Modeling Technology Impacts on Fuel Markets

*IEA support to the International Policy Process**

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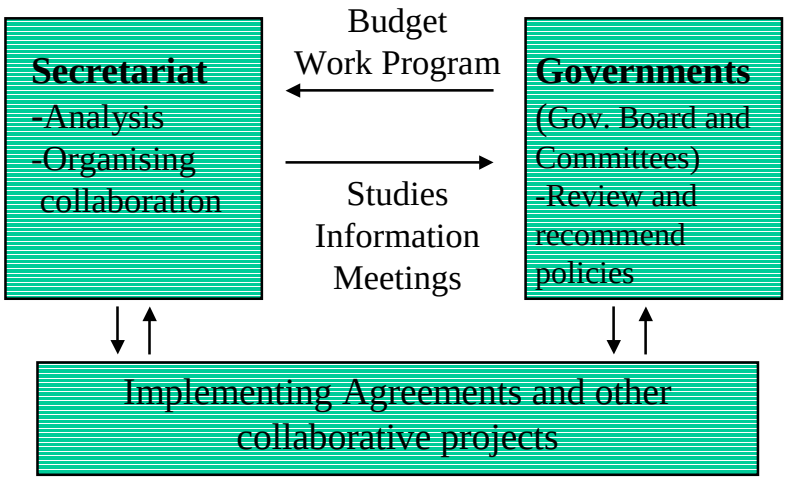
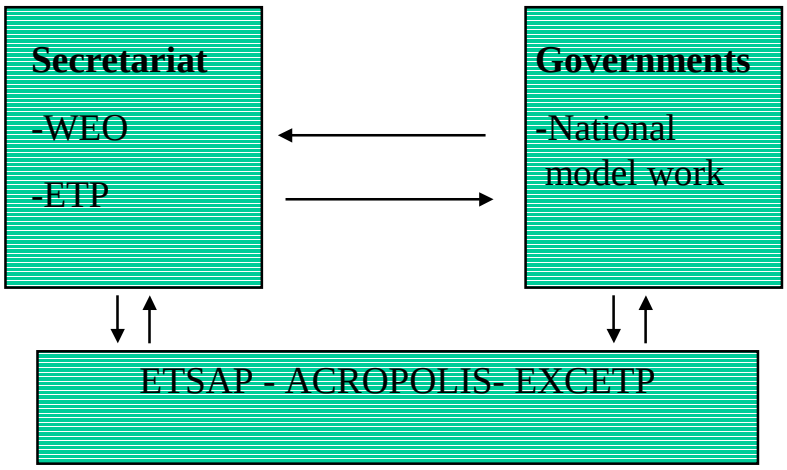
***The opinions expressed in this presentation are those of the speaker do not necessarily reflect the opinions of the IEA**

Organisation of the IEA work

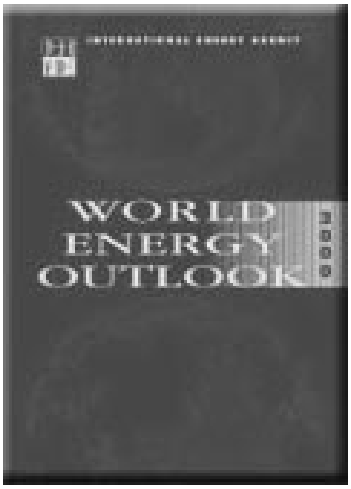


Where does Energy Models fit in?



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

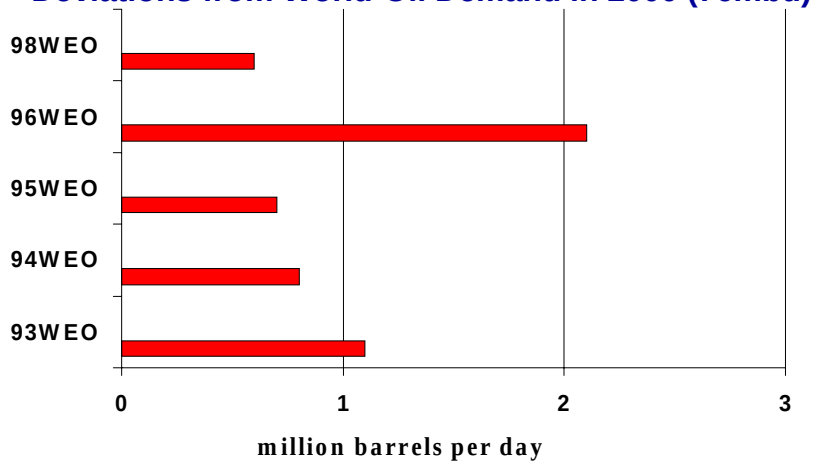
World Energy Model

- ***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)



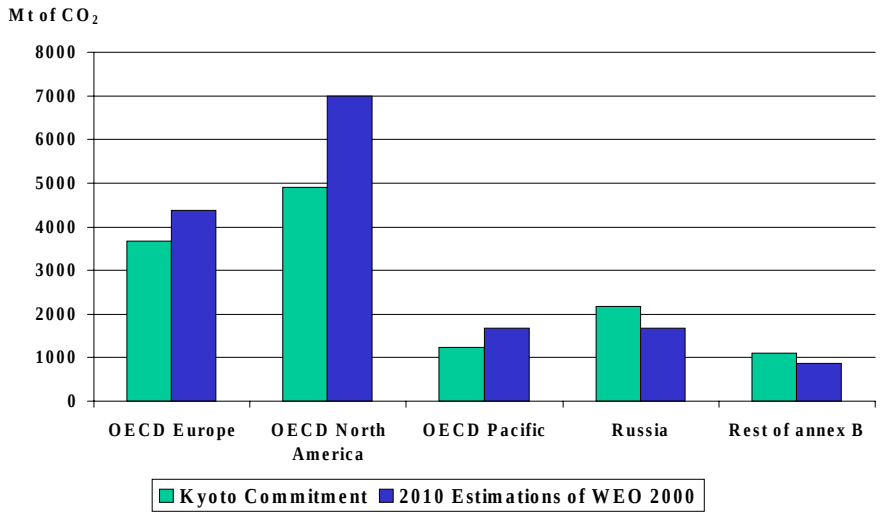
IEA Energy Modelling Activities

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**

INTERNATIONAL ENERGY AGENCY AGENCE INTERNATIONALE DE L'ENERGIE

CO_2 Emissions for Annex B countries



INTERNATIONAL ENERGY AGENCY AGENCE INTERNATIONALE DE L'ENERGIE

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**

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**