



Greenhouse Gas Stabilization Targets: What are the Near-term Implications?

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Presentation Outline

- Current and Projected GHG Concentration Levels
- Near-Term Emissions Targets towards GHG Stabilization
 - Emissions Corridor
 - Emission Level in 2020 and 2050 towards stabilization at 450 and 550 ppm CO₂e
- Global Emissions Budget: Near-term implications
 - Electricity Sector: Coal-fired power plants
- Conclusions and Key Questions



Current and Projected GHG Emissions and Concentration Levels

- Current GHG concentration levels
 - » CO₂ conc. in 2005: 381 ppm
 - » CO₂ + non-CO₂: 430 ppm CO₂e
 - » Increasing at a rate of 2.5 ppm annually
- GHG Emissions projected to grow rapidly
 - » Annual CO₂ emissions to increase by 66~77% during 2003-2030
 - » Non-CO₂ increases at a slower rate, uncertainty w/ LUCF
- GHG conc. to increase to 630 ppm CO₂e in 2050 under BAU
- Stabilization at any level requires 80+% emission reduction from 2000 levels in the long term
- The earlier the emissions decline, the lower the stabilization level



Translating Stabilization Targets: Near-Term Emissions Pathways

- “Emissions Corridor”: Several emissions pathways lead to a similar stabilization level
 - » Variation is due to timing and height of the emissions peak and emission reduction before and after the emissions peak
- Near-term emissions targets (e.g., 2020) or ranges will therefore help define what is expected from int’l efforts
- Results of stabilization pathway analyses often differ due to:
 - » Representation of carbon cycle
 - » Overshooting or not
 - » Non-CO₂ gasses
 - » Land use change and forestry



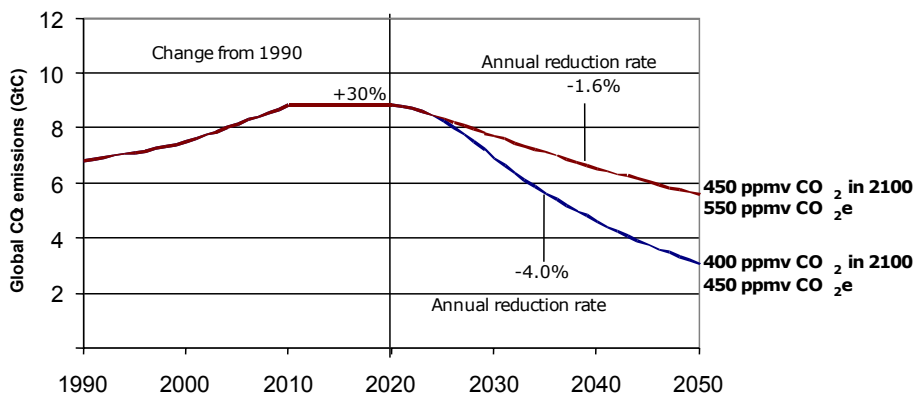
Emissions Levels towards 450 and 550 ppm CO₂e

Stabilization targets	Emission level in 2020 compared to 1990 level	Peak	Emission level in 2050 compared to 1990 level
450 ppm CO ₂ e (~400 CO ₂ only)	-10% to +30%	2010	-30% to -60%
550 ppm CO ₂ e (~450 CO ₂ only)	-10% to +50%	2015 to 2040	-0% to -40%

- The range of emissions towards a lower stabilization level at 450 ppm is narrower than 550 ppm CO₂e.
- Emissions corridor in 2050 is usually narrower than in 2020.
- CO₂ Emissions in 2003: 21% compared to 1990 level
- CO₂ Emissions in 2015 under IEA Reference Scenario (WEO 2006): 56% compared to 1990 level



Stabilization Pathways towards 450 and 550 ppm CO₂e



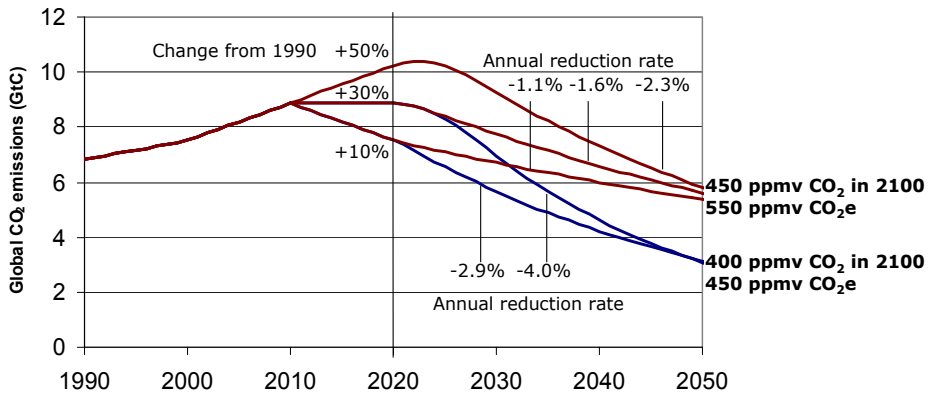
*considering only fossil and LUCF CO₂ and assuming other gases are reduced at the same rate; allowing overshooting in the 450 CO₂e case of 20~30 ppm

Rapid Emission Reduction May Not Be Economically Viable

- Historically, sustained annual emission reduction at a rate greater than 1% has been rarely achieved:
 - » United Kingdom: significant level of fuel switch from coal to gas
 - » France: nuclear power development
 - » Only the economic crash of the former Soviet Union states led to their emissions decrease faster than 1% annually
- The faster the required rate of emission reduction annually, the later and the higher emissions peak



Stabilization Pathways towards 450 and 550 ppm CO₂e



*considering only fossil and LUCF CO₂ and assuming other gases are reduced at the same rate; allowing overshooting in the 450 CO₂e case of 20 to 30 ppmv

Example Country Scenarios – CCAP Sectoral Approach

	Option 1	
	Change Relative to 1990	Change Relative to BAU
USA	0%	
EU25	-30%	
Russia	-30%	
Japan	-30%	
Annex I	-20%	
Brazil	166%	-1%
China	64%	-27%
India	135%	-24%
Mexico	151%	-5%
South Africa	71%	-7%
South Korea	149%	-22%
Non-Annex I	125%	-12%



Source: Schmidt et al., 2006; Höhne et al. 2006

Example Country Scenarios 2

	Option 2	
	Change Relative to 1990	Change Relative to BAU
USA	0%	
EU25	-24%	
Russia	-37%	
Japan	-22%	
Annex I	-18%	
Brazil	90%	-21%
China	95%	-22%
India	164%	-21%
Mexico	85%	-27%
South Africa	55%	-21%
South Korea	138%	-28%
Non-Annex I	102%	-22%



Source: Schmidt et al., 2006; Höhne et al. 2006

Global Emissions Budgets: Near-term Implications

- Global Emissions Budget (GEB) is a total net cumulative GHG emissions over the mitigation timeframe that should not be exceeded if the stabilization target is to be achieved.
- Under the BAU scenario, GEB for 2001-2100 is 6976 GtCO₂.

Stabilization Targets	GEB for 2001-2100 (GtCO ₂)	% of BAU GEB
450 ppm CO ₂ e	2100	30%
550 ppm CO ₂ e	3700	53%

- Cumulative emissions
 - » 2001-2003: 75 GtCO₂
 - » 2004-2030: 911 GtCO₂ under IEA Reference Scenario



Global Emissions Budget in the Context of Global Electricity Sector

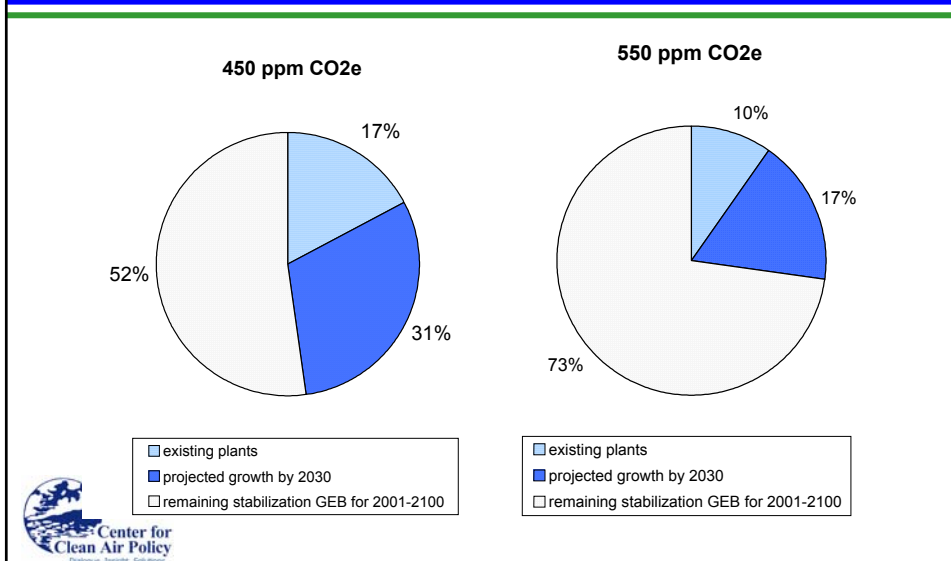
- Coal-fired power plants
 - » Accounted for 19% of total all-sector emissions in 2000
- Generation Capacity:
 - » Existing: 1119 GW in 2003
 - » Projected net addition (new - retirement): 1330 GW in 2004-2030*
- Each facility implies a certain “emission commitment” if operated over its lifetime and not retired prematurely
- Approx. emission commitments of coal-fired power plants**
 - » Existing: ~360 GtCO₂e
 - » New: ~643 GtCO₂e



*Source: IEA World Energy Outlook 2006. Reference Scenario

**Assumption: an average 500-MW new coal-fired power plant = average annual emission of 4 MtCO₂ = 242 MtCO₂ over its 60-year lifetime

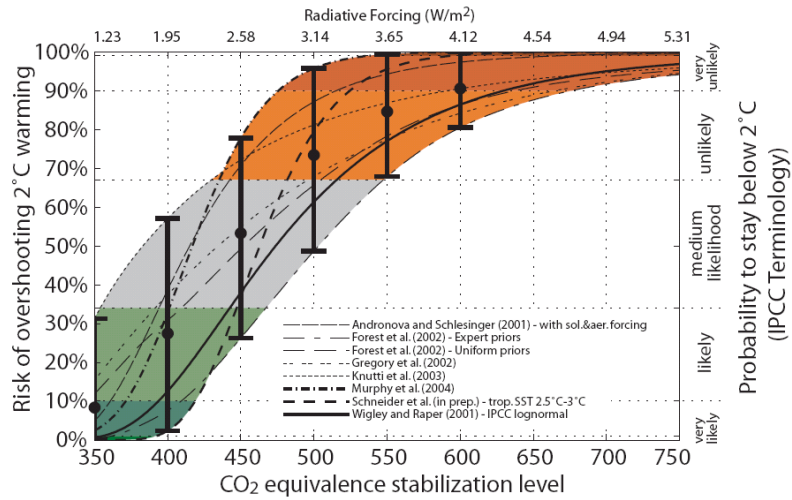
Implication of the Electricity Sector Growth on Stabilization at 450 and 550 ppm CO₂e



Critical Questions for the International Effort in Developing Post-2012 Climate Policy

- Can we get an initial sense of the aim in the 2050 timeframe? Can we agree that we want to keep in play the possibility of reaching stabilization at 450, 550 ppm CO₂e, or higher?
- Is there a global emissions budget for 2020 that is politically feasible and would keep the possibility of achieving the stabilization goal in #1 in play? Does it lead to a post-2020 annual emission reduction rate that is realistic to achieve?
- How might we divide up the shares of the 2020 emission reduction goal among groups of countries to find a package that is politically acceptable to all? How much could A1 countries do? What about current non-Kyoto parties? How much could NA1 countries do unilaterally or voluntarily beyond the CDM?
- What shape might the 2020 budget goal take? Specified targets, a range of linked pledges, etc?

Potential Stabilization Targets: Temperature Changes and Stabilization Levels



Source: MEINSHAUSEN – ON THE RISK OF OVERSHOOTING 2°C. Paper presented at Scientific Symposium "Avoiding Dangerous Climate Change", MetOffice, Exeter, 1-3 February 2005