

# FAST Nuclear Emergency Tools (FASTNET) project

## The key outputs



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# FASTNET ID card

## Background

- Call H2020-EE-2014-2-RIA (NFRP-02-2014), Nugenia labelled (TA2)

## Target

- European Emergency Centres

## Goal

- Enable Emergency Centres to provide a fast, organized and reliable prediction of accident development and the anticipation of the atmospheric releases in order to better protect the population around most of European NPPs

## Key outputs

- A reference database of severe accident scenarios
- A common graduated methodology
- 2 improved tools needed for a rapid assessment of atmospheric releases

# Partnership



This project, coordinated by the Institut de Radioprotection et de Sûreté Nucléaire (IRSN, France) involves 20 partners and 1 third party for 48 months

## A variety of stakeholders:

- NSA
- Operators
- TSO
- Universities
- IAEA

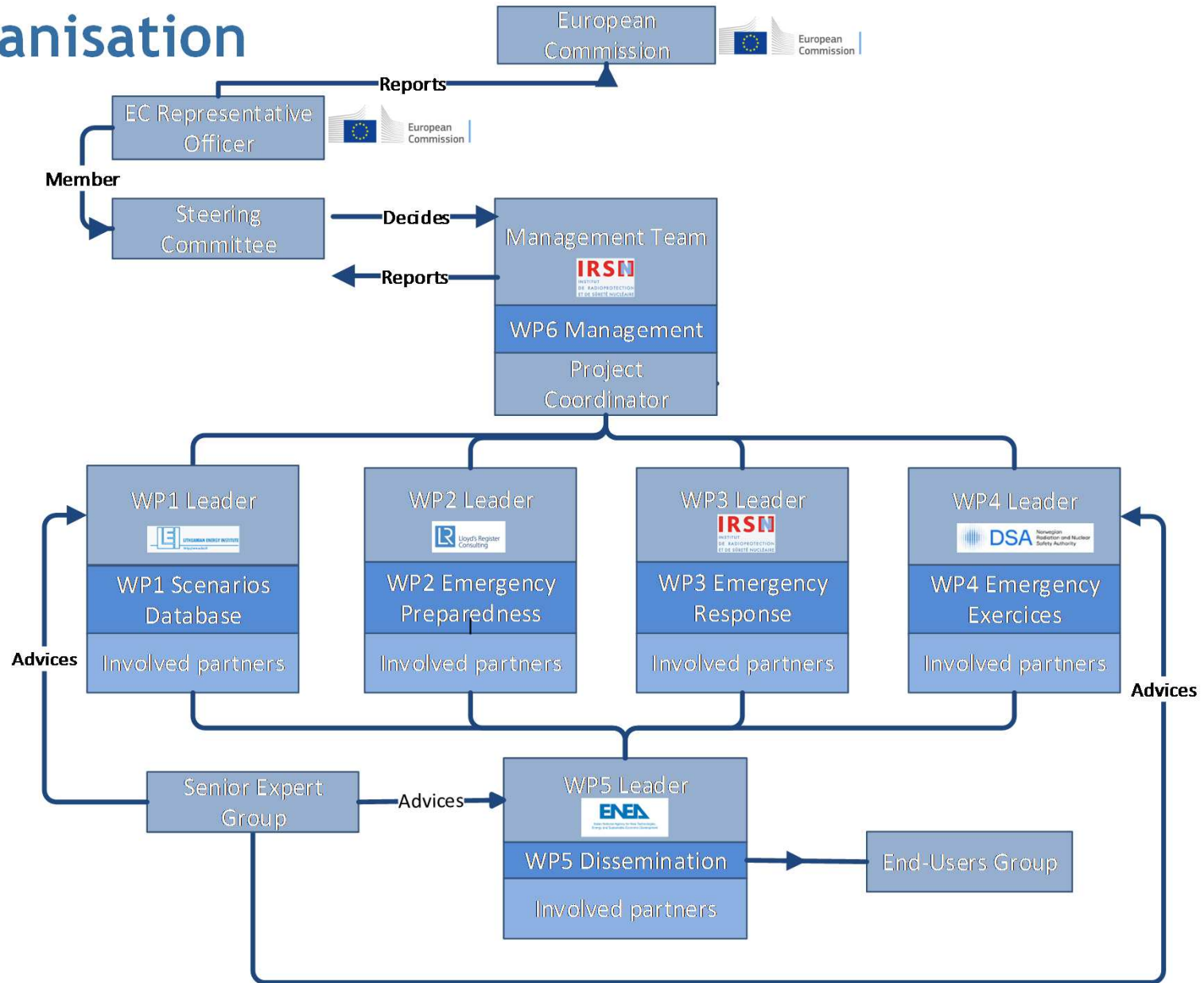
## From:

- EU
- USA
- Canada
- Russian Federation

Participant No	Short name	Participant organisation name	Country
1	IRSN	Institut de Radioprotection et de Sûreté Nucléaire	France
2	IAEA	International Atomic Energy Agency	-
3	Abmerit	ABmerit	Slovak Republic
4	Bel V	Bel V	Belgium
5	CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas	Spain
6	DEMA	Danish Emergency Management Agency	Denmark
7	EDF	Electricité De France	France
8	ENEA	Italian National agency for new technologies, Energy and sustainable economic development	Italy
9	RATEN	Institute for Nuclear Research	Romania
10	BOKU	Institute of Safety and Risk Sciences - University of Natural Resources and Life Sciences	Austria
11	JRC	Joint Research Center - European Commission	-
12	KIT	Karlsruhe Institut Technology	Germany
13	LEI	Lithuanian Energy Institute	Lithuania
14	LRC	Lloyd's Register Consulting	Sweden
15	DSA	Norwegian Radiation Protection Authority	Norway
16	NRI	UJV Rez, a. s.	Czech Republic
17	SSM	Strålsäkerhetsmyndigheten	Sweden
18	STUK	Radiation and Nuclear Safety Authority	Finland
19	CNSC	Canadian Nuclear Safety Commission	Canada
20	US-NRC	US Nuclear Regulatory Commission	USA
	SEC-NRS	Scientific and Engineering Centre for Nuclear and Radiation Safety	Russian Federation



# Organisation



## Before the project

Reference codes  
(ASTEC, MELCOR, MAAP)

PERSAN, RASTEP  
3D3P method

Experts from  
emergency  
preparedness and  
emergency response  
communities

## After the project

A severe accident scenarios database with 108 descriptions of scenarios for 4 representative NPP designs (PWR, BWR, VVER and CANDU) and a generic concept of SFP

2 tools for a rapid assessment of atmospheric releases & a common graduated methodology  
extended to 5 representative NPP designs (PWR, EPR, BWR, VVER and CANDU)

A common language

# A severe accident scenarios database (1)

- The database is deployed to a Windows server and is usable on different platforms (Mac, Linux, Windows)
- It is populated by calculations data of source term for the most important accident scenarios
- The type of the input format is:
  - EXCEL file for the grammar description (the minimum set of radioelements and their speciation necessary for a consistent calculation of the source term and the received doses...)
  - CSV file for the variable evolution
- The type of the output format is IRIX (standard format to environmental dispersion initiatives and tools)
- At the end of the project, the database will be managed by IAEA and made available to MS



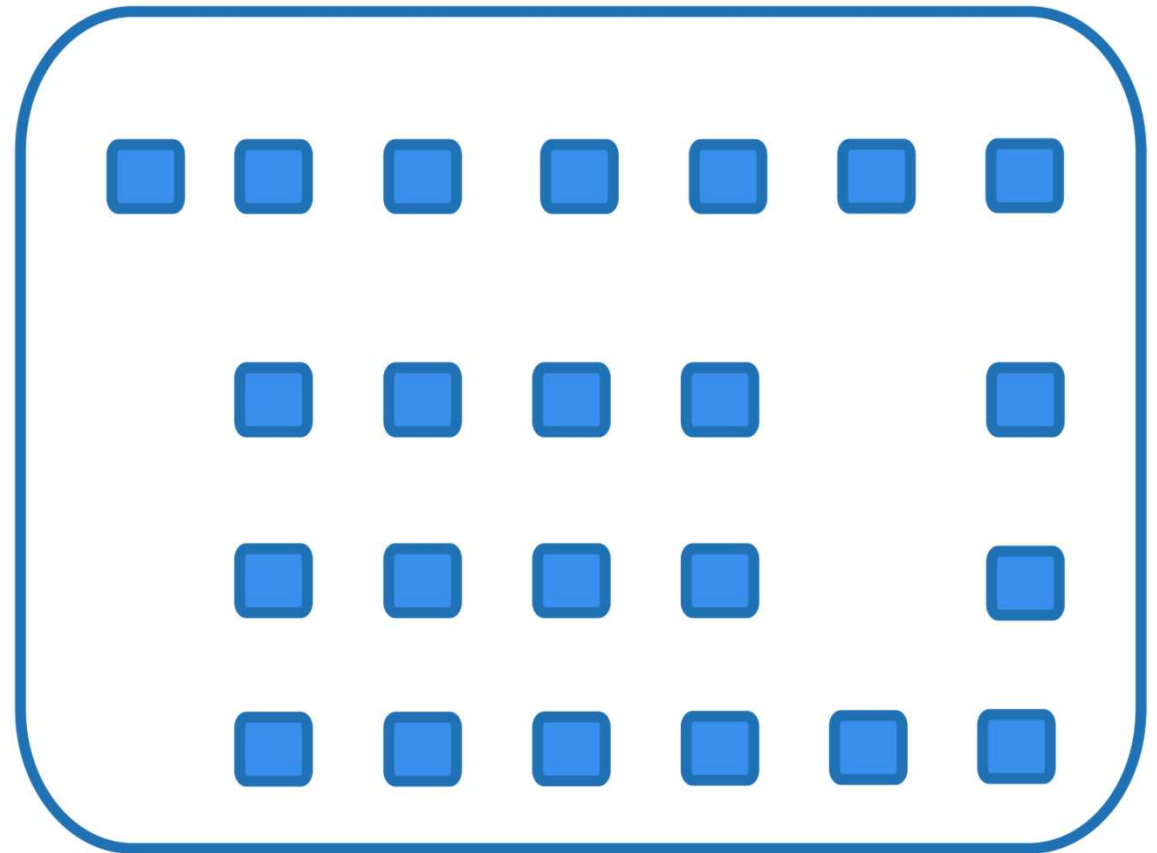


# A severe accident scenarios database (2)

Senior Expert Group designed the scenarios



ATW LB LOCAL IB LOCAL SB LOCAL SBO SFP SGTR



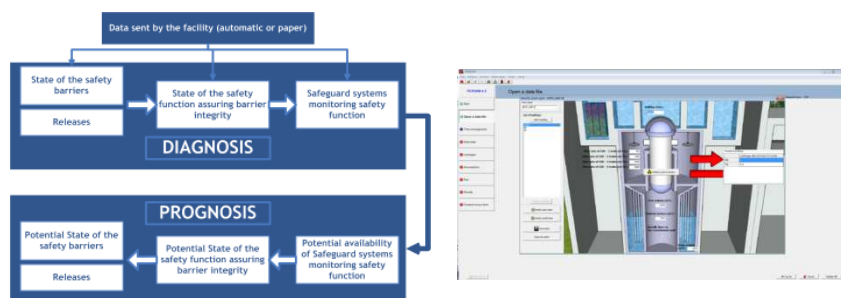


# The FASTNET method and tools (1)

Development of existing method and tools  
based on 2 complementary approaches

## Deterministic method and tool

3D3P method (graduated methodology, IRSN-EDF)  
PERSAN (fast ST evaluation tool, IRSN)

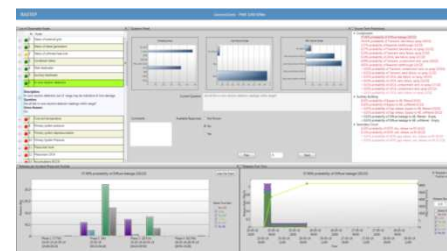


Common graduated  
methodology

PERSAN

## Probabilistic tool

RASTEP (BBN diagnosis/prognosis tool based on  
L2-PSA inversion, SSM-LRC)



RASTEP

Extension to existing plants in Europe (PWR, EPR, BWR, VVER and CANDU)

Inclusion of functionalities to produce or integrate environmental releases data at a standard format (IRIX, IAEA) in order to link them with other initiatives focused on atmospheric transport, radiological consequence assessments and data assimilation



# The FASTNET method and tools (2)

Existing method and tools have to be extended mainly in term of applicability on a larger set of reactors:

Plant concepts	Partners having recognized skills on each concept							
PWR	BelV	CIEMAT	EDF	IRSN	KIT	LRC	SSM	USNRC
EPR	EDF	IRSN	STUK	USNRC				
BWR	CIEMAT	KIT	LEI	USNRC	STUK	SSM	LRC	
CANDU	CSNC	RATEN						
VVER	ABmerit	NRI	SEC-NRS	STUK				

NPP addresses both to the power plant and its SFP facilities. But, whereas all concept of NPP implemented or foreseen in Europe will be addressed specifically, a generic solution will be proposed for SFP facilities that would be easily adapted if needed.



# The FASTNET method and tools (3)

## Improvement/validation of

### Deterministic method and tool

3D3P method (graduated methodology, IRSN-EDF)  
PERSAN (fast ST evaluation tool, IRSN)

### Probabilistic tool

RASTEP (BBN diagnosis/prognosis tool based on L2-PSA inversion, SSM-LRC)

Realisation of a training session on each method and tools



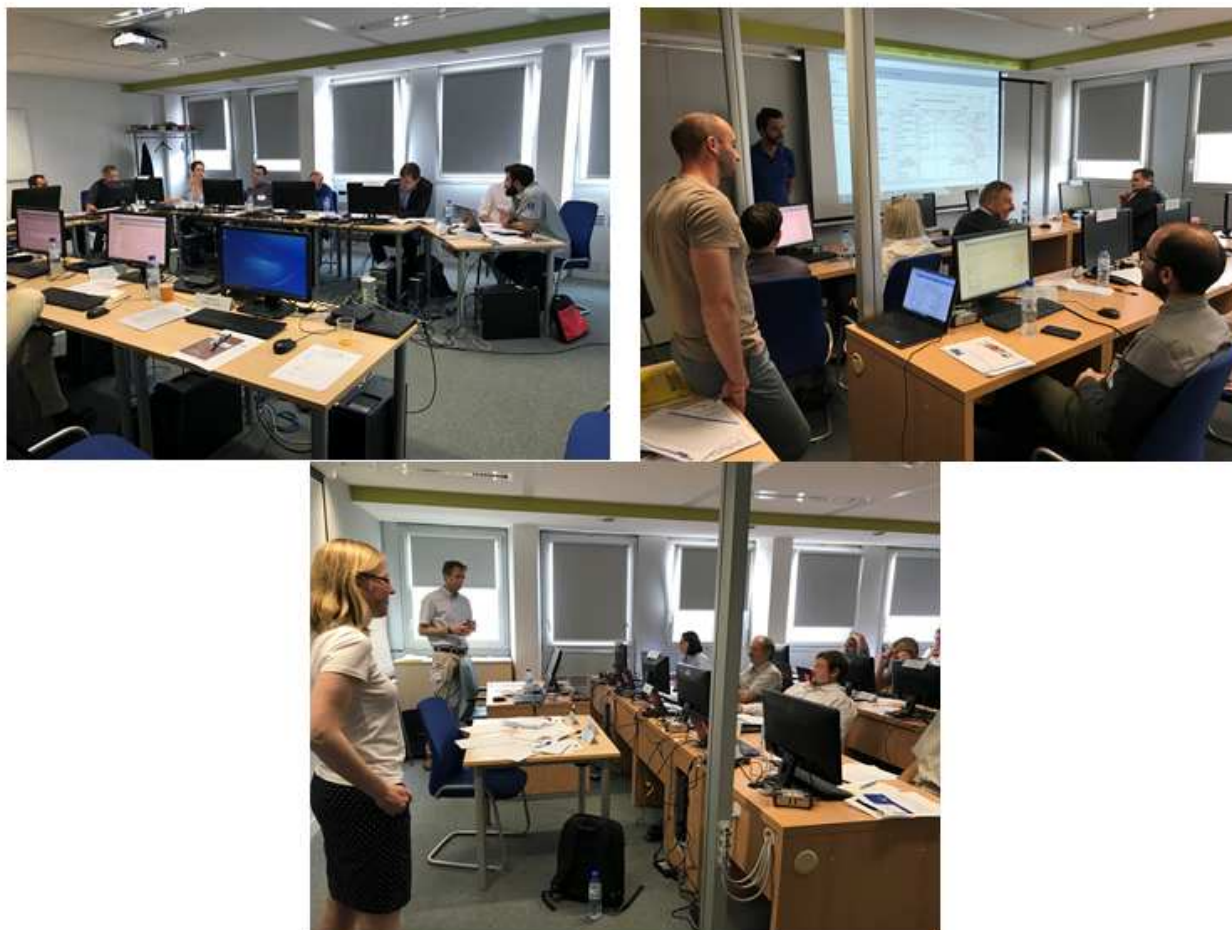
Realisation of 2 series of emergency exercises:

- the best evaluation of the source term
- the population protection



## The FASTNET method and tools (4)

Training session organized in France, from May 28<sup>th</sup> to 30<sup>th</sup>, 2018, on developed method and tools (38 participants from 22 European or non-European countries)



# The FASTNET method and tools (5)

## 2 series of exercises

### Benchmarking (December 2018)

Estimate source terms for a series of  
4 accident scenarios  
(PWR, BWR, VVER, CANDU)

A total of 22 partners participated  
16 used PERSAN and 22 RASTEP

### Single day table top (February 2019)

The accident is happening (PWR):  
analyse provided data and use the  
FASTNET tools and method in order to  
protect the population

A total of 17 partners participated  
5 used PERSAN and 8 RASTEP  
6 used 3D3P method

**Recommendations concerning the FASTNET tools and method and the partners' response during an exercise or a crisis were provided**

# Benefits

- The networking of 2 communities
- The development of a common language
- The opportunity to develop deterministic and probabilistic approaches
- The capitalization of an almost complete “toolbox” associated to a common graduated methodology, robust and efficient, in order to be implemented in any Emergency Centers for the management of emergency based on:
  - The dissemination of a severe accident scenarios database version 1.0 including a uniform description of scenarios
  - The extension of 2 fast tools, deterministic or probabilistic, to assess atmospheric releases
  - The sharing of a common expertise methodology, based on the 3D3P method, focusing on the status of the installation, now and then
- The realization of 2 series of exercises, gathering experts around realistic situations

# Expert review of the project

## Recommendations

- A database fully populated with source terms consistency checked and including the chemical forms of iodine
- A validation and robustness analysis of the FASTNET tools and method
- SPF scenarios and source terms tested during emergency exercises
- Instrumentation considerations relevant for the application of the FASTNET tools
- An adequate number of publications

## Because

- The really titanic ambitions of the project in comparison to time and resources

## Therefore

.....



# Way ahead

- Continue to communicate and publish on the FASTNET outputs
- Rely on IAEA to extend the severe accident scenarios database
- Propose the acquisition of a license for the PERSAN and RASTEP tools to the project partners and end-users who would express the need to use them in their environment, at the preparedness stage of any response to an emergency situation
- Strengthen the developed links between the project partners by the way of cooperations related to:
  - further operational trainings based on all types of NPP designs and SFP;
  - a new series of benchmarking exercises leveraging SFP scenarios and source terms;
  - a new series of exercises targeting the protection of population, based on all types of NPP designs and having a higher level of reality (table-top or full-scale formats)

# Thank you for your attention

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