

INPRO Dialogue Forum 8
Toward Nuclear Energy System Sustainability: Economics, Resources Availability, and
Institutional Arrangements
Vienna, 26-29 August, 2014

Group Summary Economics

Frank Depisch
Breakout Session



IAEA

International Atomic Energy Agency

Overview

- 13 speakers: Indonesia, Romania, Belarus, Chile, Thailand, Mexico, Algeria, IGCAR India, Pakistan, Hidropress ROSATOM, Bangladesh, BARC India, and Italy
- Presentations by speakers followed by discussions
- Presentations on situation of nuclear power within the countries, and on specific designs, e.g. sodium-cooled FBR, SMR, lead-cooled FBR
- Proposal for modifications / improvements of the INPRO Methodology in the area of Economics, especially NEST

Issues and Findings

- Economics not only for fuel but also fuel cycle, i.e. fuel cycle located at the site as innovative NES
- Importance of LUEC versus IRR in Belarus: IRR for nuclear though lower than that for coal and gas is sufficient but LUEC is critical for the economic attractiveness of nuclear option
- Improve economy and maintain necessary safety level by means of: e.g. evolution of safety methodology to best estimate approach and codes, harmonization of DSA and PSA, etc

Issues and Findings

- Economics of safety: Discussion of advantages and possible disadvantages of fuel and fuel cycle innovation through decrease of consumptions of natural uranium, optimization of cycle length and fuel burn-up
- Opting smaller scale NPP (higher LUEC) over larger unit: limited availability of suppliers, size of grid
- Proposed for new designs. Current designs need changes post Fukushima and increase in cost should be compared to alternatives.
- Propose not to include external cost in LUEC, and to do separate calculations
- Possibility to apply economics since there is no parameter to show improvement of safety



IAEA

INPRO
International Project on
Innovative Nuclear Reactors
and Fuel Cycles

Issues and Findings

- There is interest for economics assessment of fuel cycle facilities but it is difficult to get reliable input data
- Need of flexibility is argued based on past experience of vendor for deployment in countries. Vendor adapts to customer's request, e.g. to burn MOX.
- Flexible design may result in reduction of engineering cost.

Feedbacks on Sustainability Assessment of NES using INPRO Methodology

- Belarus: NEST support package provides a comfortable tool for economic analysis of NES and a clear representation of the results
- IGCAR India proposes criteria for economic assessment of fuel handling scheme: reduction in capital cost, construction and erection time, faster fuel recycling, longer refuelling interval, shorter fuel handling campaign time, reliable operation without incidents
- Case of IGCAR: INPRO Methodology to help R&D Roadmap
- Evaluation of economics indices in NEST for series of reactors is limited to LUEC, without NPV, payback time and IRR. BARC proposes formulae for NPV calculation.



Feedbacks on Sustainability Assessment of NES using INPRO Methodology

- Use of NEST to calculate LUEC for multiple units of SMRs introduced at different times
- Highlight benefits of sustainability assessment for policy makers, e.g. seeking for advantages for nuclear to offset high cost of nuclear; make NPP a national project to reduce investment risk
- Propose to include graphs / charts in NEST
- Time-dependent discount rate in NEST
- Use of real interest rate in the calculation of IDC
- Consideration of risk in fully liberalized market, e.g. long term contract in advance, location of plant and customers. Different PUES for different plants

Conclusions and Recommendations

- Breakout session on Economics proceeded as planned; Objectives were met (Discussion of issues pertaining to sustainability assessment, and Elaboration of INPRO Methodology in the area of Economics)
- INPRO Methodology was shown to be useful tool for economic assessment of nuclear power
- INPRO to consider proposed modifications and improvements of the INPRO Methodology in the area of Economics, especially NEST