A Multi-Gas Approach to Climate Policy -- with and without GWPs

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Benefits Workshop
12-13 December 2002
OECD
Paris

Two Questions

• What are the implications of a multi-gas approach when designing policies for complying with emission constraints?

• Are there alternatives to GWPs, which provide a better welfare-based justification for action?
MERGE

- Multi-gas focus (CO2, CH4 & N2O)
- When a constraint is placed on GHG emissions, the choice of technologies for the energy sector is influenced by their CO2 and CH4 emission characteristics
- Non-energy related emissions of CH4 and N2O are treated endogenously through time- and region-dependent marginal abatement cost curves
- "Second basket" of gases is not yet included
- Carbon sinks are introduced through time- and region-dependent supply curves
- Cooling effect of sulfate aerosols is introduced

MERGE Web Site Address

http://www.stanford.edu/group/MERGE/
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US Emissions in 2010 under Single-gas and Multi-gas Scenarios
US in 2010 -- Optimal Mix of Options for Reductions

GDP Losses in 2010
Two Questions

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Reference Case vs. Ceilings of $2^\circ$ and $3^\circ$ C (temperature increase from 2000, °C)

Incremental Value of Carbon Emission Rights
Price of a Ton of CH4 Relative to Carbon

Price of a Ton of CH4 Relative to Carbon -- Rate of Change Constraint
Prices of a Ton of CH4 Relative to Carbon

![Graph showing the price ratios of a ton of CH4 relative to carbon over time from 2000 to 2100. The graph includes two lines: one for base case damages and another for high damages, with 100-yr GWP indicated.]

Final Comments

- Focusing only on CO2 can lead to significant biases in the estimation of compliance costs.
- A multi-gas approach requires some way to establish equivalence among gases.
- Current approach -- the use GWPs -- has several limitations.
- We examine alternative approaches based on cost-effectiveness and cost-benefit analysis.
- Show that tradeoffs among gases depend both upon the target and the proximity to the target.