Preliminary SGM Results for EMF 22 Transition Scenarios

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EMF 22
Climate Policy Scenarios for Stabilization and in Transition
December 12, 2006

SGM Overview

- Set of 13 regional dynamic recursive CGE models
  - USA, Aus. & NZ, Canada, Eastern Europe, Former Soviet Union, India, Japan, Korea, Mexico, Middle East, Western Europe, Rest of World
- Emphasis on energy transformation, energy consumption, and greenhouse gas emissions
- Model runs from 1990 – 2050 in five-year time steps
- Keeps track of capital stocks in five-year vintages by sector
- Energy balance is maintained throughout the model time horizon
- 7 gases: CO_2, CH_4, N_2O, HFCs, HFC-23, PFCs, SF6

Scenarios

- Cap & Trade
  - Declining cap starting at 2015 levels in 2015, declining at x% per year through 2035, and remaining constant thereafter.

1.1.1	Domestic Trading	x = 0.5%
1.1.2	Annex 1 Trading	x = 0.5%
1.1.3	Annex 1 Trading & CDM	x = 0.5%
1.2.1	Domestic Trading	x = 1.0%
1.2.2	Annex 1 Trading	x = 1.0%
1.2.3	Annex 1 Trading & CDM	x = 1.0%
1.3.1	Domestic Trading	x = 0.5%
1.3.2	Annex 1 Trading	x = 0.5%
1.1.3	Annex 1 Trading & CDM	x = 0.5%

Scenarios

- Carbon Tax Scenarios
  - Carbon tax starting at 7$/tCe in 2015, increasing linearly to $30/tCe in 2035, and remaining constant thereafter.

    2.1 Carbon tax applied to Annex 1 countries only

    2.2 Carbon tax applied Globally

Scenarios

- Optimal Scenarios
  - Full 'when' 'where' 'what' flexibility (i.e. banking with a 5% Hotelling interest rate, equal carbon price across countries, and multi-gas coverage).

    3.1.1 Global Hotelling Price – Cumulative Emissions Reductions Equivalent to 0.5% Declining Cap

    3.1.2 Global Hotelling Price – Cumulative Emissions Reductions Equivalent to 1.0% Declining Cap

    3.1.3 Global Hotelling Price – Cumulative Emissions Reductions Equivalent to 1.5% Declining Cap

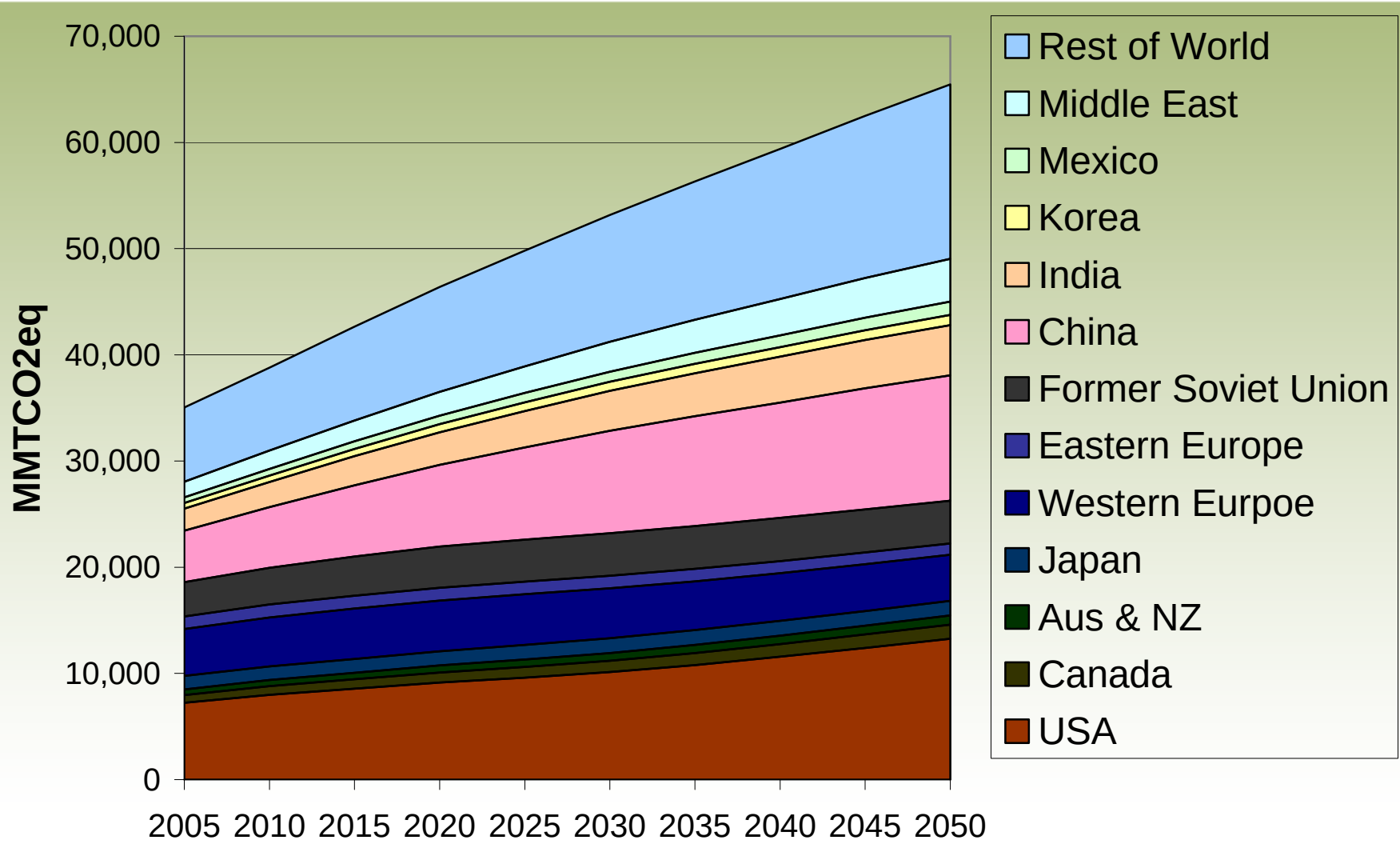
    3.2.1 Global Hotelling Price – Cumulative Emissions Reductions Equivalent to Annex 1 Linear Carbon Price

    3.3.2 Global Hotelling Price – Cumulative Emissions Reductions Equivalent to Global Linear Carbon Price

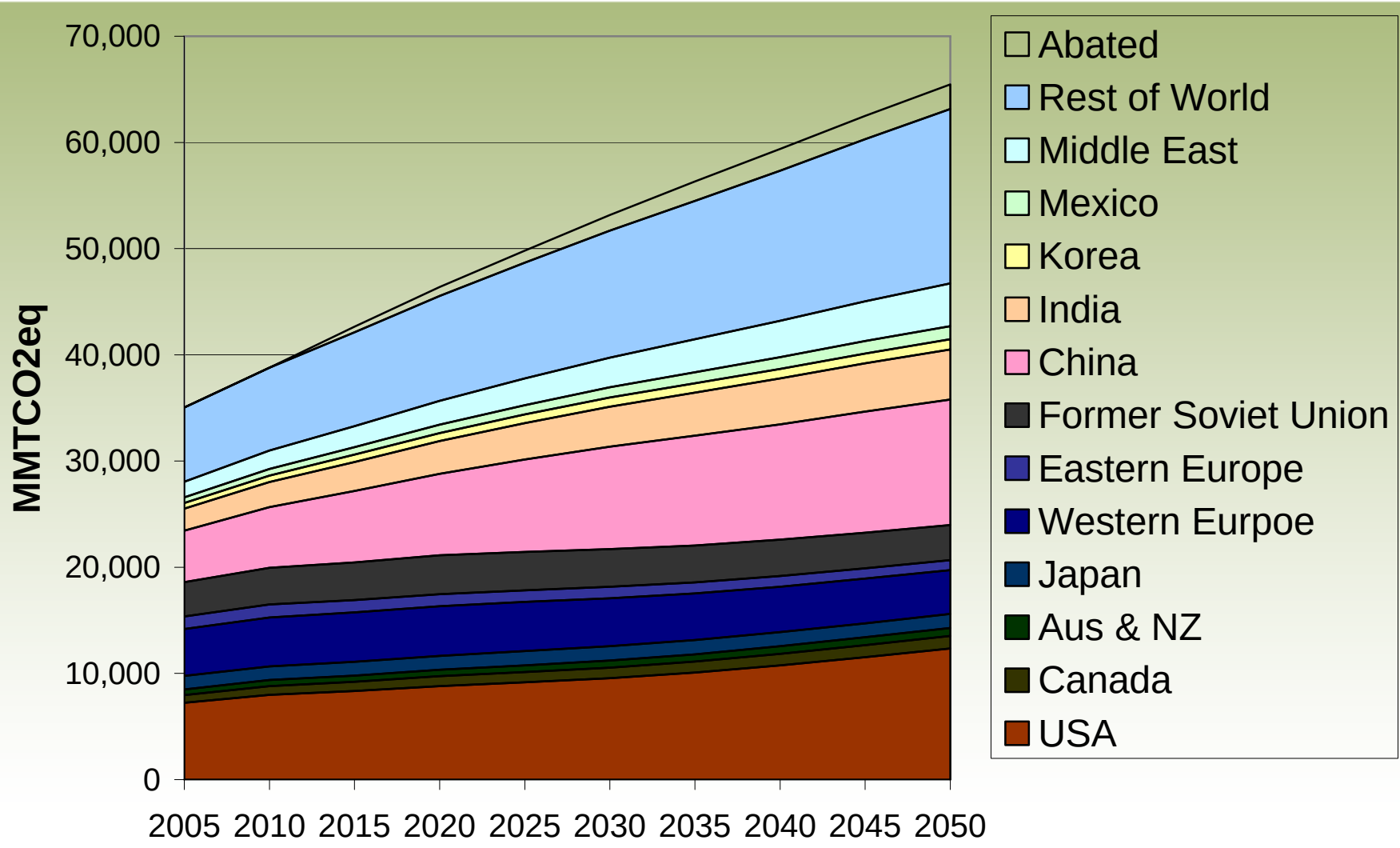
CDM Methodology

- For the CDM scenarios, we followed the methodology used in EPA's analysis of the Clean Air Planning Act (Carper, S.843 in 108th Congress), which was previously developed in cooperation with the White House Council of Economic Advisors.
  - The marginal abatement cost curves for each region are adjusted to account for expected differences between an optimal emissions trading program and a stringent offsets program.
  - The adjustments account for differences in the incentives for entities under the respective programs.
- In this analysis, the marginal abatement cost curves for CDM countries are shifted in by 75%.
- To implement this in SGM, we use an iterative procedure to limit the abatement in CDM countries to 25% of what would be achievable at the prevailing CO2 price in Annex 1 countries.

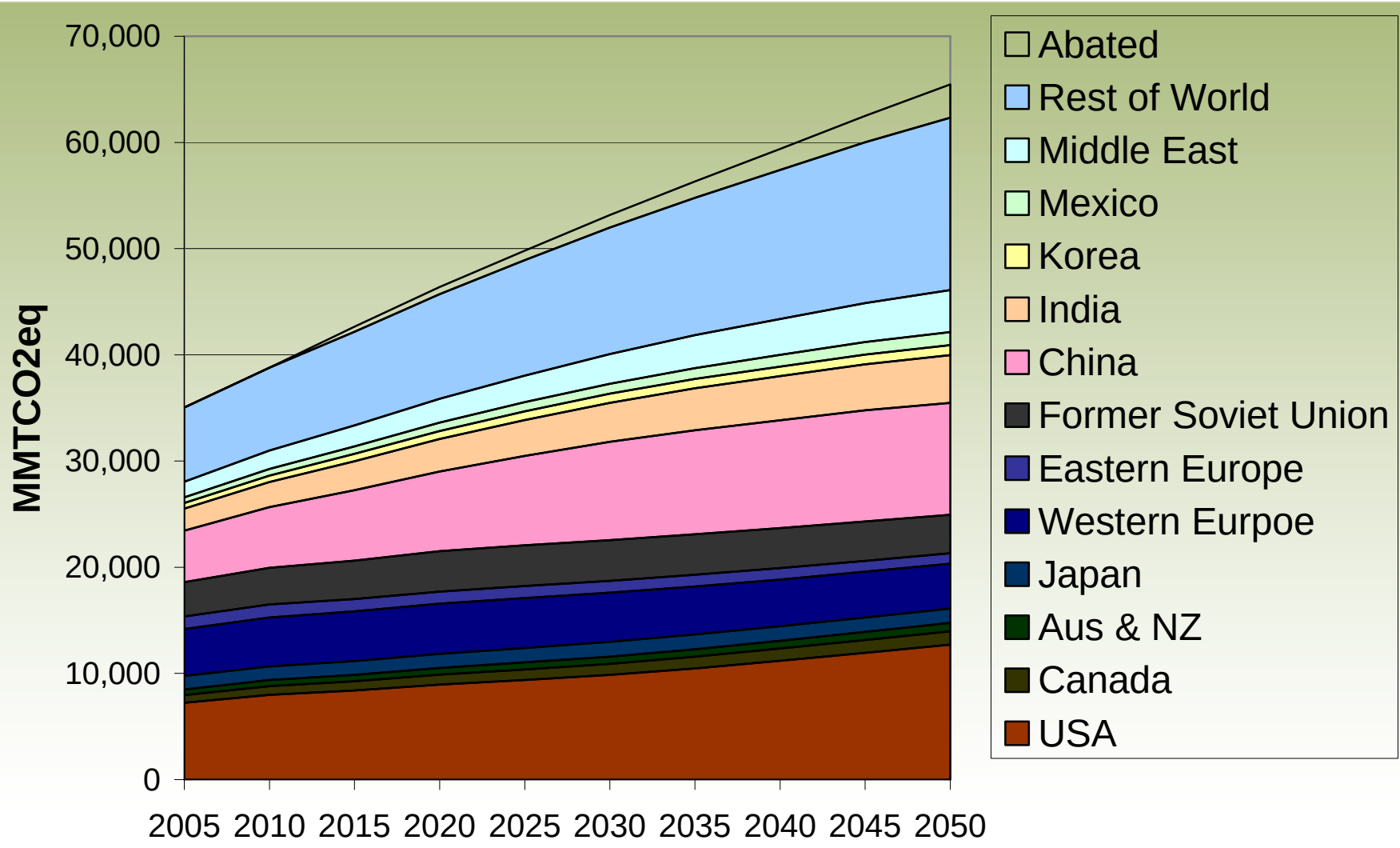
Total GHG - Base Case



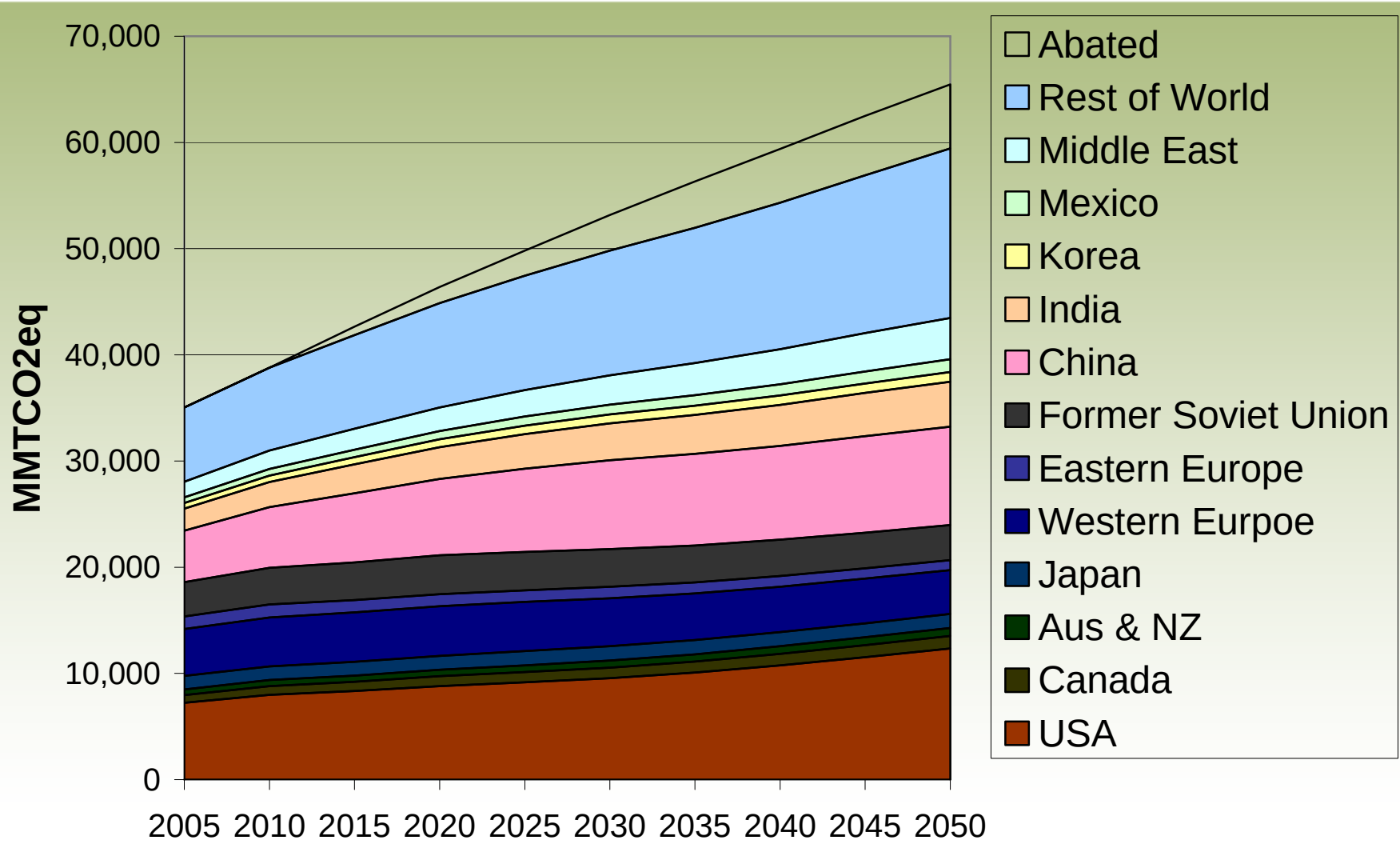
Total GHG - Annex 1 Linear Tax



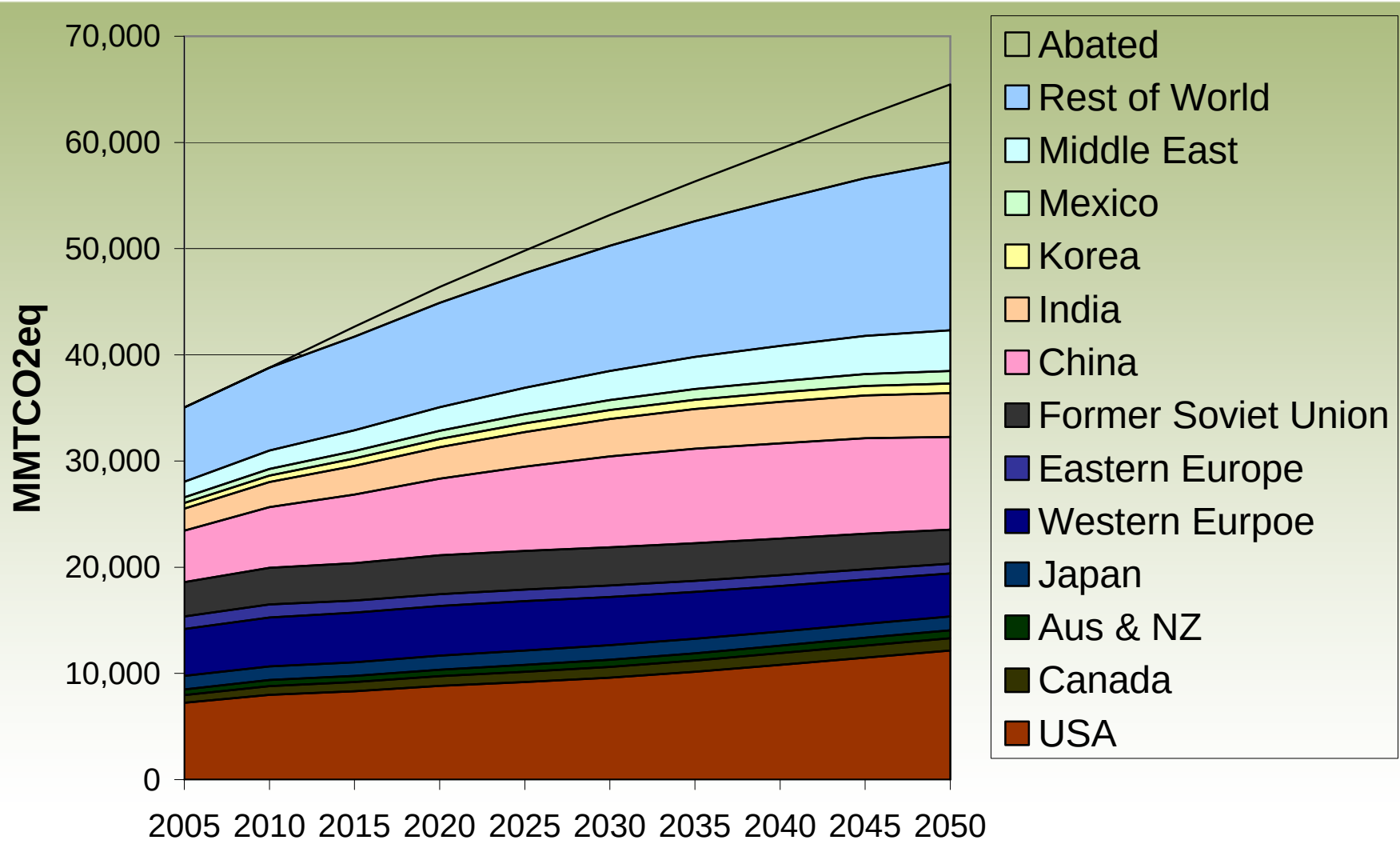
Total GHG - Global Optimal Tax (ALT)



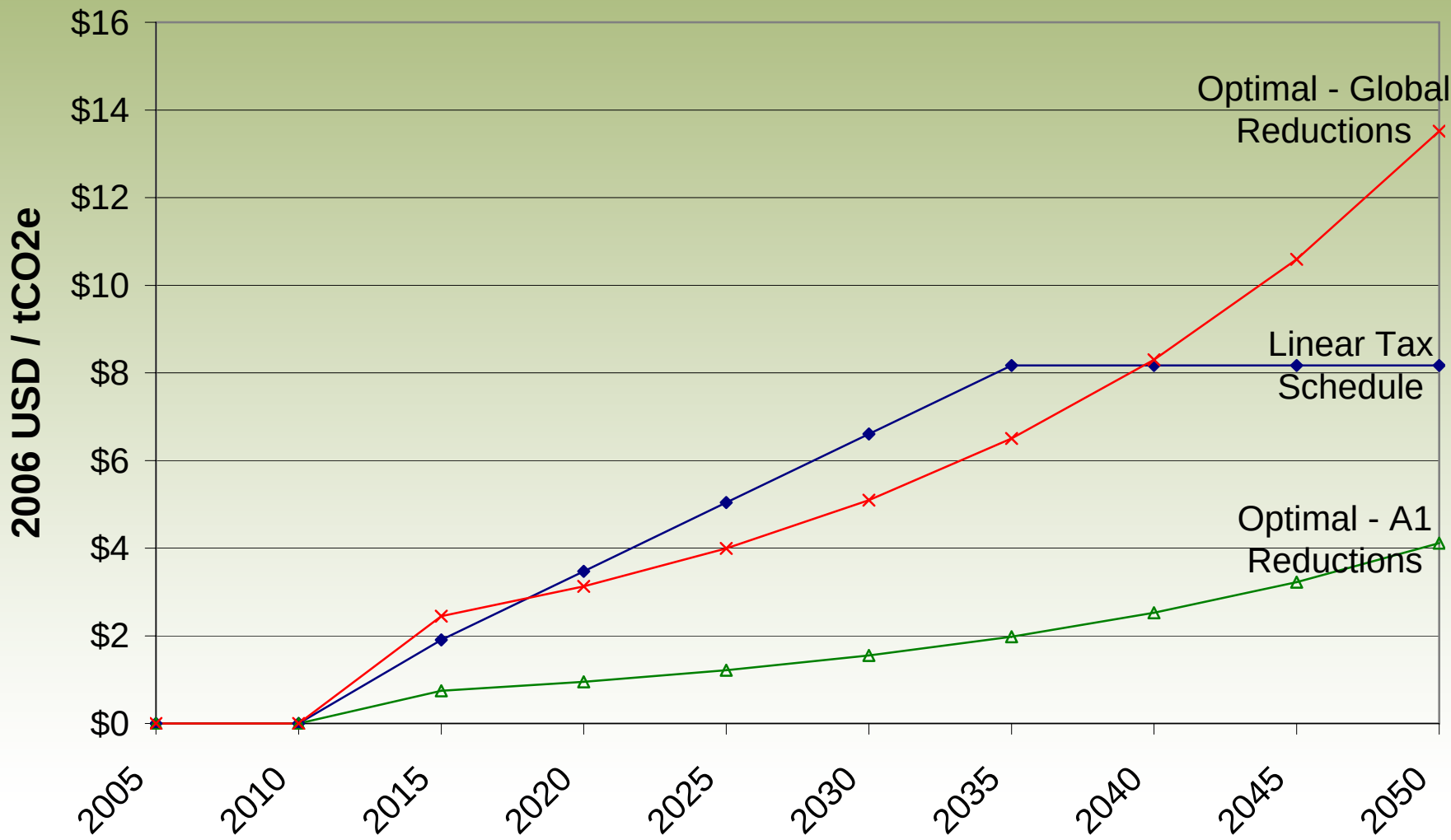
Total GHG - Global Linear Tax



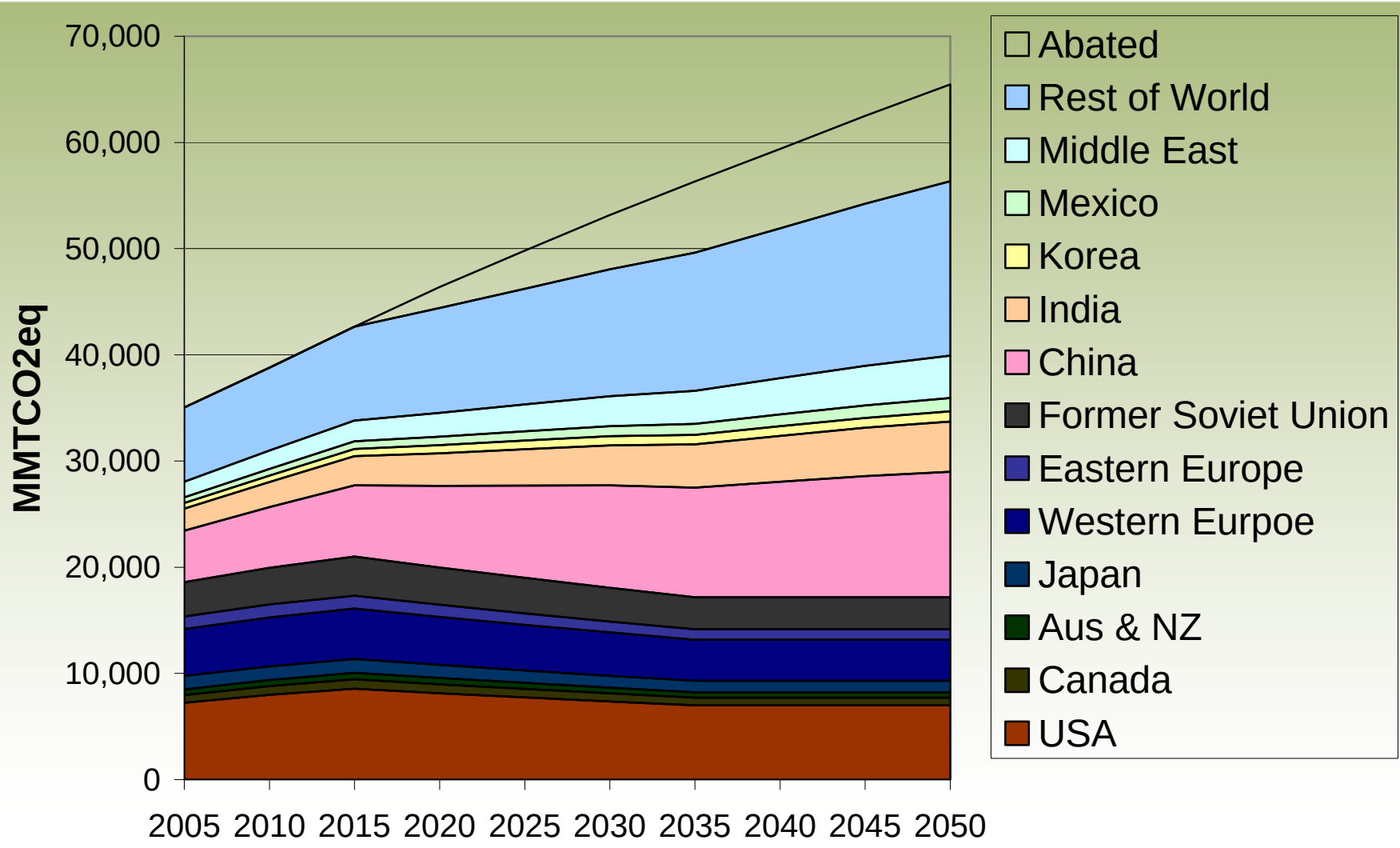
Total GHG - Global Optimal Tax (GLT)



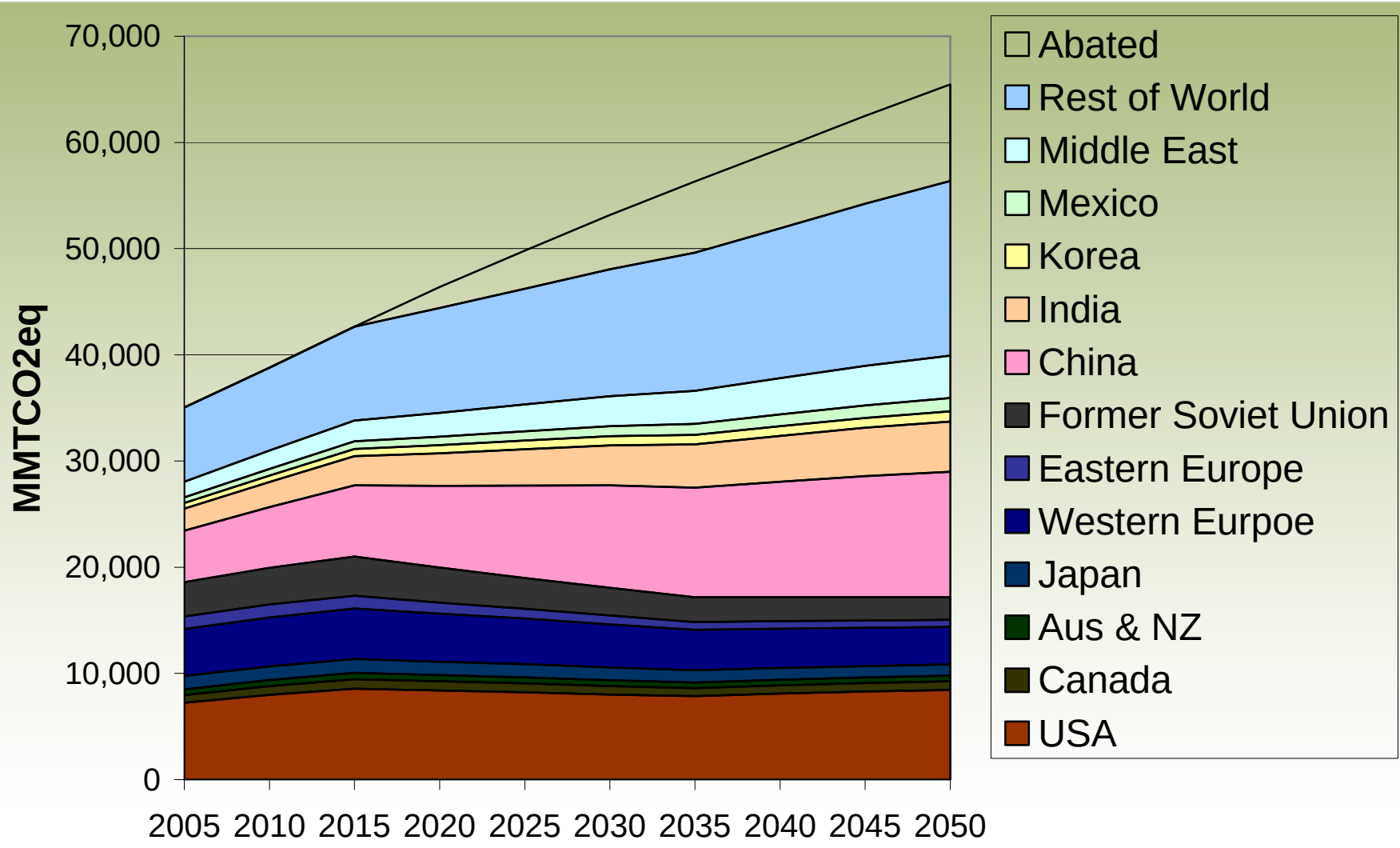
Carbon Price - Tax Scenarios



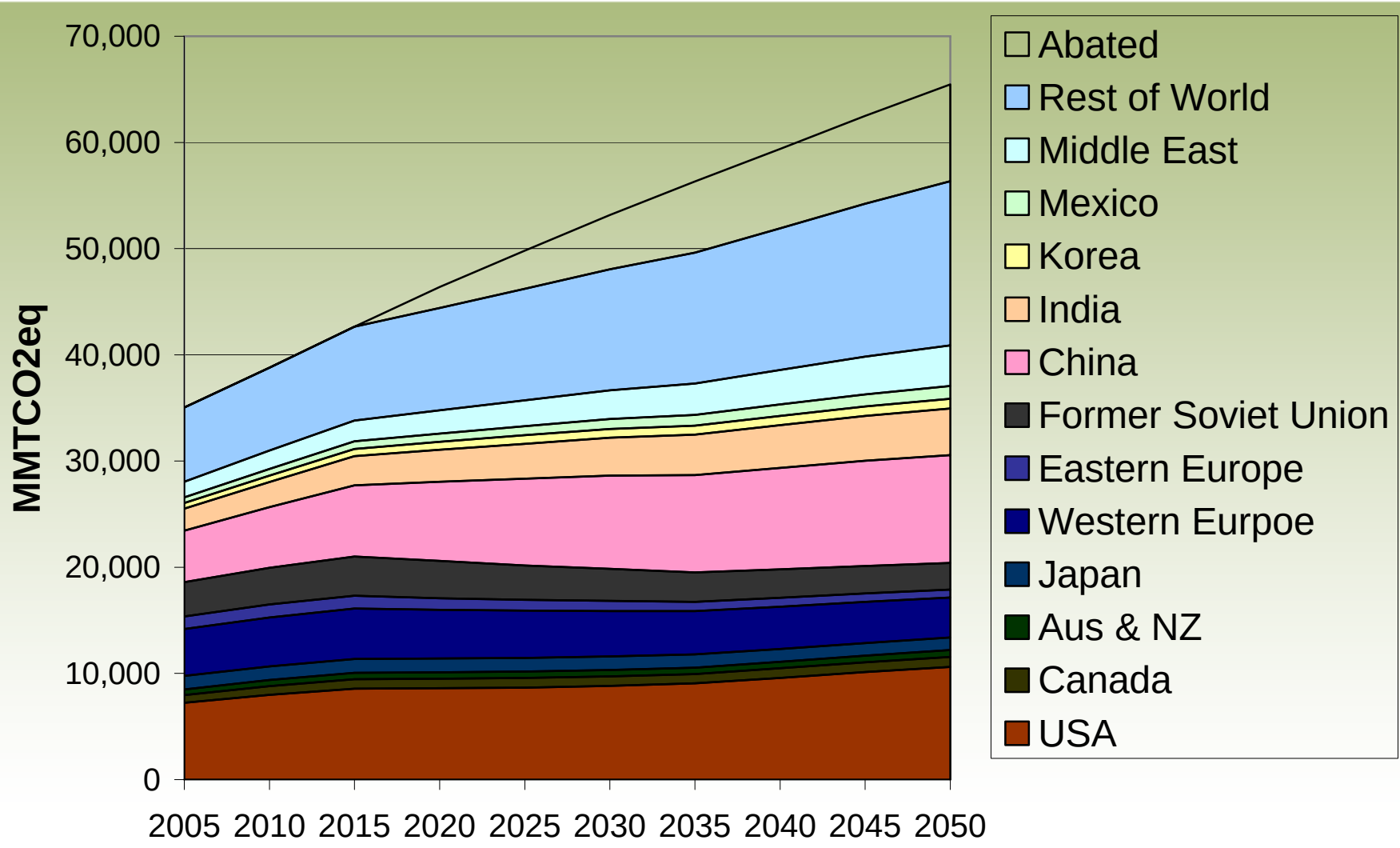
Total GHG - Annex 1 Decl. Cap 1.0%



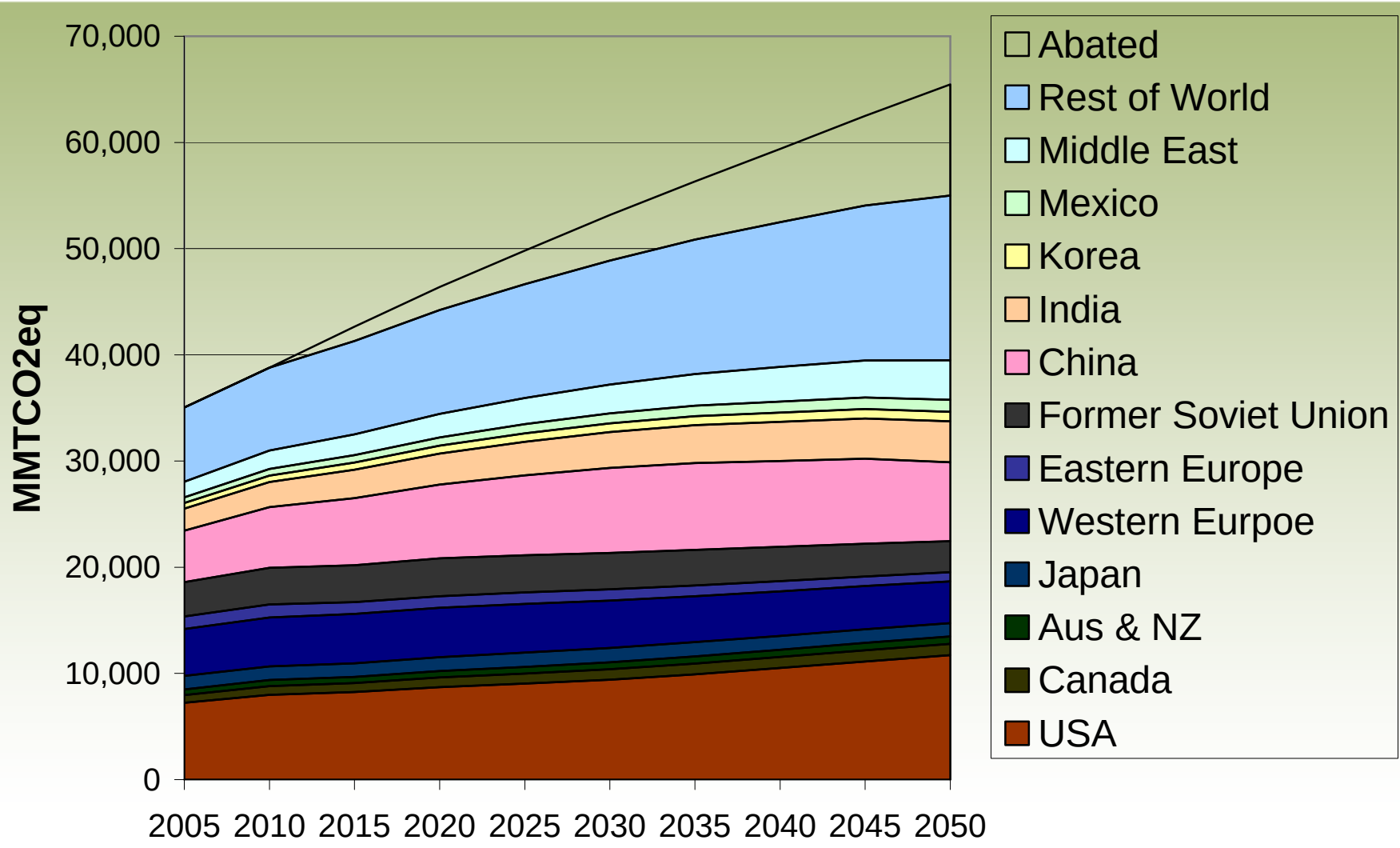
Total GHG - Annex 1 Decl. Cap 1.0% Trade



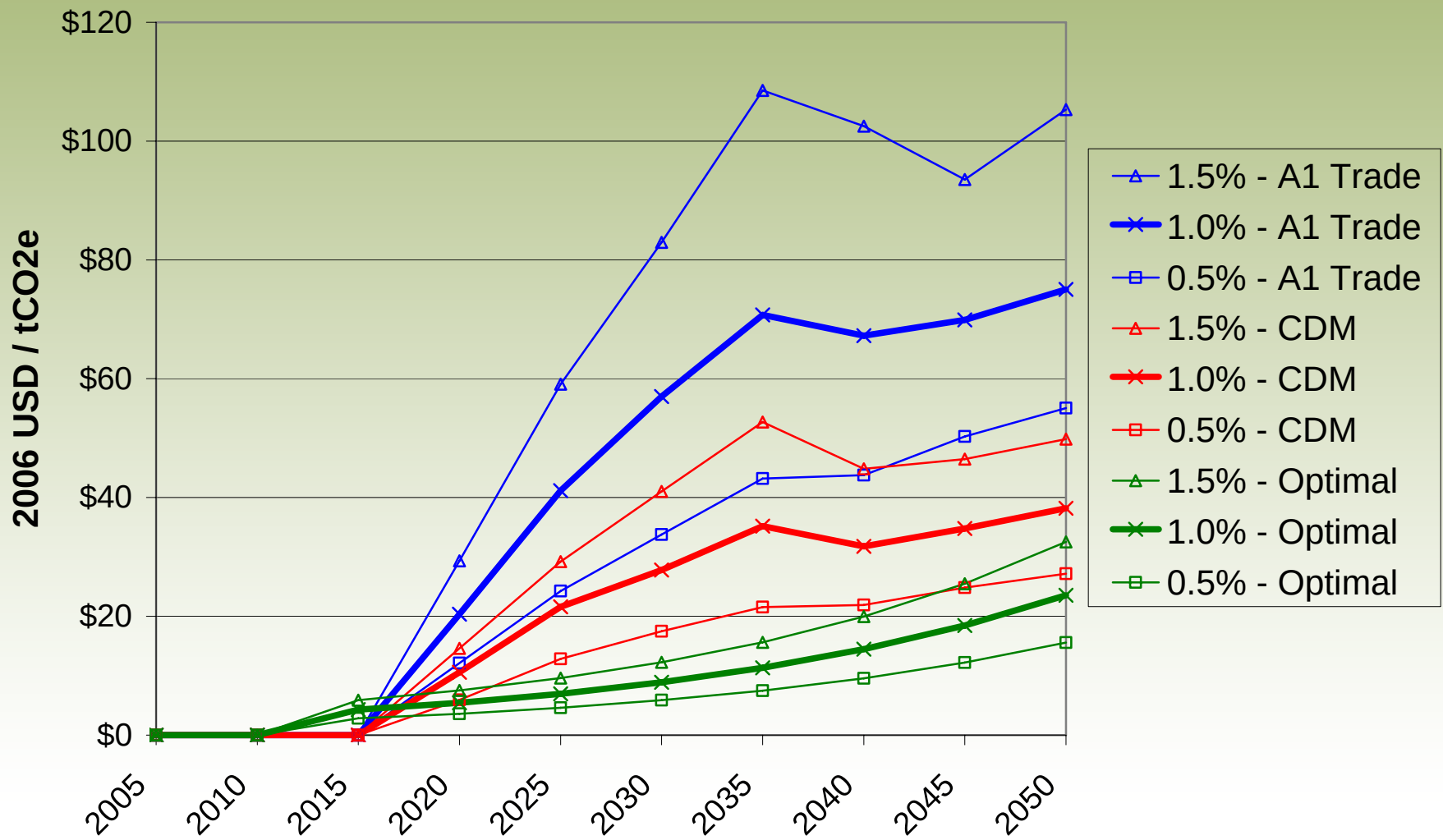
Total GHG - CDM Decl. Cap 1.0%



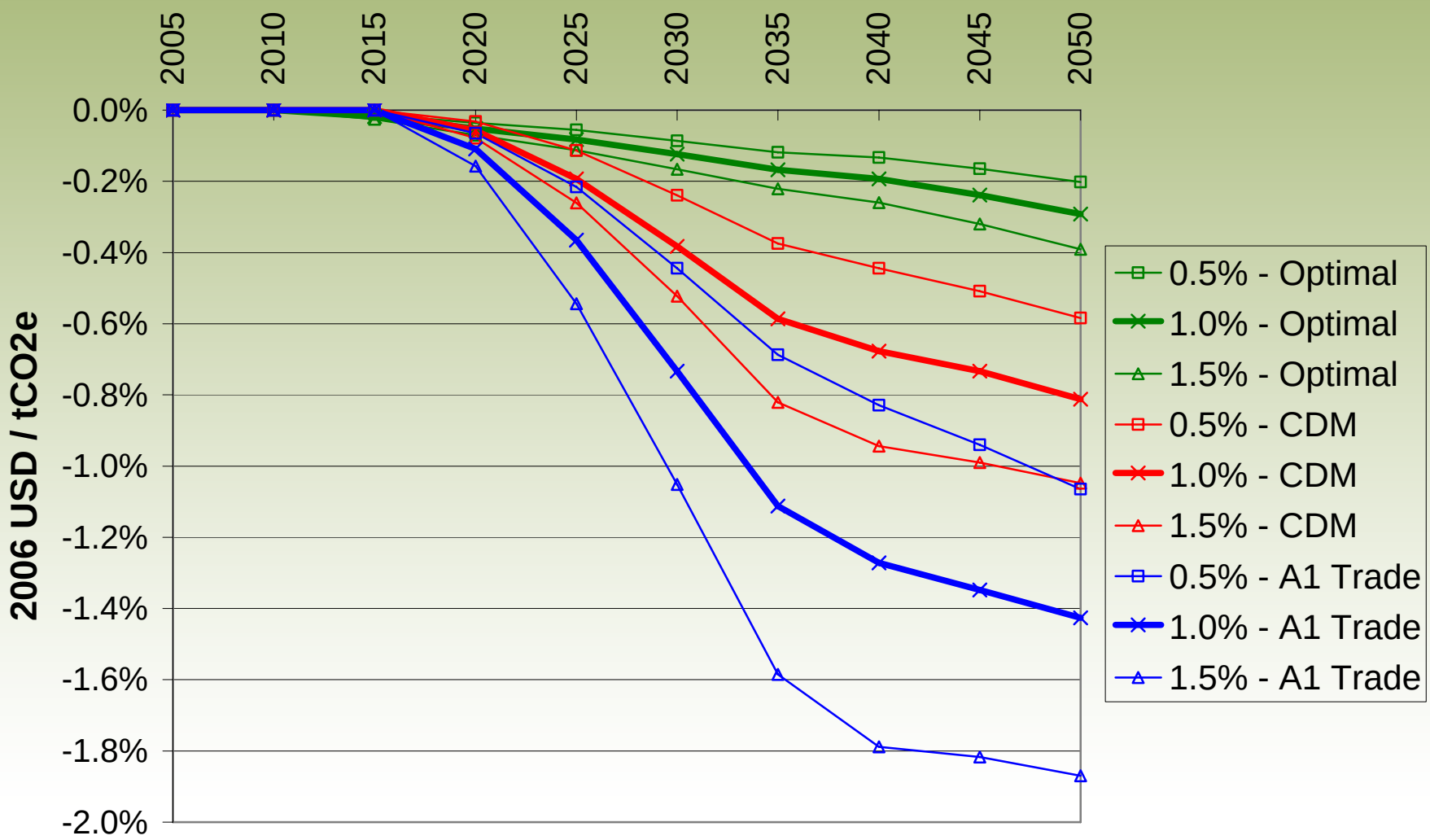
Total GHG - Optimal Decl. Cap 1.0%



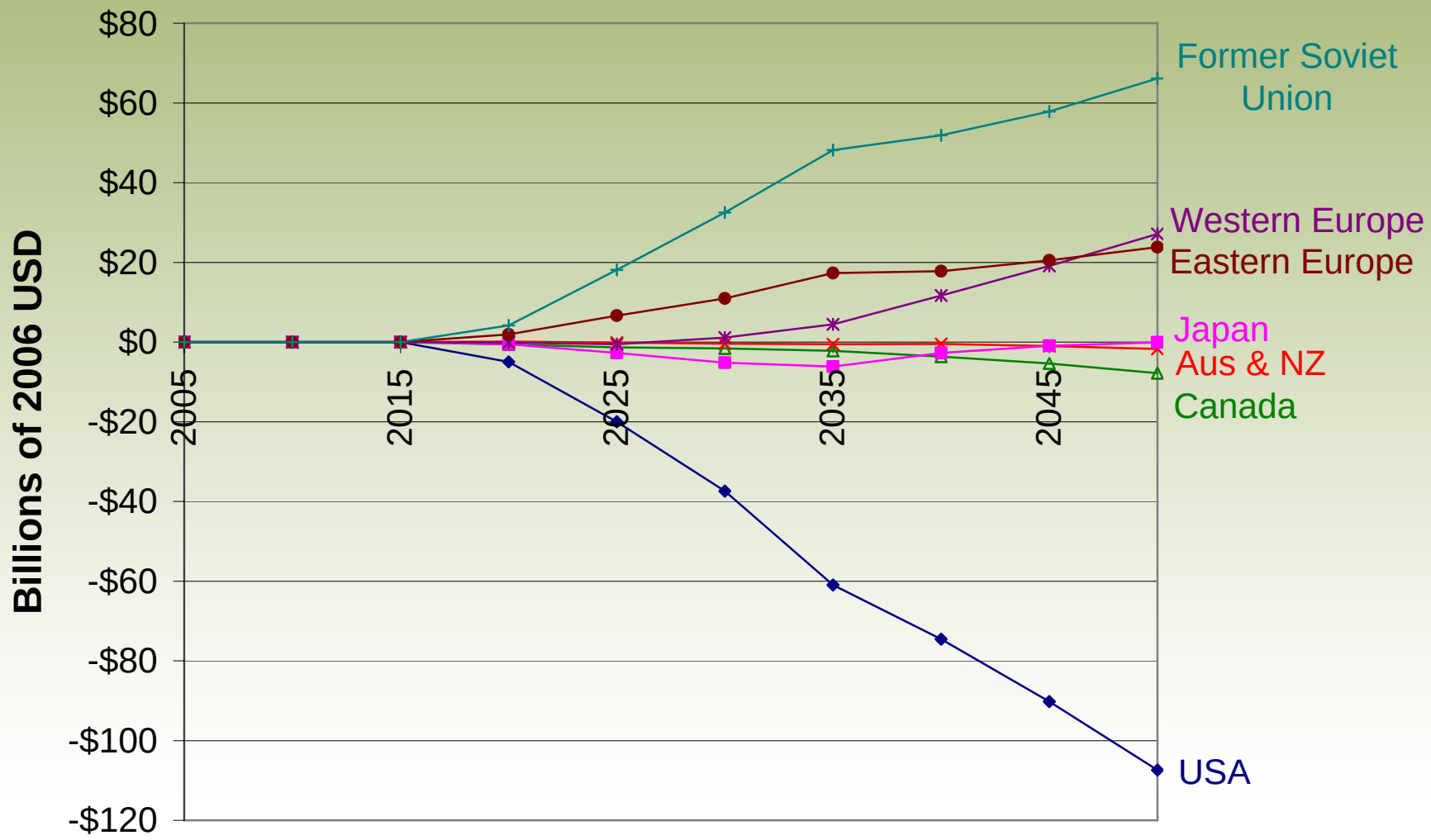
Carbon Price - Annex 1, CDM, Optimal Trading



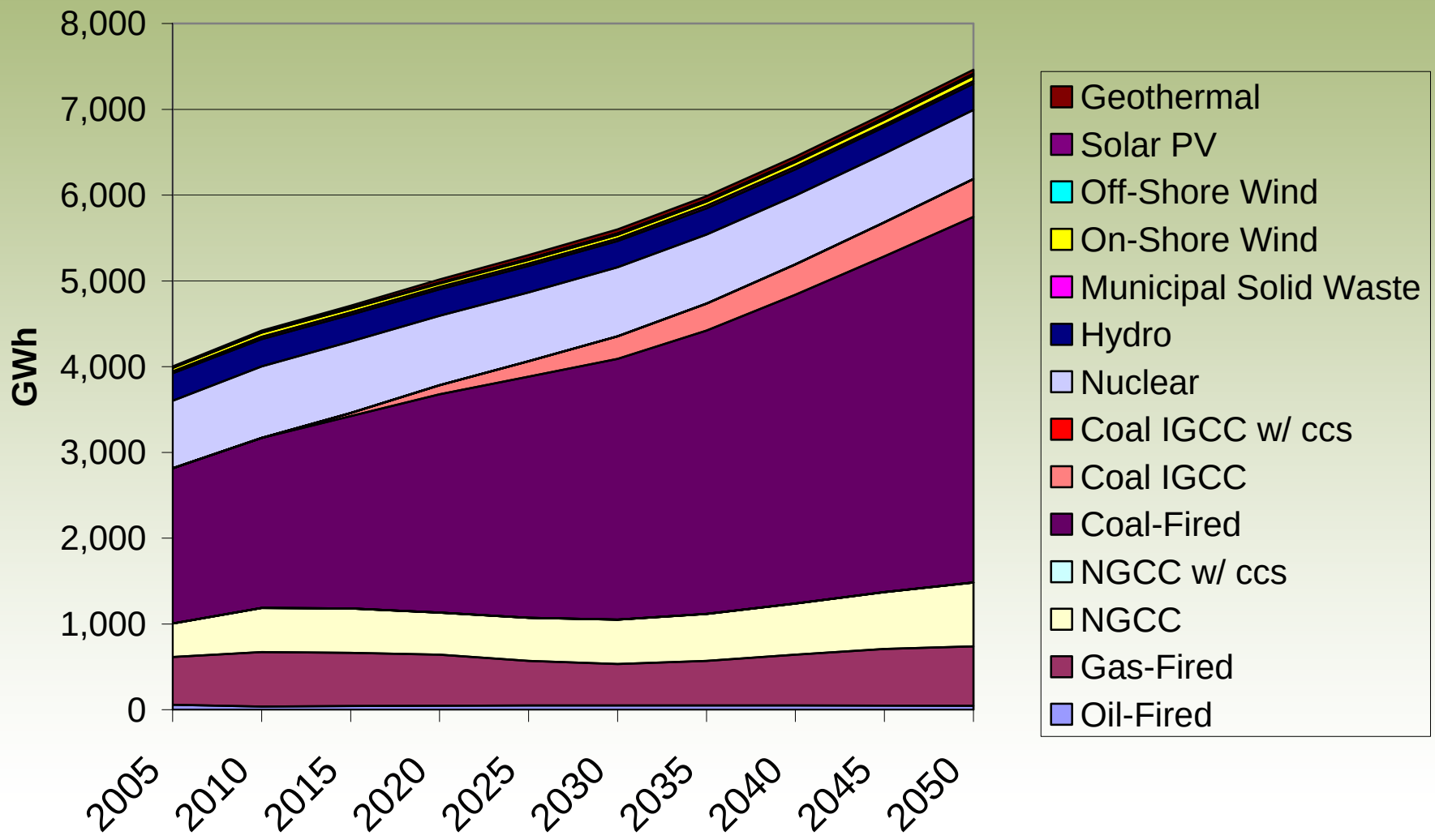
USA GDP % Change



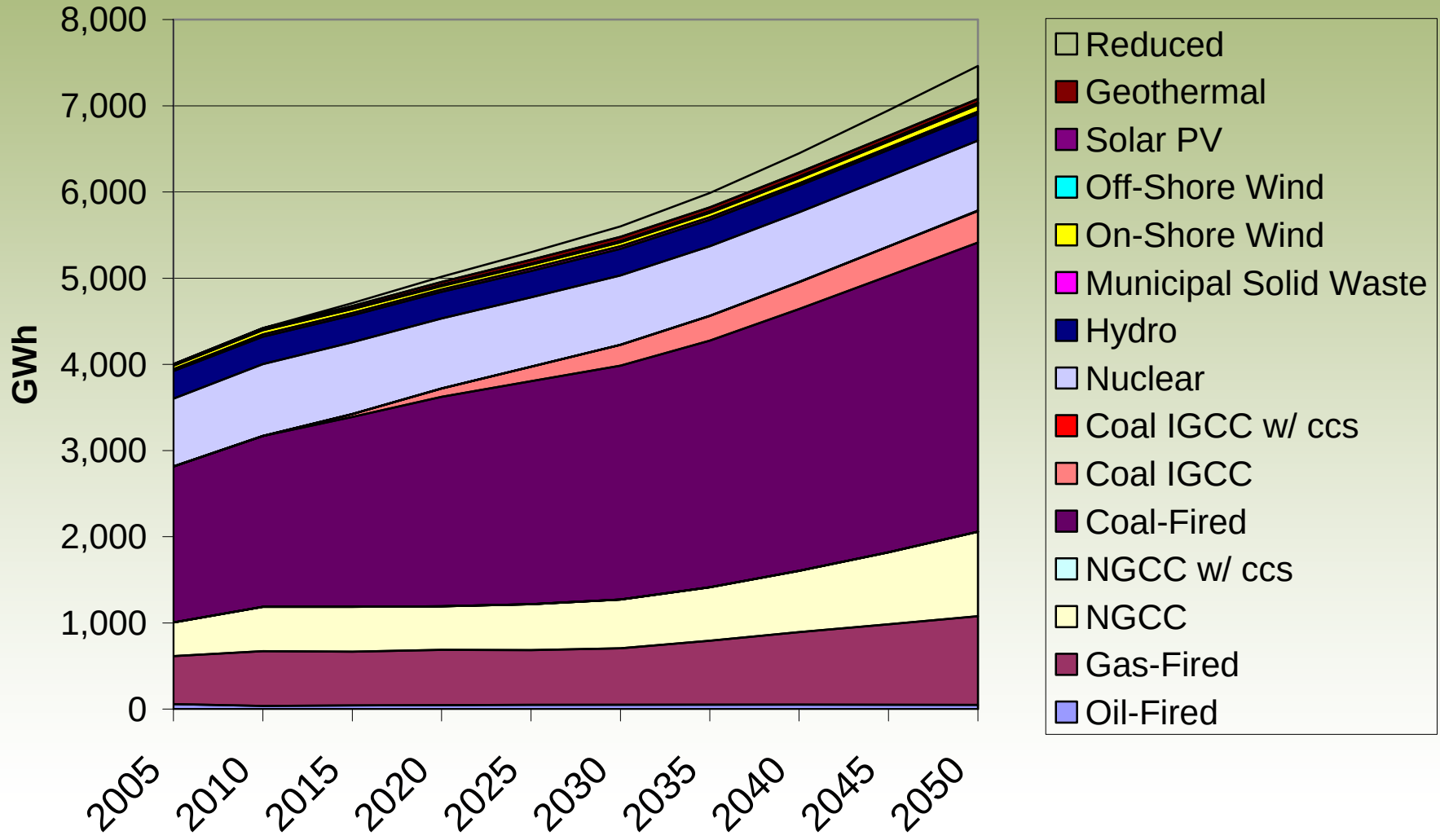
Carbon Permit Trade Revenues - A1 Trade 1.0%



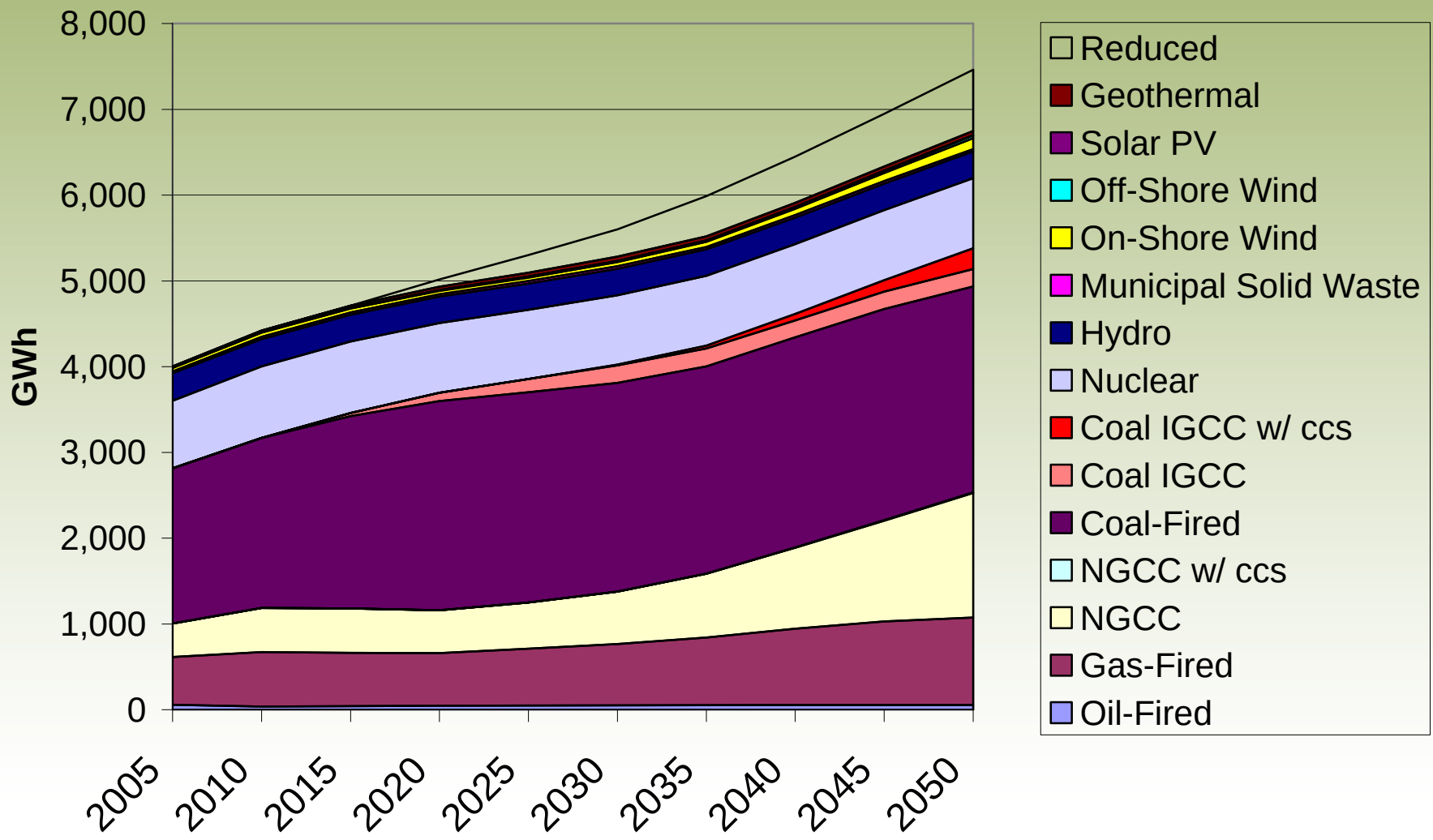
USA Electricity Generation - Base Case



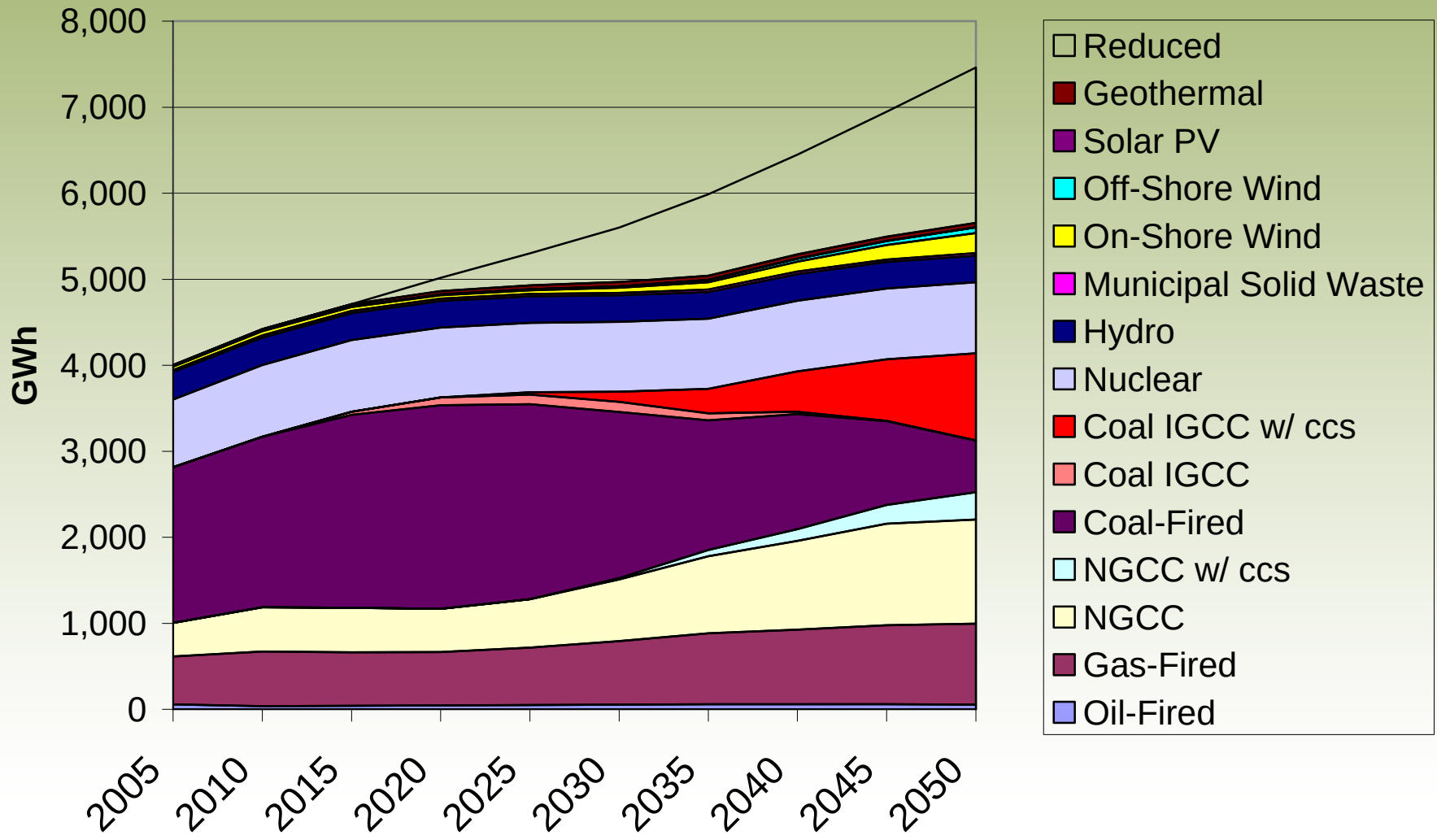
USA Electricity Generation - Optimal Decl. Cap 1.0%



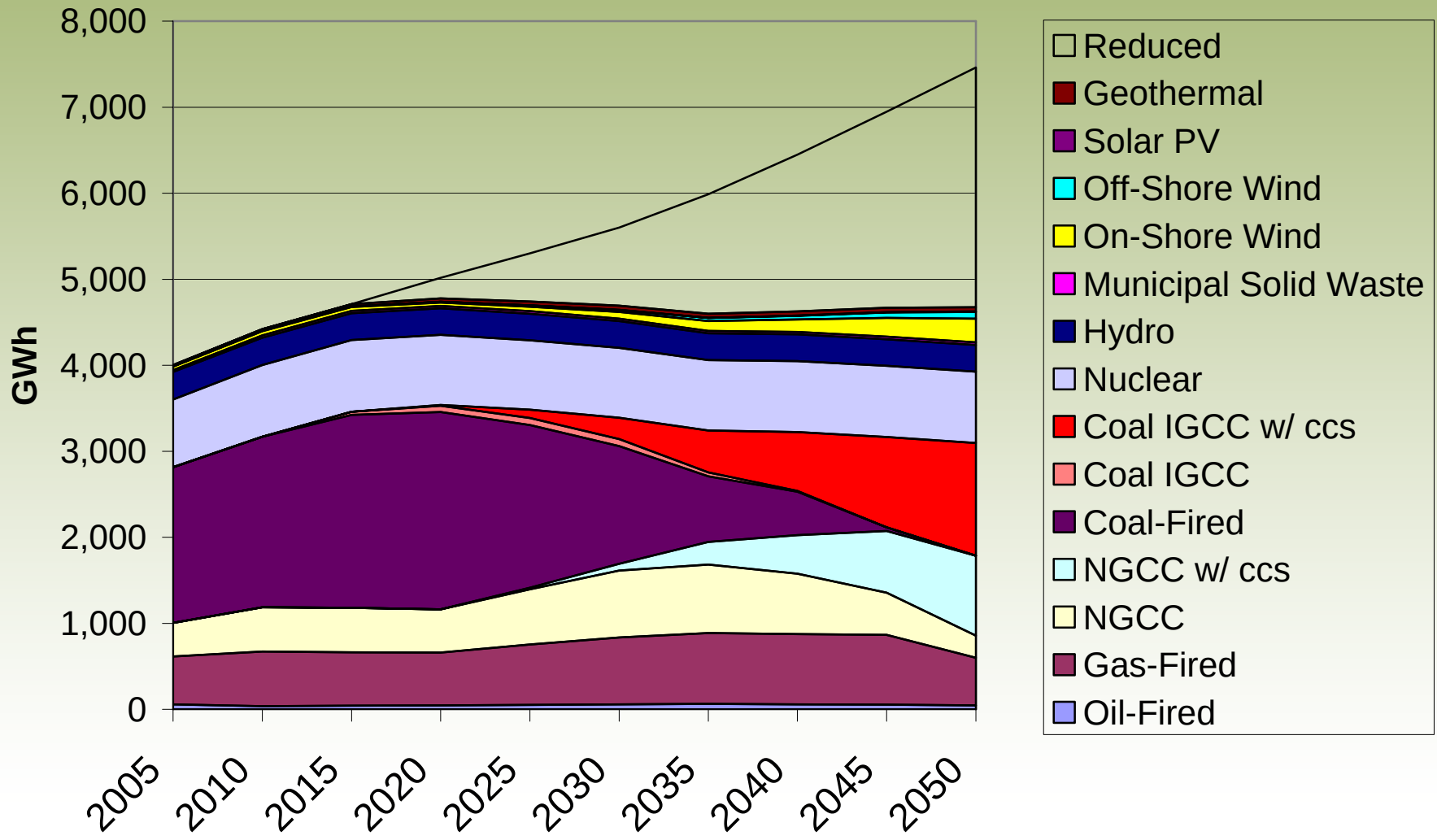
USA Electricity Generation - CDM Decl. Cap 1.0%



USA Electricity Generation - Annex 1 Cap 1.0% Trade



USA Electricity Generation - Annex 1 Cap 1.0%



SGM Model Improvements

- The analysis presented here was done with the legacy version of SGM
- We are currently in the progress of transitioning to a new Objects version of SGM
- The new version of the model will include many improvements, such as:
  - Updated nested CES production functions
  - Updated household sector based on a linear-expenditure system
  - Improved representation of international trade
  - Longer capital lifetimes in the electricity sector
  - Updated data set with a more recent base year