SNETP

An overview of Europe's

Sustainable Nuclear Energy Technology Platform

www.SNETP.eu

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

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Nuclear fission…

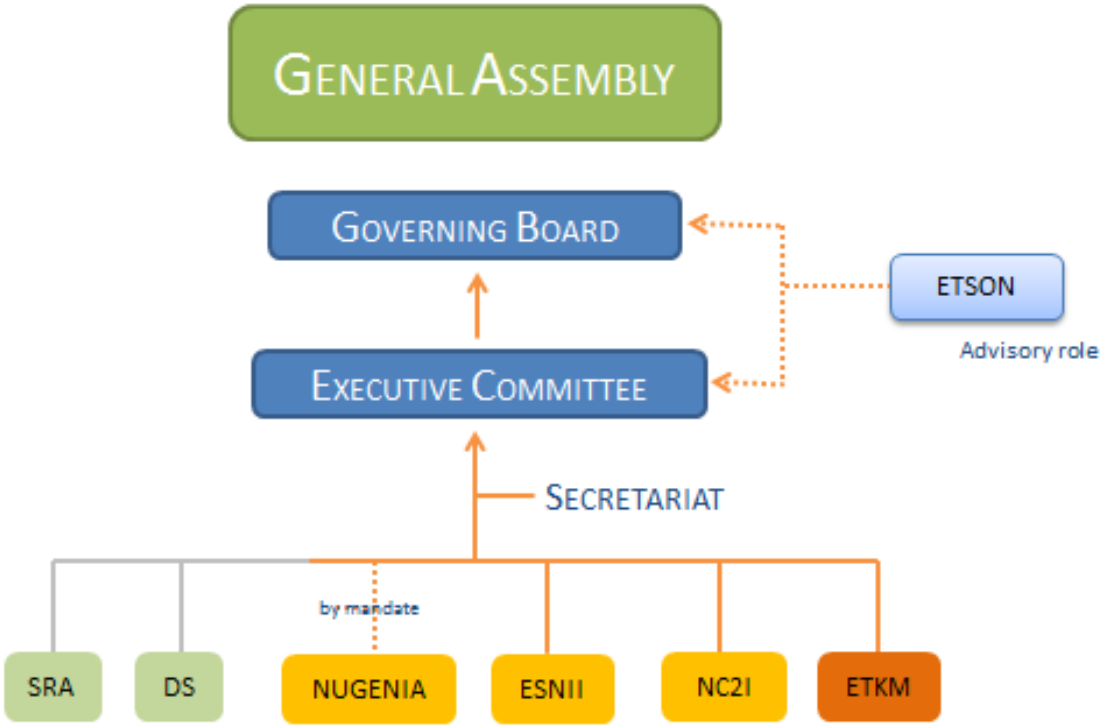
- Is a massive low-carbon energy source
- Ensures security of energy supply for Europe
- Has an excellent safety record in Europe
- **Minimizes its waste with the new generations of nuclear plants**
- Benefits from distributed and geopolitically stable uranium supply
- Offers operational availability 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) 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)



- SRA: STRATEGIC RESEARCH AGENDA
- DS: DEPLOYENT STRATEGY
- ETKM: EDUCATION, TRAINING & KNOWLEDGE MANAGEMENT
- NUGENIA: NUCLEAR GENERATION II & III REACTORS ASSOCIATION
- ESNII: EUROPEAN SUSTAINABLE NUCLEAR INDUSTRIAL INITIATIVE
- NC2I: NUCLEAR COGENERATION INDUSTRIAL INITIATIVE
- ETSON: EUROPEAN TECHNICAL SAFETY ORGANISATION NETWORK

The SNETP is composed, as of today, by 116 members

Vision: 3 strategic pillars matching SET-Plan priorities

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NUGENIA
NUclear GENeration II & III Association

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

NC2I
Nuclear Cogeneration Industrial Initiative

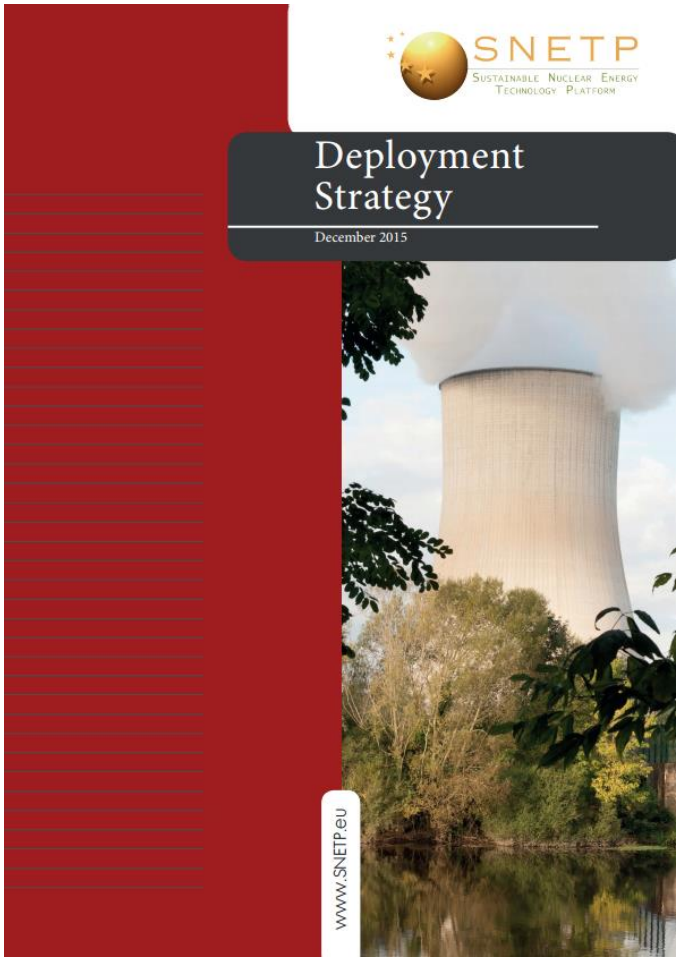
*"The first co-generation reactors could (…) appear within the next decade as demonstration projects to test the technology for coupling with industrial processes" ***

ESNII
European Sustainable Nuclear Industrial Initiative

*"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

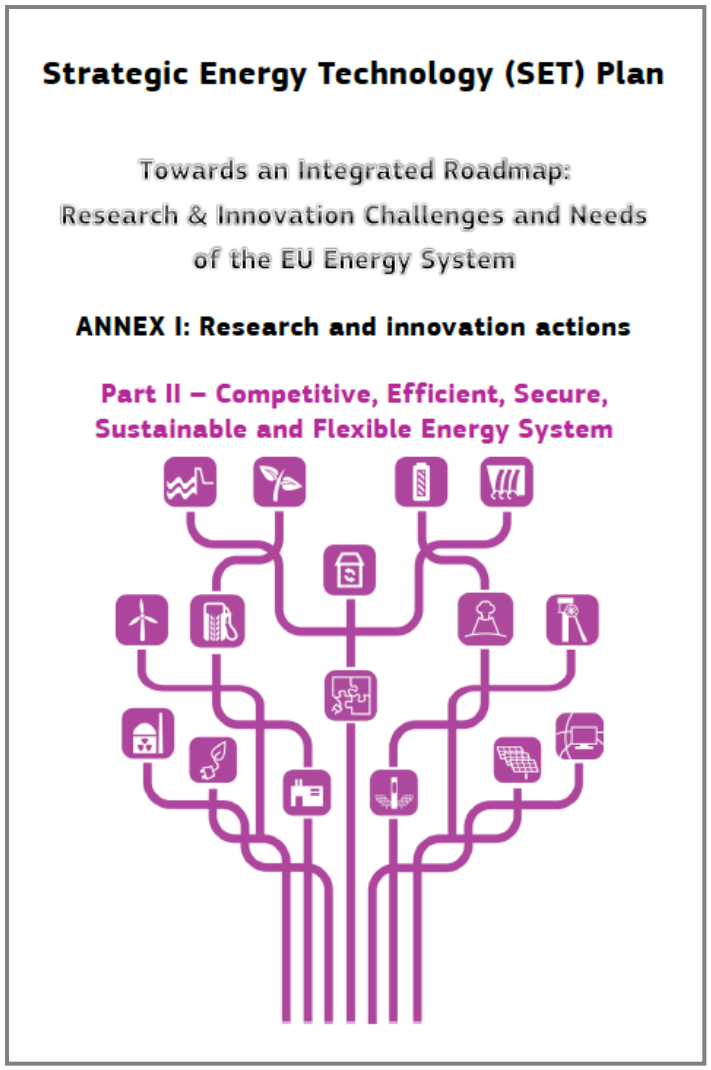
SNETP Deployment Strategy

(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**

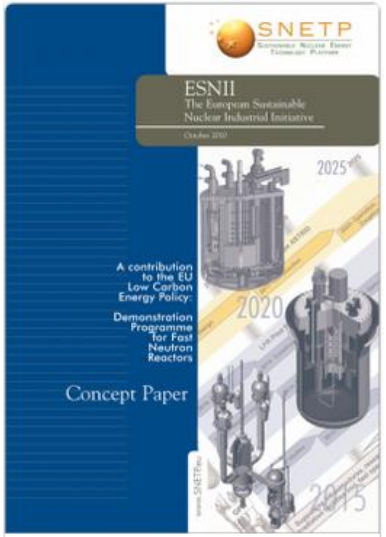
- 103 full members and 7 honorary members from 26 countries (February 2016)

ESNII – European Sustainable Nuclear Industrial Initiative

- European Industrial Initiatives (EIIs) 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.

ESNII
European Sustainable Nuclear Industrial Initiative



ESNII Concept Paper (October 2010)

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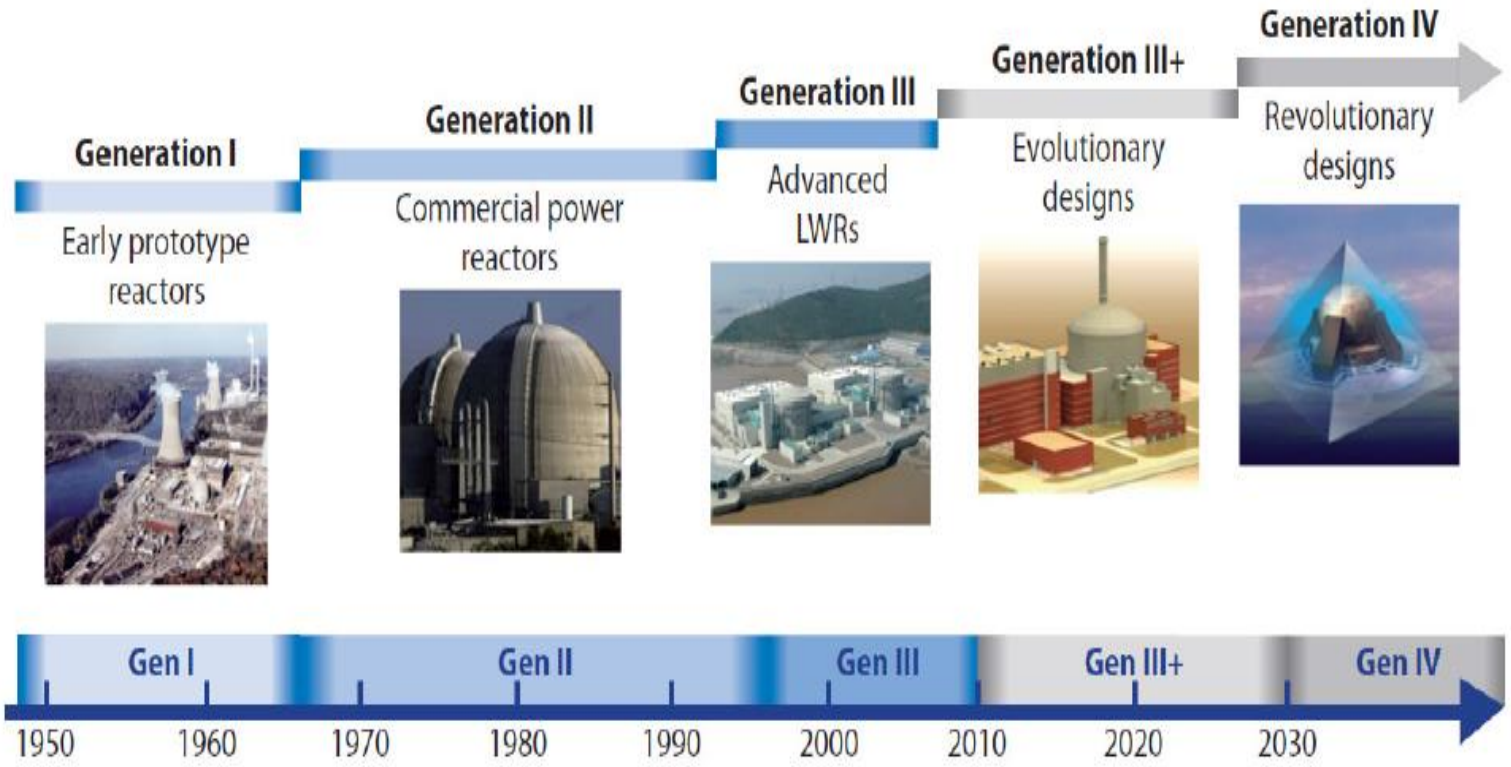
Figure ES.1: Generations of nuclear power: Time ranges correspond to the design and the first deployments of different generations of reactors



- Optimum use of natural resources
- Nuclear waste minimization
- Minimum impact on the environment

Fast reactors and closed loop fuel cycle

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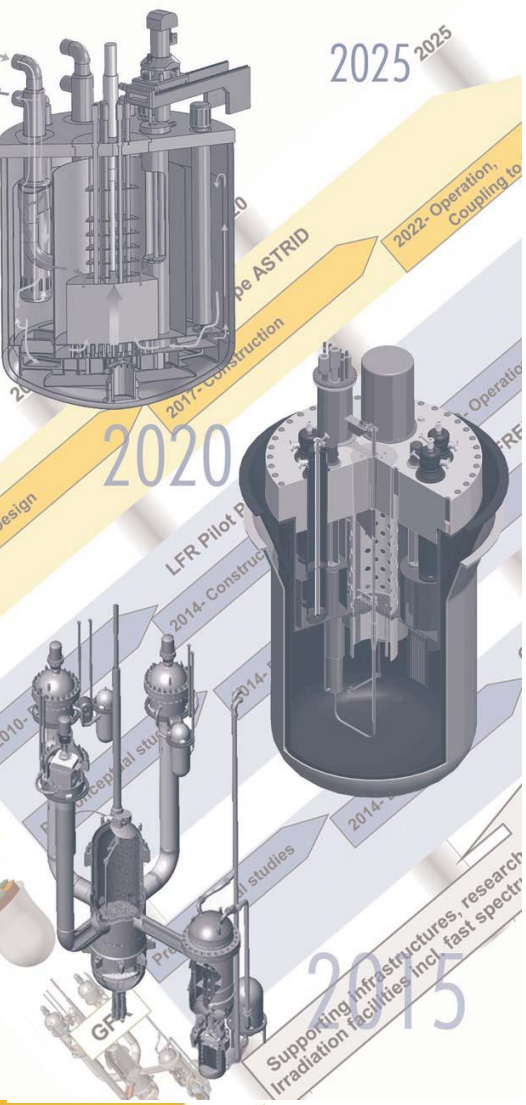
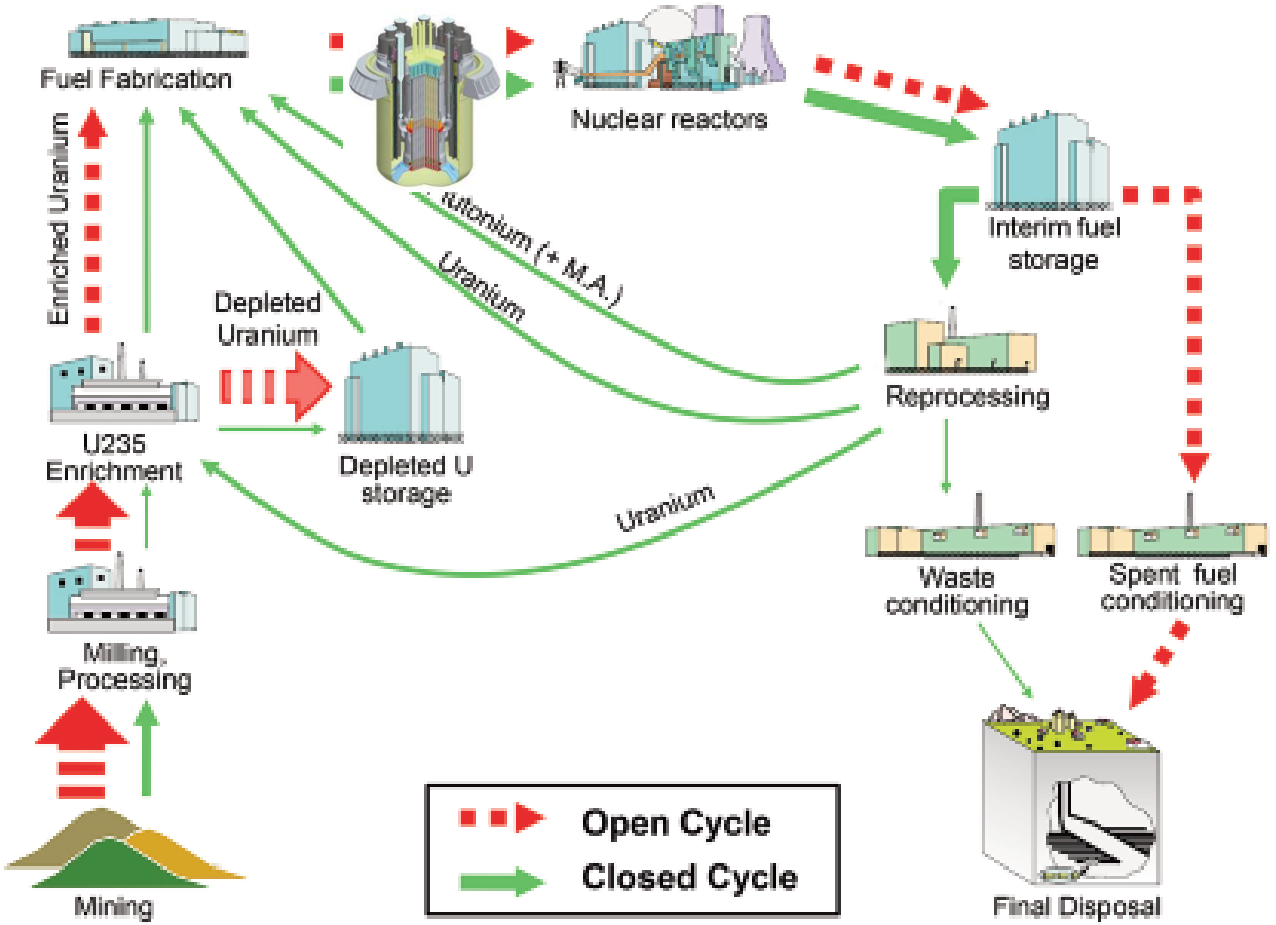
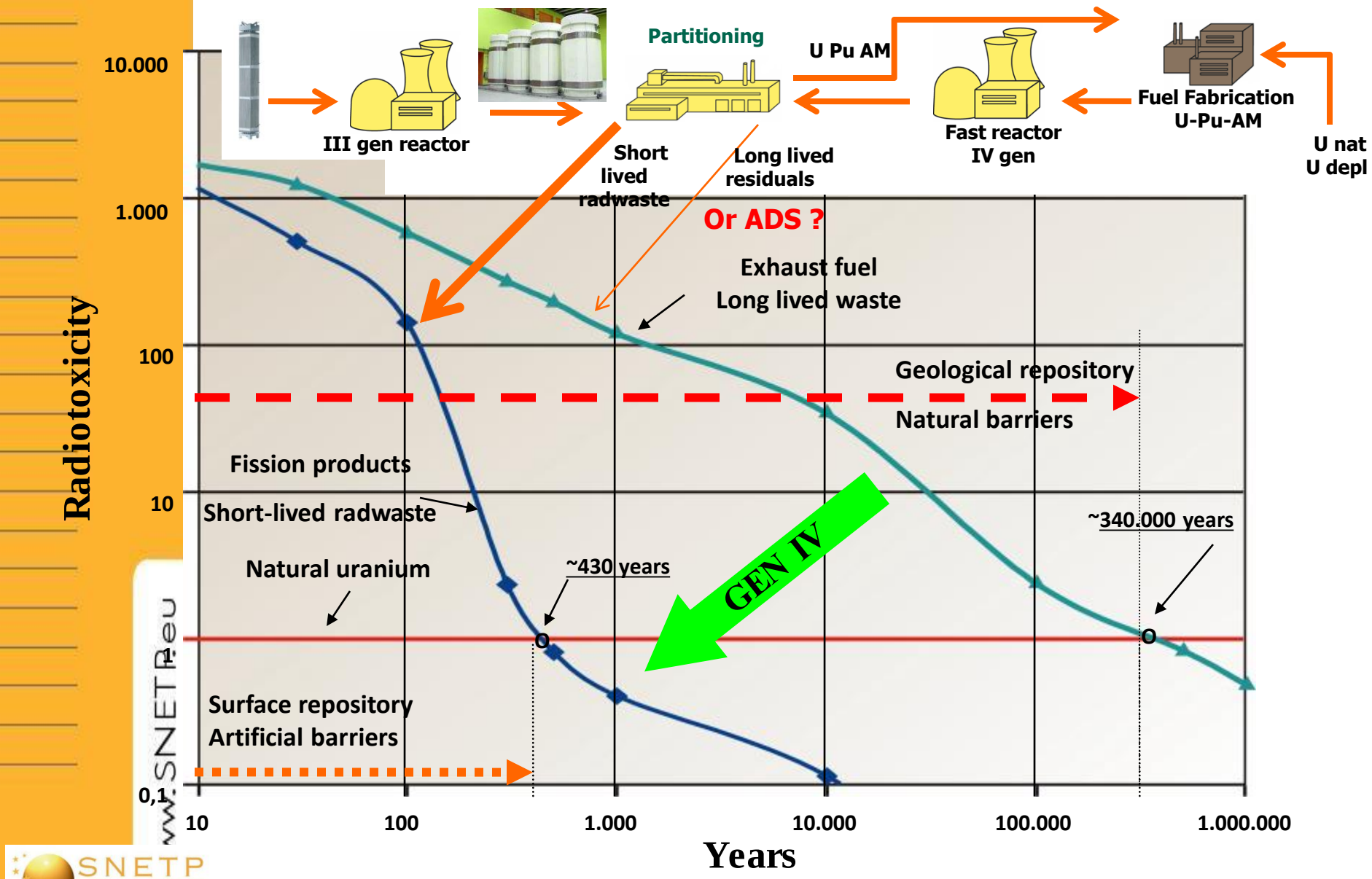
FROM SNE- TP



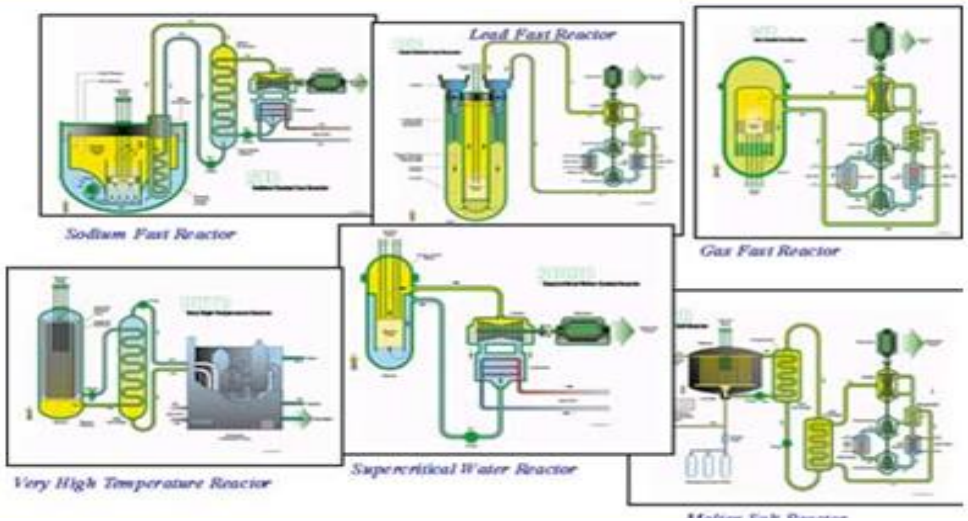


TO IGD-TP

Radiotoxicity drop with Gen IV



Gen IV System Concepts



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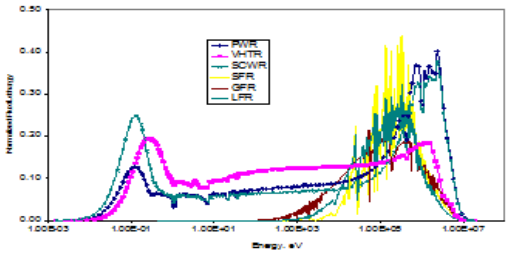
Neutron spectrum of GEN IV reactor concepts

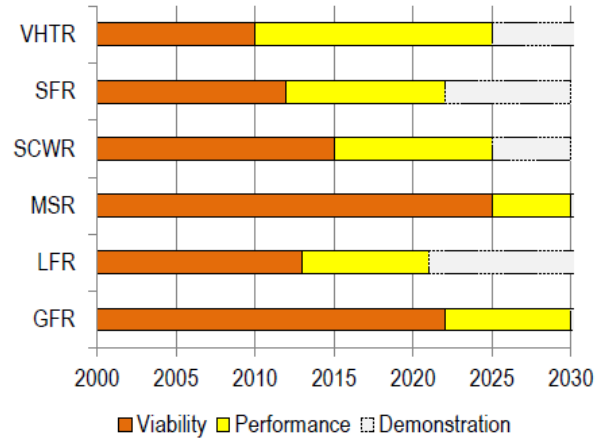


ENEA

GEN IV Reactor Concepts

Reactor concept	GFR	LFR	MSR	SFR	SCWR	VHTR
Coolant	Helium	Pb or Pb-Bi	Molten salt	Sodium	Supercritical water	Helium
Spectrum (*F fast, T thermal*)	*F*	*F*	*T*	*F*	*T/F*	*T*
Thermal efficiency (%)	48		44-50	42	44	50
Thermal power (MW)	~2400	125-3600	~2000	1500-4000	~3800	400-600
Power density ($MWth/m^3$)	50 - 100	10 - 150	22	200-300	100	6 - 10
Pressure (bar)	70	1	1	1	250	
Temperature core inlet/outlet (°C)	490 / 850	400/ 550	565 / 700	400 / 550	280 / 510	640 / 1000
Fuel	Carbide or nitride	Nitride, Oxide (or metallic)	Molten salt (fluorides)	Oxide, carbide, or metallic	Oxide (UO_2, MOX)	Oxide or oxi-carbide
Fuel burnup (at%)	5-10	10-15		15-20	5	> 10
Fuel cycle	Closed	Closed	Closed	Closed	Closed	Open

GIF roadmap 2013



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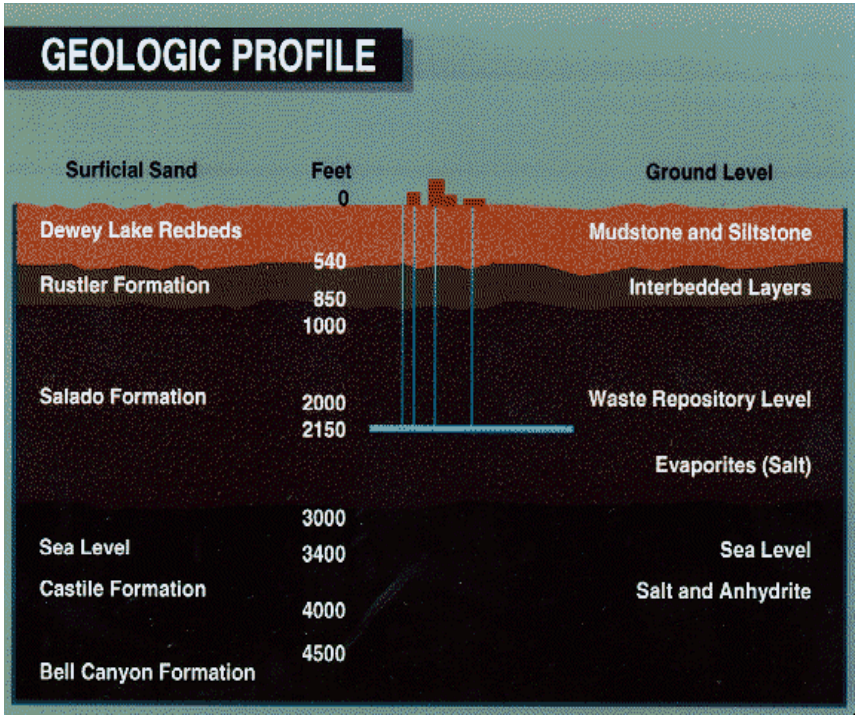
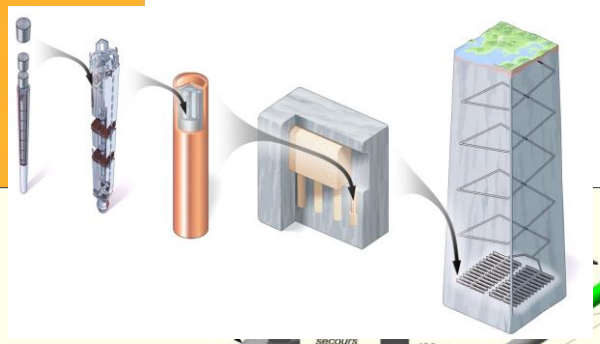
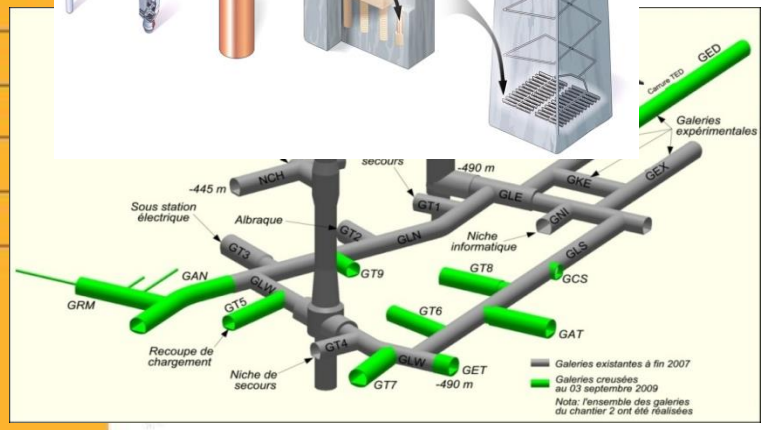
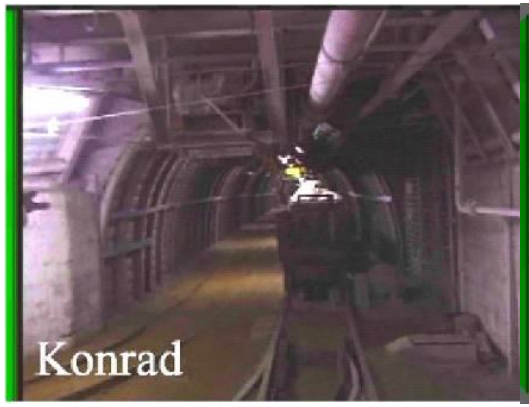
From new waste to geological disposal

- 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

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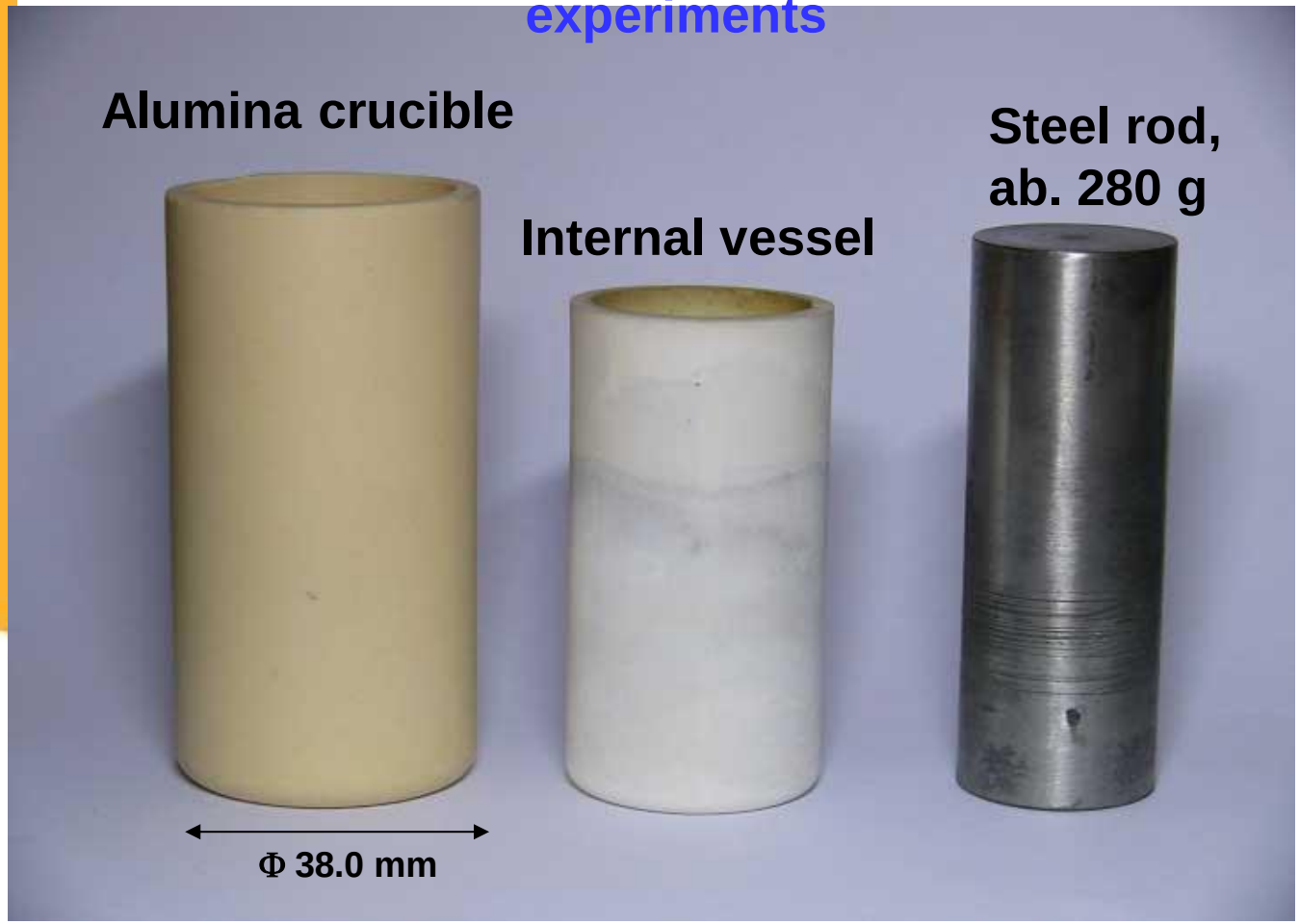
Components used for labo. scale Pressureless Consolidation experiments



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

IGD-TP 5th Exchange Forum

TWG3 - IEP IGD-TP/ SNETP

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

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Thank you for your attention

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