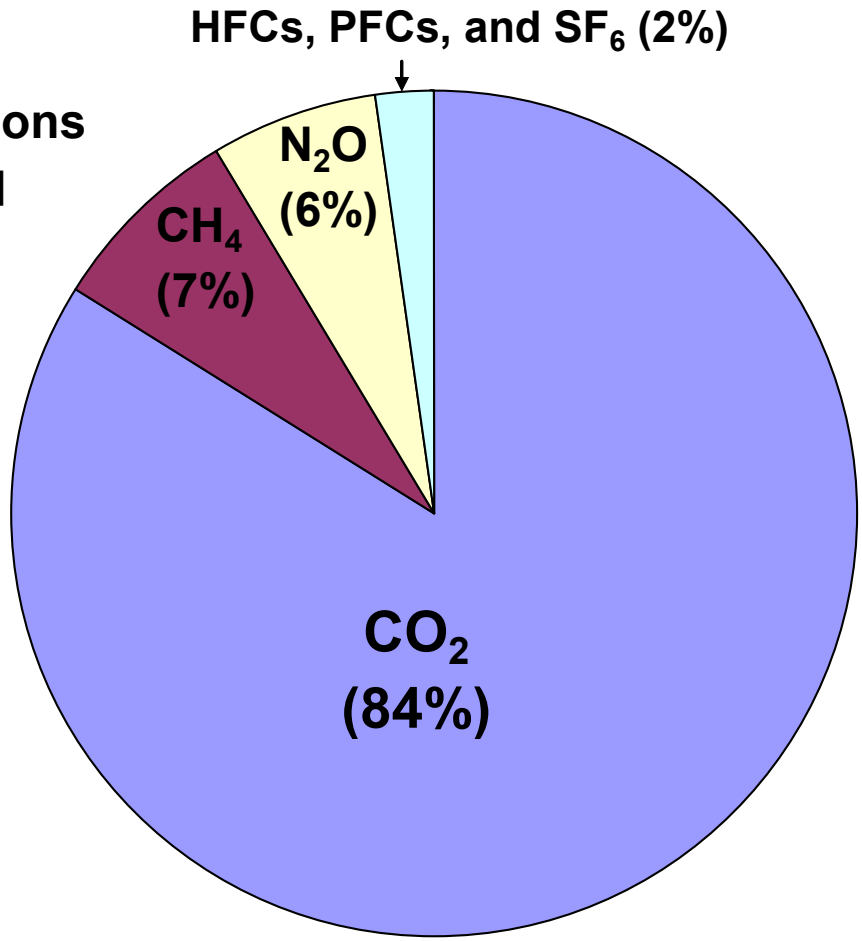
- The result – a large portfolio of mitigation options and the potential for reduced costs for a given climate policy objective



Impact of a 50% reduction from BAU in 2050, maintained to 2100

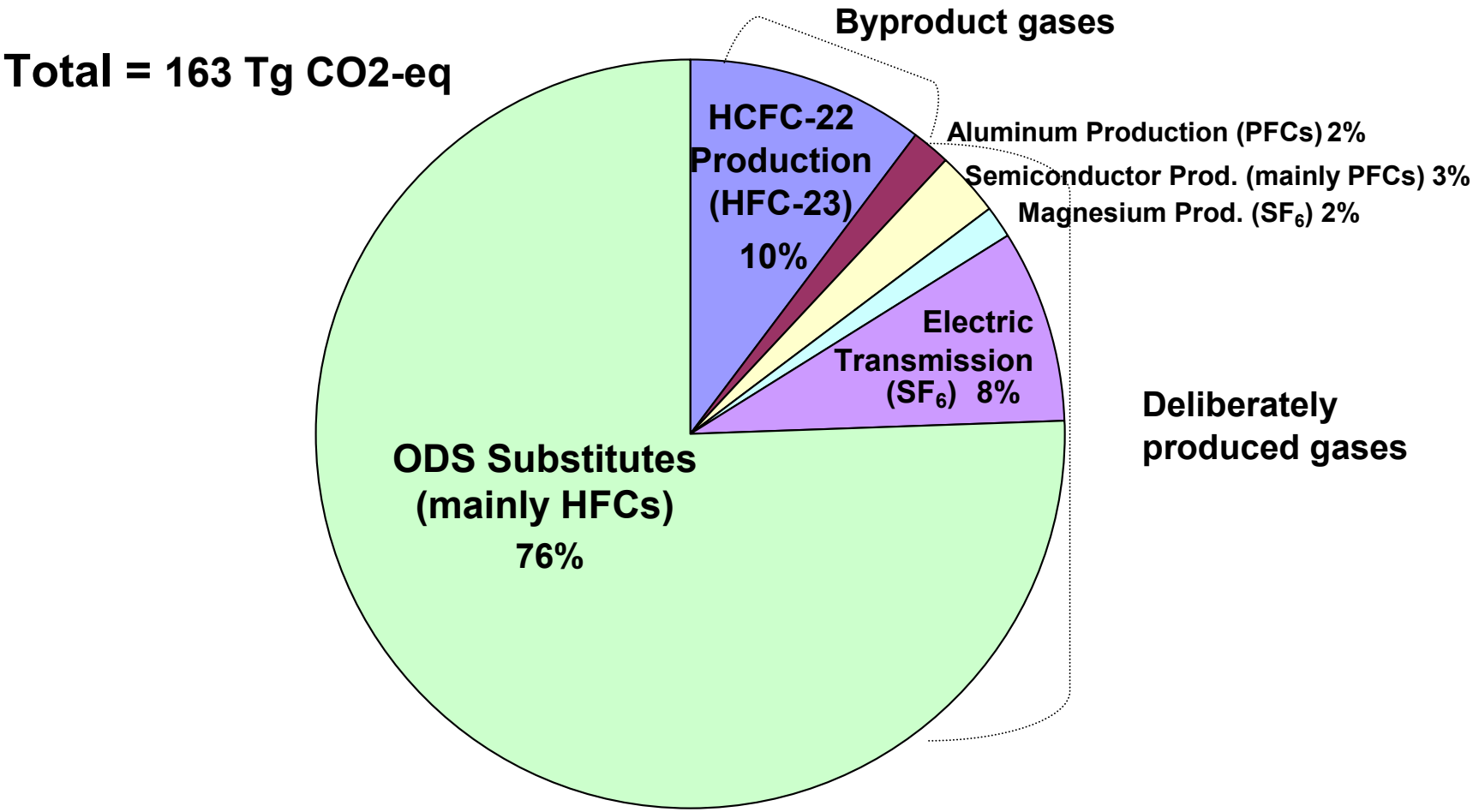
U.S. GHG Emissions (2005)

Total U.S. Emissions = 7260 Tg CO_2-eq



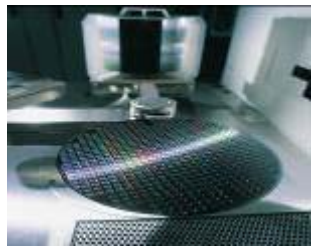
1 Tg = 1 million metric tons

U.S. Emissions of Fluorinated Gases (2005)



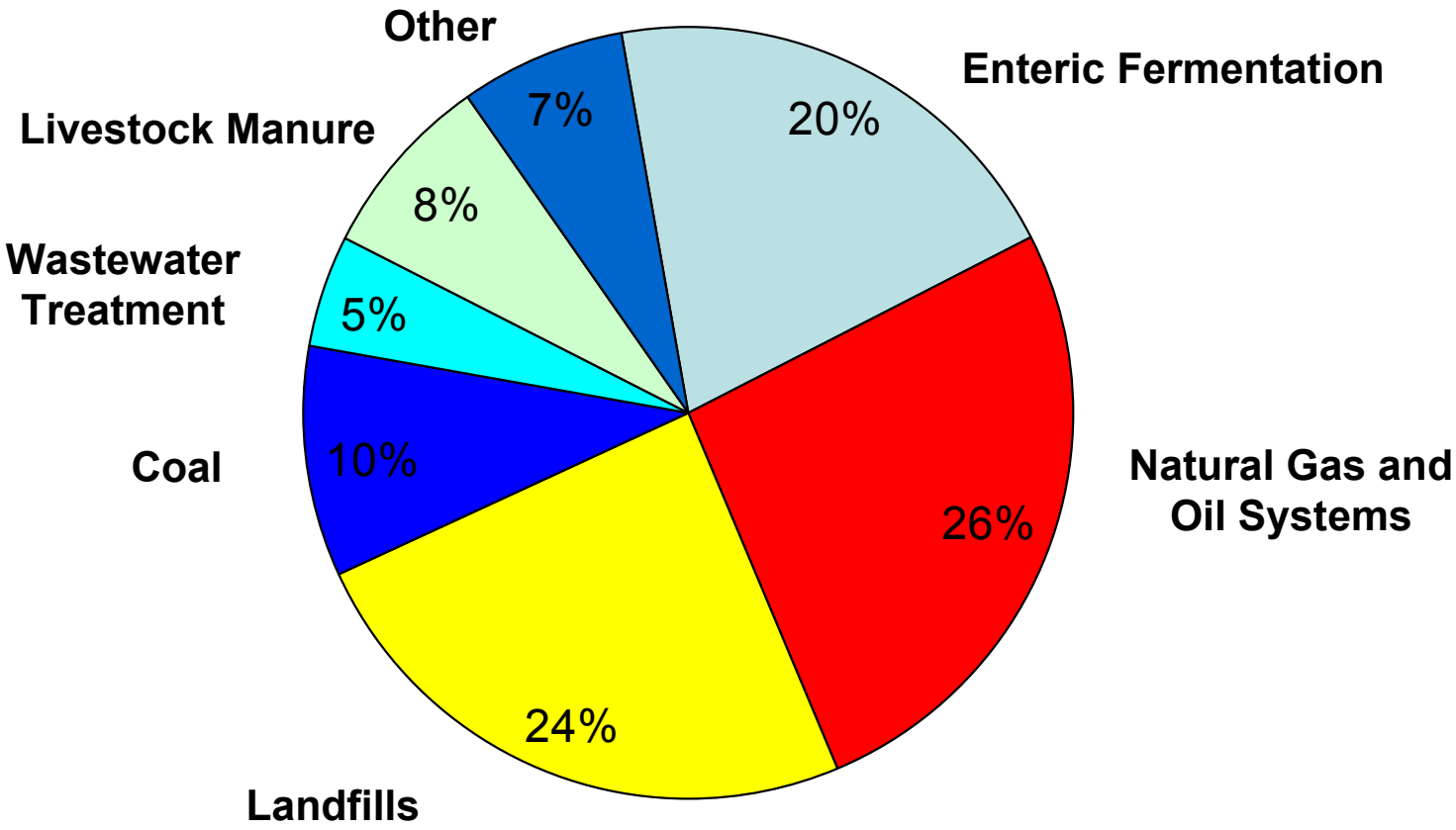
High GWP Mitigation Opportunities

Source	Key Technology
Aluminum	Reduce anode effects
Magnesium	Improved process management, SF6 substitutes
Electric Power	Improved gas handling, recycling, new equipment
Semiconductors	Improved process management, thermal destruction, alternative chemicals
HFC-23	Improved process management, thermal destruction
ODS Substitutes	Improved gas management, alternative chemicals



U.S. Emissions of Methane (2005)

Total = 539 Tg CO2-eq



Methane Mitigation Opportunities

Source	Key Technologies
Landfills	Methane recovery and combustion (i.e., power generation, industrial uses, flaring)
Coal Mines	Methane recovery and combustion, flaring, ventilation air use
Gas/Oil Systems	Use of low-bleed equipment, and better management practices
Livestock Waste	Methane collection from anaerobic digestors and combustion (power, flaring)
Ruminant Livestock	Improved production efficiency through better nutrition and management
Rice Production	Water management, organic supplements

EPA's Efforts to Reduce Emissions of Non-CO2 Gases

Public-private partnership programs target major sources

- Landfill Methane Outreach Program
- Coal Mine Methane Outreach Program
- Natural Gas STAR
- AgSTAR
- Voluntary Aluminum Industrial Partnership
- Semiconductor Partnership
- Utility SF6 Partnership
- Magnesium Partnership
- HFC-23 Reduction Partnership
- HFCs in Mobile Air Conditioning

Avoid High GWP Emissions by stratospheric ozone regulation

- Refrigerants (no venting, mandatory recovery and recycling)
- ODS Substitutes "SNAP" Program (Ban or limit use where more environmentally friendly substitutes exist)

High-GWP Partnerships

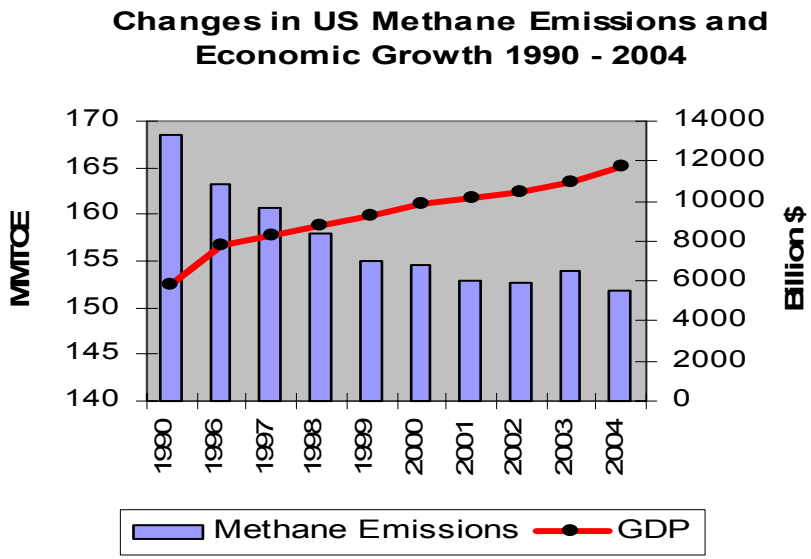
Sectors: Aluminum, Magnesium, Semiconductors, Electric Power, Mobile Air Conditioning, and HFC and HCFC producers

EPA Partnership Goals:

- ✓ Mobile Air Conditioning Partnership -
  Reduce HFCs 50% and improve fuel-efficiency by 30%
- ✓ PFC Reduction Partnership for the Semiconductor Industry -
  Reduce PFCs 10% below 1995 by end of 2010
- ✓ Voluntary Aluminum Industrial Partnership -
  Reduce direct carbon intensity by 53% below 1990 levels by 2010
- ✓ SF_6 Emissions Reduction Partnership for the Magnesium Industry -
  Phase out SF_6 by end of 2010

Methane Partnerships

- Natural Gas STAR
  - over 100 companies (57% of industry) in program
  - Since 1993, companies have reported reductions of 63 MMTCE, valued at over $4.2 billion USD.
- Coalbed Methane Outreach Program
  - 80% of mine degasification CH4 is used (up from 25% in 1993)
  - industry effort to demonstrate use for ventilation air methane
- Landfill Methane Outreach Program
  - Over 425 US projects -- tripled since 1994
  - Strong corporate interest in use of landfill gas
- AgSTAR
  - Since 1994, the number of biogas recovery systems has doubled; over 180 projects - generating about 300 million kWh per year.



General EPA Program Approach

- Understand the Fundamentals
  - Emission Sources
  - Mitigation Technologies
  - Cost and Benefits
- Identify the Barriers to Adoption
  - If technologies are profitable, why aren't they being implemented?
  - Can EPA assist in overcoming the barriers?
- Design programs that address the barriers
  - MOU Approaches
  - General Outreach Approaches
- Routinely measure, monitor and report progress
  - Internal programmatic assessment
  - External communication

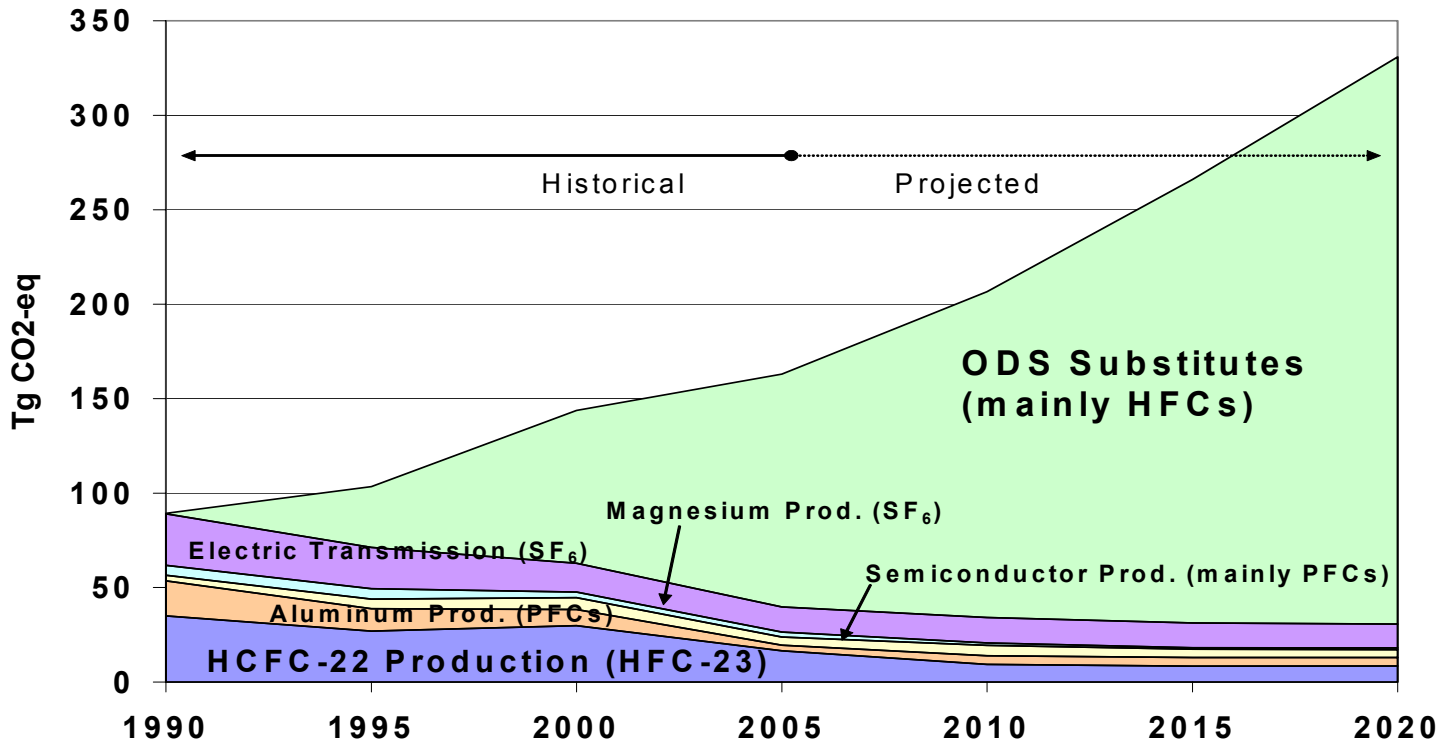
Common Barriers

- Unaware of emission levels, environmental consequences
- The “common wisdom” of the industry
- Steep learning curve to understand and assess mitigation technologies
- Unaware of other project benefits
- Hard to find project partners, financing
- Difficult to get management acceptance of new approaches
- Legal/Regulatory issues

Partnerships Overcome Barriers

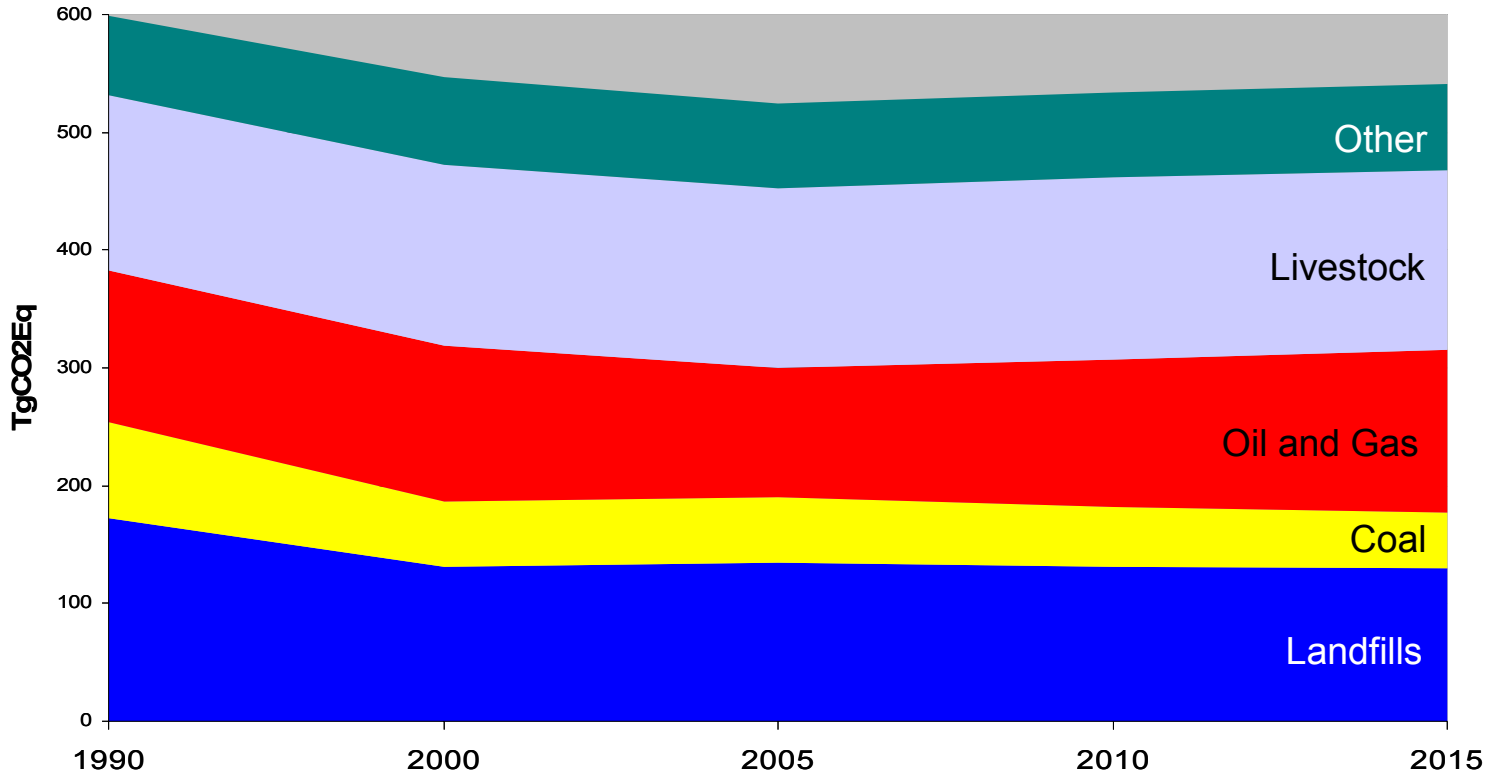
- Each program is customized to its industry
- Common strategies and approaches to address barriers:
  - Technology assessment
  - Technical/analytical support
  - Identification of Candidate Sites
  - Cost/Benefit and Financing Information
  - Information Access and Networking
  - Regulatory Assistance
  - Public Recognition

Trends (1990-2020, with Programs)



- Emissions from ODS substitutes have risen from zero in 1990 to 123 MtCO2-eq today; rise will continue through 2030 as ODS phaseout continues.
- Emissions of HFCs, PFCs, and SF6 from “industrial sources” have fallen by 55%, primarily due to EPA-industry partnership programs.

Trends (1990-2020, with Programs)



- As of 2005, the CH4 partnership programs have successfully reduced US emissions 11% below 1990 levels
- With continued efforts, emissions are expected to remain below 1990 level in spite of economic growth through 2020

Keys to Successful Partnerships

- Strong technical and economic foundation
- Customized programs
- Clear roles and responsibilities and program goals and boundaries
- Extensive expertise of program managers
- Flexible strategies
- Information sharing across industry partners
- Strategy for measuring success
- Recognition

Catalyze Global Reductions

High GWP Gases

- World Semiconductor Council
  - PFCs 10% below 1995 by 2010
- International Aluminum Institute
  - PFCs 80% below 1990 by 2010
- Asia Pacific Partnership – Aluminum Task Force
  - Reduce PFC emissions and improve efficiency from aluminum smelting
  - Working in partnership with Australia and China - Measurement/ Inventory/ Demonstration/Training
- International Magnesium Association
  - Phase-out SF6 by 2010

Methane

- Methane to Markets
  - Potential to achieve annual reductions of global CH4 emissions totaling 50 MMTCE by 2015

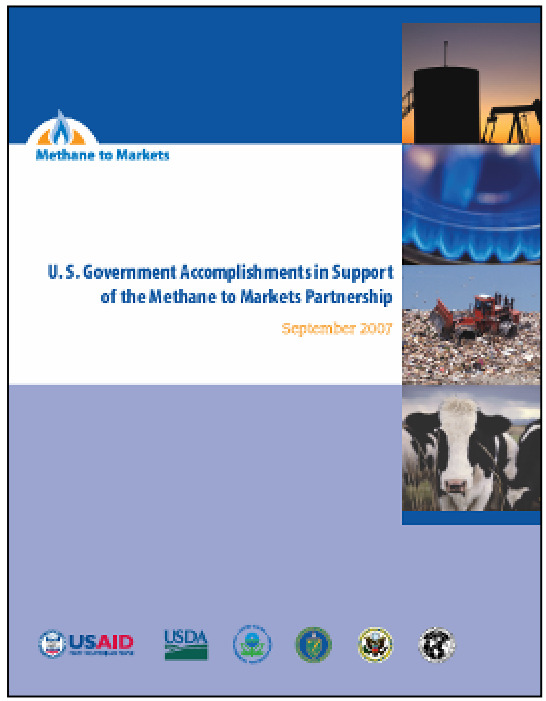
Methane to Markets

- Encourages development of ***cost-effective*** methane recovery and use opportunities in
  - coal mines
  - landfills
  - oil and gas systems and
  - agriculture (manure waste management)
- Private companies, multilateral development banks and other relevant organizations participate by joining the ***Project Network***
  - over 650 organizations now participating
- 21 Partner Governments

Argentina
Australia
Brazil
Canada
Colombia
China
European Comm.
Ecuador
Germany
India
Italy
Japan
Korea
Mexico
Nigeria
Poland
Russia
Ukraine
United Kingdom
United States
Vietnam

US Commitment

- Pledged $53 million over five years at Partnership launch in 2004. To date:
  - Provided $18.3 million to support a wide range of projects and activities
  - Leveraged over $261 million in public and private sector contributions
  - *M2M grant solicitation from EPA will be out shortly - up to $7 million*
- Providing significant support to the Partnership through the ASG and technical support in all 4 sectors
  - Providing assistance for methane recovery and use project activities in Argentina, Brazil, China, Colombia, Ecuador, India, Korea, Mexico, Nigeria, Russia, and Ukraine.



- Through 2007, supporting projects that, if fully implemented, will result in estimated annual emission reductions of approximately 9 million metric tons of carbon dioxide equivalent (MMTCO2E)

Concluding Thoughts

- Significant climate and other environmental and energy benefits
- Reduces cost of climate mitigation
- Technologies are available and in demand
- Barriers are being addressed
- Emissions can be reduced rapidly
- Partnership and industry sector approaches are successful and need to play a role in future mitigation efforts