Assessing carbon markets using COMPARE and the POLES model

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Modeling Energy-Climate Scenarios

Baseline
• BAU or stylised Reference case?
• What costs are already included?
• Policies: none, current, or expected?
• Prefer a realistic vision of what current policies (and those very likely to be implemented soon) will achieve

Scenarios
• Scenarios provide alternative visions of the energy system
• Examples include:
  • Targets for emissions, renewables, energy efficiency
  • Alternative ETS/NTS designs
  • Economic environment (global or regional)
Production of MACCs

Type of model and answers given

- **Top-down**: consistent econometric framework for energy demand in all sectors and regions, price feedbacks possible due to global coverage and international markets

- **Bottom-up**: greater technological detail, explicit representation of options (mitigation, demand, production) instead of proxies or reduced form equations with explanatory variables

POLES is a hybrid model blending a top-down framework with explicit detail in the power sector (and buildings and transport)

The sensitivity of CO₂ emissions to different carbon prices provides the Marginal Abatement Cost Curves (MACCs) underlying COMPARE

**MACCs are very dependent on the long-term scenario (and its assumptions) from which they are derived**
COMPARE is currently being updated to include a new baseline scenario (IEA WEO 2013) and MACCs based on historical data and technology costs as of 2013.

Structure allows integrating multiple features affecting carbon markets:

- Multiple market levels (e.g. International, ETS, National, Sector)
- CO$_2$-only or multi-GHG
- Various time horizons (e.g. 2020, 2030, 2050)
- Credits (e.g. CDM/JI), AAUs, limitations on credit trading, floor/ceiling on prices, taxes/transaction costs, etc
Trading example

Emission permits

EU ETS

LDCs
Credit mechanism (e.g. CDM/JI)

Pacific

International credits
Types of analyses

- Emission reductions by country/region, sector & GHG and over time
- Carbon prices under different market configurations
- Reduction targets in terms of %, absolute, or intensity
- Effect of base year on effort level
- Domestic reductions vs. permits purchased
- Reductions achieved relative to pledge
- Abatement costs
- Trading volumes between and within markets
- Trade costs
- Effort sharing between regions/sectors
- Effect of financing – value of reductions realised vs. funds provided
- Structural changes to markets
COMPARE is valuable to:

- Governments involved in international negotiations for carbon regulation and energy related issues
  - Provides numbers to help focus discussions on key areas
  - Impact assessment of market mechanisms or scenario assumptions
  - Facilitate negotiation process by incorporating alternate proposals

- Private companies exposed to carbon markets

- Market actors (companies, utilities, funds) considering the economic environment of their international assets

- Investors and innovators looking for new market opportunities
Further analyses

- Baseline and carbon price scenario comparisons between other models and POLES

- Comparisons made using energy and emission balances, as well as a tool for assessing reduction options
  - Assessing cost-efficient policies at national level: policies to promote, technologies to develop
  - Quantifying the sensitivity of future investments to carbon taxation
  - Identifying new market opportunities and their sensitivity to carbon regulation
Thank you for your attention!

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