SNETP
An overview of Europe’s
Sustainable Nuclear Energy Technology Platform
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
Reminder: benefits of nuclear fission for Europe

Nuclear fission…
- Is a massive low-carbon energy source
- Ensures security of energy supply for Europe
- Has an excellent safety record in Europe
- *Minimizes its waste with the new generations of nuclear plants*
- Benefits from distributed and geopolitically stable uranium supply
- Offers operational availability above 90 %
- Provides economic energy for a competitive European industry and affordable electricity for consumers, independently from fossil fuel price volatility
- Is a sector where Europe has industrial leadership which needs to be maintained
Hosting organization (if applicable), Participants and their roles (1)

The SNETP is composed by:

- **A General Assembly**, composed by a representative from each member of the Platform (116 members).
- **A Governing Board** providing guidance on how to initiate and push forward the Platform’s work programme - composed of approximately 30 members.
- **An Executive Committee**, monitoring and steering on a day-to-day basis the activities of the Platform (supports the Governing Board) – composed of approximately 15 members.
- **A Secretariat**, providing secretarial and organizational support to the Governing Board, Executive Committee and the General Assembly – composed of 5 members.

- **6 Working Groups**:
  - 2 Strategy WGs: **SRA** - Strategic Research Agenda and **DS** - Deployment Strategy
  - 3 Technology WGs: **NUGENIA** (Nuclear GENeration II & III Association, [www.nugenia.org](http://www.nugenia.org)) formally not a working group but operating by mandate of SNETP, **ESNII TF** – European Sustainable Nuclear Industrial Initiative Task Force (under the European SET-Plan) to prepare and implement the Fast Neutron Reactor technologies and **NC2I TF**– Nuclear Cogeneration Industrial Initiative Task Force. To prepare and implement the nuclear cogeneration R&D activities in Europe
  - Horizontal WGs: **ETKM** - Education, Training & Knowledge Management
Hosting organization (if applicable), Participants and their roles (2)

The SNETP is composed, as of today, by 116 members
Vision: 3 strategic pillars matching SET-Plan priorities

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

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

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

SET Plan Objectives
(*) [COM/2007/0723 final]
(**) [COM/2009/0519 final]
Deployment Strategy 2015

Release of the updated SNETP Deployment Strategy (Dec 2015)

- Online distribution – January/February 2016
- Paper version distribution – to all SNETP members – March 2016
Contribution of SNETP

SET Plan Integrated Roadmap and Action Plan

HEADING 5: Supporting Safe Operation of Nuclear Systems and Development of Sustainable Solutions for the Management of Radioactive Waste

Challenge 1: Safe and Efficient Operation of Nuclear Power Plants

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

Challenge 3: Optimized Integration of Nuclear Reactors in Energy Systems
NUGENIA overview

- NUGENIA is an international non-profit association founded under Belgian legislation in November 2011 and launched in March 2012.
- Its **mission** is to 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
  - Video summary

- 103 full members and 7 honorary members from 26 countries (February 2016)
ESNII – European Sustainable Nuclear Industrial Initiative

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

- 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.
- Optimum use of natural resources
- Nuclear waste minimization
- Minimum impact on the environment
Fast reactors and closed loop fuel cycle

FROM SNE-TP

TO IGD-TP
Radiotoxicity drop with Gen IV

- III gen reactor
- Partitioning
- Fast reactor IV gen
- Fuel Fabrication U-Pu-AM
- U nat U depl

Fission products
- Short-lived radwaste
- Natural uranium
- Surface repository Artificial barriers

Long lived residuals
- Exhaust fuel
- Long lived waste
- Geological repository
- Natural barriers

- 

Radiotoxicity

Years

- ~430 years
- ~340,000 years

Or ADS?

U Pu AM

Gen IV
Gen IV System Concepts

Very High Temperature Reactor
Supercritical Water Reactor
Sodium Fast Reactor
Lead Fast Reactor
Gas Fast Reactor

GEN IV Reactor Concepts

<table>
<thead>
<tr>
<th>Reactor concept</th>
<th>GFR</th>
<th>LFR</th>
<th>MSR</th>
<th>SFR</th>
<th>SCWR</th>
<th>VHTR</th>
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</thead>
<tbody>
<tr>
<td>Coolant</td>
<td>Helium</td>
<td>Pb or Pb-Bi</td>
<td>Molten salt</td>
<td>Sodium</td>
<td>Supercritical water</td>
<td>Helium</td>
</tr>
<tr>
<td>Spectrum (F/fast, T/thermal)</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F/F</td>
<td>F</td>
</tr>
<tr>
<td>Thermal efficiency (%)</td>
<td>48</td>
<td>44-50</td>
<td>42</td>
<td>44</td>
<td>50</td>
<td></td>
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<tr>
<td>Thermal power (MW)</td>
<td>~2400</td>
<td>125-3500</td>
<td>1500-4000</td>
<td>~3800</td>
<td>400-800</td>
<td></td>
</tr>
<tr>
<td>Power density (MW/m²)</td>
<td>50-100</td>
<td>10-150</td>
<td>22</td>
<td>200-300</td>
<td>100</td>
<td>6-10</td>
</tr>
<tr>
<td>Pressure (bar)</td>
<td>70</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Temperature core inlet/outlet (°C)</td>
<td>490/850</td>
<td>400/550</td>
<td>585/700</td>
<td>400/550</td>
<td>280/510</td>
<td>640/1000</td>
</tr>
<tr>
<td>Fuel</td>
<td>Carbide or nitride</td>
<td>Nitride, Oxide (or metallic)</td>
<td>Molten salt (fluorides)</td>
<td>Oxide, carbide, or metallic</td>
<td>Oxide (UO₂, MOX)</td>
<td>Oxide or oxo-carbide</td>
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<tr>
<td>Fuel burnup (at%)</td>
<td>5-10</td>
<td>10-15</td>
<td>15-20</td>
<td>5</td>
<td>&gt; 10</td>
<td></td>
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<tr>
<td>Fuel cycle</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
<td>Open</td>
</tr>
</tbody>
</table>

Neutron spectrum of GEN IV reactor concepts

GIF roadmap 2013

- VHTR
- SFR
- SCWR
- MSR
- LFR
- GFR

Viability □ Performance □ Demonstration
From new waste to geological disposal

- Burn most of TRU / Minor Actinides
- Reducing FP as much as possible
- Reducing of PuNon proliferation
- Improve stability of chemical and physical form
- Easy conditioning and storage
- Safe and economic geological disposal
- Average depth around m.500 and not m. 4000
SODALITE matrix

Components used for labo. scale Pressureless Consolidation experiments

Alumina crucible
Internal vessel
Steel rod, ab. 280 g

Mix of nepheline, salt waste and glass frit between alumina crucible and internal vessel
SNETP related meetings

• Joint meeting of the SNETP ExCom and NUGENIA Excom 18/2/2016 (Paris)
• SNETP Governing Board 22/3/2016 (Brussels)
• NUGENIA General Assembly and annual Forum 2016 (with JHR) 5-7/4/2016 (Marseille)
• Next edition of Nuclear days and SNE-TP General Assembly – Bratislava - November 30th, 2016
SNETP’s vision for the future

- Nuclear fission will continue to play an important role in the energy mix, whatever the scenario (Energy Roadmap 2050)

- Post-Fukushima R&D has been identified, including for the LTO of existing reactors

- SNETP fully aligns with the strategic objectives to support the utmost levels of nuclear safety and increase the sustainability of nuclear energy (radioactive waste minimization, optimization of the use of nuclear materials)

- In addition to national programmes SNETP counts on European legal and financial instruments (Horizon 2020, Structural Funds, EIB loans, EIT KIC InnoEnergy…) to foster joint programming and execution of R&D
SNETP- ESNII

Generation IV reactors, related fuel cycle and disposal issues

M. Sepielli  SNETP Governing Board
           IGDTP-SNETP IEG

Kalmar (Sweden), October 27-30, 2014
Thank you for your attention

www.snetp.eu