

European Sodium Fast Reactor: An Introduction

Summary / Objectives:

This webinar presents a brief history of the conceptual development of a largepower (3600 MWth) European Sodium Fast Reactor (ESFR), discusses the status of the current R&D activities on Generation-IV ESFR safety enhancements of the Horison-2020 ESFRSMART project, and provides an overview of new safety measures proposed for improvement of the three safety functions: reactivity control, heat removal and radioactivity containment. Also, experimental programs currently on-going in Europe in support of the ESFR R&D are briefly introduced. A summary of the activities to be performed during the next phase of the project concludes the webinar.

Meet the Presenter:

Dr. Konstantin Mikityuk has been involved in research of safety related aspects of various nuclear reactors with a fast neutron spectrum since he earned his doctorate from the Moscow Engineering Physics Institute in 1992: first at the Russian Research Centre "Kurchatov Institute," and then at the Paul Scherrer Institute (PSI). His current interests are safety analysis of sodium-cooled fast reactor, in particular neutronics and thermal-hydraulic aspects of sodium boiling. Dr. Mikityuk is a Group leader at PSI, Maître d'enseignement et de recherche at Ecole Polytechnique Federale de Lausanne (EPFL), Lecturer at the Eidgenössische Technische Hochschule Zürich (ETHZ). He is also the coordinator of the Horison2020 ESFR-SMART project.



ESFR-SMART: consortium						Work Package and Task Leaders		
					K. N	/ikityuk (PSI)	L. Andriolo (EDF)	
ESFR-SMART					J. K	repel (PSI)	A. Ponomarev (PSI)	
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	il r		Sodium facilities & in	strumentation	E. 6	Girardi (EDF)	C. Demaziere (CHALMERS)	
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			<u> «Kit</u>		G. 0	Gerbeth (HZDR)	C. Collignon (ENEA)	
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in SFR licensing						chwageraus (UCAM)	W. Jager (KIT)	
						indley (WOOD)	D. Staicu (JRC)	
						mmirabile (JRC)	C. Demaziere (CHALMERS)	
Experience from EU projects		Experience in	New SFR safety-		C.L	ombardo (ENEA)	N. Garcia Herranz (UPM)	
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1. European Sodium Fast Reactor: brief history

The ESFR-SMART project aims at enhancing further the safety of Generation-IV SFRs and in particular of the commercial-size ESFR in accordance with the European Sustainable Nuclear Industrial Initiative (ESNII) roadmap and in close cooperation with the ASTRID program.



2. European Sodium Fast Reactor: reactor design

- Thermal / electrical power 3600 / 1500 MW
- Mass of sodium in the primary pool ~2500 t
- Primary sodium temperature 395°C –545°C
- 6 Heat eXchangers, 3 Primary Pumps, 36 Steam Generators





3. ESFR-SMART: project in a nutshell

Name:

- ESFR-SMART: European Sodium Fast Reactor Safety Measures Assessment and Research Tools

Goals:

- Select and assess innovative safety measures for European SFR concept
- Develop new research tools related to SFR safety (calculational codes, experimental data and facilities)

Budget: 5 MEUR of Euratom contribution + ~5 MEUR of consortium's own contribution

Timeframe: 01.09.2017 31.08.2021



4. ESFR-SMART: consortium





5. Overall view of new ESFR

An overview of new safety measures proposed for improvement of the three safety functions:

- Reactivity control, Heat removal and Radioactivity containment.

New ESFR consists of tall chimney for decay heat removal, six steam generators inside the boxes, six secondary loops and the primary sodium pool with core, 3 pumps and 6 heat exchangers.



6. ESFR-SMART: past and ongoing tests

- Legacy data obtained in past tests are used for validation of computer codes.
- The new facilities for ongoing test are designed and under development.





