Designing Environmentally Compatible Energy Strategies: Global E3 Scenarios Described by IIASA Models

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China – IEA Seminar on Energy Modelling and Statistics
Beijing, 20-21 October 2003

Contents

- The International Institute for Applied Systems Analysis (IIASA)
- The Environmentally Compatible Energy Strategies (ECS) Project
- Global E3 (energy-economy-environmental) scenarios

IIASA Yesterday and Today

- 1972: Create research center (NGO) as a "neutral bridge between East and West"
- Today: Analyze, from an NGO perspective, sustainability and global change in three fields:
  (1) Energy and Technology
  (2) Environment and Natural Resources
  (3) Population and Society
- China's (2002) and Egypt's (2003) formal membership support IIASA's objective of expanding its traditional East-West orientation by a "North-South" dimension
- International and interdisciplinary NGO status allows providing global insights while playing an "honest-broker" role

ECS Research

- "Umbrella": Global energy-economy-environmental (E3) scenarios and their policy implications
- The ECS technology database CO2DB
- Clean-coal technologies
- Bottom-up multi-gas optimization
- Sustainable-development scenarios
- Hydrogen
- Networking and collaboration: IEW, EMF, IEA, WEC, IPCC, CEC, national institutions (here: Tsinghua University, ERI, NSFC, and others)

Recent ECS Products

2000

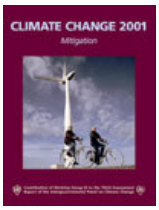
With the Intergovernmental Panel on Climate Change (IPCC), IIASA's ECS Project coordinated the development of scenarios for the IPCC

Special Report on Emissions Scenarios

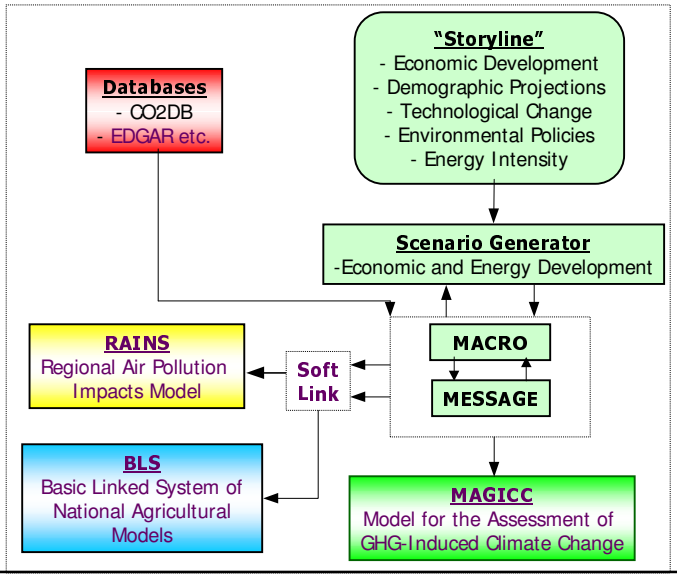
2001

ECS continued its scenario work with the IPCC, Third Assessment Report on *Climate Change 2001: Mitigation*

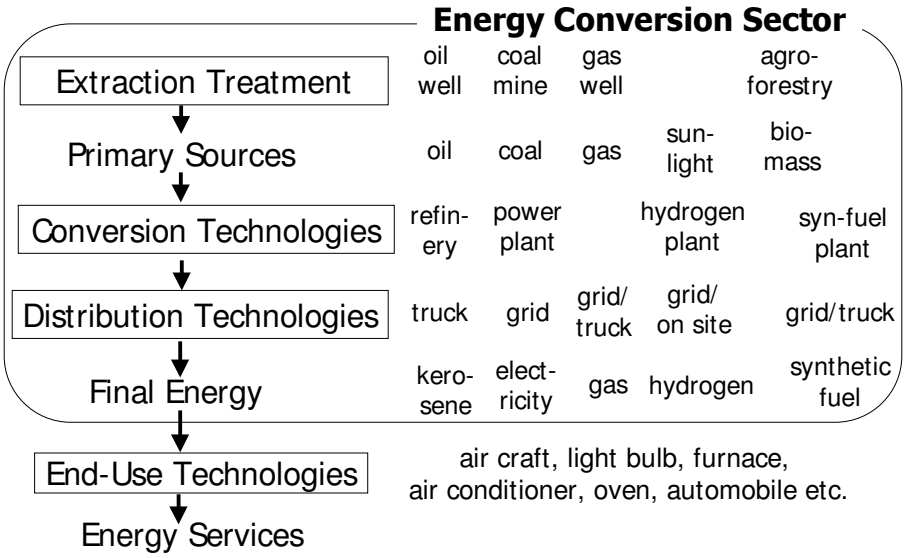
Contributing to Chapter 2 on *Greenhouse Gas Emission Mitigation Scenarios and Implications*



The IIASA Modeling Framework



The Reference Energy System



The CO2DB Database

- Detailed technical, economic and environmental characteristics as well as data on innovation, commercialization and diffusion in some 3000 entries
- Users can add to, select, filter, arrange, and compare CO2DB's data according to any of the technology characteristics included in each database entry
- ECS distributes CO2DB free of charge. In return, for ECS encourages users to share their data.

Sustainable-Development Scenarios

A Working Definition (ECS, 2001)

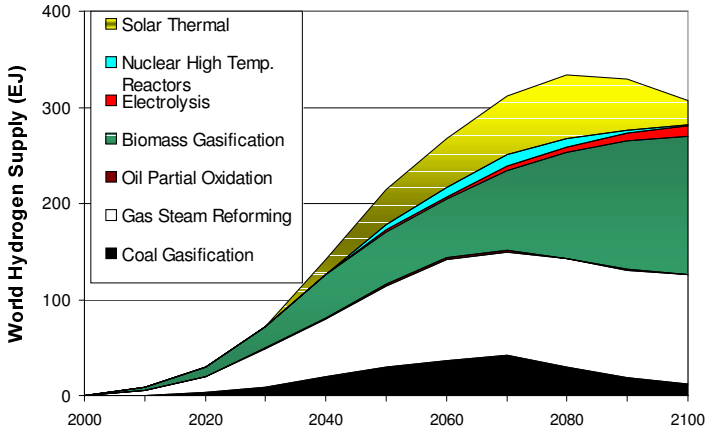
- Sustained economic growth
- Declining inter-regional economic inequity
- Non-declining reserves-to-production ratios
- Low environmental stress

Consistent with the "Brundtland Definition" (1987)

"*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*"

Hydrogen Production

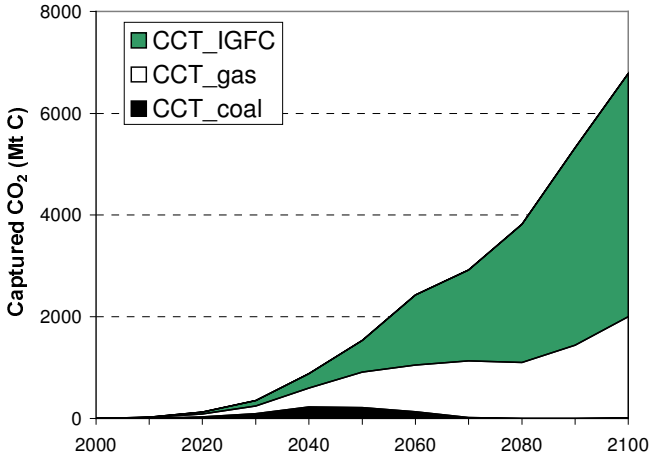
B1-H2 Scenario



Source: Barreto, Makihira, and Riahi, 2003

CO_2 Capture in the Global Power Sector

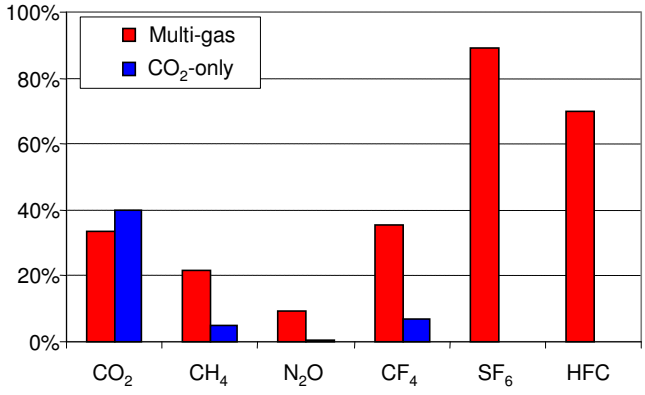
A2-CCT Policy Scenario



Source: Riahi, Barreto, Rao, and Rubin 2003

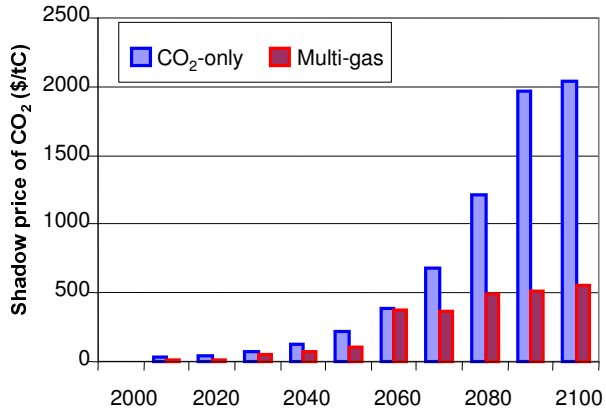
Reductions of Cumulative Emissions

Relative to baseline; ?T = 2K



Source: Rao and Riahi, 2003

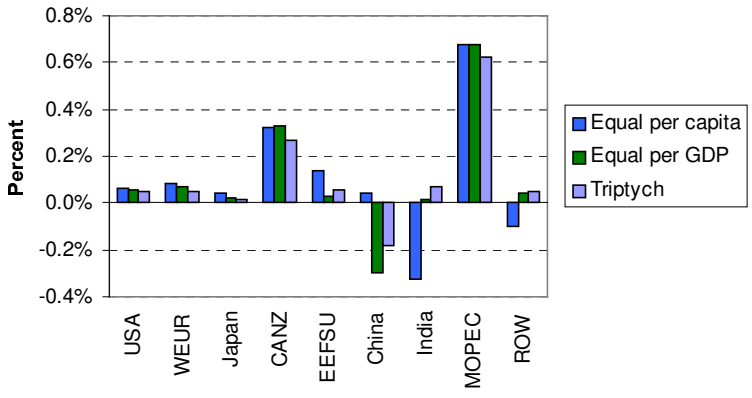
Shadow Prices



Source: Rao and Riahi, 2003

GDP Loss 2000-2040 (MERGE)

Three burden-sharing rules



Source: Klaassen, Miketa, and Zhu, 2003

Conclusions

- Technological progress can make the difference between “not sustainable” and “sustainable”
- Support of energy R&D pays off and improves the global environment at the same time (“win-win”)
- Synthetic fuels (generated with renewable energy and suitable for utilization in fuel cells) favor sustainable development
- The most important one is hydrogen

Summary

- IIASA-ECS explores long-term perspectives of the global energy system and related policy issues, generating new methods, tools and insights to support decision-making
- International and interdisciplinary NGO status allows providing global insights while playing an “honest-broker” role
- ECS collaborates with different partners and is looking forward to extending the network of its collaborators