

Sustainable Energy Development: 3E and Techno-economic Analyses at IAEA

Ferenc L. Toth

Planning & Economic Studies Section (PESS)

Department of Nuclear Energy

UN ECE CSE, Geneva, Switzerland, 24-26 November, 2010



IAEA

International Atomic Energy Agency

Overview

1. IAEA background
2. PESS: 3E and Techno-economic analyses
3. Summary

1. Introduction: IAEA background

"Atoms for Peace" to promote safe, secure and peaceful nuclear technologies:

- Safety and Security: Nuclear installations
- Safeguards and Verification: NPT + Addit'l Prot.
- Science and Technology - peaceful applications of N science and technology: Health, agriculture, water,
- Nuclear Energy: Efficient and Safe Use of Nuclear Power → *Planning and Economic Studies*

1. Introduction: IAEA background

PESS Mandate (1):

Energy modeling & capacity building

- develop energy planning tools
- build capacity for applications
- training and technical support

For:

- Energy system modeling
- Economic, financial and environmental assessments
- Analysis of options for energy strategies



1. Introduction: IAEA background

PESS Mandate (2):

Energy-economy-environment (3E) analysis

- Techno-economic analysis
- Support for research on development -energy linkages
- Contribution to international efforts on sustainable energy development and climate change (both mitigation and adaptation)

next part ...

2. 3E analysis

PESS Mandate: *Economics and 3E analysis*

Exploring issues of broad interest:

- Climate change and nuclear power
- Nuclear energy and sustainable development
- Energy security

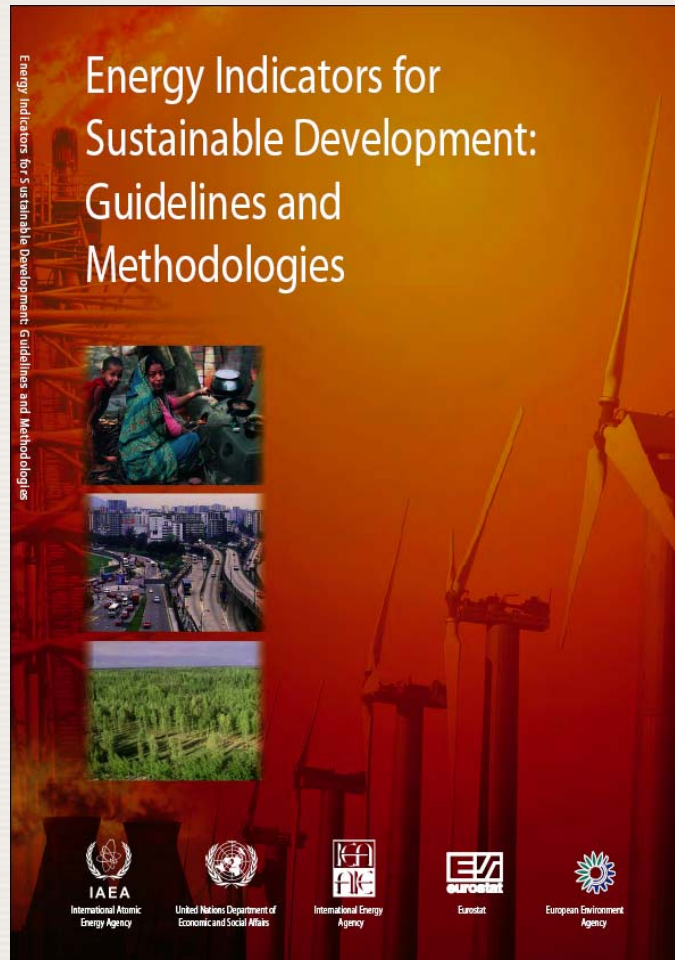
Developing tools:

➤ Energy Indicators for Sustainable Development
EISD



Innovation Indicators, INPD, SI Power Sector

2. 3E analysis

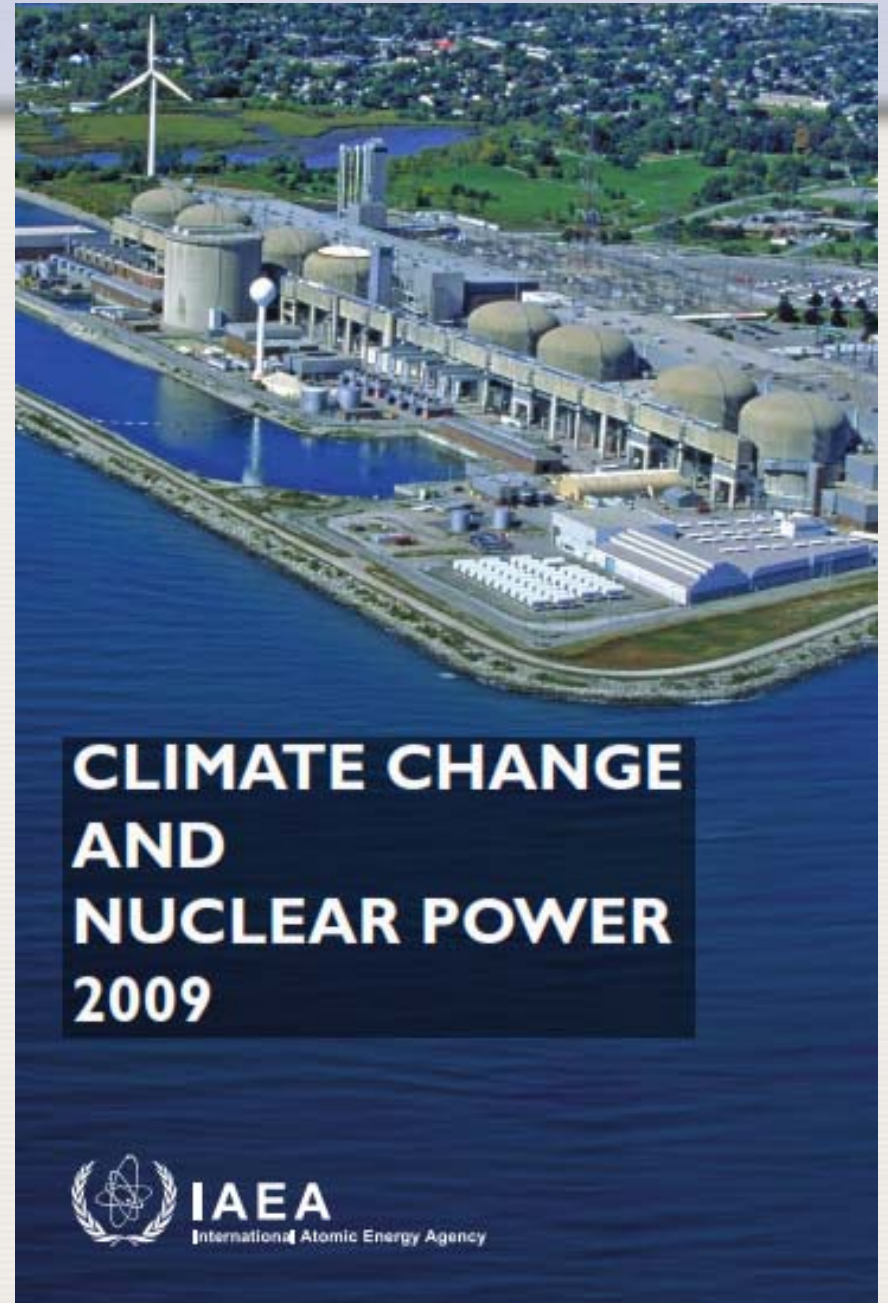


- Prepared by 5 agencies*
- 3 Dimensions of SD (economic, social, environment)
- 30 Indicators
- Guidelines, caveats, methodology (data, construction)
- Important: how to use the EISD
- *UNDESA, IEA/OECD, IAEA, EUROSTAT, EEA

2. 3E analysis

Climate Change and Nuclear Power:

- Booklet for UNFCCC COPs
- Side events at COPs
- Presentations, papers, book chapter, etc.



2. 3E analysis

Development, energy and nuclear power: Bottom-up status and prospects

- Journal special issue: IJGEI 2008
- Presentations, briefings, other papers



PROSPECTS FOR NUCLEAR ENERGY IN THE 21ST CENTURY

Guest Editors:

**Ferenc L. Toth
Hans-Holger Rogner**

International Atomic Energy Agency (IAEA),
Wagramer Strasse 5, P.O. Box 100,
A-1400 Vienna, Austria
E-mail: f.l.toth@iaea.org
E-mail: h.h.rogner@iaea.org

Published by
Inderscience Enterprises Ltd

2. 3E analysis

Climate Change and Energy - VIA:

Vulnerability of Energy Systems to Climate Change and Extreme Events

Motivations

- CC → possible increases in frequency and intensity of extreme weather events
- Energy systems: vulnerable under current climate regime and weather patterns; efforts to reduce vulnerability
- IEA: USD 26 trillion investments to provide demand; 10.5 trillion extra to reduce GHG emissions
- IAEA: account for WEs in energy planning



IAEA

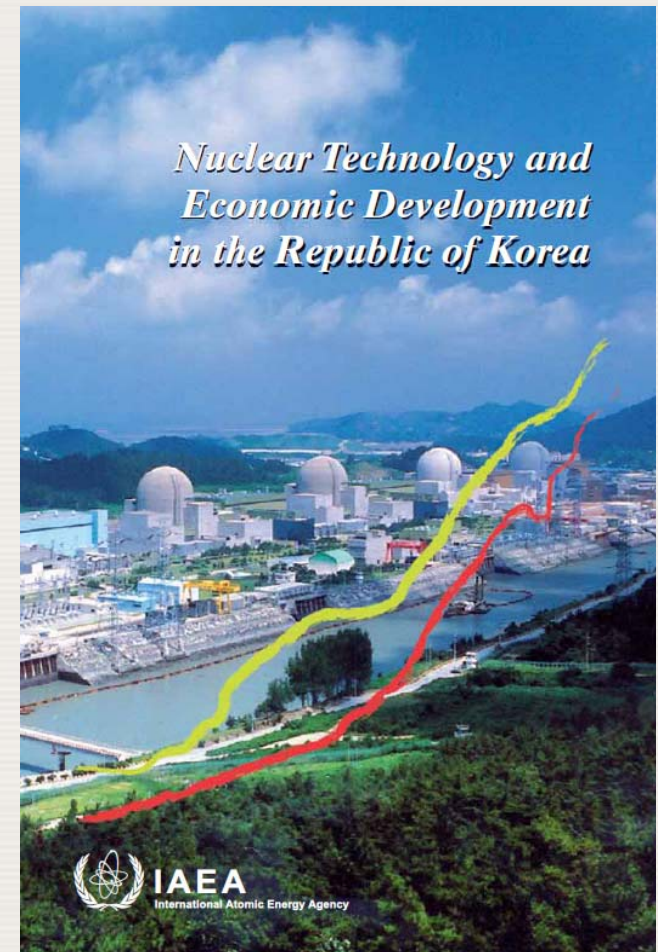
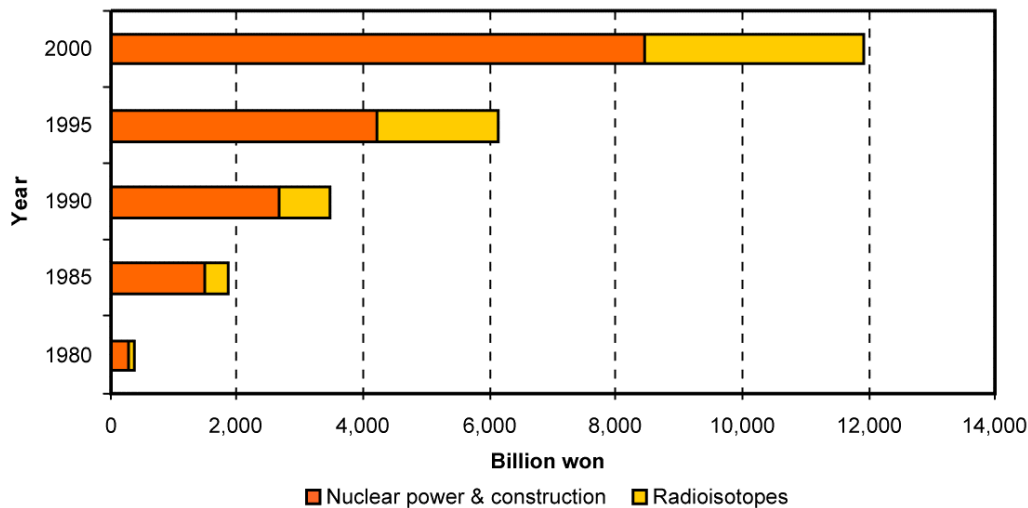
Workshop → Publication

2. 3E analysis

Development – Energy:

Contribution of Nuclear Energy and Technologies to Economic Development

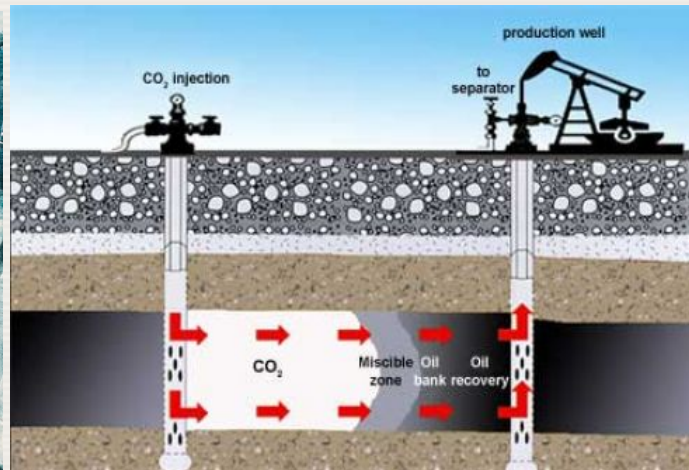
Nuclear technology contribution to economic growth in the Republic of Korea, 1980-2000



2. 3E analysis

Techno-economic analysis:
Comparative assessment of geological disposal of CO2 and radioactive waste:

- Workshop
- CRP
- Book: January 2011



The Abdus Salam
International Centre for Theoretical Physics



Joint ICTP-IAEA Meeting
on
Technical and Environmental Issues Related to
Geological Storage of Carbon Dioxide and Nuclear
Wastes
14 – 18 April 2008
Trieste - Italy

Directors:

Ahmed Irej Jalal
Ferenc L. Toth
Ismael A. Concha-Perdomo
(IAEA, Vienna, Austria)

Local Organizer

Karim Aoudia
(ICTP, Trieste, Italy)

The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy in collaboration with the International Energy Agency (IAEA), Vienna, Austria is organizing a Meeting on Technical and Environmental Issues Related to Geological Storage of Carbon Dioxide and Nuclear Wastes, to be held at ICTP from 14 to 18 April 2008.

Considerable efforts are underway to develop Carbon Capture and Storage (CCS) technologies to make the use of fossil fuels "carbon-free". While carbon capture is a routine industrial process, the large-scale application needed for the electricity generation from fossil fuels is a challenging task. Furthermore, there is little technical experience on long-term storage of carbon dioxide in geological structures. Nuclear industry, on the other hand, has developed over the years sound techniques for ultimate disposal of nuclear wastes. There is already some experience with disposal of low and medium level radioactive wastes. The CCS and nuclear industry can benefit from each other to resolve technical and environmental issues related to ultimate disposal of wastes.

This meeting will bring together earth scientists, environmentalists, technologists from CCS and nuclear disciplines, to share state-of-the-art knowledge from cross-cutting areas and will provide direction for future research.

Purpose of the Meeting

The main purpose of the meeting is to discuss the state-of-the-art technological developments for carbon dioxide and nuclear wastes disposal, technological similarities, scientific uncertainty and environmental issues. Group discussion will clarify differences and similarities of these technologies, and will help in the elaboration of research work for future in this area.

Topics to be covered by the Meeting

The state-of-the-art technological developments for CO2 and nuclear wastes disposal.

- CO2 Storage options
- Scientific uncertainties and monitoring issues
- Lessons learned from nuclear wastes disposal
- Health, ecological, and environmental issues.

Participation

The meeting is open to about 15 scientists. The participation will be by invitation to renowned scientists from all countries, which are members of the United Nations, UNESCO or IAEA. Limited funds are available for some participants who are nationals of, and working in, a developing country. Such support is available only for those who attend the entire activity. There is no registration fee.

Enquires about the participation and other information should be addressed to:
A.Nalaj@iaea.org, wosha@ictp.it, F.L.Toth@iaea.org, I.A.Concha-Perdomo@iaea.org

MEETING SECRETARIAT (Ms. S. Tanasovic, ICTP):
Telephone: +39-040-2209911 Fax: +39-040-220980 E-mail: sm152@ictp.it

July 2007

PARTICIPATION

Upon invitation only

2. 3E analysis

Techno-economic analysis:

NP and other technologies

Perceived interest from MSs: Strategic dilemma:

Expand coal + CCD \leftrightarrow introduce/expand NP

→ Waste: CO₂ and RW - geological disposal

Assistance: help compare pros and cons

Activities:

- one-week workshop at ICTP in Trieste (April 2008)
- book: first in-depth comparative assessment :
1 intro + 11 thematic + 8 regional chapters (~2010)
- CRP: national comparative studies

2. 3E analysis

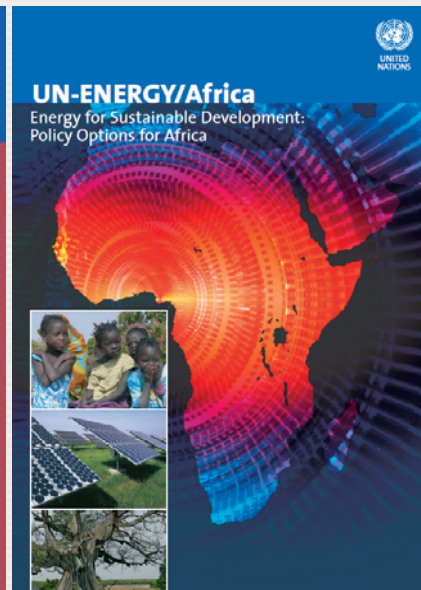
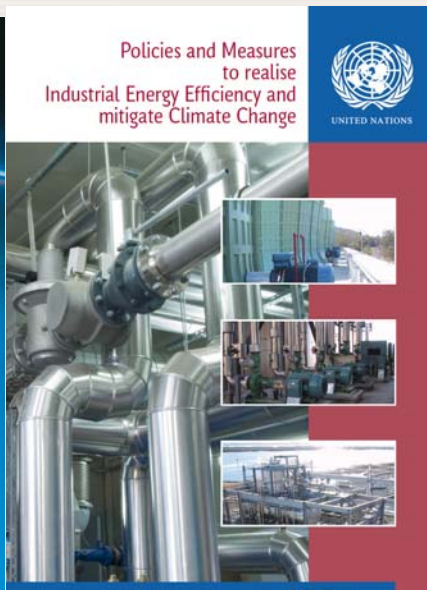
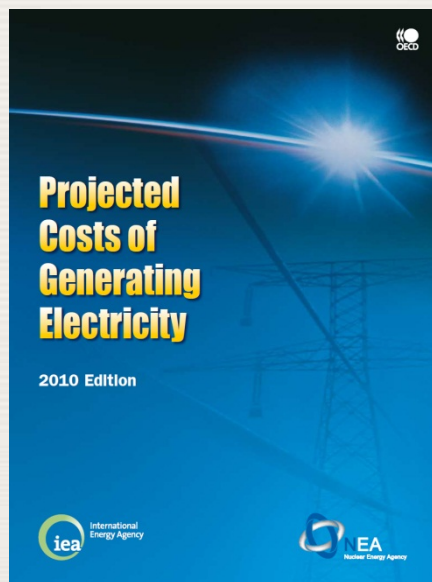
Contribution to International Efforts on Sustainable Energy Development and Climate Change:

IPCC: AR4, SREX, Expert Meetings, AR5

UN Commission on Sustainable Development

UNFCCC COP, UN-Energy Studies and Activities

International Energy Assessments: IEA, NEA



3. Summary

IAEA in Energy-Development linkages:

- Not only “Atomic”: all energy sources,
all technologies

(29 vs 154 MSs); technology neutral

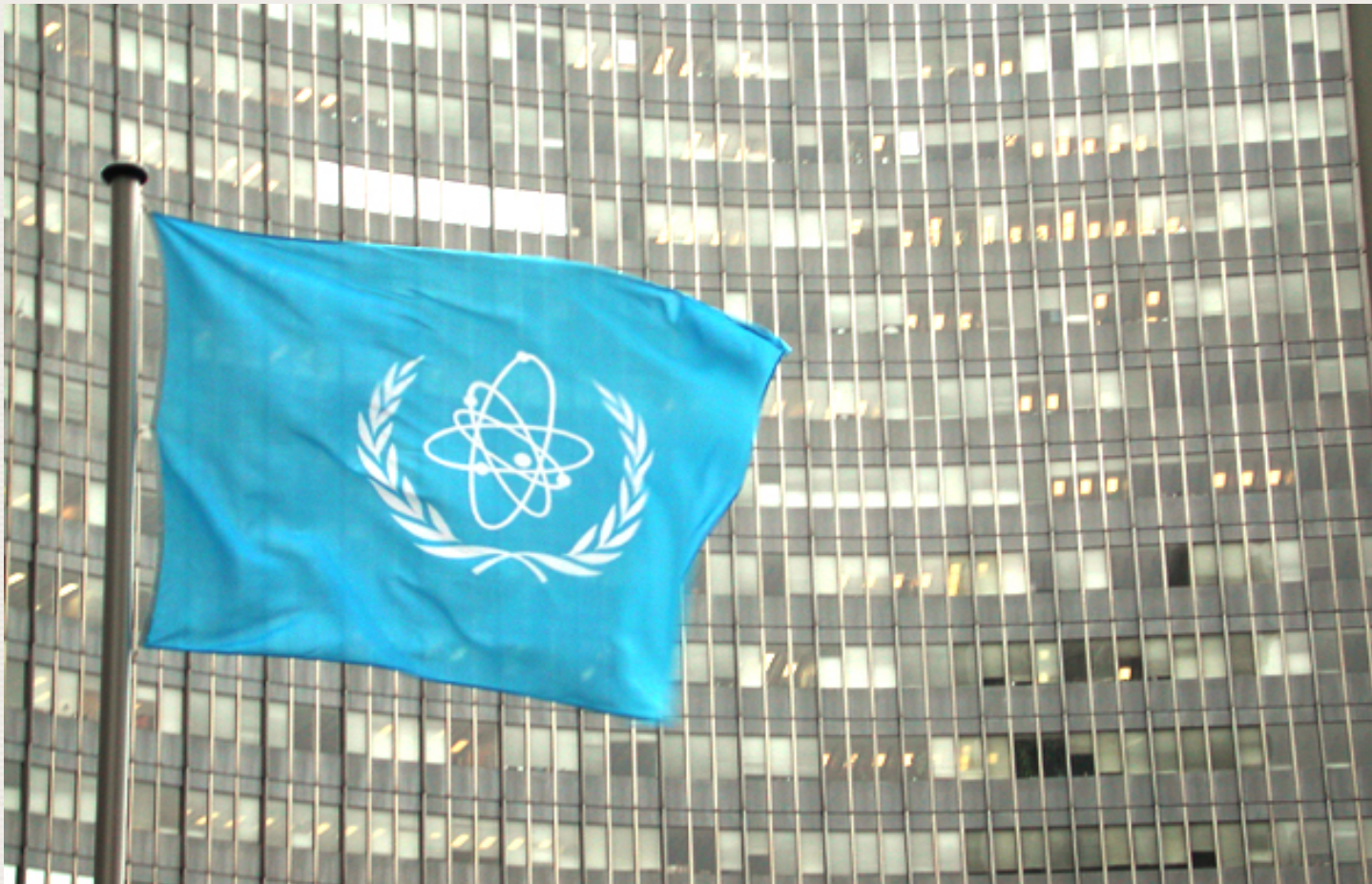
- Not only “Energy”: need for Integrated Assessment:
CLEW model system:

extended resource planning tool

Serving Member States:

- Tools (models, indicators, methods, projections)
- Capacity building (training, TC projects)

IAEA



...atoms for peace.