

**ESNII**  
**European Sustainable Nuclear Industrial**  
**Initiative**  
**Ongoing Activities**

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**Chair ESNII Task Force**  
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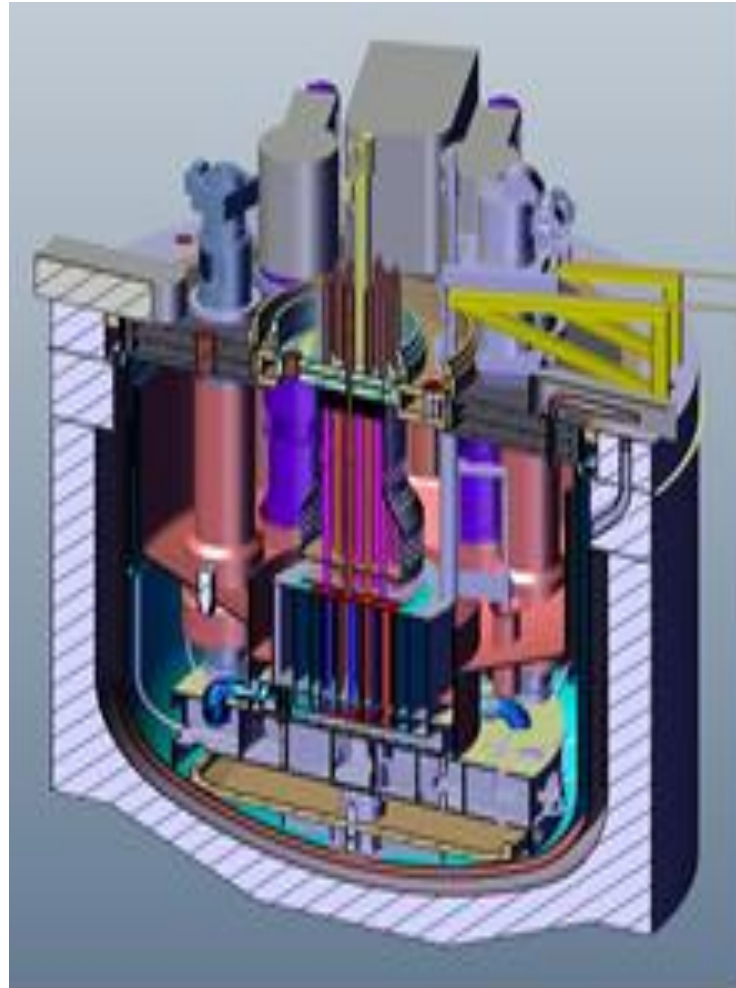
# ESNII Scope

- In particular, ESNII is an Instrument for coordinating the implementation of the SNETP pillar on **sustainability of nuclear fission, based on Gen IV fast reactors with closed fuel cycle (targeted deployment 2040)**

In 2012, ESNII made a prioritization exercise with regard to technologies and projects:

- With respect to the 2010 evaluation of technologies, **Sodium** is considered to be the reference technology since it has more substantial technological and reactor operations feed-back. *This is an actual and long term trend. Within 24 months at least one large sodium reactor (>500 MWe) will reach criticality*
- The **Lead**(-bismuth) Fast Reactor technology has significantly extended its technological base and can be considered as the shorter-term alternative technology
- The **Gas** Fast Reactor technology has to be considered as a longer-term alternative option.

# ASTRID



# ESNII programmes - ASTRID



**ASTRID** - CEA obtained a green light to start *Conceptual Design phase* on the period 2013-2015. About 600 persons were involved in 2014 in the ASTRID design and the R&D in support.

The main objectives of the Conceptual Design phase are:

- to confirm identified innovative options;
- to provide R&D results in support to the design activities, and in support to the safety case;
- to expand the industrial and international collaboration around ASTRID;
- to conclude on still open options, as: **energy conversion system**, architecture of the reactor pit in relationship the design of the reactor vessel cooling system, confinement;
- to drive an optimization of the design in order to reduce costs;
- to prepare the Safety Options File that will be issued in 2015;
- to prepare next phases (basic design, construction);
- to gather European and international R&D in support of ASTRID. The **Japanese Govt is an active contributor through its JAEA agency (and MHI group)**

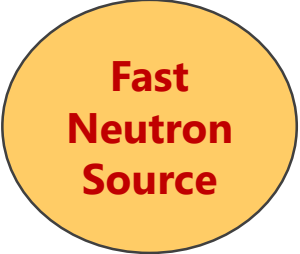
# MYRRHA

**Accelerator**  
(600 MeV - 4 mA proton)

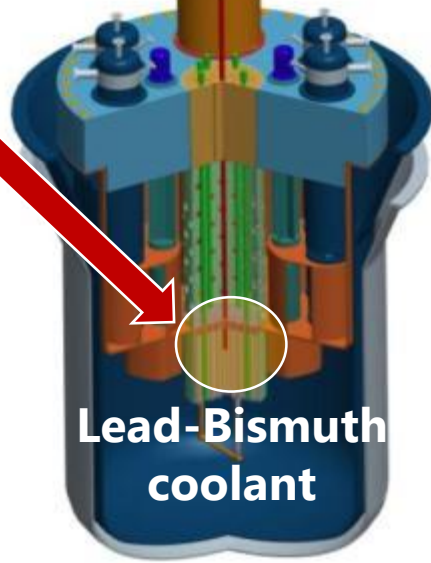
**Reactor**  
• Subcritical or Critical modes  
• 65 to 100 MWth



**Spallation Source**



**Multipurpose  
Flexible  
Irradiation  
Facility**



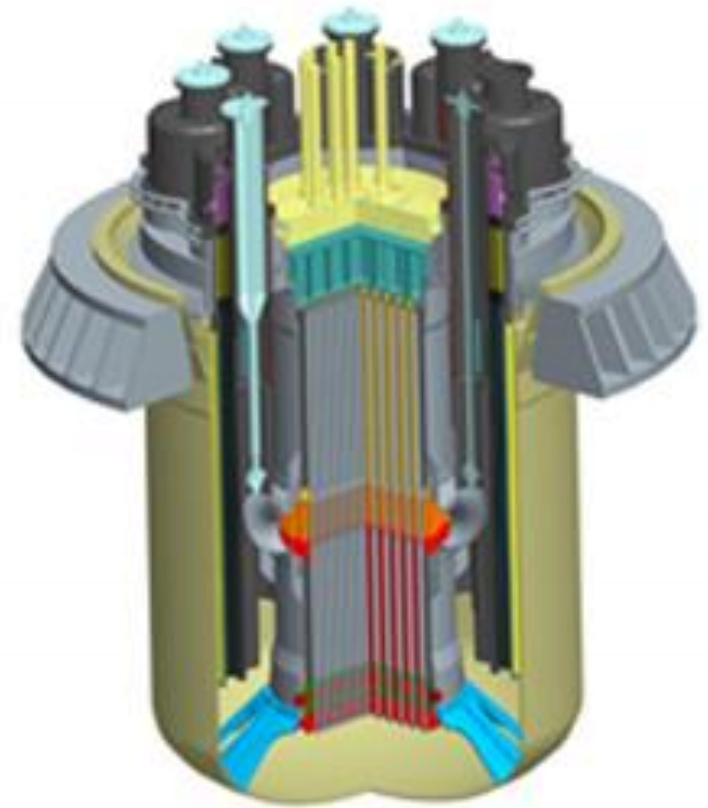
# ESNII programmes – news from MYRRHA



- FEED contract (outside the primary system) awarded in Nov. 2013, to an international consortium composed by AREVA TA (France), Ansaldo Nucleare (Italy) and Empresarios Agrupados (Spain) and Grontmij (Belgium) as sub-contractor, to design the infrastructure for the international MYRRHA research reactor.
- Double wall SG requested by FANC regulator, so the optimized design of the primary system is to be completed by september 2015. FEED contract adapted to these changes on the primary system
- R&D continues as foreseen (Mexico loop for oxygen control, complot loop, Venus experimental program for fast spectrum neutronics....)
- Request to obtain European Money in the framework of the JUNCKER investment plan for MYRRHA.
- Cost Increase from 1 to 1, 5 Geuros detailed by the project team.

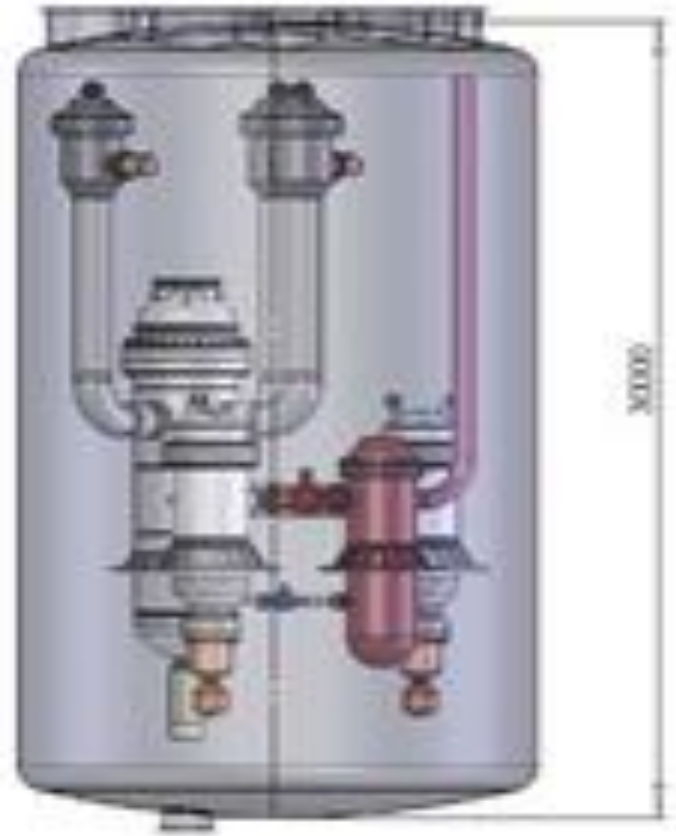
# ALFRED Lead Technology

- FALCON consortium formed in december 2013 between ENEA, Ansaldo Nuclear and Romanian R&D Institute ICN
- Applications for ALFRED to become part of ESFRI project and to obtain Romanian Structural Funds
- Technical Review of the design in 2014, with 8 points under review
- The TSO IRSN also requested changes in the SG technology (inside the Reactor vessel)
- Doubledwall Steam Generators compulsory in ALFRED as in MYRRHA





# ALLEGRO



# ALLEGRO

- New Strategy announced by the 4 partners in early 2015
- Reduce ALLEGRO power from 75 MWth to cca 10 MWth and optimize the core configuration
- To increase main blowers inertia (Management of LOCA and SBO), gas turbine coupled to the primary blowers
- Switch to UO<sub>2</sub> pellet in AIM1 cladding instead of MOX fuel and develop in phase 2 a ceramic design



# Results of ESNII and orientations for the future (1/2)



- ESNII promotes 4 main projects but does not distribute money
- Its important accomplishments are strategic prioritisation, coordination of research and of European research teams and technical advice to emerging projects
- In the technical field it has achieved some harmonisation of fast reactor fuel R&D in Europe. This is not the case in the Generation IV International Forum (GIF), in Asia (3 fuels), in Russia(3 fuels).
- For the next 20-25 years, Europe through ESNII will use one R&D fuel for its 2 leading projects : **mixed uranium and plutonium oxide, (pelletized) MOX** with an offshoot for Allegro phase 1 and phase 2.
- This important technical choice must be consolidated in the detailed research programs and projected in the future for 20 years.

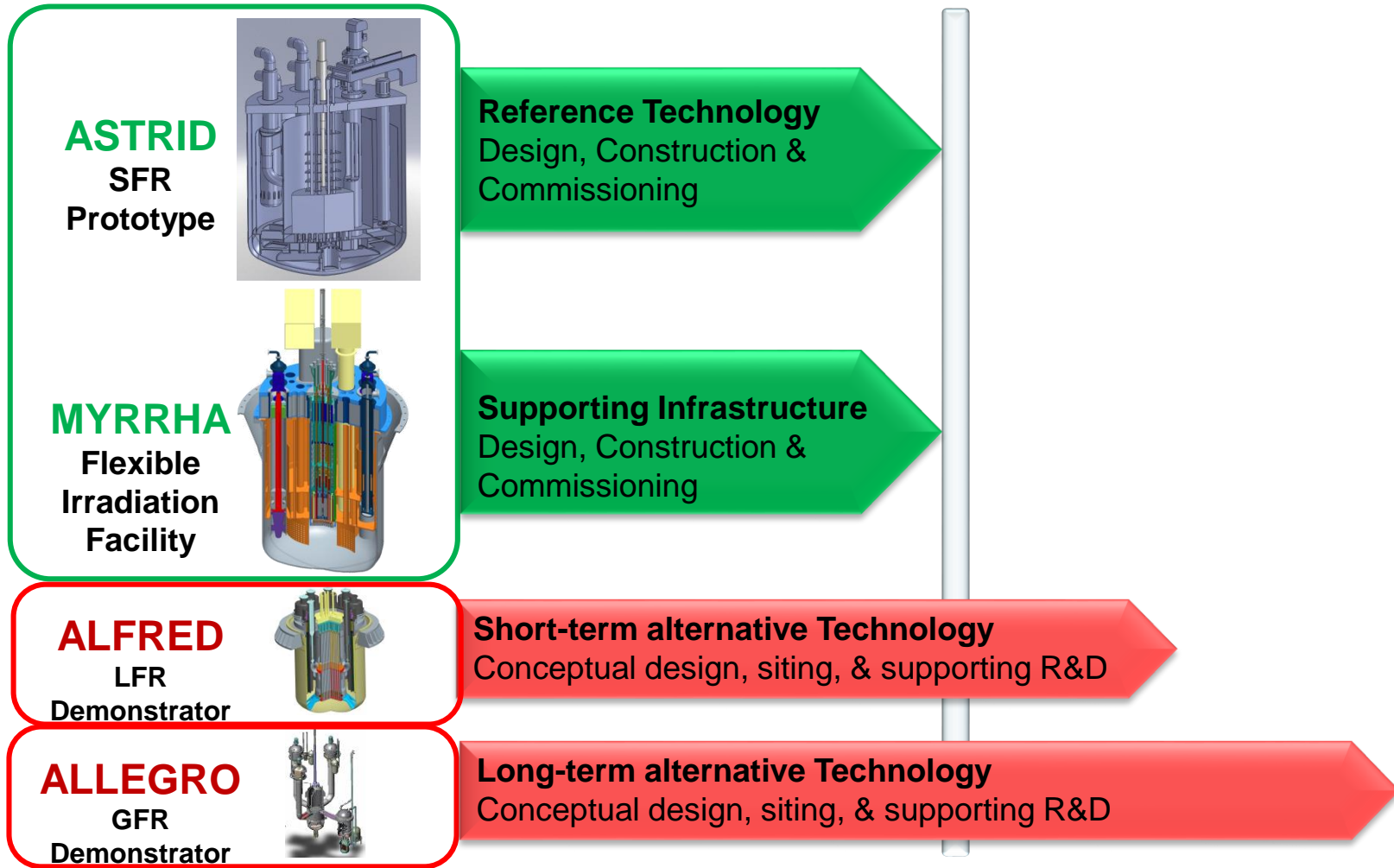
## Results of ESNII and orientations for the future (2/2)

- EC money for fission research will remain at the same level for the next 6 years
- The projects will move forward between 2015 and 2020 through member states money and industry in kind contributions and money, we hope through the JUNCKER plan (EC)
- Allegro maybe ALFRED are particular since they have access to european structural funds
- ASTRID and MYRRHA may take different forms
- But the projects will need public support and acceptance from the research community at large
- The 4 projects **will need long term research** in parallel with project detailed design and construction
- **Starting this afternoon, we are holding our 2 days review of the 4 ESNII projects and of the ESNII + Work Packages**

- **You are all invited**

# Roadmap for ESNII

2025



# What is ESNII?

- The [SET-Plan](#) establishes an energy technology policy for Europe.
  - Strategic plan to accelerate the development and deployment of cost-effective low carbon technologies.
  - Plan comprises measures relating to planning, implementation, resources and international cooperation in the field of energy technology
- Reference documents: [COM/2007/0723 final](#) and [COM/2009/0519 final](#)
- ESNII is a SET-Plan official European Industrial Initiative (*together with Wind, Solar, Grids, CCS, Bioenergy, Smart Cities, FCH, Nuclear Fusion*).
- Objectives of the Ells: *Ells are joint large scale technology development projects between academia, research and industry. The goal of the Ells is to focus and align the efforts of the Community, Member States and industry in order to achieve common goals and to create a critical mass of activities and actors, thereby strengthening industrial energy research and innovation on technologies for which working at the Community level will add most value* (from [SETIS](#) webpage – Strategic Energy Technologies Information System)

# ESNII Scope

In 2012, ESNII made a prioritisation exercise with regard to technologies and projects and defined its main goal:

*The main goal* of ESNII is to design, license, construct, commission and put into operation before 2025:

- the Sodium Fast Reactor Prototype reactor called **ASTRID**
- the flexible fast spectrum irradiation facility **MYRRHA**

while investigating the feasibility and deployment of the two other projects, ALFRED and ALLEGRO