**Fusion reactors in INPRO strategic studies and new INPRO collaborative project on the “Legal and Institutional Issues of prospective deployment of Fusion facilities”**

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The International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) is a membership-based project that supports its members in their long-term planning and collaboration on innovations in nuclear power reactors, fuel cycles and institutional approaches to promote the sustainable development of nuclear energy. It currently includes 42 members – 41 IAEA Member States and the European Commission (EC). As IAEA looking-forward service INPRO also supports Member States’ activities in cross-cutting areas in technology development between nuclear fission and nuclear fusion for energy production, and integration of Nuclear Energy Systems (NES) with other clean energy sources.

Based on the INPRO Methodology a number of strategic studies were fulfilled and published for nuclear energy systems scenarios modelling, analysis and sustainability assessment. Collaborative projects GAINS and SYNERGIES included the visions on future world’s architecture of NES with different types of reactors and fuel cycle.

INPRO applied approaches for analysis of technical and institutional innovations essential for sustainable nuclear energy deployment. The legal issues and institutional arrangements that play an important role in the development of sustainable nuclear energy systems is an important task of INPRO in supporting Member States in their pursuit of innovations in NPP and NES. Similar analytical approach was applied for transportable NPP and cooperative nuclear fuel cycle back-end. The INPRO instruments are also useful for finding of “gaps” in nuclear power systems. Currently the project has service instruments for instance: “NES Sustainability Assessment” (NESA) and “Analysis Support for Enhanced Nuclear Energy Sustainability” (ASENES).

In the past INPRO studies fusion reactors were considered in the Technical Report “Nuclear Energy Development in the 21st Century: Global Scenarios and Regional Trends” (2010, NP-T-1.8). Due to absence of initial data for comprehensive analysis, the scope of examination was limited to the potential use of fusion reactors for the breeding of fissile material for fission reactors. Such a synergistic fusion-fission nuclear energy system may have potential advantages and such a nuclear energy system may be considered in more detail in a future study.

Following the technical progress in the area of fusion systems development and responding to the interest in Member States expressed at the 30th INPRO Steering Committee meeting in October 2021, the INPRO Secretariat has decided to launch a new INPRO collaborative project – an INPRO study on “Legal and Institutional Issues of Prospective Deployment of Fusion Facilities”. The decision was also based on earlier recommendations of INPRO MSs, the IAEA General Conference resolution and the support by the Standing Advisory Group for Nuclear Energy (SAGNE).

The study is aimed to contribute to the synergies in technology development between nuclear fission and fusion for energy production and is targeted on the beyond technical aspects. INPRO can facilitate bringing together the knowledge in cross cutting issues to help accelerate the deployment of fusion power plants.

The overall objective of the INPRO study on “Legal and Institutional Issues of Prospective Deployment of Fusion Facilities” is to support the fusion community in its effort to accelerate the technology development of fusion power generating systems and early identification of possible gaps in long-term sustainability, such as regulatory framework, nuclear safety and security issues, nuclear liability, safeguards and non-proliferation issues, key export/import issues, comprehensive infrastructure issues as well as main drivers and impediments to fusion facilities implementation.