Modeling Technology Impacts on Fuel Markets

IEA support to the International Policy Process*

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*The opinions expressed in this presentation are those of the speaker do not necessarily reflect the opinions of the IEA

Organisation of the IEA work

Secretariat
-Analysis
-Organising collaboration

Budget Work Program

Governments
(Gov. Board and Committees)
-Review and recommend policies

Implementing Agreements and other collaborative projects

Studies Information Meetings
Where does Energy Models fit in?

Secretariat
- WEO
- ETP

Governments
- National model work

ETSAP - ACROPOLIS - EXCETP

IEA Energy Modelling Activities

World Energy Outlook

- IEA’s flagship publication
- Detailed long-term projections of energy demand, supply and CO2 emissions
- Bi-annual (WEO 2002 to be published in September)
- Based on input from all relevant IEA activities
- Derived using the IEA World Energy Model (WEM)
IEA Energy Modelling Activities

World Energy Model

Previous version:
- Based on a Top-down approach
- Priority on explaining fuel market developments

World Energy Model

Good Accuracy in Projecting Oil Demand

Deviations from World-Oil Demand in 2000 (76mbd)

<table>
<thead>
<tr>
<th>Year</th>
<th>Deviation (million barrels per day)</th>
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<tbody>
<tr>
<td>98W EO</td>
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<tr>
<td>96W EO</td>
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<td>95W EO</td>
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<td>94W EO</td>
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<td>93W EO</td>
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IEA Energy Modelling Activities

World Energy Model

- **Previous version:**
  - Based on a Top-down approach
  - Priority on explaining fuel market developments
  - Less details on technology
  - Focus on “Business as Usual” developments

CO₂ Emissions for Annex B countries

- **Mt of CO₂**
- **Kyoto Commitment**
- **2010 Estimations of WEO 2000**

- OECD Europe
- OECD North America
- OECD Pacific
- Russia
- Rest of annex B
IEA Energy Modelling Activities

World Energy Model

To explore how trends can be altered through concrete policies more technology detail is needed

- **New version:**
  - “Marriage” of top-down and bottom-up
  - Very detailed demand side
  - Representation of technologies on both supply and demand side
  - Used to develop Alternative Scenario (focus on climate policies) for WEO-2002

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IEA Energy Modelling Activities

Energy Technology Perspective Project

*Filling in the long-term technology piece*

**Objectives**

- **Develop a global energy technology model** to assess technology impact on fuel markets, CO2 emissions and energy security
- **Identify technology options** that can be the most cost-effective in achieving energy policy goals
- **Provide a basis for designing policies** to further develop and deploy promising technologies
- **Provide greater technology richness** to the World Energy Outlook 2002 & 2004
Energy Technology Perspective Project

The Model Approach

- Global Model is based on MARKAL
- Developed by ETSAP modelers
- Long term time horizon (through 2050)
- Covers the whole energy system from fuel extraction to end-use
- Covers 15 world regions

Energy Technology Perspectives

Regions Modeled

IEA-Regions:
- US
- Canada
- Japan
- Australia and New Zealand
- IEA-Europe
- South Korea

Non-IEA Regions:
- Eastern Europe
- FSU
- China
- India
- Rest of Asia
- Latin America
- Mexico
- Africa
- Middle East
Energy Technology Perspective Project

The Model Approach II

- Technology data are collected in collaboration with ETSAP, various IEA bodies and national sources
- Technology learning effects included for key technologies
- Regional data and model structure subject to detailed review
- Additional MARKAL models will be used to study policies at country or regional levels, e.g. the Nordic MARKAL model, Australia...?

Energy Technology Perspectives

Scenario Analysis

- Define scenario assumptions reflecting different regional economic growth rates, OPEC behavior, industrial development, environmental concerns, etc.
- Transform scenario assumptions into projections for energy service demand for different world regions and end-uses
- Perform comparative assessment of potentials for various technologies and fuels to satisfy demand for energy services under the different policy scenarios
Energy Technology Perspectives

Priority issues to be analysed

- The role of fossil fuel zero emission and renewable technologies to reduce emissions in the power generation sector
- The impact of oil and gas exploration and production technologies on global and regional energy supply
- Policies to help the transfer and deployment of new technologies in developing countries
- Strategies to meet global transport needs with minimal environmental impacts
- Roadmap to a H2 economy

Energy Technology Perspectives

Product Schedule

- **1 September**: First version of global model debugged and ready for scenario analysis
- **Oct/Nov/Dec**: Presentation of first set of scenarios building on WEO-2002, to various IEA committees and the Governing Board
- **May 2003**: First IEA ETP publication with results from a number of scenarios
- **Fall 2003/Spring 2004**: Detailed topical reports focusing on specific technology areas, sectors and policy targets and instruments
IEA Energy Modelling Activities

Summary

- IEA is both a user and a developer of energy models
- Interaction with modellers outside the Secretariat is important
- Strong focus on the policy relevance of the model results
- Climate change not the only reason for modelling interest: Energy security, energy access and energy market reforms
- Long-term interactions between technology and fuel markets is a key issue