Overview of EMF 22 International Scenarios

Tuesday, September 15, 2009

Overview

- **The goal of EMF 22 is to put together, in a timely manner, a high-quality, coordinated set of transition policy scenarios using high-quality modeling to inform ongoing and upcoming climate policy discussions.**

- Moving from idealized scenarios to more realistic scenarios that don't satisfy perfect where, when, and what flexibility.
- Three focus areas:
  - **International transition scenarios:** Delayed participation and long-term concentration goals.
  - **U.S. transition scenarios:** Three cumulative emissions goals through 2050 in the U.S.
  - **E.U. transition scenarios:** Unpacking the E.U. 2020 goal.
- Modelers required to construct a common set of scenarios, but they also include their own scenarios that inform particular facets of the issues being explored.

This was a fast-track project, but it still has taken some time.

- A range of meetings dating back several years, including Tsukuba, December, 2006
- Design Meeting: Dublin, February 21-22, 2008
  - Working meeting to identify key issues and discuss study design
  - Finalize study design soon after
- Preliminary Results Meeting: IIASA, September 25-26, 2008
  - Present preliminary results and obtain feedback
  - Make data and presentations available to modelers after meeting
- Final Data Due, February 2009
- Final Modelers Meeting: March, 4-5, 2009
  - Present final results and obtain feedback
  - Discuss key themes
  - Make data and presentations available to modelers immediately after meeting
- Draft Papers: April, 2009
- Communication
  - Meeting in DC: June 4, 2009
  - E.U. Rollout Activities: In Planning
- Special Issue: All papers completed and posted on Science Direct; completing overview papers

The EMF 22 International Scenarios explore ten possible international approaches to mitigation.

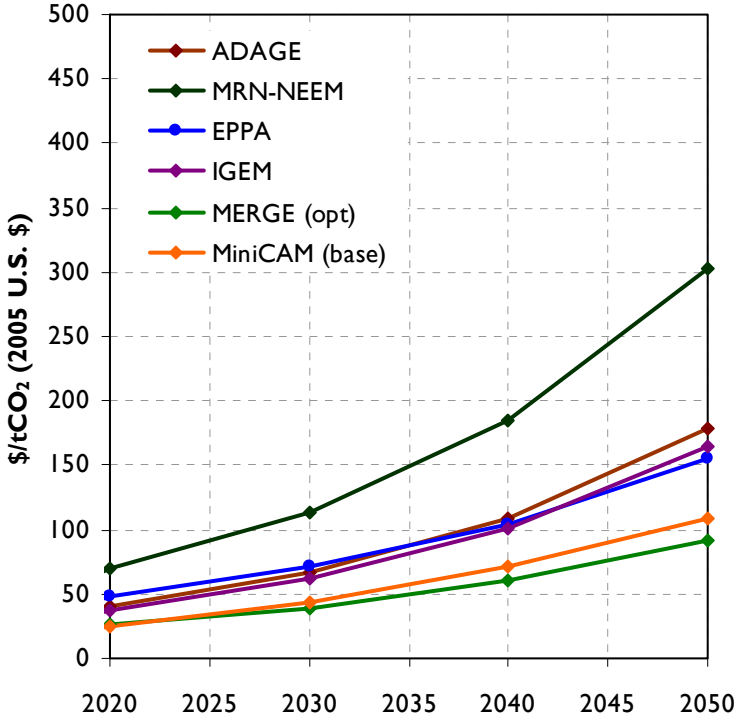
- The ten scenarios are combinations of
  - Three concentration goals based on Kyoto gases
    - (1) 450 CO2-e, (2) 550 CO2-e, and (3) 650 CO2-e
  - Two means of achieving concentration goals
    - (1) not-to-exceed this century and (2) overshoot through 2100
  - Two international policy regimes
    - (1) Full participation immediately and (2) delayed participation by non-Annex 1 regions and Russia

Who Participated in the EMF 22 Scenarios

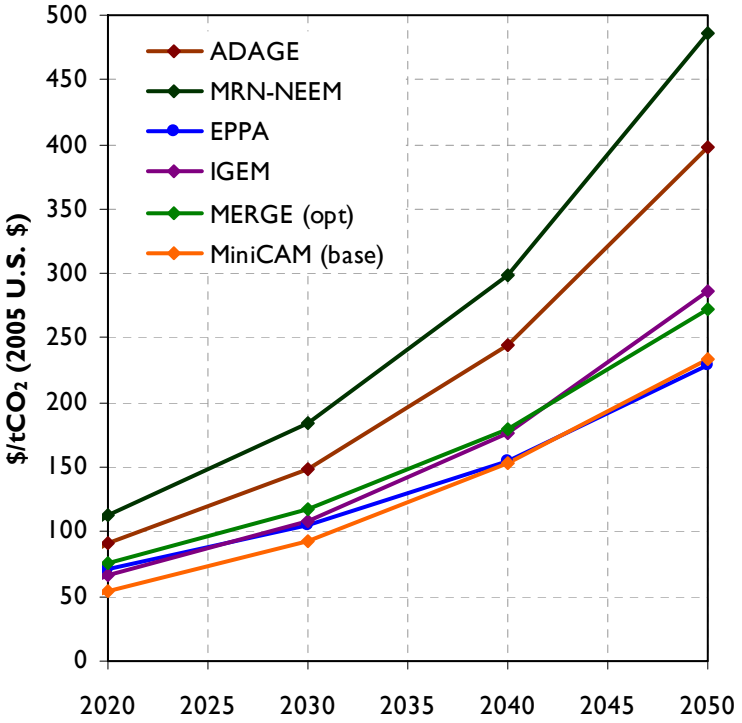
	Models	International Scenarios	U.S. Scenarios	E.U. Scenarios
1	ADAGE		X	
2	EPPA		X	
3	IGEM		X	
4	MRN-NEEM		X	
5	MERGE	X	X	
6	MiniCAM	X	X	
7	ETSAP-TIAM	X		
8	FUND	X		
9	GTEM	X		
10	IMAGE	X		
11	MESSAGE	X		
12	POLES	X		
13	SGM	X		
14	WITCH	X		
15	DART			X
16	GEMINI-E3			X
17	PACE			X

Sample Results: Allowance Prices in the U.S. Study

"50% Reduction" by 2050



"80% Reduction" by 2050



Sample Result: Scenarios From the International Study

	Model	650 CO2-e		550 CO2-e				450 CO2-e			
		Full	Delay	Full		Delay		Full		Delay	
		Not-to-Exceed	Not-to-Exceed	Not-to Exceed	Overshoot	Not-To-Exceed	Overshoot	Not-to Exceed	Overshoot	Not-To-Exceed	Overshoot
1	ETSAP-TIAM	+	+	+	+	+	+	+	+	XX	+
2	FUND	+	+	+	+	+	+	XX	+	XX	XX
3	GTEM	+	+	+	+	XX	+	XX	+	XX	XX
4	IMAGE	+	+	+	+	+	+	XX	XX	XX	XX
	IMAGE-BC	-N/A-	-N/A-	-N/A-	-N/A-	-N/A-	-N/A-	XX	+	XX	XX
5	MERGE Optimistic	+	+	+	+	XX	XX	XX	XX	XX	XX
	MERGE Pessimistic	+	+	+	+	+	+	XX	XX	XX	XX
6	MESSAGE	+	+	+	+	XX	+	XX	+	XX	XX
	MESSAGE - NOBECS	+	-N/A-	+	+	-N/A-	-N/A-	XX	+	XX	XX
7	MiniCAM Base	+	+	+	+	XX	+	+	+	XX	+
	MiniCAM LoTech	+	+	+	+	XX	+	XX	+	XX	XX
8	POLES	+	+	+	+	XX	+	XX	XX	XX	XX
9	SGM	+	+	+	+	+	+	XX	XX	XX	XX
10	WITCH	+	+	+	+	+	+	XX	XX	XX	XX

Some models were unable to achieve particular climate action cases under the specs of the study.

Sample Results: The Challenges of 450 CO_2-e

(*From the MiniCAM Paper: Calvin et al.*)

	Not-to-Exceed	Overshoot
Immediate Accession	1) Includes immediate participation by all regions 2) Includes 70% dramatic emissions reductions by 2020 3) Includes substantial transformation of the energy system by 2020, including the construction of 500 new nuclear reactors, and the capture of 20 billion tons of CO2 4) Includes a carbon price of $100/tCO2 globally in 2020 5) Includes a tax on land-use emissions beginning in 2020 6) Includes advanced technologies	1) Includes immediate participation by all regions 2) Includes the construction of 126 new nuclear reactors and the capture of nearly a billion tons of CO2 in 2020 3) Includes negative global emissions by the end of the century, and thus requires broad deployment of bioCCS technologies 4) Carbon prices escalate to $775/tCO2 in 2095 5) Possible without a tax on land-use emissions, but would result in a tripling of carbon taxes and a substantial increase in the cost of meeting the target.
Delayed Accession	X	1) Includes dramatic emissions reductions for Groups 2 and 3 at the time of their accession, 2) Includes negative emissions in Group 1 by 2050 and negative global emissions by the end of the century, and thus requires broad deployment of bioCCS technologies 3) Carbon prices begin at $50/tCO2, and rise to $2000/tCO2 4) Results in significant land-use leakage, where crop production is outsourced to non-participating regions resulting in a substantial increase in land-use change emissions in these regions

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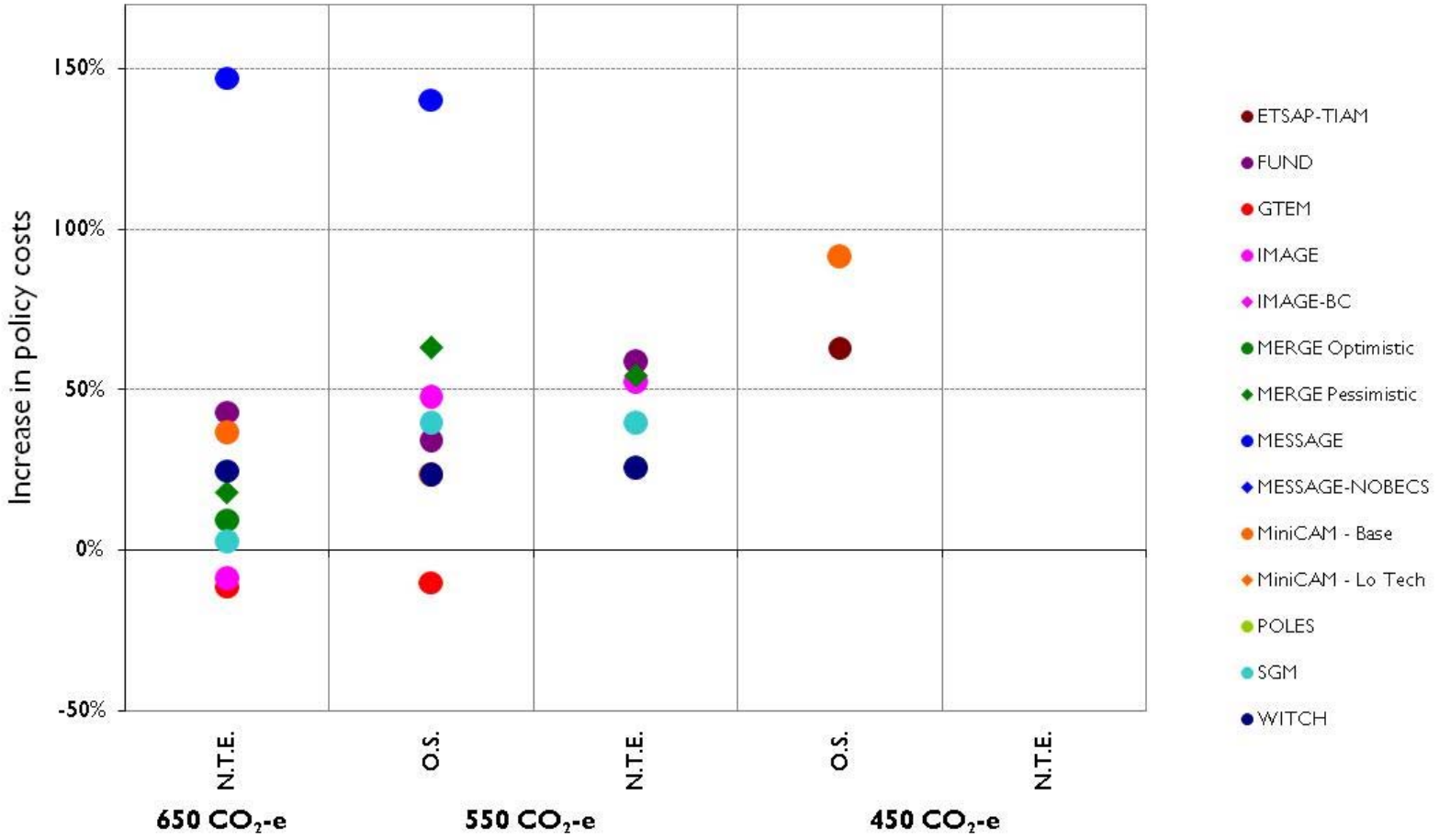
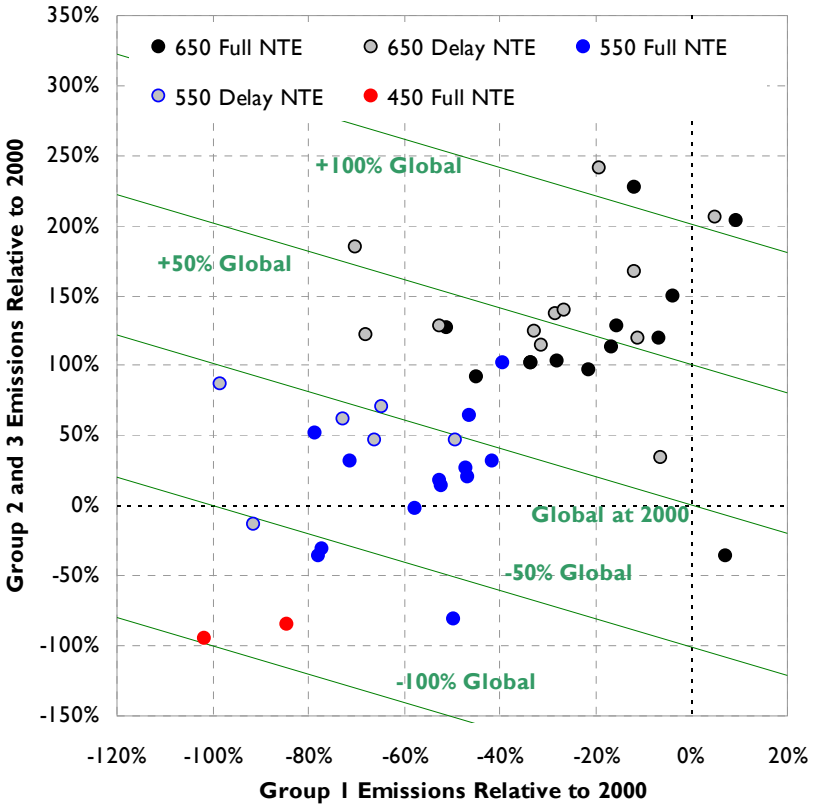
Sample Results: Costs of Delay to China

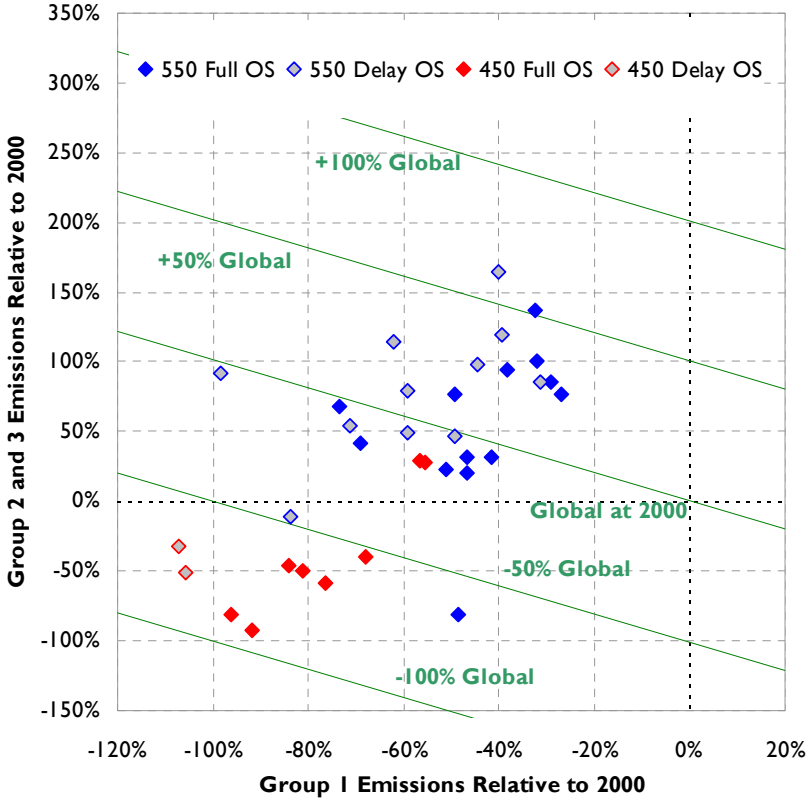


Sample Results: Regional Reductions in 2050 across Scenarios

Not-to-Exceed Scenarios



Overshoot Scenarios



Natural Extensions?

- More nuanced and "realistic" policy structures, particularly in the near-term.
  - More "Realistic" Relative Burdens
  - More "Realistic" Mechanisms for Mitigation (e.g., command and control policies)
  - Across Both: Consideration of Local Circumstances
- More exploration of technology development and deployment pathways.
- More explicit consideration of physical systems
  - For example, temperature based goals
  - Feedbacks, for example, land use and energy demand
  - The impacts of overshoots