Reporting and Review of Methane Emissions under the UNFCCC

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Who Reports Emissions under the UNFCCC?

«Forty Developed countries (Annex I) report annually

«Developing countries (non-Annex I) – report periodically as part of their national communications

What/how do Annex I Parties report?

- Six main GHG gases/species: CO2, CH4, N2O, HFCs, PFCs, SF6 and SO2, CO, NOx and NMVOCs
- All sectors – Fuel combustion, fugitive fuel emissions, industry, agriculture, waste, and forestry
- In accordance with IPCC guidelines and guidance
- Electronically using a detailed Common Reporting Format … 40+ tables, covering activity data and emission factors
- Methodological information and any changes in methods in a written report

The UNFCCC process includes an extensive peer review and quality control process of Annex I data

«Since 2000, all data are reviewed annually by individual experts, panels and "in country" reviews

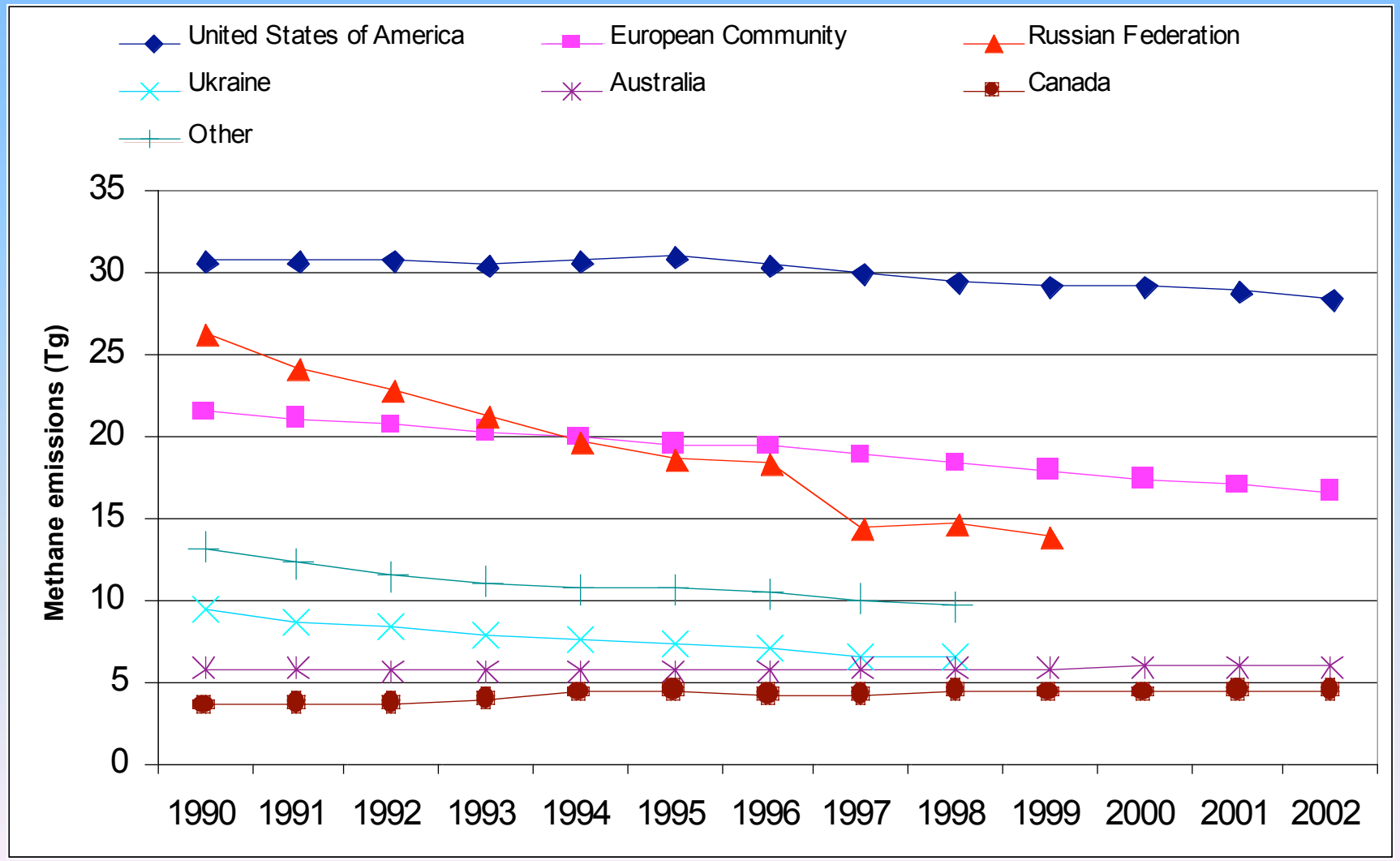
«Over 100 experts participate every year

«30-40 new experts participate in UNFCCC expert training courses each year

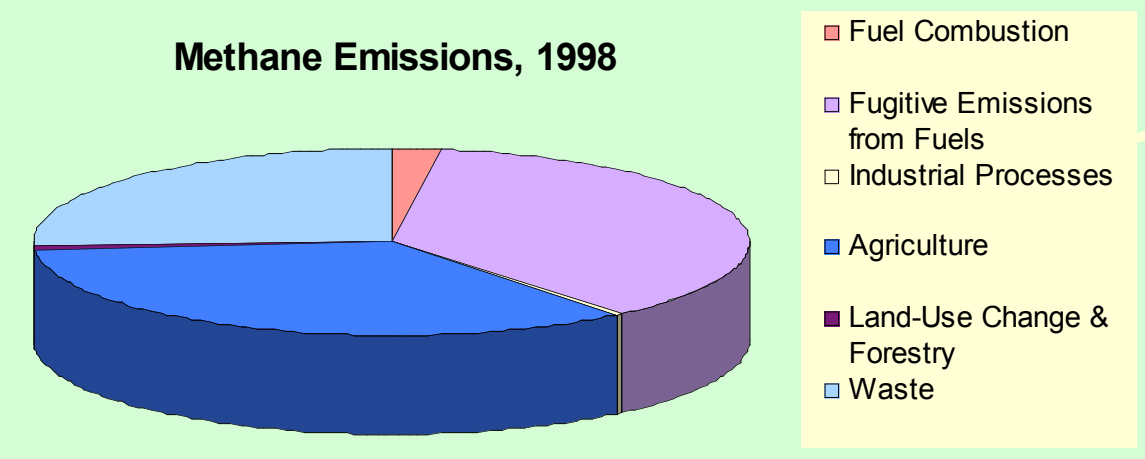
«Annual reports and data are available on the secretariat's web site
http://unfccc.int/national_reports/items/1408.php

The review process has led to more timely, complete and accurate Annex I data

Methane Emission have Declined in most Annex I Countries since 1990

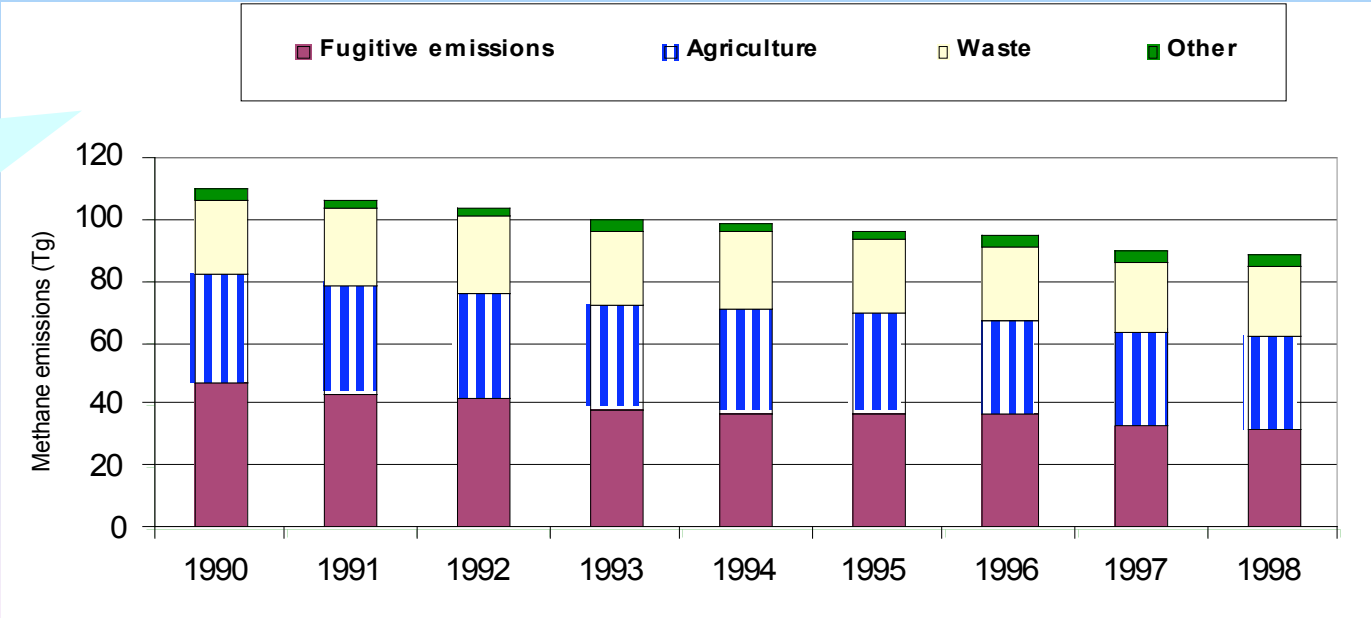


Methane emissions have declined by approximately 20 Tg since 1990



Main sources reported by Parties

Fugitive (30%) and agriculture (15%) emissions have declined the most!



National Policies & Measures are Targeting Key Sources (Examples)

Fugitive

« Adoption of improved technologies and practices
« Shifts in coal production from deep mines
« Reductions in gas pipeline leaks

Agriculture

« Improvements in manure management

Waste management

« Landfill gas capture and use
« Municipal waste incineration
« Recycling of organic and other types of waste

Concluding remarks…

- « Annex I Parties are providing high quality data suitable for scientific and policy uses
- « Analyses using the MAGICC model suggests that the reductions in Annex I emissions are consistent with the slow growth in atmospheric concentrations over the last several years[1], however…
- « A lack of consistent data from Non-Annex I Parties limits scientific understanding of changes in atmospheric concentrations

1) Paper submitted to Journal of Climate Change

A Whirlwind Methane Tour -- Technologies, Economics and Policy

Dina Kruger, Director
USEPA Climate Change Division
April 4, 2005

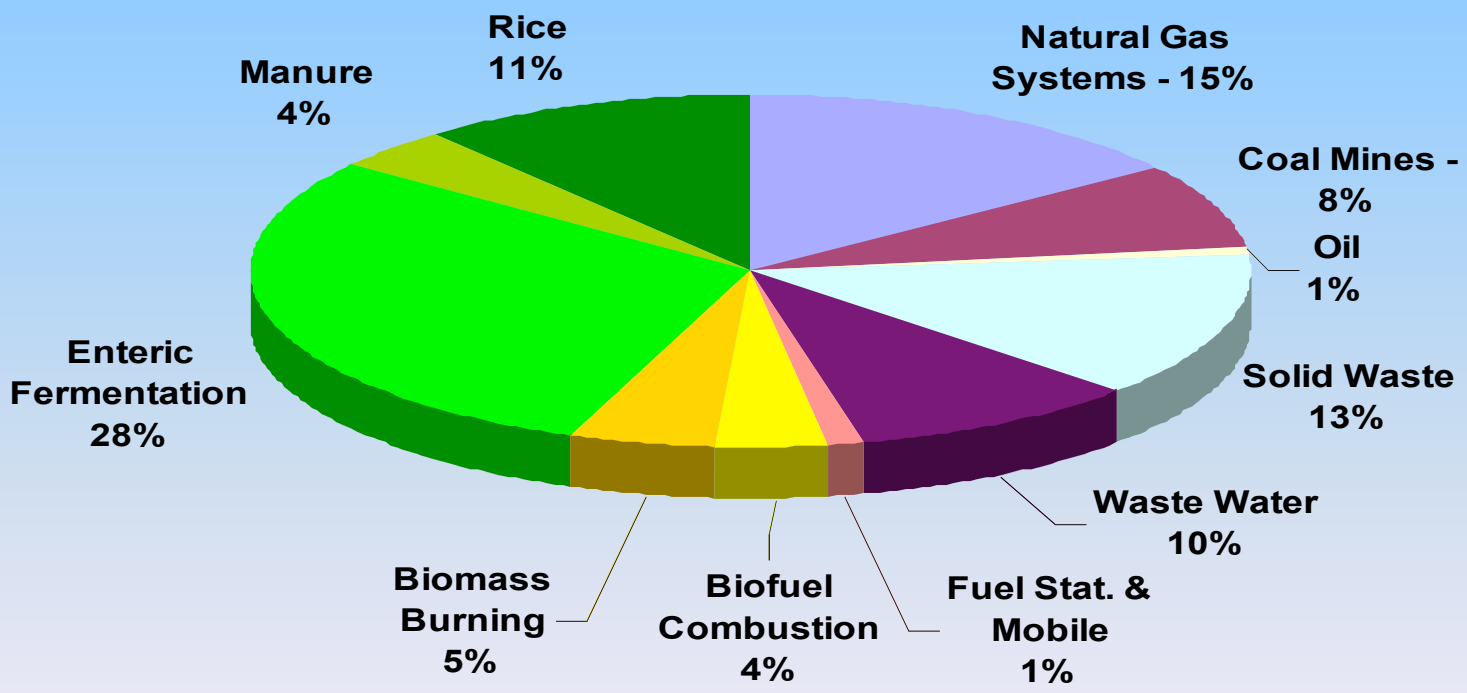
Overview

- Technology Assessment
- Economic Assessment
- Policy Context for Methane Reductions

Is it feasible to achieve a global warming success story with methane?

Global Methane Emissions by Source, 2000

Total emissions in 2000 = 5,933 MtCO2e



Source: US EPA

Reducing CH_4 from Energy

- Coal Mines
  - Drill wells to recover CH_4 released by mining
  - Use in Pipelines, electricity, at the mine
  - Improve mine safety
- Oil and Gas Systems
  - Reduce leaks and improve practices at all stages of system
  - More product to sell

Reduce CH4 from Waste

- Landfills
  - Collect CH_4 generated by waste decomposition
  - Use for electricity, industry, communities, vehicles, flare
  - Improve safety and odors

- Livestock Manure
  - Collect CH_4 generated in large dairy/swine lagoons
  - Use on-farm, generate electricity, flare
  - Reduce odors, improve water quality

Reduce CH_4 from Agriculture

- Ruminant Livestock
  - Improve diet and nutrition
  - Improve overall animal health
  - Increased product (milk, meat, work) from animals
  - Lower emissions per unit product

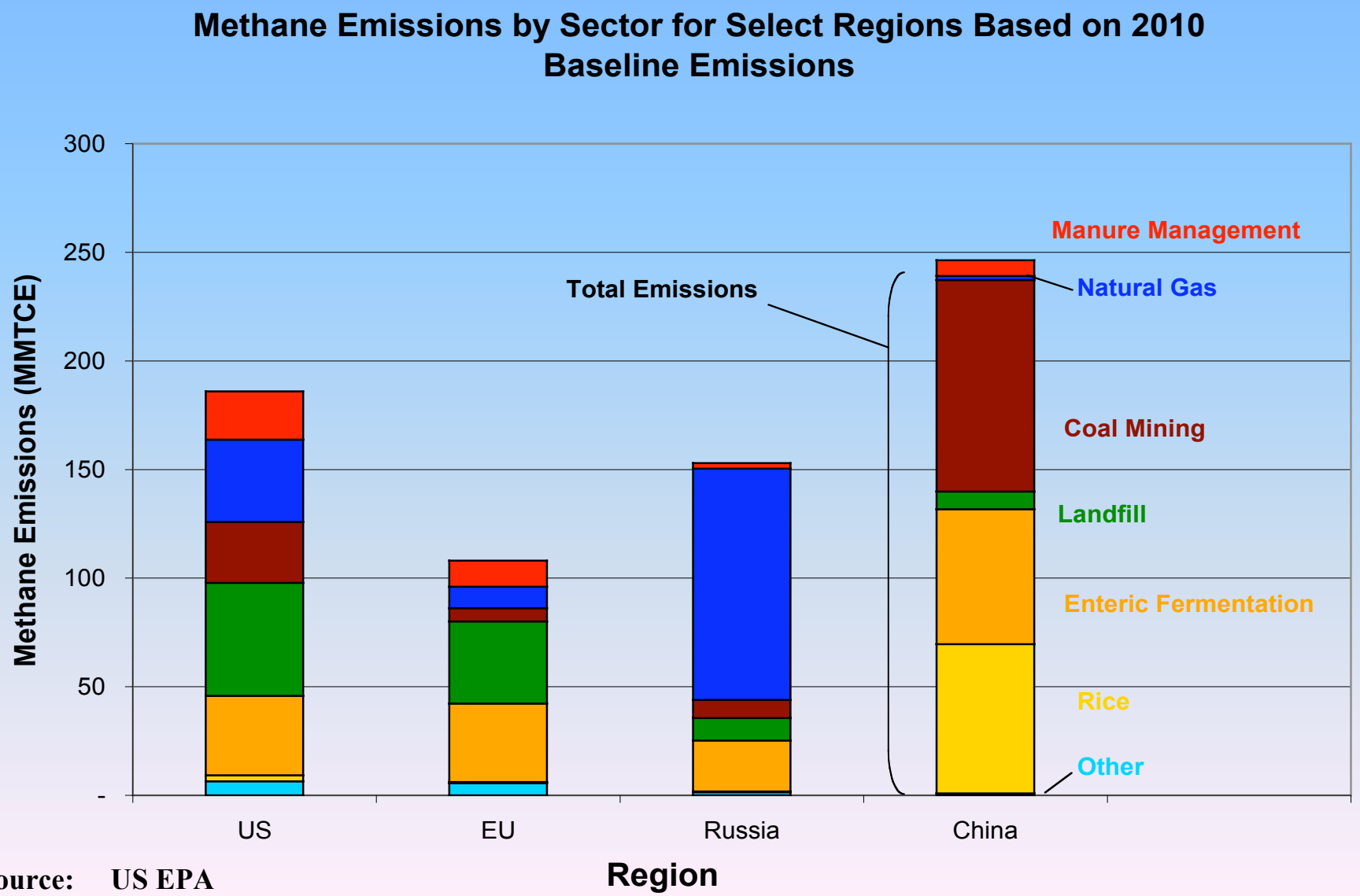
- Rice Cultivation
  - Use different cultivars
  - Modify water management, fertilization practices
  - More research needed to ensure productivity maintained and no unintended effects (i.e., N_2O)

Technology Potential

Source	Near-Term Potential	Expanded Longer-Term Potential?
Coal Mining	Strong	Yes (mine ventilation air)
Oil & Gas Systems	Strong	Yes (better leak detection)
Landfills	Strong	Yes (recycling, advanced landfilling practices)
Livestock Manure	Good, but *	Yes (new technologies)
Ruminant Livestock	Limited	Yes, but*
Rice Cultivation	Limited	Yes, but*

* Significant deployment challenges (i.e., number of actors, markets)

CH_4 Sources and Strategies are Country-specific

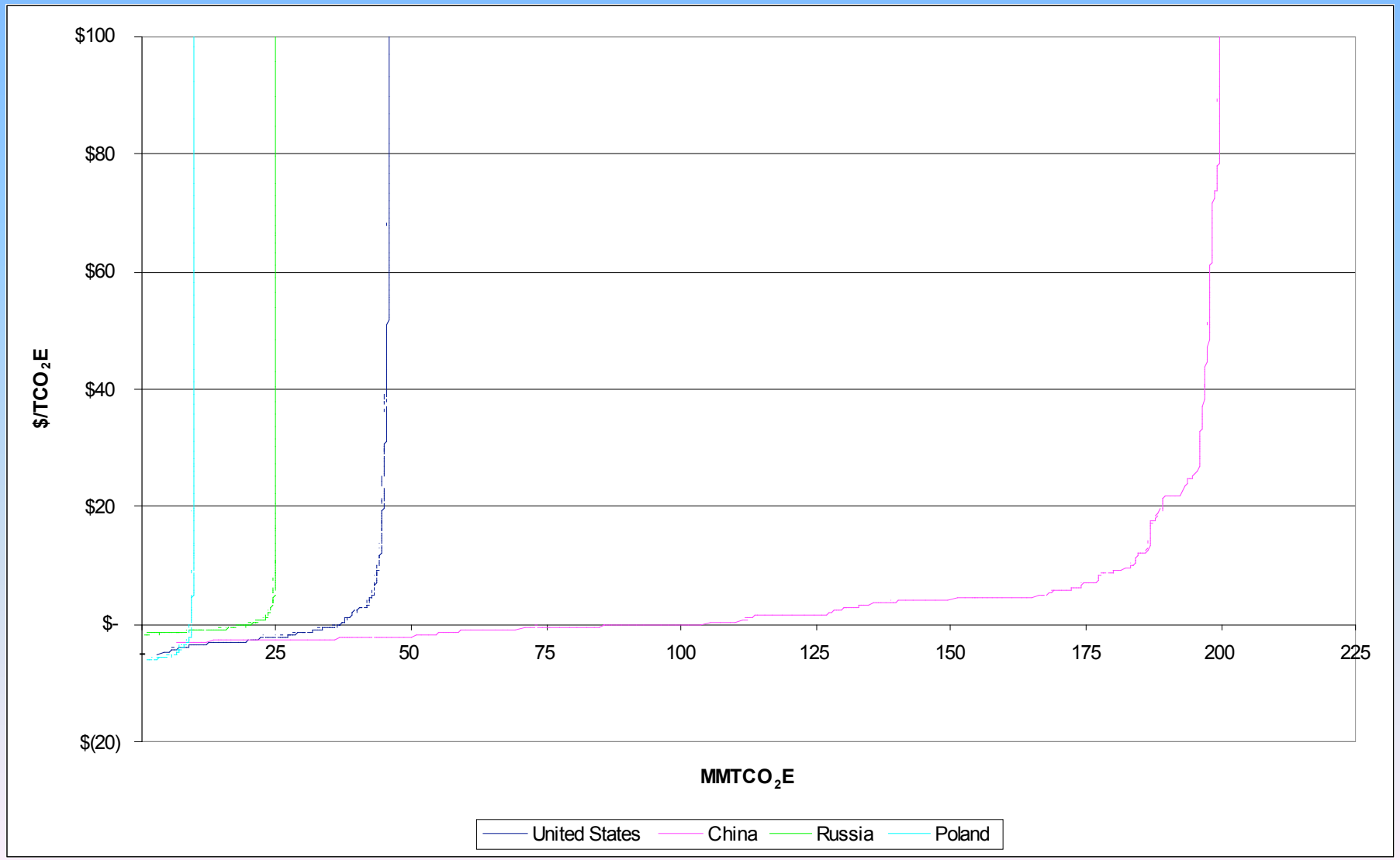


Source: US EPA

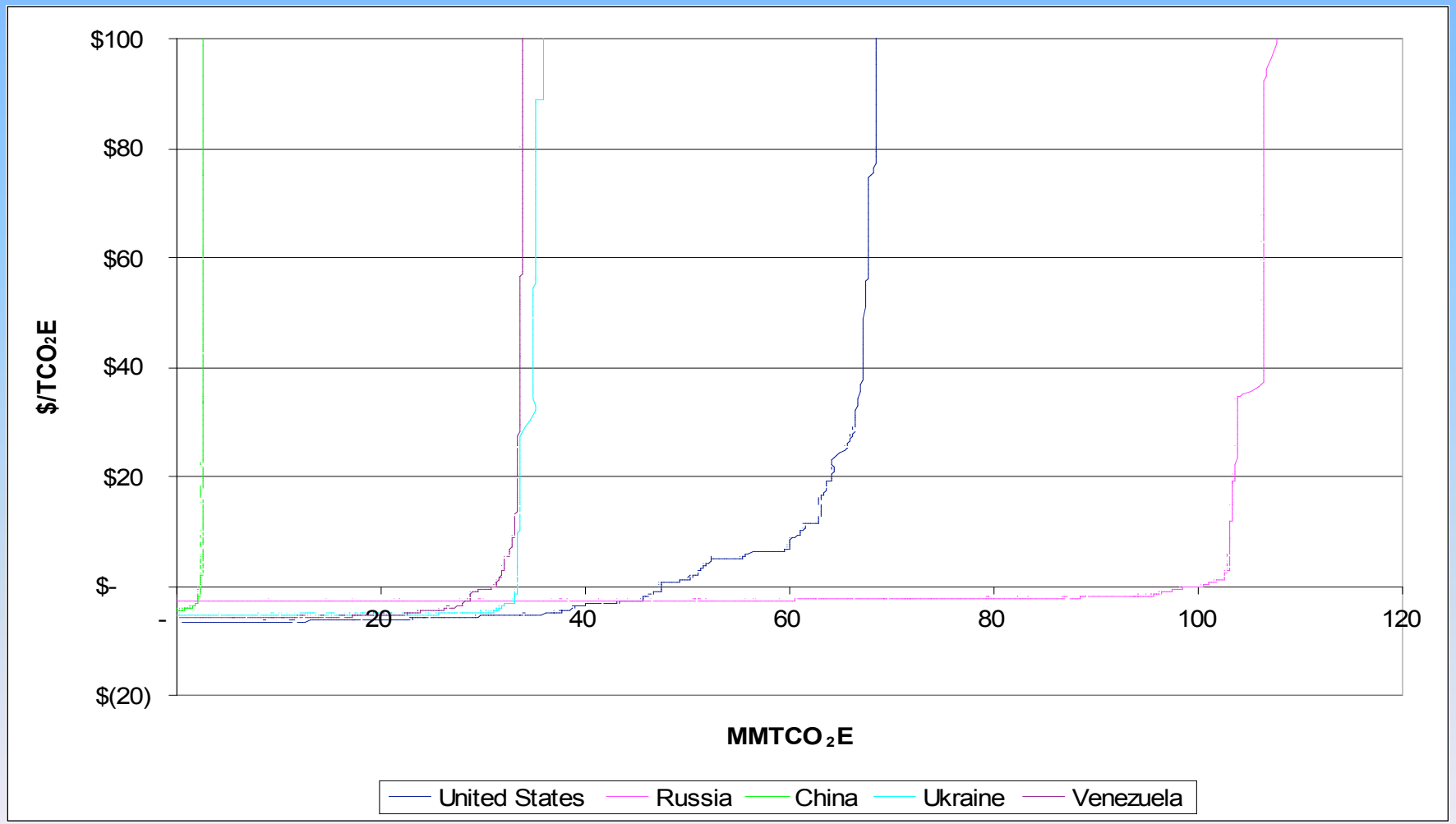
Economic Analyses of CH_4 Reduction Potential

- Several economic assessments of methane available since late 1990s
  - USEPA, International Energy Agency, AEA Technologies, Ecofys
- Stanford Energy Modeling Forum just completed study of non-CO2 GHG abatement potential
  - International teams developed unified data sets (EPA, AEA, Ecofys) for methane and other non-CO2 GHGs
  - Economic assessment disaggregated by methane source and by country or region
  - These data used by over 19 international climate modeling teams (MIT, EPRI, PNNL, AIM, RIVM, etc)
  - Special Issue of Energy Journal in Summer 2005
  - Data available on the EPA website: www.epa.gov/methane

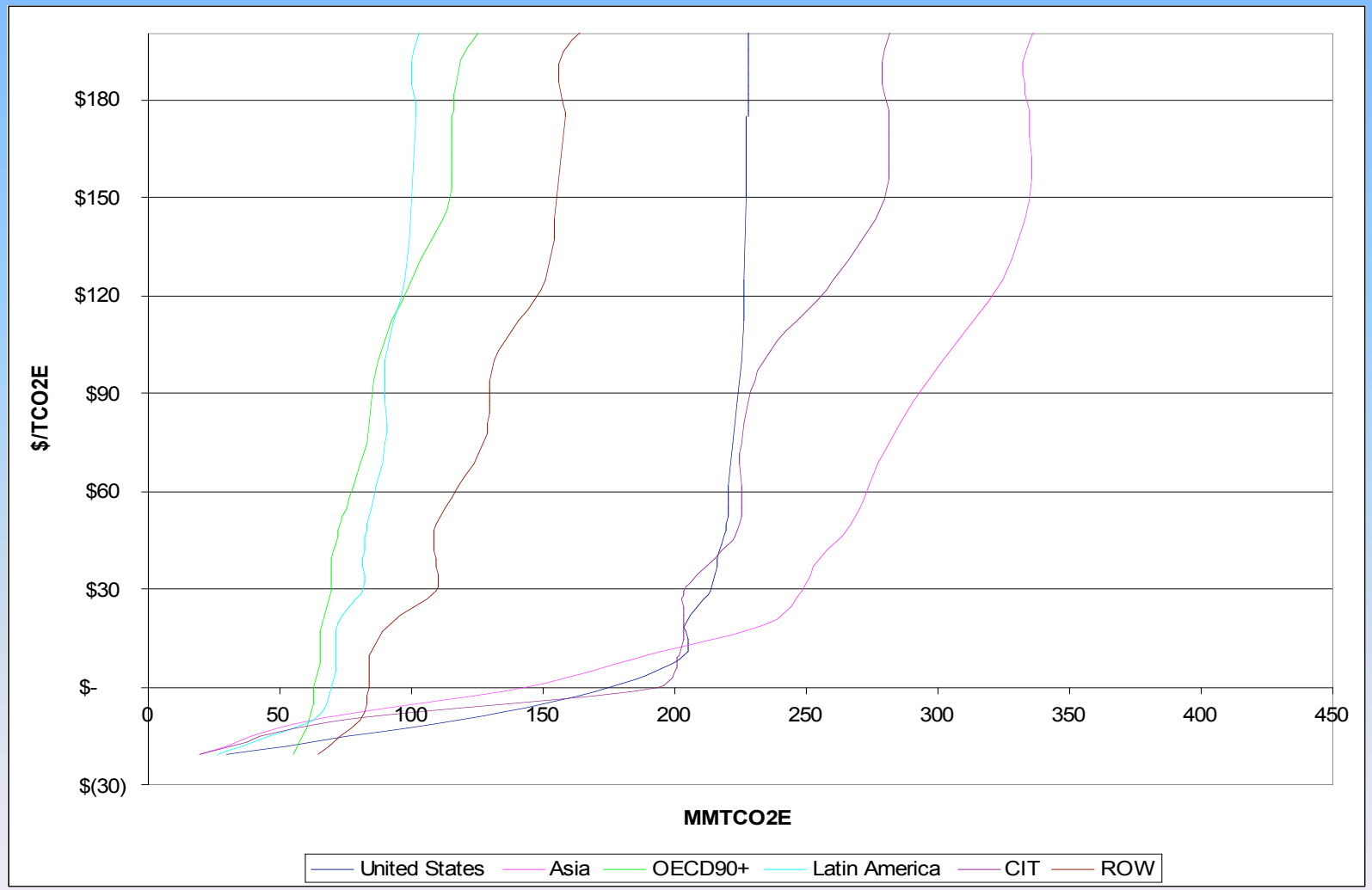
2010 Coal Mining Cost Curve (for selected countries)



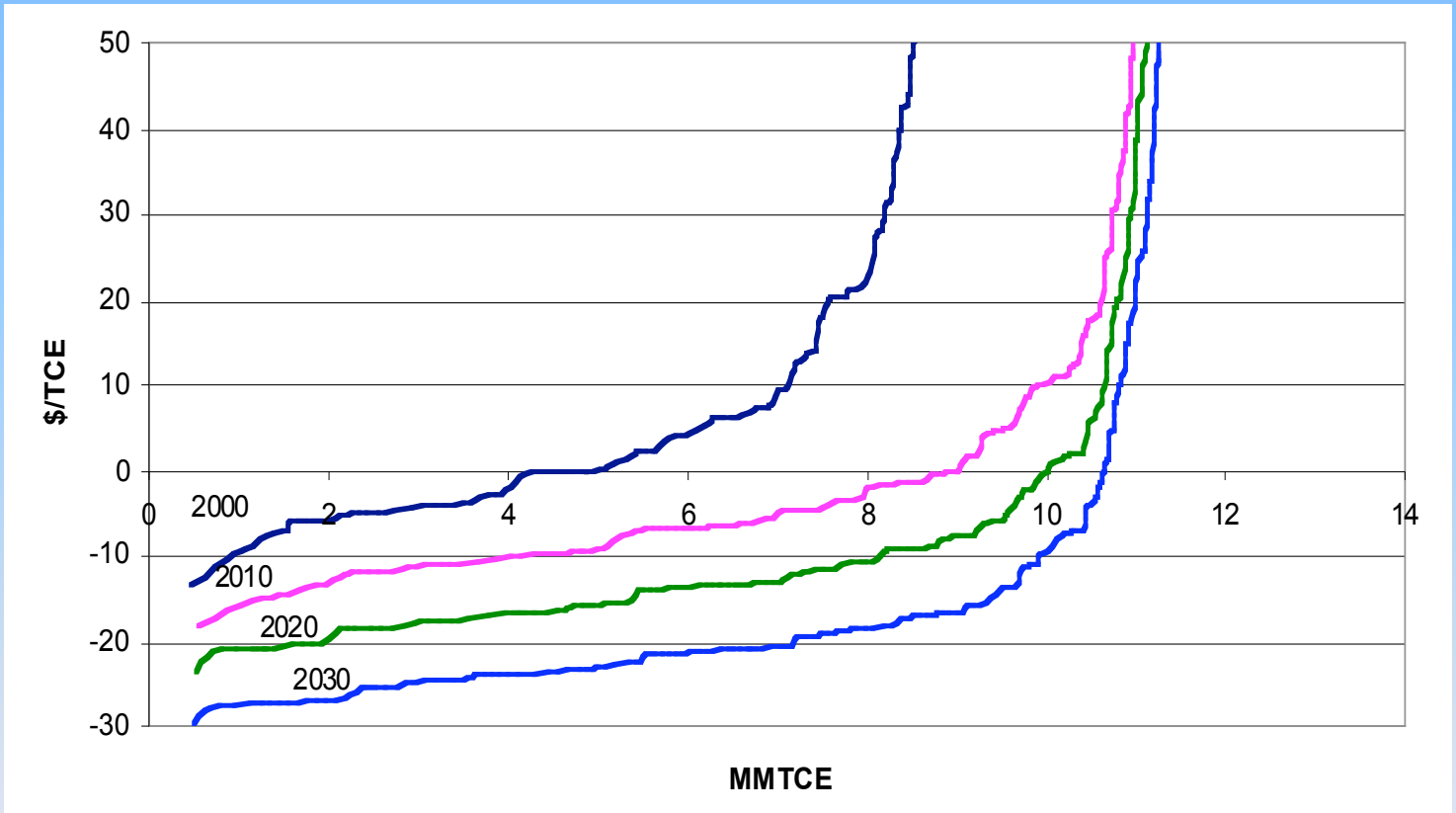
2010 Natural Gas Cost Curve (for selected countries)



2010 Aggregate Cost Curve (by Region; coal, gas & solid waste)



New Work: Cost Curves will Change over Time
U.S. Cost Curve for Coal Mining Sector



Barriers beyond Economics

- Lack of awareness of emission levels and value of lost fuel
- Lack of information on and training in new technologies and practices
- Traditional industry practices
- Regulatory and legal issues
- Limited methane markets and infrastructure
- Uncertain investment climate

Policy Instruments for Methane Recovery

- Voluntary programs aimed at overcoming market barriers
  - Successful strategy in US with coal, landfill & oil/gas
  - Focuses on cost-effective reduction opportunities
- Regulatory programs
  - Ex: US Landfill Rule, EU Landfill Directive, flash tanks
  - Generally motivated by other environmental concerns
- Financial Incentives
  - Tax credits (i.e., coalbed methane, renewable energy)
- Market Mechanisms
  - Emissions trading or offsets

All policy instruments are not appropriate for all methane sources!

Methane in the Kyoto Protocol

- Methane included in "basket of gases"
- Domestic methane reductions targeted by many Annex I countries
  - However, CH_4 not currently included in the EU emission Trading System
- Strong international interest in methane through the Clean Development Mechanism (CDM)
  - Primarily landfills and livestock manure
  - CDM is off to a "slow start" administratively

Methane to Markets Partnership

- Launched in November 2004 through US leadership
- Promotes near-term development of cost effective methane projects
- Will provide targeted assistance to developing and transition countries
- Focuses on coal, oil & gas, landfills, and manure
- 15 Countries have joined
  - Argentina, Australia, Brazil, China, Colombia, India, Italy, Japan, Korea, Mexico, Nigeria, Russia, Ukraine, United Kingdom, and the United States
  - Canada, Germany have stated intent to join
  - ~55% of global emissions covered already

Methane to Markets Plays a Unique Role

- Ensures high-level focus specifically on methane
  - Overcomes the neglect that goes with being the "second most important GHG"
  - Raises awareness within governments of the multiple reasons for methane recovery
- Directly engages the private sector and financing organizations in methane recovery
- Creates opportunities for exchange and action between all participants with a role in project development

Methane to Markets supports the goals of the UN Framework Convention.
It is not an "alternative" to the Kyoto Protocol

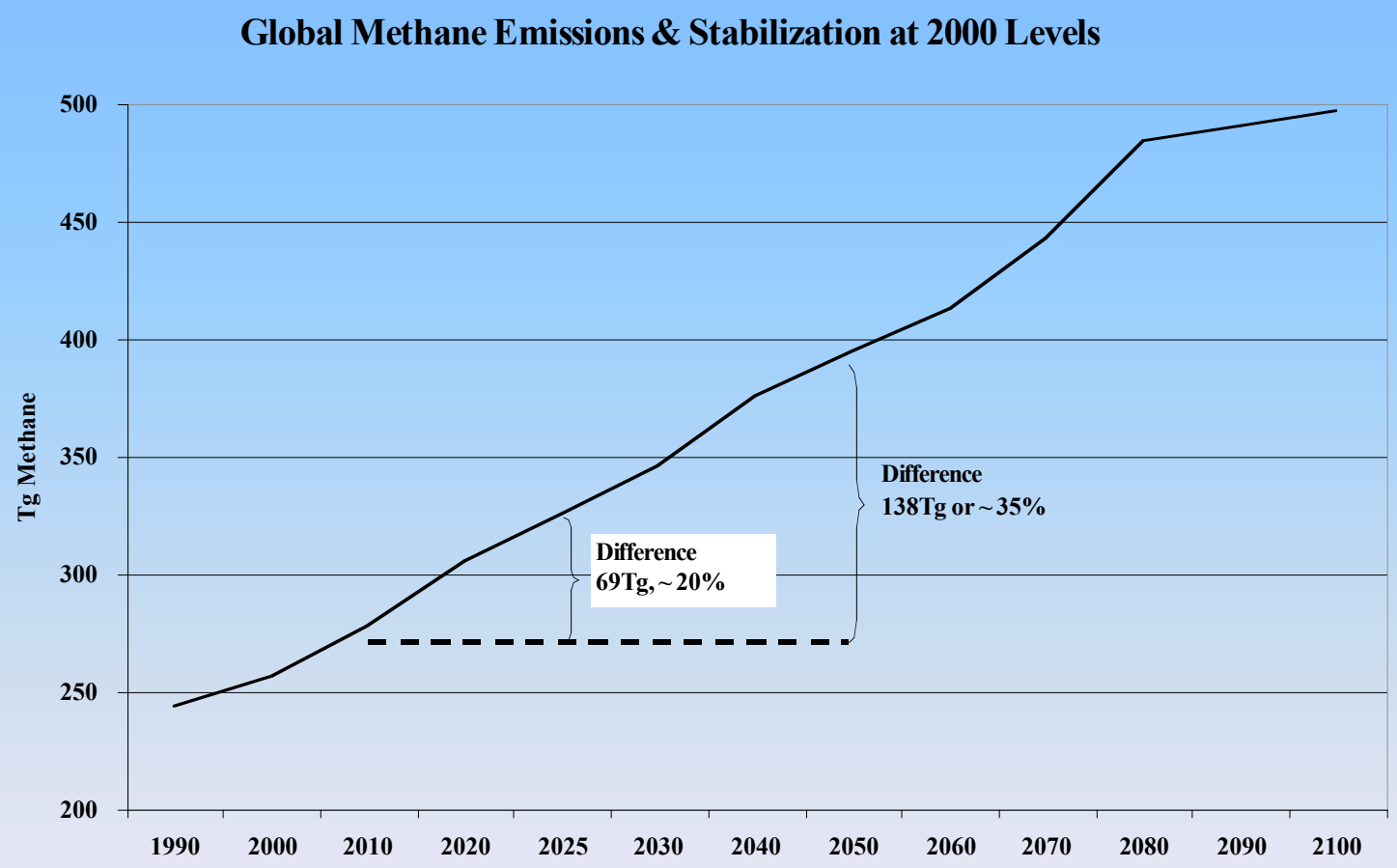
Take Home Messages for CH_4 …

- Methane is essentially "natural gas"
  - Technologies for methane recovery and use are available
  - Favorable economics due to the market value of natural gas
- Many methane projects can be readily "added on" or integrated into ongoing operations
  - Issues like premature retirement of capital are rare
- The non-climate reasons for reducing methane are frequently more important to the involved parties
  - Safety issues
  - Productivity
  - Quality of life – odors, clean fuel supplies

So, is there potential for a "success story" here?

- It depends…
  - Technically: significant, near-term reduction potential
  - Economically: many profitable opportunities and more at comparatively low-cost (in climate terms)
- But what level of CH_4 reduction is "success"?
  - Methane to Markets & the Kyoto Protocol will result in emission reductions
  - Are these approaches "enough"?
- In 2002, we examined the feasibility of the methane component of the "Hansen scenario"
  - Could we stabilize methane emissions over the period 2000 to 2050?
  - The analysis has not been updated but main findings hold true

Global CH4 emissions and stabilization at 2000 levels



Source: Courtesy H. Pitcher MiniCAM B2 run

Global and Regional Anthropogenic Methane Emission Projections (Tg-CH_4)

Conclusion

- *Stabilization could nearly be achieved in 2025 based on the emission reduction potential associated with four major methane sources: landfills, coal mines, natural gas and oil systems, and manure management systems*

- *Maintaining stabilization through 2050 would necessitate emission reductions across a wider array of sources, particularly ruminant livestock and rice production.*

- But success is also dependent on
  - A willingness to pay
  - Ability to achieve global participation in reducing emissions