Economic Methods and Activities

Planning & Economic Studies Section (PESS)

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David Shropshire, SH-PESS

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International Atomic Energy Agency

Two complementary areas

1. Energy Modeling and Techno-Economic Analysis (PESS)

2. NESAs and Nuclear Cost Analysis (INPRO)

Jointly, we support Feasibility Study Workshops, training courses, and benchmarking of nuclear cost models with GenIV EMWG.

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Scope of PESS Capacity Building

- Help build capabilities in Member States for energy assessment studies to:
  - Develop sustainable energy strategies;
  - Identify the potential contribution of different technologies, including nuclear power, in meeting future energy needs.

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Capacity Building Activities

- Provide training on energy planning tools and nuclear financing options.
- Provide capacity building for energy and nuclear power planning at Regional and Sub-regional levels (AFRA, ECOWAS).
- Support “new comers” by conducting Pre-feasibility & Feasibility studies.
- Model the Socio and Macro-Economic impacts of nuclear.

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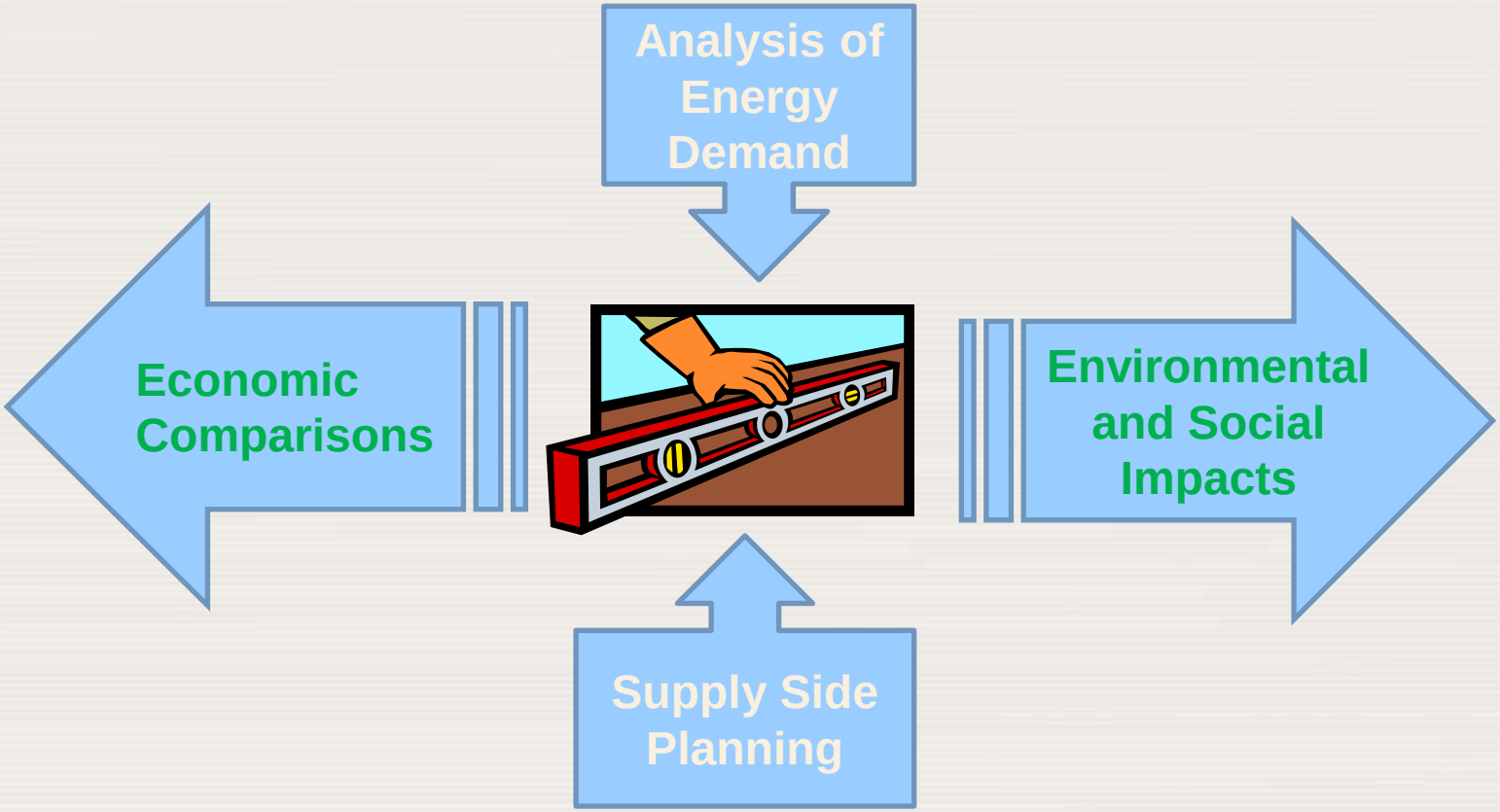
Energy Planning Tools are used to balance energy resources sustainably



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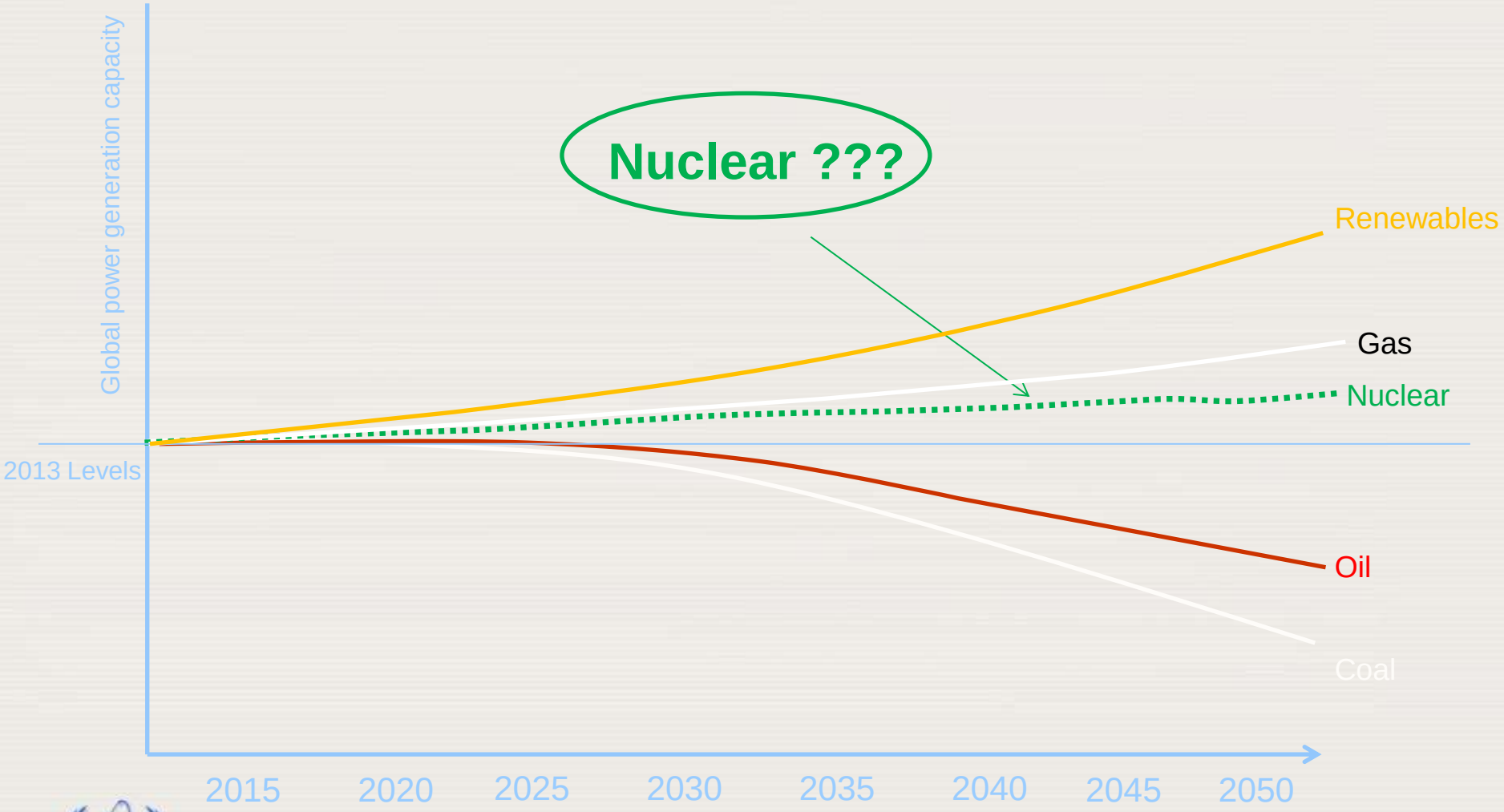
Energy Planning is key to managing a changing the energy mix (>>Renewables)



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Energy Modelling Activities

- MAED
- WASP
- MESSAGE
- FINPLAN
- SIMPACTS
- MAWD
- ESST

Developing enhanced versions of energy models:

MAED-D

MAED-EL

SIMPACTS

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Model for the Analysis of Energy Demand (MAED)

INPUT

- Energy sector data (energy balance)
- Scenario assumptions
  - Socio-economic
  - Technological
- Substitutable energy uses
- Process efficiencies
- Hourly load characteristics

OUTPUT

- Useful or final energy demand by sector/fuel
- Electricity demand
- Degree of electrification
- Hourly electric load
- Load duration curves

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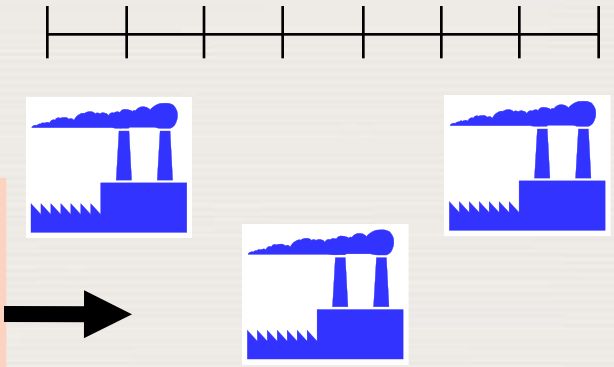
Wien Automatic System Planning Package (WASP)

INPUT

- Load forecast
- Existing system
- Candidates
- Constraints:
  - Reliability
  - Implementation
  - Fuel
  - Generation
  - Emissions

OUTPUT



- Build schedule
- Generation
- Costs
- Fuel consumption
- Emissions

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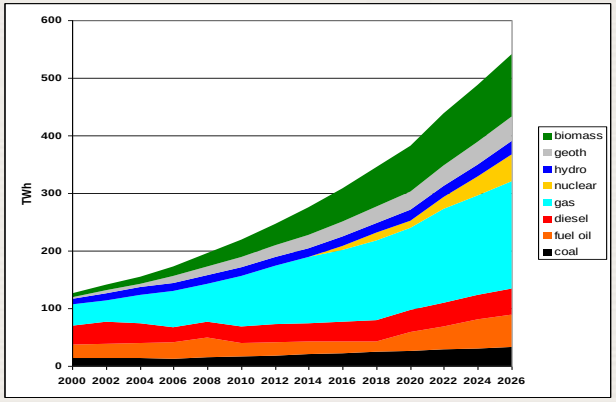
Model for Energy Supply System Alternatives and their General Environmental impacts (MESSAGE)

INPUT

- Energy system structure (including vintage of plant and equipment)
- Base year energy flows and prices
- Energy demand projections (MAED)
- Technology and resource options & their techno-economic performance profiles
- Technical and policy constraints

OUTPUT



- Primary and final energy mix
- Emissions and waste streams
- Health and environmental impacts (externalities)
- Resource use
- Land use
- Import dependence
- Investment requirements

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Financial Analysis of Electric Sector Expansion Plans (FINPLAN)

INPUT

- Investment programme (= capacity additions) & operating expenses
- Economic and fiscal parameters (inflation, escalation, exchange rates, taxes)
- Financial parameters (credits, bonds…)

OUTPUT

For each year:

- Cash flows
- Balance Sheet, Statement of Sources, Applications of Funds
- Financial Ratios:
  - Working Capital Ratio
  - Leverage ratio
  - Debt Repayment Ratio
  - …
  - Global Ratio

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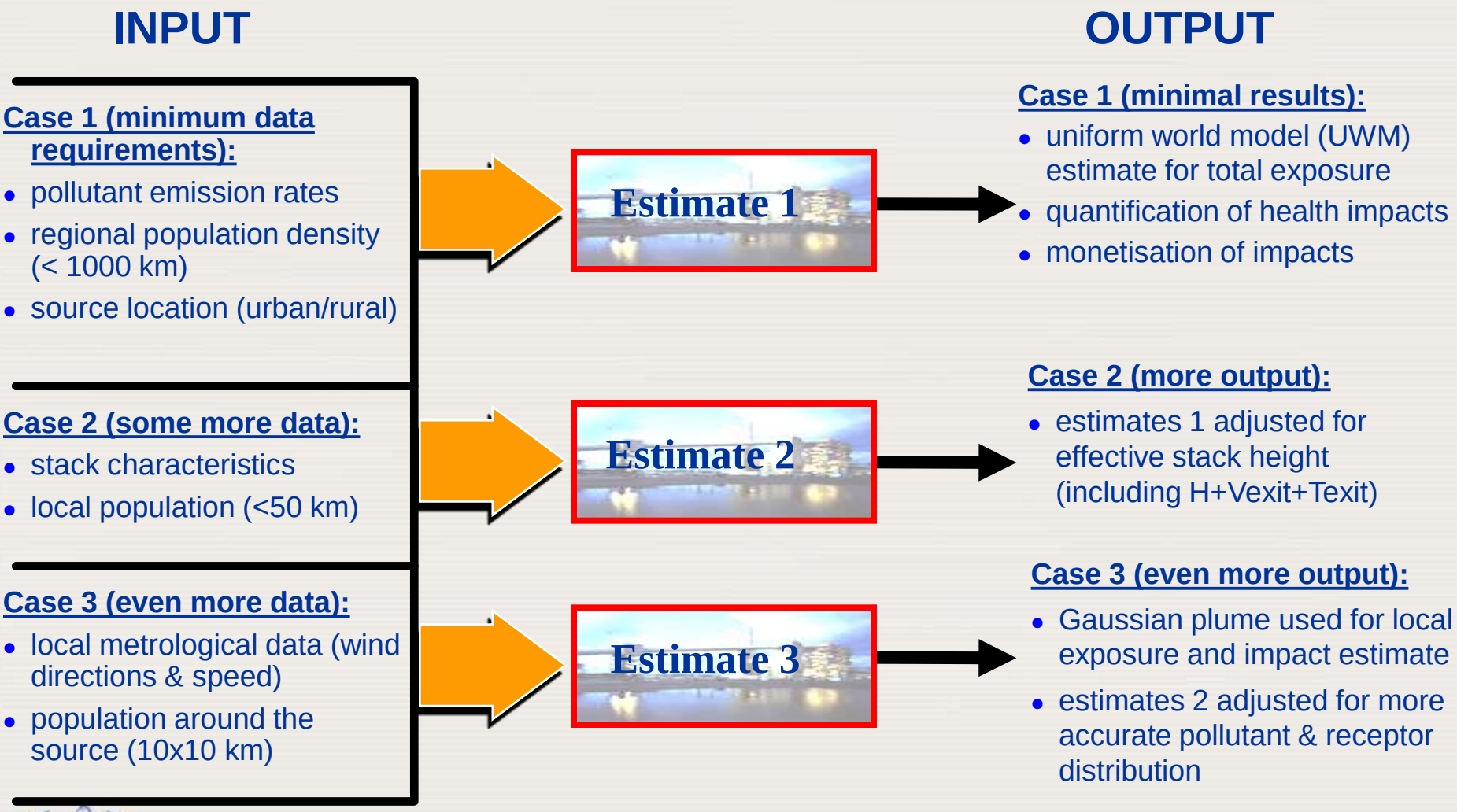
Simplified Approach for Estimating Impacts of Electricity Generation (SIMPACTS)



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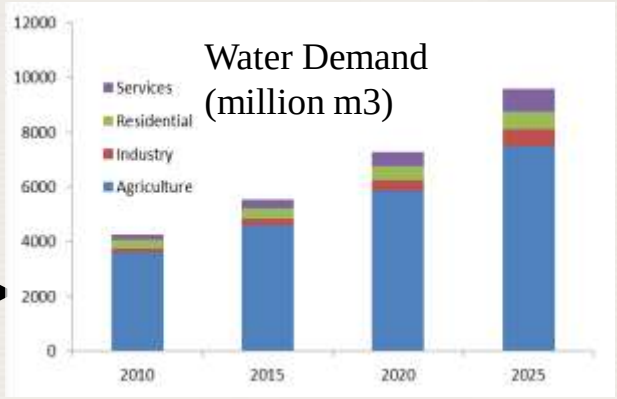
Model for Analysis of Water Demand (MAWD)

INPUT

- Demography and Economy, Sectoral Break-down.
- Agriculture land area, cropping pattern
- Climatic conditions and possible future changes
- Urban-rural composition
- Water Intensity for various end-uses
- Technological and policy options for end-use improvements

OUTPUT



- End-use water demand for different sectors
- Water Demand by quality (irrigation water, industrial water, domestic use water, etc.)
- Urban-rural split of water demand
- Seasonal variation of water demand.

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PESS Energy, Economics, and Environment (3E) Activities

- Assess financing and macroeconomic impacts of nuclear power programmes.
- Prepare special reports:
  - 2014 Climate Change and Nuclear Power
  - 2014 Nuclear Power and Sustainable Development
- Create understanding of the interdependencies between Climate change, Land-use, Energy, and Water (CLEW).

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PESS Energy, Economics, and Environment (3E) Activities

- Prepare briefing sheets on nuclear power myth busting, implication of integration of nuclear and renewables, implications of nuclear energy phase-out.
- Collaborate on economic data and analysis with OECD-NEA/IEA, European Commission-Joint Research Centre, and GenIV International Forum.

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Macro-economic analysis quantifies benefits from a nuclear programme

- Crucial that MSs understand the challenges and opportunities provided by a nuclear energy projects
  - National income, employment, balance of payments, etc.
- Key to development of a national position, and to public information sharing.
- Agency advances include:
  - Developing and validating state-of-the-art economic modelling techniques and databases.
  - Aiding the preparation of customized studies assessing macroeconomic impacts (GDP, jobs etc.) at the MS level.

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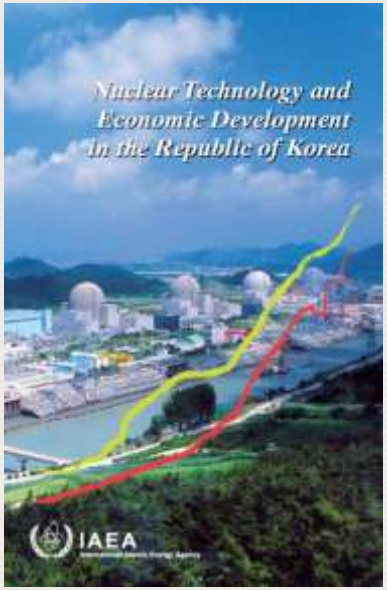
Macroeconomic assessments extend from past, present, to future



From 2004-2009 IAEA & ROK studied benefits to date of nuclear technologies to the economy of ROK

CS on *Macroeconomic Impacts of a Nuclear Power Programme* in Southeast Asia , held in Malaysia from 2 to 6 December 2013.

CRP (2014-2017): To apply (validate) the newly developed modelling tool to selected case studies

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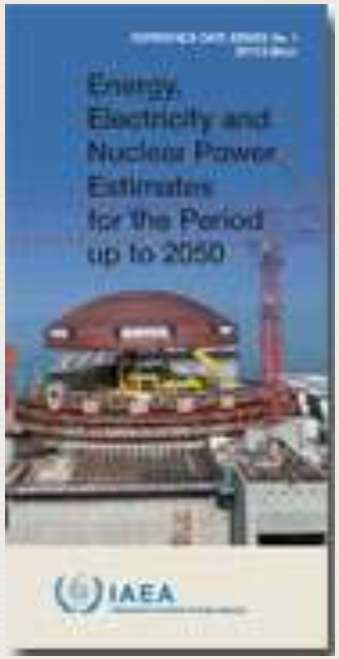
Data Support Activities

- **2014 Reference Data Series #1**
- **Energy-Economy Databank (EEDB) Updates**
- **International Energy Statistics**
- **2014 Nuclear Technology Review**
- **DG Briefs**



Example

In 2011, Cameroon's total primary energy supply mix was: Nuclear 0%, Oil 23.3 %, Gas 3.5%, Hydro 5.6 % and Other Sources 67.6 %. Total electricity generation amounted to 6.0 TWh, with an electricity consumption rate of 238 kWh per capita (Ranking 88 out of 105 in Non-OECD countries).

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Summary

- **PESS collaborates closely with INPRO in many areas of nuclear energy planning and economics**
- **IAEA develops and refines the economic tools and analysis capabilities to meet the needs of our MS.**

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Thank you

More Info on PESS at http://www.iaea.org/OurWork/ST/NE/Pess/

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