



ESNII
European Sustainable Nuclear Industrial Initiative



SNETP
SUSTAINABLE NUCLEAR ENERGY
TECHNOLOGY PLATFORM

Biennial conference

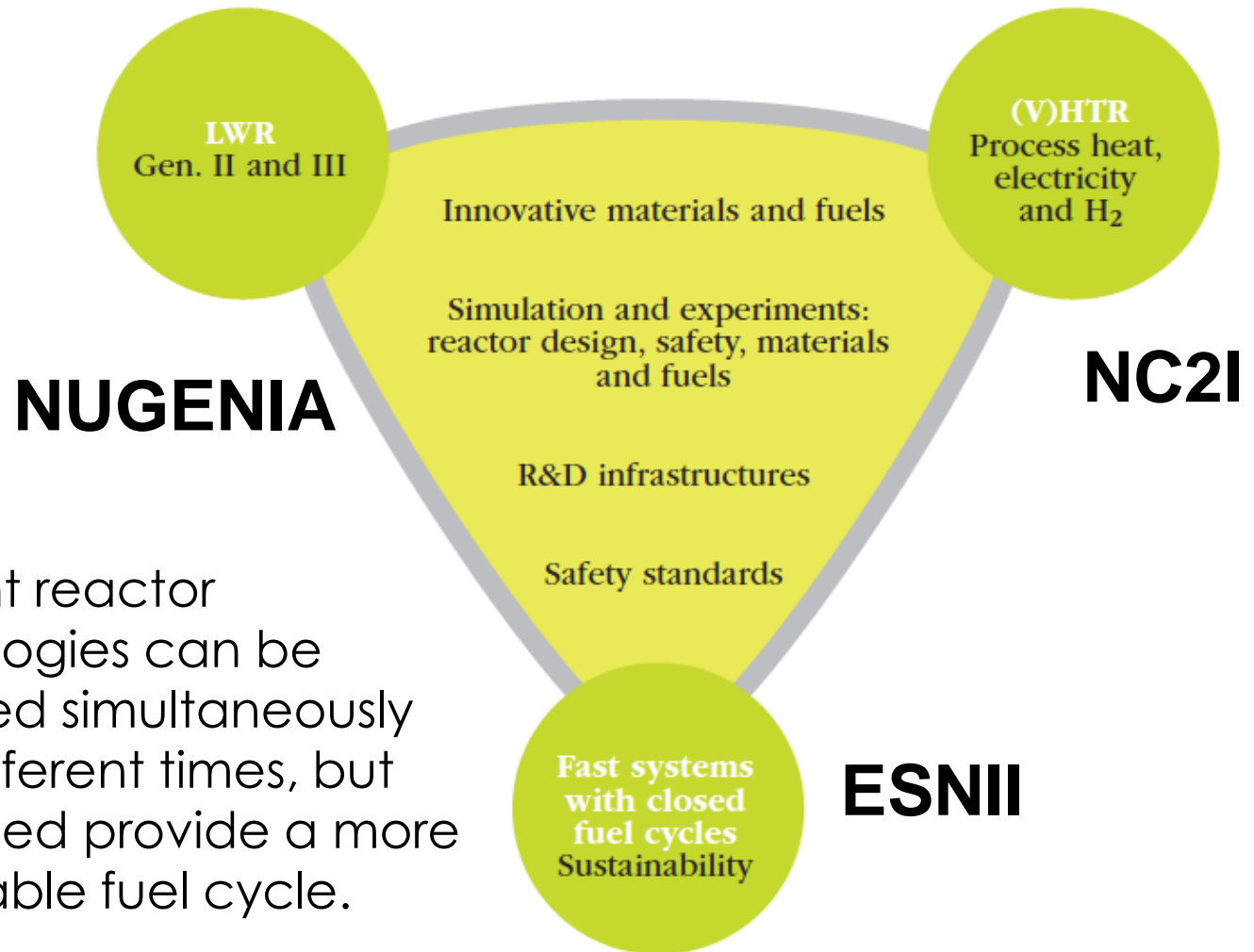
17-18-19 March 2015, Brussels, Belgium

ESNII in the framework of the SNETP

Enrique M. Gonzalez Romero
CIEMAT, Director of Nuclear Division
Chairman of the SNETP Executive Committee

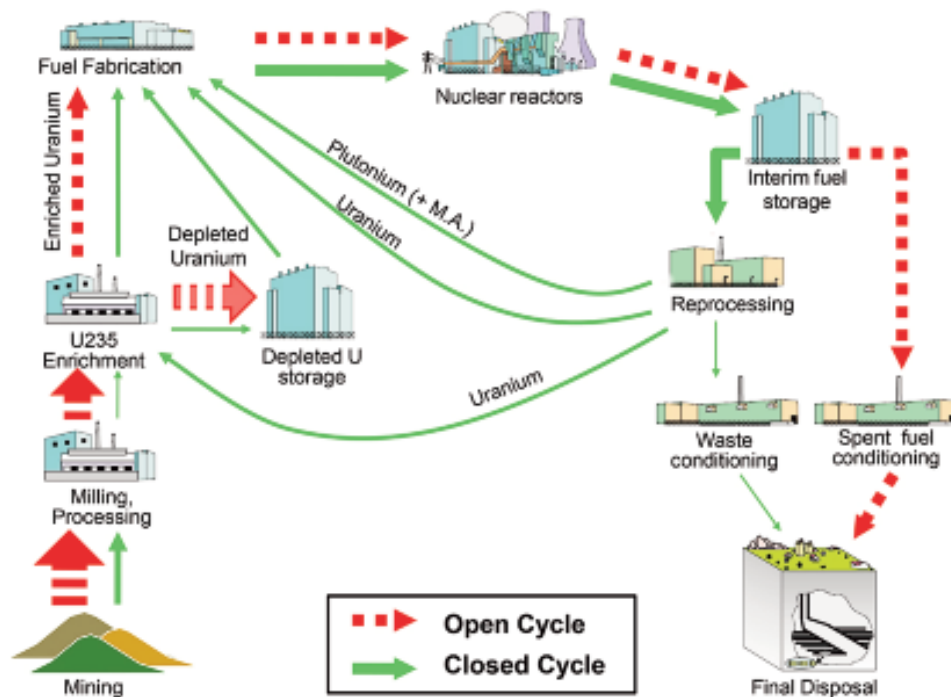
ESNII in the vision report

The SNETP vision of nuclear sustainability



Different reactor technologies can be operated simultaneously or at different times, but combined provide a more sustainable fuel cycle.

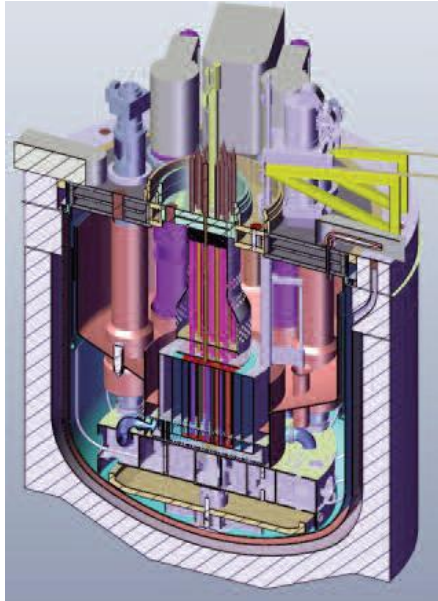
Closing the fuel cycle



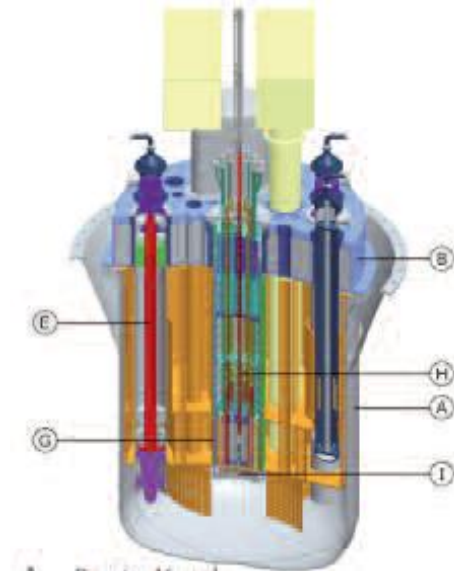
- **Multiple recycling of U+Pu (M.A.):** Fast neutron systems + reprocessing are the key to the long term sustainability.
- **Nuclear waste minimization** (including partitioning and transmutation)
- Optimization of the use of **Uranium resources**

The 2 ways of P&T

Critical FR vs. ADS



Minor Actinide Recycling



- To fully close the cycle including M.A. transmutation: many Adv-FR with small M.A. content or Clean FR + dedicated ADS with high M.A. concentration
- **Critical FRs** all technologies Na (ASTRID), Pb (ALFRED), Gas (ALLEGRO) -> **Gen IV requirements**
- **ADS + flexible fast neutron irradiation device:** MYRRHA -> Demonstration of **subcritical operation**

ESNII a realistic path to fast reactors



- Different technologies but sharing as much as possible basic technologies, validation tests and developments
- Relay on technologies with larger operational experience, but without discarding other options until there is a demonstrated solution
- All paths remain open but with very clear priorities
- MYRRHA as a flexible irradiation facility to contribute to tests needed for validation of materials and fuels to be used in the other fast systems
- Attention to practical key issues such as project structure, funding schemes, forms of international collaboration
- Not forgetting the connections and cross cutting research of ESNII with NUGENIA (Gen II&III), with EERA-JPNM and with IDG-TP (e.g. materials, fuel cycle, waste forms, data, safety)

ESNII a realistic path to fast reactors



The ESNII associated R&D:

- Includes needed cross fertilization of Industry and Research
- Goes all the way to the demonstration prototypes
- Covers from existing fuel concepts driving fuels to validating most advanced fuels for transmutation.
- Includes the dedicated reprocessing plant
- For the critical reactors includes the demonstration of the Generation-IV standards feasibility
- Provides the wide (European) framework and perspective imposed by the time scope and funding needs
- Collaboration between different M.S. and different types of actors in the construction and exploitation of the facilities
- **International Collaboration – the GIF**

ESNII is the future but must start now



SNETP
SUSTAINABLE NUCLEAR ENERGY
TECHNOLOGY PLATFORM

- The main objective of ESNII is to **maintain European leadership** in fast spectrum reactor technologies that will excel in safety and will be able to achieve a more sustainable development of nuclear energy.
- “The key message is that, for the elaboration of a coherent and consistent energy supply strategy including nuclear **after 2030 we urgently need from SNETP a reliable and precise information on the agenda of development of Gen IV** ,which are the steps undertaken now to have the first reactor licenced by a certain date and how SNETP is anticipating the envisaged difficulties.”

Message from DG ENER (16/09/2014)

- Challenging projects with new technologies and large impact like those of ESNII are a key element to appeal for the **best talents and recover them for nuclear industry.**

ESNII in the Integrated Roadmap



• **Challenge 2: Sustainability of Waste Management and Use of Fuel Resources**

KEY ISSUES

- Increase sustainability in the long term by making more efficient use of nuclear fuel resources.
- Increase sustainability in the long term by minimising the high level radioactive wastes and optimising their management.
- Ensure availability of suitable materials for sustainable nuclear energy systems, to withstand high temperature and high irradiation, in contact with aggressive coolants, so as to fully guarantee safe and efficient operation.
- The associated R&D actions will require long implementation times due to the specific nature of nuclear activities. In order to develop new nuclear technologies, detailed screening, qualification and licensing activities are necessary before a technology can be industrialised, resulting in typical lead times of 10 to 15 years.

ESNII in the Integrated Roadmap



Identified R&D Actions

- Support the development, licensing, construction and commissioning of the high priority Demonstration plants for the Gen IV fast reactors (FR)
- Qualify nuclear materials for operation under Gen IV conditions and develop innovative materials to improve plant safety and efficiency.
- Nuclear fuel reprocessing and fabrication of fuel for the demonstration plants
- R&D for alternative fast reactor technologies
- Partitioning and Transmutation
- Geological Disposal
- Interim spent fuel and high level waste storage

ESNII credible and prioritized implementation plan

