Sustainable Nuclear Energy Technology Platform

- ESNII – European Sustainable Nuclear Industrial Initiative
- NC2I – Nuclear cogeneration
- NUGENIA – Nuclear Gen II & III Association

N. Camarcat (EDF, ESNII Chair)
15th INPRO Dialogue Forum – 3 July 2018
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About SNETP

- SNETP was set up in 2007 under the auspices of the European Commission, to gather stakeholders building a common vision: industry, research centres, safety organisations, universities, non-governmental organisations, SMEs, etc.

- SNETP’s official European Technology Platform label was renewed in 2013.

- The overall goal is to support technological development for enhancing safe and competitive nuclear fission in a sustainable energy mix, as part of the EU’s SET-Plan:
  - Low greenhouse gas emissions
  - Security of energy supply for Europe
  - Stable electricity prices

- R&D is necessary to further enhance the safety and sustainability of nuclear fission, and to open new markets

- SNETP has expressed its strategic orientations around three technological pillars, and launched task forces to implement them.
SNETP’s main milestones

- Sept 2007: SNETP launch with Commissioners for Research and Energy, publication of Vision Report
- June 2009: Strategic Research Agenda
- May 2010: Deployment Strategy
- Nov 2010: Launch of ESNII
- Jan 2011: Education & Training Strategy
- Oct 2011: Launch of NC2I
- March 2012: Launch of NUGENIA
- Jan 2013: Publication of “Identification of Research Areas in Response to the Fukushima Accident”
- Feb 2013: Updated Strategic Research & Innovation Agenda
- 2014-2015: NUGENIA Roadmap & Global Vision
- 2015: SNETP Deployment Strategy
- Dec 2017: NC2I Concept Paper

Documents available for download on www.snetp.eu and prints upon request (secretariat@snetp.eu)
Vision: 3 strategic pillars matching SET-Plan priorities

“Maintain competitiveness in fission technologies, together with long-term waste management solutions” (*)

“Complete the preparations for the demonstration of a new generation (Gen-IV) of fission reactors for increased sustainability”**

**The first cogeneration reactors could (...) appear within the next decade as demonstration projects to test the technology for coupling with industrial processes”**

SET Plan Objectives
(*) [COM/2007/0723 final]
(**) [COM/2009/0519 final]
NUGENIA Association

- **What is NUGENIA?** an international non-profit association founded under Belgian law in November 2011 and launched in March 2012.

- **Mission:** be an integrated framework for safe, reliable and competitive Gen II & III fission technologies, which:
  - Fosters collaboration between industry, SMEs, RTOs, academia and technical safety organisations
  - Builds knowledge and expertise
  - Generates results with added value

- **Organisation of the R&D activities** around 8 technical areas

- **Projects**
  - 13 Euratom projects ongoing under H2020 & 5 in-kind projects

- **Membership:** 103 full members and 7 honorary members from 24 countries (as of February 2017)
Contribute to clean and competitive energy beyond electricity by facilitating deployment of nuclear cogeneration plants.
NC2I vision: Low temperature applications

- *District heating, desalination, a few industrial applications*
- **Coupling with existing LWR reactors,**
  - so far, limited deployment,
  - but with very positive records,
  - already for a long time.
- **Objectives of NC2I:**
  - Identifying conditions for larger deployment
  - Supporting initiatives that will facilitate the growth of low temperature nuclear cogeneration
    - in particular application to cogeneration of LWR SMRs and other types of SMRs with enhanced safety features
NC2I vision: High temperature applications

Key target for 2030:
Commissioning in Europe the first High Temperature Gas-cooled Reactor (HTGR) as heat source for industrial plant

Actions:
Cooperate with EC & authorities in target countries to facilitate:
• preparing an appropriate licensing framework
• defining the most suitable technical options
• selecting an appropriate site
• developing a robust business model
• building a team for the project & gather available expertise
• developing international collaboration
NC2I vision: High temperature applications

• A H2020 Project: GEMINI +

• Purpose
  – Provide a conceptual design for a HT nuclear cogeneration system for supply of process steam to industry
  – Provide a framework for the licensing and a Business plan for a full scale demonstration

• Duration: 09/2017 – 08/2020

• Coordinated by: NCBJ
ESNII – European Sustainable Nuclear Industrial Initiative

• Framework
  – European Industrial Initiatives (EIIs) constitute key elements of Europe's SET-Plan.
  – ESNII was formally launched at the SET-Plan Conference in Brussels on 15 November 2010

• Purpose and scope
  – ESNII addresses the need for demonstration of Gen-IV Fast Neutron Reactor technologies, together with the supporting research infrastructures, fuel facilities and R&D work.
  – The main goal of ESNII is to design, license, construct, commission and put into operation in 2025-2030.
    • 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 (LFR demonstrator) and ALLEGRO (GFR demonstrator)

• Organisation
Generation IV – SNETP Vision

ESNII
- Sodium Fast Reactor

ESNII
- Lead Fast Reactor

ESNII
- Gas Fast Reactor

Third pillar of SNE-TP Co-generation
- Very High Temperature Reactor

Long Term option “NUGENIA”
- Supercritical Water-cooled Reactor

Long Term option SNE-TP Annex
- Molten Salt Reactor (fast?)
ESNII: the actors

• The ESNII Task Force
  – Memorandum of Understanding under SNETP umbrella
  – 13 founders, now 31 members
  – Balance between industry and research (13 & 18)

• For manageability, the ESNII Task Force decided to set up a 2-level structure:
  – Task Force: all members
  – Executive Board: leaders of the ESNII projects
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.
- 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.
ESNII Scope 2/2)

In 2012, ESNII made a prioritisation exercise with regard to the projects:

The main goal of ESNII is to design, license, construct, commission and put into operation in 2025-2030:

- the Sodium Fast Reactor Prototype reactor called **ASTRID**
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while investigating the feasibility and deployment of the two other projects, ALFRED (LFR demonstrator) and ALLEGRO (GFR demonstrator)
H2020 running Project in the scope of ESNII

• **Inspyre**: Investigations Supporting MOX Fuel Licensing in ESNII Prototype Reactors

• **Purpose**: Investigation on the fast reactor MOX fuel to support the licensing of the start-up cores of the ESNII reactor prototype

• **Duration**: 09/2017- 08/2021

• **Coordinator**: CEA
Thank you for attention

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