EU Approach to Modelling the Impacts of Response Measures

Pre-sessional experts meeting

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Montréal

Overview

- EU's approach towards modelling on impacts of response measures
- Key findings of the modelling workshop 2002
- Longer-term issues and the way forward

Modelling as a tool for decision-makers

- Essential function of models is to support decision making
- Provide a structured framework for organising ideas and data
- Useful for evaluating relationships between variables within a given system

However, **models cannot**:

- Predict outcomes due to uncertainty and the ambiguous relationship between reality and model results

Problems modelling impacts of response measures

- Energy markets are dynamic, complex and interdependent systems
- Uncertainty of changes in energy demand and future prices
- Uncertainty of economic influences – evolution rather than equilibrium
- Different models based on differing assumptions

Problems modelling impacts of response measures

- Spillover effects due to:
  - –economic substitutions result of price and trade terms;
  - –diffusion of technological innovations as a result of action in Annex 1 countries;
  - –policy and political influence of Annex 1 countries mitigation efforts on CO_2 abatement activities

Assumptions of energy and economy models

- Reference or Business as Usual scenario of future developments - the higher the baseline, the greater the estimated cost of reducing emissions;
- Substitution among fossil fuels, between fossil fuels and non-fossil fuels, between energy and other factors of production, and products of differing energy intensities;
- Assumptions about the international policy regime to be pursued, including the amount of emissions trading, the use of flexibility mechanisms, and the use of sinks of CO_2

Assumptions of energy and economy models

- Assumptions relating to energy intensive industries
- Whether model accounts for OPEC's actions as a cartel to control oil prices (few do assuming perfect competition);
- Whether the model accounts for reductions of other greenhouses gases besides CO2;
- Future availability of conventional (cheap to access) oil reserves.

Divergence of Models

- **Top-down** macro-economic models require large aggregation - creates very high degree uncertainty
- **Bottom-up** models or engineering models based on available and likely future technologies
- Estimates for impact of climate PAMs on energy sector differ widely between these approaches:
  - **Top-down** tend to produce higher costs estimates as typically assume optimal deployment of resources in BAU
  - **Bottom-up** tend to produce lower estimates of costs as assume low or nil cost technology or energy efficiency
- Increasing hybridisation models – difficult to compare outcomes due to differences:
  - Dates measured, types of costs measures, range of regional groupings, assumptions Kyoto Protocol PAMs

Convergence of models results

- All models show substantial future increase OPEC revenues above present levels
- Revenues will **not decline**, rather the rate of growth in revenues may be slowed
- Income is **affected much more by fluctuations in the oil market** than impacts of response measures
- All models show potential impact **reduced** if:
  - Full portfolio of mitigation options are used (unlike OWEM which assumes all commitments met by CO2 reduction)
  - Emissions trading used to ensure most efficient allocation of emissions reductions
  - Burden-sharing through the CDM

Factors influencing potential impacts

Impacts of response measures may be **increased** by:

- Uncertainty of future policy approaches
- Uncertainty of future investment requirements

Impacts of response measures may be **reduced** by:

- Market-based policies and measures
- Taking the broad range of GHGs
- Cartel behaviour to limit output (increasing price)
- Consumer-producer dialogue to reduce future market uncertainty
- Development of carbon capture and storage

Differing impacts between countries

- Depending on relative percentage of reliance on oil exports as proportion of GDP
- Countries overseas investment may be at risk as a result of climate change
- Countries able to produce oil at cheapest cost least affected
- Countries with least economic diversification most affected

Short-term issues

- Limited substitution due to slow rate turnover capital stock, therefore response measures are unlikely to impact on oil exporters revenues in short term
- Innovation and deployment of efficiency technology may make cheaper to use fossil fuels more efficiently than substitute
- Training needed to improve data collection, modelling and interpretation

Longer-term issues

- Unclear how future revenues fossil fuels will be impacted
- Significant increase in car use in the developing world will increase demand for oil
- Increase demand for gas as shift away from coa for electricity production
- Access to energy for the 1.6 billion that lack access to modern energy services
- Industrial development in developing countries – increase demand for manufactured products
- Demand for high value added oil-based products – plastics and pharmaceuticals also likely to increase

International Energy Agency

- Global energy needs are likely to continue to grow steadily for at least the next 25 years, and if governments stick to current policies (the IEA 'Reference Scenario') then the world's energy needs will be more than 50% higher in 2030 than today.
- By 2030 the world will be consuming 16.3 billion tonnes of oil equivalent, 5.5 btoe more than today
- Reserves in the Middle East and North Africa will be crucial for meeting these needs

Improvement to models

- Complexities and uncertainties in oil market render it very complex to model
- Current models are unable to model climate policy impacts adequately
- Existing models produce a wide diversity of short-term impacts
- Improvements are needed to models:
  - Structures and analytical framework for evaluating the impacts of policies and measures
  - Expanding the range of policies analysed and gases covered

Use of models

- Important to distinguish between:
  - the **development** of methodologies and tools
  - the **dissemination** of models, methodologies and tools as presently available
- Generally most models are in developed countries
- Developing countries need to better understand models and how they can be utilised to understand relationships within a system

Next steps

- Need to improve models - types of policies covered and GHGs modelled
- Lack of information about the different specification of models available
  - Look forward to Fourth Assessment Report of the IPCC
- Lack of capacity to use existing models
  - Support developing countries training in modelling

Concluding remarks

- Impossible to know due to complexity of energy markets - dynamic, complex, interdependent systems built on massive capital investments
- The effects from the implementation of response measures:
  - are unequally distributed and difficult to quantify
  - may be both positive and negative impacts on a given economy
  - negative impacts are increased by uncertainty
  - can be reduced through market-based approaches and a broad GHG approach, as well as use of sinks
- Focus on now on improving modelling and providing capacity-building to use models