Appendix C-4

Second Generation Model

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SGM Regions

- Annex I
  - United States
  - Canada
  - Western Europe
  - Japan
  - Australia
  - Former Soviet Union
  - Eastern Europe
- Non-Annex I
  - China
  - India
  - Middle East
  - Mexico
  - South Korea
  - Brazil
  - Rest of World

Model Overview and Purpose

- Goals of FCCC
- Carbon emissions vs. concentrations
- Uses for top-down economic models
- Recent analysis using SGM
  - Return to 1990
  - Energy Modeling Forum
  - 1998 Administration analysis
- Current SGM activities and development

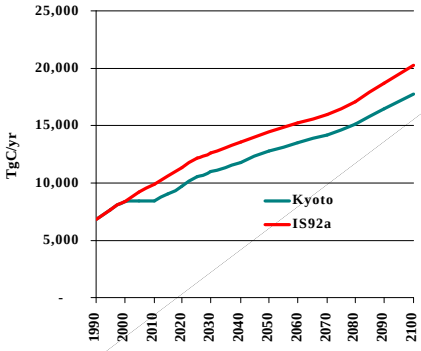
The FCCC

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

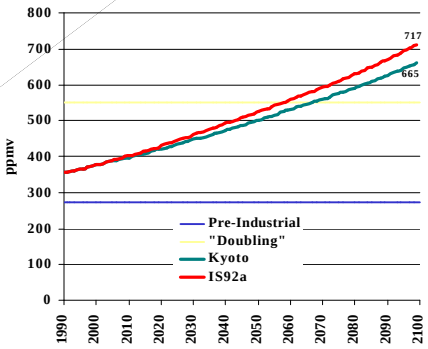
Article 2

Kyoto

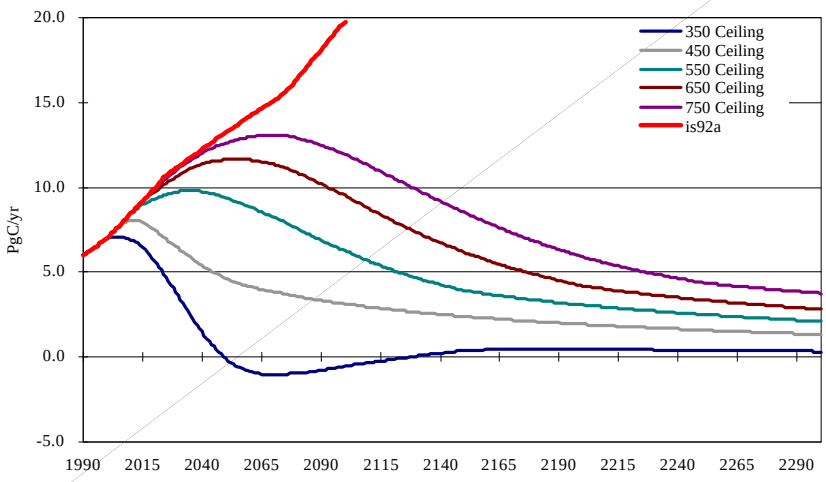
Emissions



Concentrations

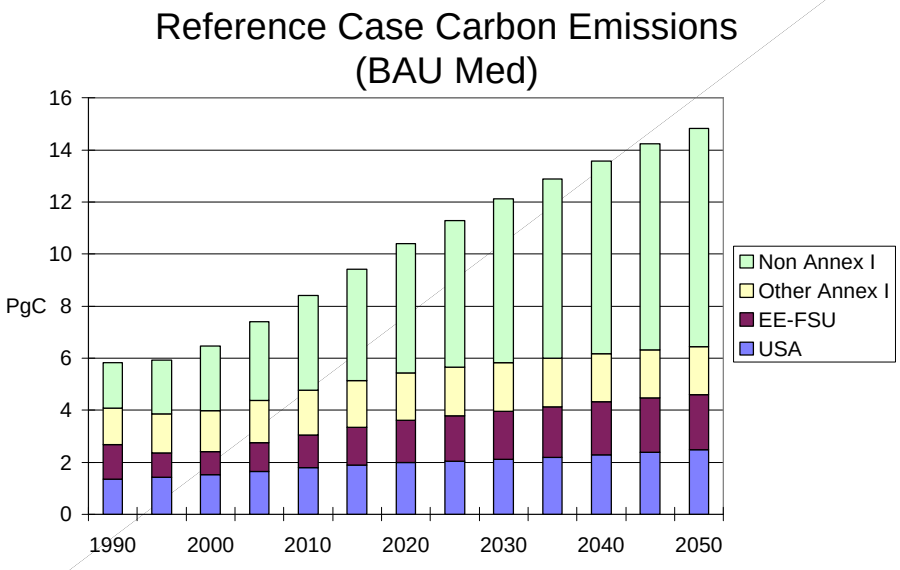


Atmospheric Stabilization



Top-Down Economic Models

- Project baseline carbon emissions over time for a country or group of countries
- Find the least-cost way to meet any particular emissions constraint
- Provide a measure of the carbon price, in dollars per metric ton
- Provide some measure of the overall cost of meeting an emissions target



Return to 1990

- Analysis completed before Kyoto
  - Annex I targets equal 1990 emissions
  - Sensitivity on targets (+10%, -10%)
- No credit for sinks and other gases
- Analysis with and without “paper tons”

US Permit Prices in 2010 (1992 US$)

No Paper Tons for EE/FSU

	No Trading	Annex I Trading	Global Trading
M1990 - 10%	173	109	38
M1990	108	72	26
M1990 + 10%	60	42	16

Paper Tons for EE/FSU

		Annex I Trading	Global Trading
M1990 - 10%		88	31
M1990		39	15
M1990 + 10%		6	2

Energy Modeling Forum

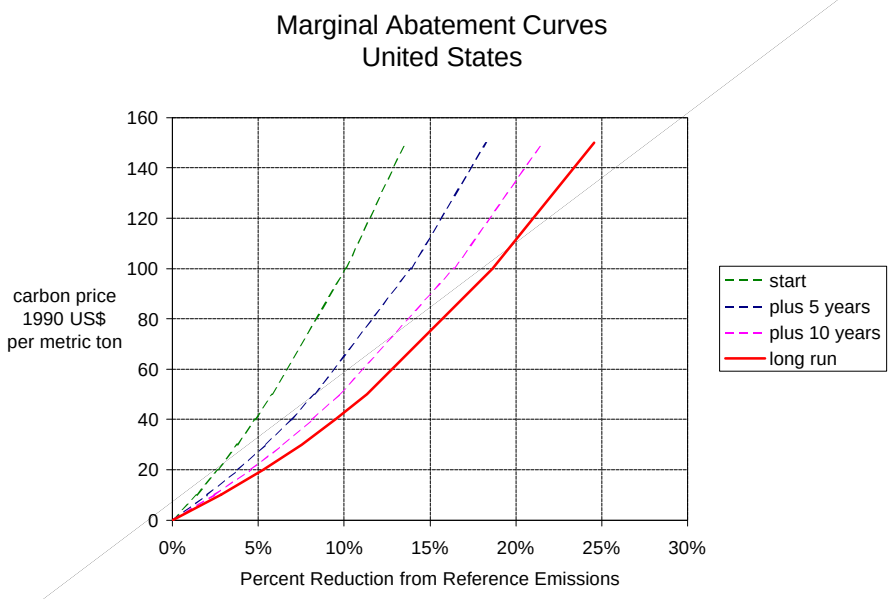
- EMF 14
  - Stabilize atmosphere
- EMF 16
  - Kyoto emissions targets
- EMF 18
  - Impact of Annex I actions on non-Annex I nations

US Permit Prices in 2010
(1990 US$)

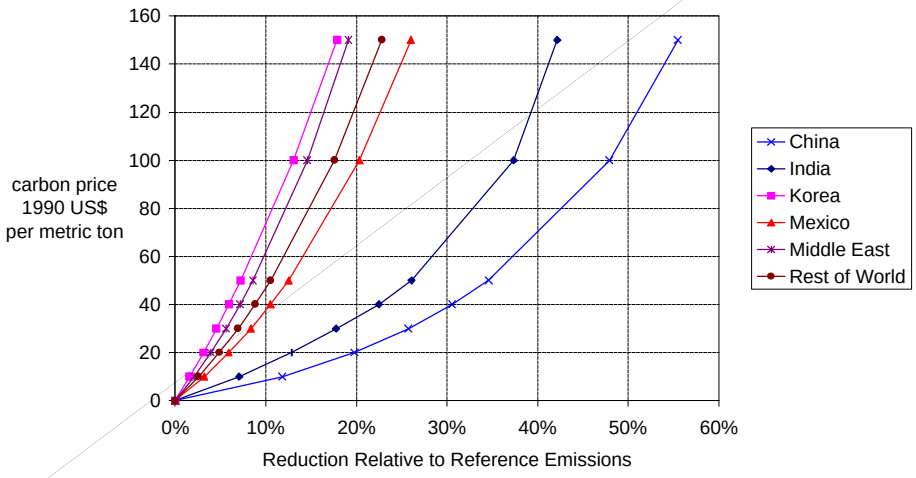
	No Trading	Annex I Limit on Sales	Annex I Limit on Purchases	Full Annex I Trading	CDM	Double Bubble	Annex I plus China and India	Global Trading
Kyoto Targets	**188**	181	103	**85**	73	59	27	**22**
Kyoto Targets + 5%	149							

1998 Administration Analysis

- Analysis by Council of Economic Advisers
- Reduced form analysis
  - SGM was not run directly
  - Marginal abatement curves derived from many SGM model runs
  - Emissions baselines taken from a different source (U.S. Energy Information Administration)
  - Supply curve for non-CO_2 greenhouse gases (U.S. Environmental Protection Agency)



Marginal Abatement Curves for Non-Annex I Regions



Measuring and Reporting Cost

- Direct Cost
  - area under marginal abatement curve
- International Transfer Payments
- Indirect Costs
  - terms of trade (energy)
  - terms of trade (non-energy)
  - energy tax/subsidy distortions
  - revenue recycling

SGM Data Requirements

Original Data	Derived Data for SGM
1990 Input-Output Table 1990 Energy Balances	Hybrid Input-Output Table
Annual Investment Data by Sector	Capital Stocks by Sector
Data on Fossil Fuel Resources	Resource Grades
Electricity Supply: generation, installed capacity, energy consumption, capital costs, operating costs	Input-output representation of electricity generation by fuel
National Income Accounts	tax rates, savings rates

Production Sectors in SGM

SGM 98

1 Agriculture
2 Everything Else
3 Oil Production
4 Gas Production
5 Coal Production
6 Biomass
7 Nuclear Fuel
8 Electricity Production
- Oil-Fired
- Gas-Fired
- Coal-Fired
- Nuclear
- Hydro

9 Oil Refining
10 Gas Distribution

SGM 2000

1 Other Agriculture
2 Everything Else
3 Oil Production
4 Gas Production
5 Coal Production
6 Coal Products
7 Biomass
8 Electricity Production
- Oil-Fired
- Gas-Fired
- Coal-Fired
- Nuclear
- Hydro

9 Oil Refining
10 Gas Distribution
11 Paper and Pulp
12 Chemicals
13 Cement
14 Primary Iron and Steel
15 Primary Non-Ferrous Metals
16 Other Industry
17 Passenger Transport
18 Freight Transport
19 Grains and Oil Crops
20 Animal Products
21 Forestry
22 Food Processing
23
24
25

Status and Future Work

- Improve analysis of electric supply, transportation, and biomass fuels
- Build new sectors for agriculture and forestry
- Improve ability to simulate emissions trading within a country
  - Sector targets
  - Emissions trading among sectors