

Sustainable Nuclear Energy Technology Platform

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

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Chairman of SNETP

EPERC- 1-3 April 2019 Rome (I)

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 History



- 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
- 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 Vision Paper
- June 2019: SNETP Evolution towards a legal entity

















Documents available for download on www.snetp.eu and prints upon request (secretariat@snetp.eu)

Vision: 3 strategic pillars matching SET-Plan priorities



LWR Gen. II and III

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Innovative materials and fuels

Process heat, electricity and H₂



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

Simulation and experiments: reactor design, safety, materials and fuels

R&D infrastructures

Safety standards

Fast systems with closed fuel cycles Sustainability



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

ESNII European Sussianible 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]

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NUGENIA – Purpose & Objectives



- 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 & 6 in-kind projects
- Membership: 101 full members and 8 honorary members from 24 countries (as of October 2018)





13 H2020 Euratom ongoing projects



- SOTERIA (CEA): Safe LTO of LWR (Degradation of RPV and RVI, follow-up project of FP7 projects PERFORM60 & LONGLIFE);
- Mc Safe (KIT): High-Performance Monte Carlo Methods for SAFEty Demonstration – From Proof of Concept to realistic Safety Analysis and to Industry-like Applications
- INCEFA+ (AMEC): INcreasing Safety in NPPs by Covering gaps in Environmental Fatigue Assessment
- IVMR (UJV): Management Strategy of In-Vessel Melt Retention in existing and future NPPs
- ATLAS + (VTT): Advanced Structural Integrity Assessment Tools for Safe Long Term Operation

MEACTOS (CIEMAT): Mitigating EAC Through Optimisation of Surface condition

ADVISE (FDF): Advanced Inspection of Complex Structures

NOMAD (IZFP): NDE System for the inspection of operation-induced material degradation

- **T&M CABLES** (EDF): European Tools and Methodologies for an efficient ageing management of nuclear power plant cables
- Il Trovatore (SCK-CEN): Innovative cladding materials for advanced accident-tolerant energy systems
- CORTEX (IRSN): Non-Intrusive Core Monitoring
 Techniques Relying on Inherent Reactor Dynamics
- FASTNET (IRSN): Fast Accident Source Term tools for Emergency Centers
- NARSIS (CEA): New Approach to Reactor Safety Improvements



The projects have received funding from the European Union's Horizon 2020 research and innovation programme

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3. ESNII – European Sustainable SNETP Nuclear Industrial Initiative

Framework

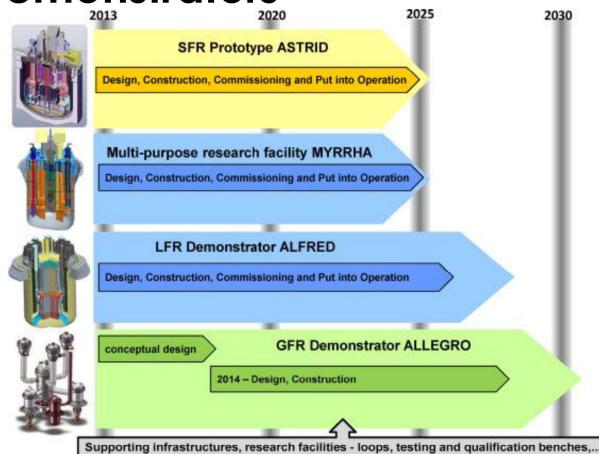
- European Industrial Initiatives (Ells) constitute key elements of Europe's SET-Plan.
- ESNII was formally launched at the SET-Plan Conference in Brussels on 15 November 2010

Purpose and scope

- ESNII addresses the need for demonstration of Gen-IV Fast Neutron Reactor technologies.
- In 2019, ESNII reopened the discussions on the evaluation of the "ESNII Projects & System maturity" using two criteria: the technology readiness level (worldwide) and the advancement of a particular project in Europe.
 - Even though the Lead(-bismuth) Fast Reactor technology is not largely deployed worldwide, MYRRHA should be considered as the number one Generation IV project in Europe, considering its project advancement & good future perspectives.
 - SFR & LFR projects (ASTRID & ALFRED) should be ranked second as, despite
 the situation of ASTRID, Sodium is still the reference technology at the
 international level and considering that ALFRED project offers good
 perspectives even though the technology is less mature.
 - The Gas Fast Reactor technology is considered as a longer-term alternative option (ALLEGRO)

ESNII Demonstrators

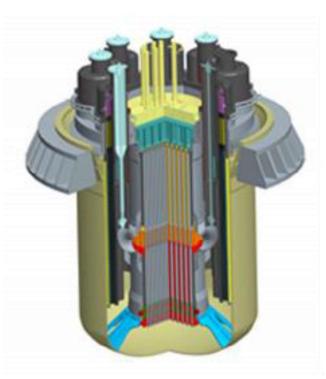




and fuel manufacturing facilities

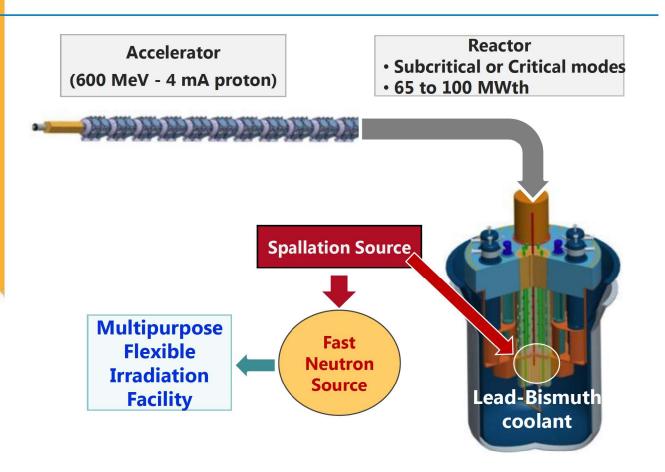
ALFRED Lead Technology SNE IF SUSTAINABLE NUCLEAR ENERGY TECHNOLOGY PLATFORM

- FALCON consortium formed in december 2013 between ENEA, Ansaldo Nuclear and Roumanian R&D Institute ICN
- Applications for ALFRED to become part of ESFRI project and to obtain Roumanian 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



MYRRHA



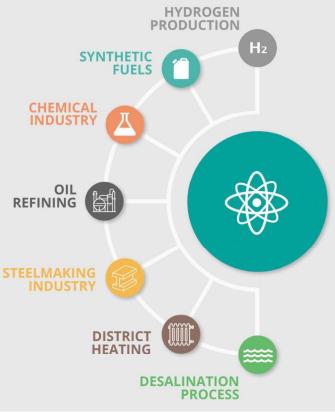


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Nuclear cogeneration HYDROGEN PRODUCTION CO

2. NC2I





Contribute to clean and competitive energy beyond electricity by facilitating deployment of nuclear cogeneration plants



SNE-TP Deployment Strategy



peak of activity		ı	Integrated vision of SNETP Gen II III IV Co-generation - Best case scenario						
T(y): objective achievemen	2015	2020		2025	2030	2035	2040	2045	2050
	Plant life time manag	gement l	Long Term	Operation	I.	NPPs age > 50 years	in 2035	1	
LWR	new build					in average	verage 100 units in EU		
European fleet		decommiss	sioning & d	lismantling	NPP & fuel cycle facili	ity			
				_			-		
FUEL CYCLE open	direct disposal of sper	nt fuel							
	MOX fuel for mono recycling in LWR and deep geological repository								
closed	MOX fuel for Fast Neutron Prototype								
	MOX Multi recycling facility prototype for FNR								
transmutation		1	MA bearing	fuel irradiation at lab					
				basic design	n & license MA bearing	fuel facility - fabrication	on of MA fuel assem	ibly	
PROTOTYPE ASTRID	Dania Danian /Lia	Canatauatia						SFR FOAK	
MYRRHA	Basic Design/Lic Construction commissionning & operations Concept/P _I Basic Design/Lic Construction commissionning & operations							SFR FUAK	
ALFRED	Concept/PreLicensing		Basic Desig			nning & operations		1.5	R FOAK
ALLEGRO	concept viability		basic Desig	Concept/PreLic	Basic Design/Lic	Construction	commissionning & c		N I OAK
ALLEGIO	concept viability			conceptitees	busic besign, tie	construction	commissioning & c	perations	
HTR - cogen	Concept/PreLicensing	Basic Desig	n/Lic	Construction	commissionning & op	erations			
		9	steam prod	luction System design	steam production unit	t coupling			
	harmonization of licensing process for new prototypes								
							FND		CONTROL OF
METHODOLOGIES	harmonization of licer			LWR-			FNR -	_	other
	small modular concept: construction techniques - safety approach Flexible operations for existing and next fleet- ensure stability of electricity generation with mix energy sources								
LWR -FNR-cogeneration	enhanced safety in o				ectricity generation with	FNR-	other		
	ennanced safety in o	peration and	i by design	LVVN-		FINN-	other		
cross cutting issues	Performance and ageing for long term operation of NPP:								
DAGIC TECHNIQUOCY	structural integrity - component ageing phenomena -instrumentation - on site monitoring & diagnosis								
BASIC TECHNOLOGY				high reliability compo	nents				
LWR - FNR - co generation	advanced manufacturing & assembly process - accident tolerant fuel - qualification & control - advanced material & surface engineering								
							-		
Mutualization in:	high reliability & optimized funcionalities of systems								
capabilities methods & tools	1&C - digital system - cyber security - system resiliency under severe conditions								
innovative technology				Research infrastructu	re - modelling & nume	erical simulation - tra	nsfer of knowledge		
transfer of knowledge	irradiation & hot lab - cha	racterisation o	apabilities -		physics & multi scale simul			on & training	

SNETP Evolution Timeline until April 2019

SNETP Sustainable Nuclear Energy Technology Platform

Next steps:

- End Nov/Dec 2018: Consolidation of the remarks and preparation of a new version by the SNETP Evolution TF
- 11-12 Dec 2018: NUGENIA ExCom
 - Discussions on the evolution of NUGENIA's governance
 - Last remarks on the statutes
- Mid-January 2019: Distribution of another draft of the statutes on a shared platform open to the whole SNETP Community
- Mid-February 2019: Closing of the webpage and consolidation/integration of the remarks by the TF
- End-February 2019: Final version issued by the TF
- March 2019 : Review by legal departments
- April 2019 : NUGENIA GA



Thank you for attention

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