

On the Urgent Need of a Nuclear Energy Strategy for Europe

Position Paper of High Scientific Council

In today's world, the ever more pressing climate change challenge, combined with the resurgence of increasing geopolitical tensions, highlights the strategic importance of transitioning into a reliable, affordable, secure and sovereign low-carbon energy system for Europe.

In light of this situation, the ENS HSC

RECOGNISES THAT

- Energy represents a trilemma requiring balanced, effective and integrated solutions to climate change, security of supply and affordable energy for all:
 - i) environmental protection and mitigation of climate change are of paramount importance;
 - ii) as declared by several high representatives of the countries that participated to the first Nuclear Energy Summit in Brussels, on March 21st 2024, geopolitical and strategic concernsⁱ require enhanced energy security, and
 - iii) the strong socio-economic impact on the citizens and on the industrial sector in European countries calls for solutions addressing the affordability of energy supply;
- Nuclear energy is part of an effective solution to this trilemma for Europe, given that:
 - i) It is the energy source with one of the lowest greenhouse gas emissions throughout its whole life cycleⁱⁱ, and the source that uses the least amount of land and of critical materials per unit of energy producedⁱⁱⁱ.
 - ii) Europe has large autonomy in maintaining and developing this technology, from the nuclear fuel enrichment and fabrication to the nuclear reactor technology design, construction, operation, maintenance and decommissioning, to the radioactive waste management and final disposal, with very limited dependencies from other countries with respect to all other energy sources.

ⁱ European Commission, [EU strategic dependencies and capacities: second stage of in-depth reviews](#), 2022.

ⁱⁱ S. Schlömer (ed.), [Technology-specific Cost and Performance Parameters](#), Annex III of Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014.

ⁱⁱⁱ Hannah Ritchie, [How does the land use of different electricity sources compare?](#), <https://ourworldindata.org/land-use-per-energy-source>, 2022.

- iii) It is the only clean energy source able to produce in large quantities and in a stable, dispatchable and affordable way all the main energy vectors: electricity, heat and hydrogen.
 - iv) It provides good quality jobs and top-level expertise in a multitude of disciplines. It represents an asset for sustainable economic development.
- Nuclear energy is a logical long term, strategic choice for Europe, framed into an articulated supply chain and historically based on a technological and industrial European leadership; however, both these features have been endangered in recent decades by a lack of nuclear energy industrial projects and minimum financial support to R&D&I in Europe.
 - This strategic choice not only addresses Europe's energy needs but also underscores its significance in supporting critical sectors such as healthcare through nuclear medical applications and other non-power nuclear technologies.
 - As stated during the Nuclear Energy Summit^{iv}, for nuclear energy to make a substantial contribution in solving the energy trilemma, the following elements are needed:
 - i) New and adequate investments have to be secured.
 - ii) Nuclear industry has to improve in terms of effective delivery, on time and on budget.
 - iii) Beyond the electricity sector, nuclear plants have to integrate hybrid energy systems by providing co-generative solutions, allowing e.g. the co-production of hydrogen, desalinated water, biofuels, electricity, district heating and heat for industrial applications.
 - iv) The extension of the safe operation lifetime of today's nuclear fleet, as "one of the cheapest ways to secure clean power at scale".

To duly implement this crucially needed nuclear energy contribution, the ENS HSC

CONSIDERS THAT

- Research and development, and innovation are of paramount importance and represent fundamental enablers for the delivery of the European energy goals, as they are needed to develop:
 - i) Innovative technologies supporting near-term new builds
 - ii) Suitable and efficient solutions for the effective lifetime extension of the large fleet of nuclear reactors in operation in Europe.
 - iii) New reactor technologies, like (but not limited to) the Small Modular Reactors and the Advanced Modular Reactors, capable of enhancing safety, improving efficiency, meeting cost and delivery schedules, and addressing integration into hybrid energy systems.

^{iv} Speech by President von der Leyen at the Nuclear Energy Summit, "Check against delivery", https://ec.europa.eu/commission/presscorner/detail/en/speech_24_1624, 2024

- iv) New fuel and fuel cycles, especially for advanced reactors, targeting improved efficiency, better uranium utilization, reduction of nuclear waste and reduction in radioactive waste lifetimes.
 - v) A strong, large, collaborative European nuclear energy supply chain furthering industrial standardization.
 - vi) Industrial facilities needed to demonstrate the modularization approach.
 - vii) Shared (research-industry) labs for innovative manufacturing methods, for testing facilities for innovative systems and components, for new materials especially for Advanced reactors.
 - viii) New education and training programmes and facilities, including research and training reactors, to accelerate the preparation of the large workforce needed throughout Europe for all the parts of the nuclear sector, including science, energy, healthcare and others.
- Effective multilateral collaboration between nuclear sector, science and academic communities, governments and the EU is essential to streamline efforts and enable the acceleration of nuclear programmes, which are an important part of the energy transition.
 - Nuclear safety and security regulation must be independent, effective and efficient not only to give the public confidence in the safety of the increased nuclear energy deployment, but also to give industry regulatory certainty so that they can plan nuclear energy deployment with confidence.
 - Collaboration between national nuclear regulators will be essential not only to harmonize safety standards for new nuclear power plant designs, but also to harmonize regulatory approaches including joint assessments of safety documentation.

All that considered, the ENS HSC

RECOMMENDS

1. To elaborate and implement as a matter of urgency and with a long-term strategic view, a comprehensive European Nuclear Energy Strategy.
2. That the European Nuclear Energy Strategy must:
 - i) contribute to Europe's energy transition to a reliable, affordable, secure and sovereign low-carbon energy system, in line with international agreements and according to the principles of a just transition
 - ii) ensure European international competitiveness in terms of industry and knowledge in the field of nuclear energy technologies
 - iii) enable the recovery of European nuclear capacity and performance in order to restore its scientific and industrial leadership in this critical sector; and
 - iv) enable Europe to achieve its strategic energy autonomy, in particular in the nuclear sector.
3. To radically improve the level of funding for research and development, innovation and education, ideally in collaboration with the nuclear industrial sector, to levels comparable to those of competitor regions of the world.