



Joint IAEA–GIF Workshop on the Safety of Non-Water Cooled Reactors

EVT2204905

30 May to 2 June 2023

IAEA Headquarters, Vienna, Austria,

meeting rooms:

CR2 – 30 May and 2 June

M0E75 – 31 May and 1 June

and virtually through MS Teams

Introduction

The International Atomic Energy Agency (IAEA) and the Generation IV International Forum (GIF) have jointly committed to collaborate between their respective programmes, and share information in selected areas of mutual interest. One of the key areas of focus for both the GIF and the IAEA is the safety of liquid metal cooled fast reactors (LMFRs) – including sodium cooled fast reactors (SFRs) and lead cooled fast reactors (LFRs) – high temperature gas cooled reactors (HTGRs) and molten salt reactors (MSRs).

A particularly important area of mutual interest is the harmonization of safety approaches, safety requirements, Safety Design Criteria (SDC) and Safety Design Guidelines (SDG), as well as the applicability of IAEA safety standards for the next-generation of advanced non-water cooled reactors (NWCRCs) under development worldwide.

Within the framework of this collaboration, ten joint IAEA–GIF technical workshops on the safety of SFRs have been held since 2010 (the meetings organised since 2018 also covered LFRs). Two joint IAEA-GIF meetings on the safety of HTGRs (the meeting organised in 2022 also covered MSRs) have also been held.

The focus of this workshop will be twofold:

- i. Building on the outcome of previous abovementioned IAEA-GIF meetings on the safety of LMFRs, to provide a forum for the exchange of technical information on the development and implementation of SDC and SDG, developed since 2011 within the GIF, for LMFRs, and experiences in the application of IAEA design safety and safety assessment standards to LMFRs;
- ii. To provide a platform for the exchange of technical information on the safety approach in the design of, and application of IAEA design safety and safety assessment standards to, HTGRs and MSRs. Furthermore, the workshop will allow IAEA to collect feedback from the GIF representatives and other participants on a draft IAEA TECDOC on “Considerations on the Safety of High-Temperature Gas-Cooled Reactors and Molten Salt Reactors” currently under development.

Objectives

The main objectives of this workshop are to:

- Share information on the development of SDC and SDG for LMFRs by the GIF and collect feedback on the implementation of SDG for SFRs and SDC for LFRs by the designers of innovative LMFRs concepts;
- Share information on the safety approach and on design solutions implemented in LMFRs in operation and on innovative design solutions under development for new LMFRs;
- Share experience on the safety approach and on design solutions under development for HTGRs and MSRs;
- Share experience in development of licensing frameworks for LMFRs, HTGRs and MSRs;
- Share experience in the application of IAEA design safety and safety assessment standards to LMFRs, HTGRs and MSRs; and
- Collect feedback on a draft IAEA TECDOC on “Considerations on the Safety of High-Temperature Gas-Cooled Reactors and Molten Salt Reactors”.

Contacts

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Proposed Agenda

Tue 30 th May		
Time (CEST)	Topic	Speaker
<u>Opening session</u>		
10:00-10:10	IAEA welcome remarks: - Department of Nuclear Energy, Division of Nuclear Power	Ms Aline DES CLOIZEAUX (IAEA, DIR-NENP)
10:10-10:20	GIF welcome remarks	Mr Daniel BRADY (Department of Natural Resources, Canada, GIF Policy Group Vice-Chair - Regulatory Issues)
10:20-10:30	Objective of the meeting	Mr Simone MASSARA, Mr Javier YLLERA (IAEA, Scientific Secretaries)
10:30-10:50	Introduction of participants Approval of the agenda Appointment of the session Chairs	All IAEA
<u>Technical Session I: Overview of IAEA and GIF safety-related activities</u> Co-chairs: Mr Daniel BRADY (Canada, GIF Policy Group Vice-Chair - Regulatory Issues), Mr Javier YLLERA (IAEA)		
10:50-11:20	Overview of the GIF and Safety Related Activities	Mr Daniel BRADY (Department of Natural Resources, Canada, GIF Policy Group Vice-Chair - Regulatory Issues)
11:20-11:50	Coffee/tea break	
11:50-12:10	Status of the Nuclear Harmonization and Standardization Initiative: Regulatory Track	Ms Paula CALLE VIVES (IAEA, RAS)
12:10-12:30	Status of the Nuclear Harmonization and Standardization Initiative: Industry Track	Ms Eve-Lyne PELLETIER (IAEA, NPTDS)
12:30-12:45	Discussion and wrap-up of technical session I	
12:45-14:00	Lunch break	
<u>Technical Session II - part 1: Liquid Metal cooled Fast Reactor related activities</u> Co-chairs: Mr Frederic SERRE (CEA, France, GIF SFR SSC), Mr Simone MASSARA (IAEA)		
14:00-14:30	Overview of GIF SFR Project Activities to Improve the SFR Safety as of 2023	Mr Frederic SERRE (CEA, France, GIF SFR SSC)
14:30-15:00	Activities of the GIF Safety and Operation Project of Sodium-Cooled Fast Reactor Systems	Mr Hidemasa YAMANO (JAEA, Japan, GIF SFR SO PMB)
15:00-15:30	Development of SDC and SDG for Generation IV Sodium-cooled Fast Reactors	Mr Satoshi FUTAGAMI (JAEA, Japan, GIF RSWG)
15:30-15:50	Coffee/tea break	
15:50-16:20	Progress of a pool-type SFR conceptual design study in Japan	Mr Koichi HIGURASHI (MFBR, Japan)
16:20-16:50	A Trial Implementation of the Risk-Informed Methodology for GIF SFRs	Mr Shigenobu KUBO (JAEA, Japan, GIF RSWG)
16:50-17:20	Application of GIF Safety design criteria and Safety design guidelines to the ASTRID 600 design at the example of the passive shutdown systems	Mr Christoph DOEDERLEIN (CEA, France, GIF RSWG)
17:20-17:45	Discussion	
17:45	Adjourn	

Wed 31st May		
Time (CEST)	Topic	Speaker
<u>Technical Session II - part 2: Liquid Metal cooled Fast Reactor related activities</u> Co-chairs: Mr Mariano TARANTINO (ENEA, Italy, GIF LFR pSSC), Mr Vladimir KRIVENTSEV (IAEA)		
09:30-10:00	Status of GIF LFR Safety Design Criteria	Mr Mariano TARANTINO (ENEA, Italy, GIF LFR pSSC)
10:00-10:30	Overview of GIF LFR systems: Synergies and Commonalities	Mr Mariano TARANTINO (ENEA, Italy, GIF LFR pSSC)
10:30-11:00	Considerations on the Safety Demonstration of ALFRED	Ms Mirela NITOI (RATEN ICN, Romania)
11:00-11:20	Coffee/tea break	
11:20-11:50	Status of Westinghouse LFR Testing and Safety Analysis	Mr Jun LIAO (Westinghouse Electric Company, USA)
11:50-12:20	Safety Concept and Licensing Experience for the FOAK NPP with SVBR-100 Reactor	Mr Oleg KOMLEV (Joint Stock Company "AKME-Engineering", Russian Federation)
12:20-12:45	IAEA involvement in the review of Safety Design Criteria for SFR and LFR	Mr Javier YLLERA (IAEA, SAS)
12:45-13:45	Lunch break	
13:45-14:15	On-going IAEA projects on the safety of LMFR	Mr Simone MASSARA (IAEA, SAS)
14:15-14:45	IAEA activities in the field of fast reactor technology	Ms Nikoleta MORELOVA, Mr Vladimir KRIVENTSEV (IAEA, NPTDS)
14:45-15:15	Discussion and wrap-up of technical session II	
15:15-15:35	Coffee/tea break	
<u>Technical Session III: (Very-) High Temperature Gas Reactor related activities</u> Co-chairs: Mr Jim KINSEY (INL, USA, GIF RSWG), Mr Hadid SUBKI (IAEA)		
15:35-16:05	VHTR Safety Design Criteria	Mr Jim KINSEY (INL, USA, GIF RSWG)
16:05-16:35	Overview on the safety analysis tools validation and verification efforts within the GIF VHTR-CMVB framework	Mr Paolo BALESTRA (INL, USA, GIF VHTR CMVB PMB)
16:35-17:05	TRISO Fuel Performance Evaluation	Mr Paul DEMKOWICZ (INL, USA, GIF VHTR FFC PMB)
17:05-17:35	HTGR safety analysis code system in Korea	Mr Byung Ha PARK (KAERI, Republic of Korea)
17:35-18:05	Approaches of safety regulation of nuclear-hydrogen facilities in the Russian Federation	Mr Valerii KHLOBYSTOV (Scientific and Engineering Centre for Nuclear and Radiation Safety (SEC NRS), Russian Federation)
18:05-18:30	Discussion	
18:30	Adjourn	
18:30-19:30	Reception hosted by the IAEA (Salon B-C, close to the VIC Cafeteria)	

Thu 1 st June		
Time (CEST)	Topic	Speaker
09:30-09:40	Status of development of IAEA TECDOC on “Considerations on the Safety of High-Temperature Gas-Cooled Reactors and Molten Salt Reactors”	Ms Lara PEGUERO (IAEA, SAS)
09:40-10:20	Introduction to sections 2-3 of IAEA TECDOC on “Considerations on the Safety of High-Temperature Gas-Cooled Reactors and Molten Salt Reactors”	Mr Gerd BRINKMANN (BriVaTech Consulting, Germany)
10:20-10:40	Discussion	
10:40-11:00	Coffee/tea break	
11:00-11:20	Advances in HTGR-type SMR technology development & recommendations from the Technical Working Group on Gas Cooled Reactors (2022)	Mr Hadid SUBKI (IAEA, NPTDS)
11:20-11:50	Discussion and wrap-up of technical session III	
Technical Session IV: Molten Salt Reactor related activities Co-chairs: Mr Jiri KREPEL (PSI, Switzerland, GIF MSR pSSC), Mr Javier YLLERA (IAEA)		
11:50-12:10	Update on IAEA publication in the pipeline: (draft) Technical Report Series on the Status of Molten Salt Reactor technology	Mr Hadid SUBKI (IAEA, NPTDS)
12:10-12:40	Severe Plant Condition Considerations for MSR	Mr Thomas BOISSEAU (Framatome, France)
12:40-13:50	Lunch break	
13:50-14:20	First outline of the safety approach of the ISAC project	Ms Elena MARTIN LOPEZ (CEA, France)
14:20-14:50	Source Term for Severe Accident in Molten Salt Reactor	Mr Jiri KREPEL (PSI, Switzerland, GIF MSR pSSC)
14:50-15:20	The Computational Investigation of Freeze Plug of Molten Salt Reactors for Nuclear Safety	Ms Senem SENTURK LULE (Istanbul Technical University Energy Institute, Turkiye)
15:20-15:50	Coffee/tea break	
15:50-16:20	MSR Safety Adequacy Demonstration: US Contributions Towards a Common Goal	Mr David E. HOLCOMB (INL, USA)
16:20-16:40	Introduction to sections 4-5 of IAEA TECDOC on “Considerations on the Safety of High-Temperature Gas-Cooled Reactors and Molten Salt Reactors”	Mr Bernard CARLUEC (France)
16:40-17:10	IAEA analysis of applicability of SSR-2/1 (Rev. 1) to MSR and first reflections on major gaps identified for the development of a safety approach for MSR	Mr Bernard CARLUEC (France)
17:10-18:00	Discussion and wrap-up of technical session IV	
18:00	Adjourn	

Fri 2nd June		
Time (CEST)	Topic	Speaker
<u>Technical Session V: Cross-cutting activities relevant to the safety of advanced reactor technologies</u> Co-chairs: GIF, Mr Javier YLLERA (IAEA)		
11:15-11:45	Activities of the GIF Task Force on Advanced Manufacturing and Materials Engineering	Mr Lyndon EDWARDS (ANSTO, Australia, GIF AMMETF)
11:45-12:15	IRSN review of Generation IV nuclear energy systems: a focus on SFR, LFR, MSR, VHTR	Mr Vincenzo TIBERI (IRSN, France)
12:15-12:45	Joint RSWG/PRPP/VHTR-SSC effort for establishing safeguards, safety, and security interfaces for VHTR system	Mr Bryan VAN DER ENDE (CNL, Canada, GIF PRPPWG)
12:45-13:25	Coffee/tea break	
13:25-13:40	Consideration of Non-Water Cooled Reactors and SMR Safety in the IAEA Safety Standards	Ms Ana GOMEZ COBO (IAEA, SAS-SH)
13:40-14:00	Development of the Safety Guide on the Safety Demonstration of Innovative Technology in Power Reactor Designs (DS537)	Mr Shahan POGHOSYAN (IAEA, SAS)
14:00-14:15	IAEA activities on the safety of NWCR planned for 2023-2024	Ms Ana GOMEZ COBO (IAEA, SAS-SH)
<u>Closing session</u>		
14:15-14:50	General discussion: - Wrap-up facilitated by session co-chairs - Topics of interest for the future cooperation between IAEA and GIF - Next meetings (frequency, scope)	All
14:50-15:00	IAEA closing remarks: - Department of Nuclear Safety and Security, Division of Nuclear Installation Safety	Ms Ana GOMEZ COBO (IAEA, SAS-SH)
15:00	Meeting adjourn	