
INNOVATION AND NUCLEAR KNOWLEDGE: FROM THE PRESERVATION OF KNOWLEDGE TO THE DEVELOPMENT OF KNOW-HOW

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The renaissance of the nuclear option for sustainable energy supply has created the basis for innovation on nuclear systems, reopening the range of technologies to be considered in the future.

The Generation IV International Forum, and the International Project on Innovative reactors and Fuel Cycle (INPRO) are certainly the most active initiatives since 2000 to specify objectives for future nuclear energy systems, to establish a comprehensive methodology and users requirements, and to select technologies that are most likely to meet nuclear energy needs beyond 2030 and to be developed in international collaboration. The stringent criteria assigned to future nuclear systems foster the achievement of breakthroughs in technologies.

Innovations for future nuclear energy systems call for a good knowledge of the past achievements and current practice. At the same time, innovations are often to be sought at the boarder between different areas, which explains the different nature of the knowledge to be gathered, and the different processes to achieve this goal.

Among the technologies that experience a renewed interest today, HTR, SFR and MSR have been developed to the stage of experimental and/or prototype reactors. Before being phased out, they have been the subject of investigations for decades and a considerable amount of data is available from the past experience. Initiatives to develop data bases on those types of reactors, on a national basis or an international basis, turn out to be invaluable resources for the development of 4th generation nuclear systems as they permit to accelerate the development of new technologies today, while saving decades of R&D and significant expenses.

For the SFR, an exemplary and precursory approach in France has permitted to preserve the knowledge gained during five decades of R&D and to be passed down to future generation despite the governmental decision to decommission Superphenix in 1998 (MADONA encyclopaedia, Phenix lifetime extension project, continuous operation of the sodium school).

The HTR-10 and HTTR experimental reactors under operation in China and Japan, respectively, perpetuate R&D activities on HTR technologies. The creation of the European Network on HTR Technologies (HTR-TN) in 1998, involving 18 organisations, is intended to share the experience acquired in this field by member countries of the European Union.

For the MSR, the considerable amount of results accumulated by ORNL in the 60's and 70's forms a significant basis for the demonstration of the viability of a MSR breeder concept. The MOST project, supported by Euratom, gave the opportunity to revisit the potential of MSR and to update the data and knowledge on MSR.

Those examples show that initiatives are now taken at the international level. Today, the international dimension has become crucial, which explains the essential role of IAEA and OECD/NEA to compile open background information. At the same time, sharing the knowledge acquired within the framework of national programmes, such as envisaged in the

Generation IV International Forum for ultimate commercial uses, calls for a fair treatment of the intellectual property rights.

In addition, knowledge in nuclear engineering and design calls for maintaining education and training in nuclear fields, while making the access easy to international participants, especially those from countries having decided to phase out of nuclear.

Initiatives have already been taken by the European Commission to implement a network of Institutes offering training in nuclear science and engineering, so as to establish a European program of education in nuclear engineering. Other initiatives are considered on specific subjects such as an international sodium school, which would build on existing sodium schools in France and in Japan.

New technologies for the management of information offer opportunities to preserve for the future not only documents but also technical data, computer codes, calculation results and algorithms.

Large international initiatives such as the Generation IV Forum and INPRO certainly contribute to the objective of the development of know-how by stimulating multi-disciplinary interaction and also providing foundations for the development of education and training.