

INFRASTRUCTURE ORIENTED ACTIVITIES
OF THE IAEA INPRO PROJECT
AS A RESPONSE TO THE
OPPORTUNITIES AND CHALLENGES OF NUCLEAR ENERGY

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ABSTRACT

Existing scenarios for global energy use predict that demand in 50 years will be at least double than today. . Electricity demand is projected to grow even faster. These scenarios suggest that the use of all available generating options, including nuclear energy, will inevitably be required to meet those demands.

If nuclear energy is to play a meaningful role in the global energy supply in the foreseeable future, innovative approaches will be required to address concerns about economic competitiveness, environment, safety, waste management, potential proliferation risks and necessary infrastructure.

In the event of a renaissance of nuclear energy, adequate infrastructure development will become crucial for Member States considering the future use of nuclear power. The IAEA should be ready to provide assistance in this area. A special resolution was adopted by the IAEA General Conference held in September 2005 on “Strengthening the Agency’s Activities Related to Nuclear Science, Technology and Applications: Approaches to Supporting Nuclear Power Infrastructure Development”.

Previously, in 2000, taking into account future energy scenarios and the needs of Member States, the IAEA General Conference had adopted a resolution initiating the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO).

Based on the scenarios foreseen for the next fifty years, INPRO has identified requirements for different aspects of future nuclear energy systems in areas such as economics, environment, safety, waste management, proliferation resistance and infrastructure and has developed a methodology to assess innovative nuclear energy systems and fuel cycles. Using this assessment tool, the need for innovations in nuclear technology can be defined, which can be achieved through research, development and demonstration (RD&D).

INPRO has developed these requirements during its first stage, called Phase 1A, which lasted from 2001 to mid-2003. In the second stage, Phase 1B (first part), INPRO organized 14 case studies (8 of them performed by national teams and 6 by individuals) to test and validate the methodology. At the end of 2004, INPRO completed this stage by issuing an IAEA report (TECDOC1434) with an upgraded methodology based on the recommendations given in the case studies.

This enables assessments of both global and national scenarios to be carried out for potentially promising innovative nuclear energy systems (INS). In line with the principles of INPRO’s methodology, these INS must satisfy the conditions for sustainable development, for strengthening the non-proliferation regime, and for

solving energy problems at global, regional and national levels in the 21st century. They must also consider and evaluate nationally accepted technological options, taking into account national requirements and specific needs.

Issues other than technical requirements are important to potential users of INS. Many of the factors that will either facilitate or obstruct the on-going deployment of nuclear power over the next fifty years relate to nuclear power *infrastructure*, at both national and international level (international arrangements). Nuclear power infrastructure comprises everything necessary for the successful deployment and operation of nuclear power plants, including its legal, institutional, industrial, economic and socio-political features/substructures. Globalization, and the importance of developing countries in future world energy markets, point to the need to adapt infrastructures, both nationally and regionally. Moreover, this should be done in a way which facilitates the deployment of nuclear power systems in developing countries.

In a world with a growing need for sustainable energy, harmonization of regulations and licensing procedures in different markets could facilitate the application of nuclear technology. This is in the interest of suppliers and developers of technology as well as users and investors. The development of INS which comply with the basic principles, user requirements and criteria established by INPRO for safety, economics, environment, waste management, proliferation resistance and infrastructure set out in this report should facilitate such harmonization. It could also help to facilitate a change in the way how the production of nuclear energy is regulated.

Such considerations led INPRO to define the following basic principle for infrastructure:

Regional and international arrangements shall provide options that enable any country that so wishes to adopt INS for the supply of energy and related products without making an excessive investment in national infrastructure.

In the associated user requirements it is recognized that:

- there is a need to establish legal frameworks at national and international level;
- a country planning to install an INS should make available the adequate industrial and economic infrastructure ;
- structural measures should be taken to secure public acceptance;
- adequate human resources should be locally or regionally available to implement, deploy, execute and decommission the nuclear project

Globalization brings with it the opportunity to draw on a much broader pool of resources rather than striving to maintain a complete domestic capability across the many disciplines and technologies on which nuclear energy systems depend. Adopting nuclear technology for the supply of energy requires a significant investment in national capability – at the very least to position a country to be a knowledgeable purchaser. However, it is also important to recognize that a country has options concerning the upfront investment required because of the wide range of services and products available internationally, including operating and even regulatory services.

The scope of possible infrastructure oriented activities in INPRO includes:

- undertaking relevant studies and analysis to demonstrate the strengthened role of INS for sustainable development;
- (??) making evaluations to promote the use of INS for electricity production and non-electrical applications;

- facilitating the application of INPRO methodology to guide INS deployment strategies on a national, regional, or global scale, with emphasis on the needs of developing countries;
- identifying institutional and infrastructure options for Multilateral Fuel Cycle organizations and other innovative approaches which would facilitate the introduction and further deployment of nuclear energy;
- identifying innovative approaches to the communication process of all aspects of INS to the public, policy advisors, decision makers and other stakeholders;
- providing assistance for and facilitation of harmonization of licensing and industrial codes and standards, including subcontracting by licensing authorities and international design certification as well as maintenance or development of necessary competences and experience, research facilities, etc.

The paper summarizes the present status of INPRO and describes the main results to date, providing an outlook on future activities with particular emphasis on the area of infrastructure.