



ESNII Vision paper

SNETP Forum

02 February 2021

Remotely

ESNII Vision paper – draft version



Content of the ESNII Vision paper



1. **Mission statement:** Why does ESNII exist? Which needs are addressed?
2. **Vision statement:** What is targeted in the long-run?
3. **Strategy:** How to achieve it?
4. **Actions:** What will be done?

1. ESNII mission statement



ESNII mission stems from the energy needs assessment of the European economy and focuses on Generation IV systems development with closed fuel cycles in line with the integrated SET-Plan.

The use of fast reactors in a closed fuel cycle can allow:

- large increase (50x) in efficiency with regard to natural resources consumption
- significant reduction in radiotoxicity and volume of high-level nuclear waste. Advanced reprocessing and fuel manufacturing techniques to recycle the MA are necessary to realise this goal.

2. ESNII Vision statement



ESNII aims to develop safe and performing fast neutrons spectrum reactor technologies with closed fuel cycle Generation IV energy systems, allowing competitive and sustainable energy production, better use of the uranium resources and waste minimization.

3. ESNII Strategy



(1/2)

- ESNII initiative has been able to gather European teams to pursue R&D&Demonstration on GEN IV systems using advanced and innovative technologies based on fast neutron spectrum and closed fuel cycles.
- a clear strategy is to promote the advances in R&D&Demonstration of these technologies, utilizing synergies and common technical solutions to maximize effectiveness of the whole process.
 - One good example is the nuclear fuel. The technical choice of pelletized FR MOX fuel should lead to the harmonization of FR fuel R&D in Europe.

ESNII Strategy – promoted initiatives (2/2)

● Industrial initiatives

- **LFR - ALFRED** - Advanced Lead-cooled FR European Demonstrator
- **GFR - ALLEGRO** - Gas-cooled Fast Reactor demonstrator
- **SFR** - Sodium Fast Reactor technology

● R&D project in support to the ESNII technologies

- **MYRRHA** - flexible fast spectrum facility conceived as a lead-bismuth cooled Accelerator Driven System demonstrator

ESNII R&D priorities

- fuel development & qualification
- materials development & qualification
- coolant behaviour, TH and chemistry control
- component design and testing
- instrumentation and control
- safety assessment & code validation
- fuel handling technology & fuel-coolant interaction
- robust decay heat removal systems
- development of out-of-pile and in-pile mock-ups and demonstrators

4. ESNII Actions within SNETP



- share a common technological roadmap and develop synergies among national and EU-funded programmes, based on sustainable industrial initiatives,
- promote and support the R&D&Demonstration programmes needed to implement this roadmap,
- consolidate the technology roadmap and promote the construction of the facilities needed for the demonstration programmes,
- establish the common basis of an R&D, industrial and financial partnership, facilitating the constitution of consortia and P-P partnerships for the best exploitation of the developed technologies and projects,
- provide indications on the design, safety and operational parameters under which the assessment shall be made to establish a sound and timely process for the evaluation of the technologies, the associated projects and their potential.



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