

SNETP FORUM 2023

Gothenburg, Sweden

15-17 May 2023

Scope

[SNETP](#) is an international association (AISBL) composed of around 110 members from 25 countries, gathering nuclear power plant operators, research centres, nuclear industry and technical support organizations. The association has been supporting the creation and the implementation of R&D programmes since 2007.

European Technology Platforms (ETPs), such as SNETP, are industry-led stakeholder fora recognised by the European Commission as key players in driving innovation, knowledge transfer and European competitiveness. Among their numerous activities, they develop research and innovation agendas supported by private and public funding for an implementation at EU but also at member state levels.

SNETP believes that continuous technological innovation is fundamental to maintaining a high-level of safety and competitiveness in the EU nuclear sector and requires the establishment of a coordinated R&D&I programme at European level in close collaboration with international partners. In a context of climate change and global competition, SNETP is convinced that nuclear energy can play a significant role in meeting climate objectives as a zero-greenhouse gas emissions energy source, especially in areas there are not easy to decarbonise like industry and transportation.

The SNETP Forum 2023, aims at discussing and analysing recent technological innovations in the field of SMRs, AMR and advanced nuclear, safety, waste management & recycling, non-electricity applications, LTO and improved NPP operation, fuel elements and hybridisation, to enable the nuclear sector to play its role in the mitigation of climate change and to contribute to climate neutrality. The aim is to underpin the topics of interest to the European community and those that would eventually lead to R&D and innovation priorities and the harmonization of best practices within EU countries and beyond. Methodologies should be shared between LWR, Gen IV and ADS development for reinforcing innovation in nuclear technologies.

The technical programme has been designed by the SNETP Scientific and Industrial Innovation Committee (SIIC) as to cover major topics of interest to the stakeholders of SNETP.

Technical programme: Topics & proposed moderators

1. SMR, AMR & Advanced nuclear systems (all day)

Innovative technologies and solutions are needed to ensure that a whole range of competitive and adapted nuclear solutions will be available in convergence with other power generation technologies, providing improved speed of construction and extended implementation possibilities in local systems. In addition to the nuclear reactors in operation and those under construction, Europe needs to expand the range of reactors technologies available to meet national/local specificities. The development of different SMRs, based on most matured technologies or on other advanced technologies, offers the possibility to deploy flexible options for both power and non-power applications and contribute to decarbonization. R&D&I should support the development of SMRs to make them safe and competitive with other means of production as part of a global deployment strategy over the coming decades.

The long-term sustainability of nuclear energy will be ensured by GEN IV reactors and closing of the fuel cycle to improve reactor economics while minimizing the nuclear waste. GEN IV fast neutron reactors and Accelerator Driven Systems are also offering a transmutation solution. This requires a large R&D programme and research facilities to support development, design and licensing of the needed prototypes.

Specific attention shall be given to the various EU programmes on SMR / AMR and to the emerging actors in the field, such as start-ups.

2. Safety Research (morning day 2)

The establishment of high safety standards is a must for the nuclear industry. In order to assure the optimum performance of the running nuclear reactors and the development of even safer and more competitive European reactors, ambitious R&D&I programs are needed. Recently, there are two elements that draw the attention of a good part of the international community: passive systems (to a good extent related with SMRs, but not only) and new nuclear fuels (EATF), potentially capable to perform better under both even more demanding nominal conditions (i.e., higher power rates; longer irradiation times) and off-nominal conditions. For power plants in operation, nuclear must continue to develop R&D&I programs in the areas of accidents and hazards such as earthquakes, fire or severe accidents but also on methodological approaches such as Probabilistic Studies. Climate change and its consequences should also be considered in the way the sector envisage safety and resilience of nuclear power plants more globally.

3. Waste management & recycling (morning day 2)

The current and projected fleet of plants consists largely of water-cooled, water-moderated reactors. These reactors have over time achieved a high degree of maturity in terms of economic performance and safety. To achieve major steps in terms of sustainability (reduced high-level waste production, better use of resources and higher thermal efficiencies) and to open the way for high-temperature non-electricity applications, new types of reactors based on other coolant technologies should be envisaged combined with more advanced fuel cycles. The use of fast reactors in a closed fuel cycle approach will allow a large decrease in natural resource (uranium) consumption, allowing therefore a more sustainable implementation of nuclear energy. One of the major concerns of society regarding the implementation of nuclear energy is also the high-level nuclear waste. Fast spectrum reactors with

closed fuel cycles will allow a significant reduction in high-level nuclear waste radiotoxicity and volume. Advanced reprocessing and fuel manufacturing techniques are needed to recycle the minor actinides. This session shall discuss the how the sustainability in terms of resource utilization and high level waste minimization can be gradually increased.

4. Non-electric applications of nuclear energy including hybridization (all day)

In a context of high energy prices, stringent emission reduction targets and reduced availability specifically of natural gas, nuclear energy has the potential to provide dependable solutions for low-carbon cogeneration of heat and electricity, and hydrogen production. Dialogue and collaboration with other sectors such as chemical, cement, steel, paper, etc. industries are key to address these challenges from the end-user perspective.

Nuclear power is a reliable technology for low-carbon, baseload electricity production. Today's industrial nuclear power plants produce 26% of all electricity. However, electricity represents only 24% of the European energy consumption, while heating and cooling for residential and industrial uses account for 50%. Almost unnoticed by the public, close to 100% of heat is obtained from combustion of large amounts of fossil fuels which implies that an effective European decarbonization strategy must address this sector with high priority. In a context of climate change and geopolitical constraints, nuclear energy has considerable potential to reducing greenhouse gas emissions (GHGs) worldwide by providing a secured supply of electricity, district heating and high temperature heat for industrial processes including for the required large-scale production of hydrogen. Many of the envisaged non-electric applications can produce storable energy carriers and are thus considered enabling technologies for Hybrid Energy Systems including large fractions of variable renewables.

The topic will be addressed by 4 panel sessions to promote information exchange between all stakeholders with particular focus on end-users, vendors and supply chain companies, regulators and investors.

5. LTO & improved plant operation & maintenance (Afternoon day 2)

With an important number of reactors in Europe now coming to the end of their initial operational design life, the question of life extension and more general long-term operation has become more and more important. LTO makes it possible for nuclear operators to get a higher return on their initial investment and for citizens to get their electricity supply at an acceptable cost, especially in the current energy context. European R&D&I should support the implementation of LTO but also maintenance activities with optimal safety and security conditions by providing innovative solutions to assess external hazards due to climate change (seismic events, flooding, high intensity wind, etc.) systems and components reliability, on-line monitoring and predictive tools (modelling and simulations). The robotics sector contributes to improving conduct of maintenance operations and further R&D&I and collaboration in that sense would be welcome.

6. Fuel elements & core design (Afternoon day 2)

Industry stakeholders target to improve further the safety of nuclear reactors, while adapting it to more flexible operation modes and to smaller reactor sizes. Another important objective is to enhance the sustainability of nuclear energy by making progress in nuclear fuel recycling, which would increase the available resources, reduce the ratio of waste per produced energy unit and optimize the fuel cost contribution to the nuclear levelized cost of electricity (LCOE). Innovative core designs and nuclear fuel elements are key elements to reach these goals.



The development qualification and full introduction of new fuel technologies requires advanced performance codes based on a thorough understanding of the fuel element behaviour obtained by complementary post irradiation experiments, separate effect experiments and multiscale modelling.

For each of these topics, experts will be invited to present their views and to propose new collaborative project ideas.