

**OECD / NEA Workshop  
On  
Innovations in Water-cooled Reactor Technologies**

**11-12 February 2015  
Issy-les-Moulineaux, France**

**NUGENIA Association  
For GEN II / GEN III R&D**



**G.B. BRUNA**



## The SNETP R&D

- The SNETP [Sustainable Nuclear Energy Technology Platform] supports R&D programs within the E.U. (and abroad) for current (GEN II / GEN III) and future (GEN III + / GEN IV) reactors.
- Implementation is judged very important by SNETP: attention is to be devoted on how the research outcomes profit to the design and operation **⇒ transfer to industrial practice.**
- After Fukushima events, the SNETP asked for a complete revision of R&D Roadmap published in the *SRA 2009 - Strategic Research Agenda* - to check whether implementation of new topics and / or reorientations were necessary. A Task Group was settled, chaired by **Jozeph Mizak** from NRI Rez.

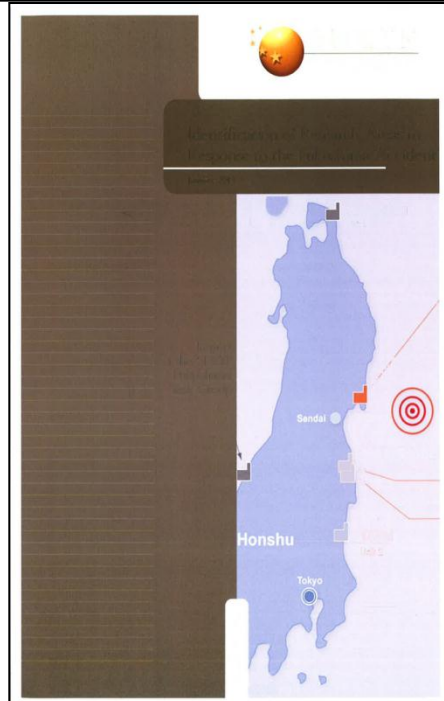
## The SNETP R&D

- Not only technical issues, but also organizational and societal ones were addressed.
- The Report *Identification of Research Areas in Response to the Fukushima Accident* was published.
- The Report identifies 13 Research Topics gathering relevant issues within homogenous fields of endeavour
- No fully new areas for research were identified, but several topics in the *SRA 2009* appeared to be worthy for higher R&D priority  $\implies$  *SRIA 2013 (Strategic Research and Innovation Agenda)* issued February 2013

## *SNETP Reports*

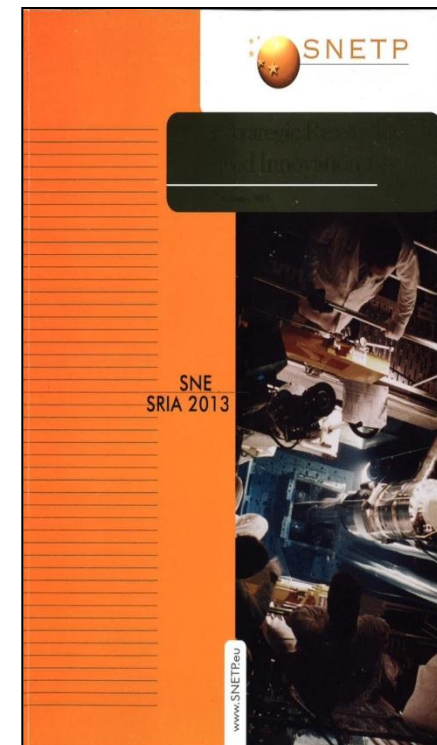
### *Identification of Research Areas in Response to the Fukushima Accident*

Report Of the SNETP Fukushima Task Group  
*SNETP January 2013*



### *The SNETP SRIA 2013 Strategic Research & Innovation Agenda*

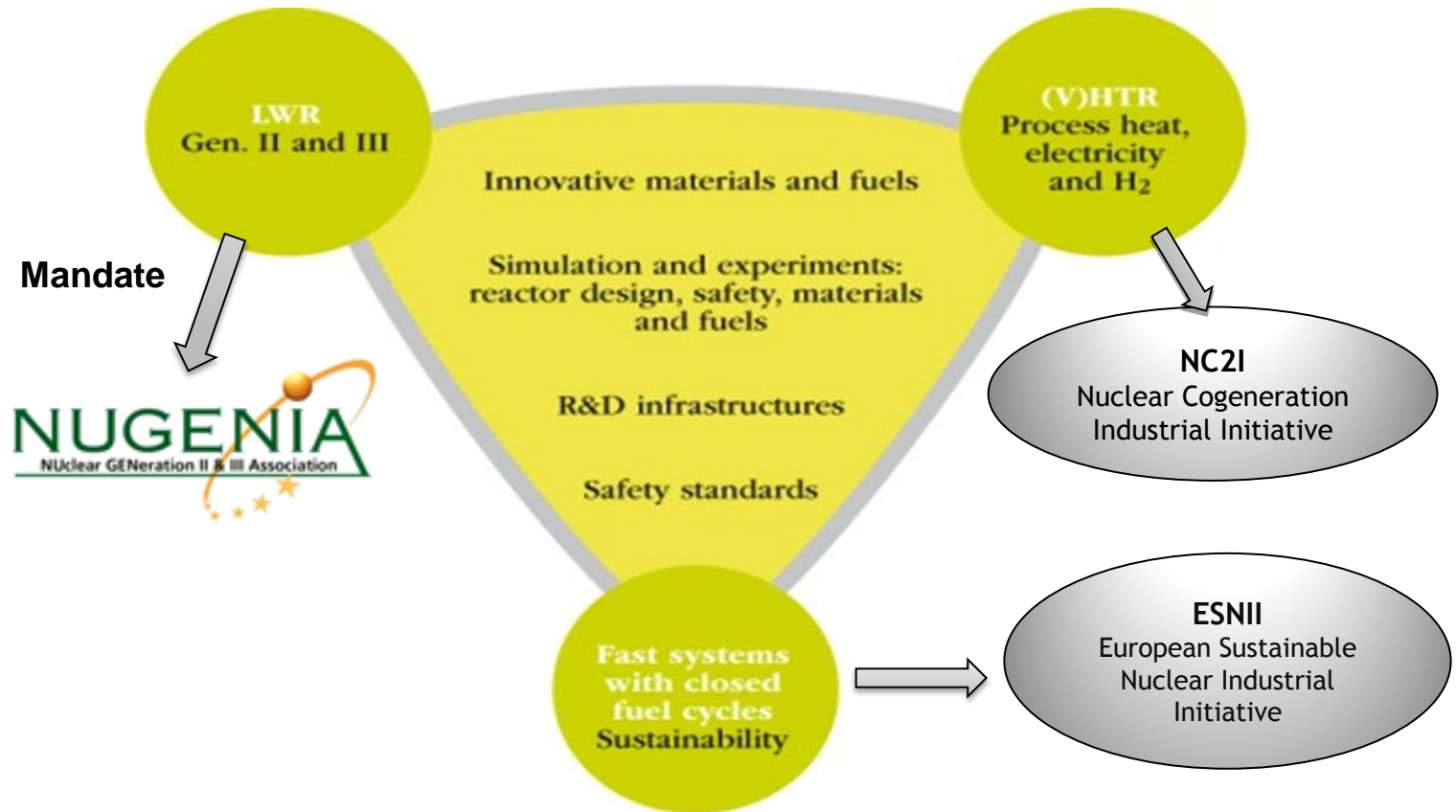
SNETP, May 2013



# **NUGENIA Association**

- | The **NUGENIA Association** was born in the aim at federating all R&D efforts within E.U. in the field of the GEN II / GEN III reactors, gathering pre-existing Working Groups, Networks of Excellence, Associations and Initiatives, such as :
  - | - The SNETP GEN II / GEN III WG
  - | - **SARNET**
  - | - **NULIFE**
  - | - Later on **ENIC**
  - | ....

# NUGENIA within SNETP



# NUGENIA in short

- International non-profit Association of Belgian law founded in November 2011 and officially launched in Brussels, March 2012
- R&D on fission technology, mainly GEN II-III
  - **Redaction of *Roadmaps***
  - **Contribution to SNETP SRIA**
  - **Elaboration of R&D projects (Portfolio, Platform Innovation)**
  - **Annual GA and Forum**
  - **Strong support to harmonization of practices, codes and standards**
  - **Dissemination of knowledge**



# NUGENIA : 8 Topic Area for R&D

1 Safety and Risk of NPPs



2 Severe Accidents



3 Core and Reactor Operation



4 Integrity Assessment of Systems, Structure and Components



5 Fuel Development, Waste and Spent Fuel Management and Decommissioning



6 Innovative LWR Design and Technology



7 Harmonisation



8 In-service Inspection and NDE (ENIQ)



## NUGENIA's identified R&D High Level Objectives

### Safety in operation & by design:

- Identifying preventive and protective measures against all sources of external or internal events
- Identifying the way to efficiently and effectively implement them in current and future reactors.

### High reliability and optimized functionality of systems:

- Ensuring safe and secure operation of systems in Gen II and III NPPs through
  - High reliability and optimized functionality
  - Unified European wide guidance for nuclear energy stakeholders.

### High reliability of components:

- Ensuring the safe operation of components in Gen II and III NPPs through
  - high reliability by technological development in the fabrication process
  - reliable maintenance and affordable inspectability





## Modelling:

- Increasing the reliability and predictability of the advanced simulation codes through coupling of different physical processes
- Providing with an extended validation for design needs and safety-assessment relying on existing data base from mock-up experiments and operation feedback

## Public awareness:

- Addressing the rationale behind nuclear energy acceptance / resistance and public resistance, taking into account the differences in energy policies and in public awareness among different European countries.



## Integration of NPPs in the energy mix:

- Ensuring flexible LWRs operation with large load cycle for using mix energy sources in the most efficient way.
- Improving NPP manoeuvrability and plant life time management (e.g usage factor for material, component ageing, fuel cycle, water chemistry practices, I&C...cost economics) to cope with increased grid instability engendered by renewable energy.

## Technology obsolescence:

- Identifying key components or systems obsolescence impact on NPP safety and availability.
- Developing obsolescence mitigation procedures and recommendations

## Performance and ageing of NPPs for long term operation:

- To obtain enhanced understanding of the ageing degradation mechanisms and make available approaches and tools for effective monitoring and mitigation to guarantee that the ageing effects are properly managed or analysed (e.g. by time limiting ageing analysis (TLAA)).

- **Prime-level Topics selected to propose ideas and develop collaborative R&D programs**

- Development and assessment of the IVR - In-Vessel Retention - technology -
- Comprehensive and cross-cutting approach on the ARF - Accident Resistant Fuel -
- Comprehensive and cross-cutting approach of SMR - Small Modular Reactors - design and safety
- Development and assessment of Passive Safety
- Technology and performance of measurement devices in degraded operation and extreme conditions...
- Non-destructive testing for components and systems
- Pre-normative research and harmonization of practices.



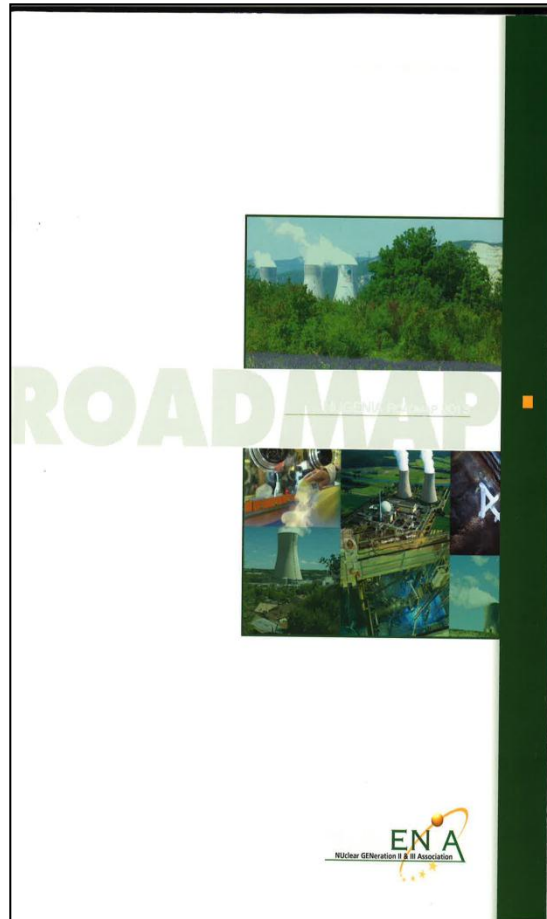
# NUGENIA's Roadmaps

## Two Roadmaps:

- ***NUGENIA Roadmap - Challenges and Priorities - 2013, a summary document*** (≈ 60 pages)
  - **April 2012:** Decision of launching
  - **Mai 2012:** Setting-up of the Editorial Board
  - **July 2012:** Editing (Objectives, Challenges, R&D Topics) for consultation
  - **From September 2012:** Contribution to **SNETP SRIA**
    - **January 2013 :** Publication of the **SNETP report on Fukushima R&D Priorities**
    - **February 2013:** Publication of the **SNETP SRIA**
  - **October 2013:** Publication and presentation at **FISA Conference in Vilnius**
- ***NUGENIA Roadmap Working Document,***
  - A detailed working document (≈ 400 pages)
  - Launched first, (2012) then put on stand-by to implement the ***NUGENIA Roadmap - Challenges and Priorities - 2013***
  - Coordinated by G. Bruna, NUGENIA's current Technical Coordinator
  - Under publication : issuance scheduled by **March 2015**
  - **To be presented at the 4<sup>th</sup> NUGENIA Forum, April 2015**



# ***NUGENIA Roadmap 2013***



***The***

***NUGENIA  
Roadmap  
- Challenges &  
Priorities - 2013***

***October 2013***