



ERMSAR 2022

Severe Accident Research Eleven Years after the Fukushima Accident



The 10th edition of the ERMSAR (European Review Meeting on Severe Accident Research) Conference, in memory of Martin Kissane, was successfully held in hybrid format from 16 to 19 May 2022 in Karlsruhe, hosted and locally organized by KIT, after 3 years for the previous edition in Prague. For the fourth time, it has been organized in the frame of the Technical Area 2 of the NUclear GENeration II and III pillar (NUGENIA TA2) of SNETP Association, and for the first time in collaboration with IAEA and OECD/NEA. The Technical Programme Committee involved 18 researchers from diverse organizations (BT, CEA, CIEMAT, ENEA, Framatome GmbH, GRS, IAEA, INRN, IRSN, JSI, KIT, KTH, NEA and University of Pisa).

ERMSAR 2022 gathered 118 participants (more than 100 in presence!) from nearly 50 organizations settled in 21 countries worldwide (EU, USA, Republic of Korea, Brazil, Japan, India), which highlights ERMSAR as the reference international conference on Severe Accidents. Sixty papers were orally presented and 9 more were exhibited in the posters stand, among which is worth noting there were two submitted by Ukrainian colleagues from ES Group.

In addition, the technical programme included three plenary sessions, in addition to a specific presentation on NUGENIA/TA2 latest activities and status:

- International programmes on severe accident research (contributions from EC, NEA and IAEA).
- Fukushima, from the understanding to accident management and decommissioning (NEA; TEPCO; JAEA/CLADS).
- Round table on new elements in the SA research domain (ATFs, Energy Research Inc.; SMRs, TRACTEBEL; environmental impact, KIT; modeling innovation, IRSN).

The conference, open to both NUGENIA and non-NUGENIA members, was focused on the latest progress of international knowledge on severe accidents and has been mainly an opportunity for researchers to discuss, finally in presence after 2 years of sanitary emergency, about future R&D priorities in this field. The Conference topics are highlighted in the following technical session list.

1		In-vessel corium and debris coolability
2	2-1	Severe accident scenarios
	2-2	Uncertainties in severe accident scenarios
3		Ex-vessel corium interactions and coolability
4		Severe accidents scenarios in innovative systems
5		Source term
6		Severe Accident Modeling and Code Development
7	7-1	Hydrogen and Containment Related issues
	7-2	Containment Behaviour - Recombination

It is worth to highlight as some new R&D needs in this SA area, emerging from the ERMSAR 2022 presentations, will be challenged by three future Horizon Europe Projects born inside NUGENIA TA2 as: ASSAS, for the possible Artificial Intelligence use in SA simulations; SEAKNOT, for SA knowledge management, preservation and to efficiently orient SA forthcoming research in next 10 years; and SASPAM-SA, for the application of current SA grounds to LWSMRs. These projects demonstrate that severe accident research is



“alive” and “healthy” notwithstanding that the total research funding is not raising. Furthermore, experimental/theoretical investigations are still on-going and/or planned in other international projects (e.g. MUSA, IPRESCA, THEMIS, ESTER, IAEA/CRP) to tackle open issues in the field and new calculation models and approaches are being developed and tested, with particular emphasis on those phenomena affected by large uncertainties and high potential influence on accident unfolding and/or mitigation.

As major conclusions from ERMSAR 2022 it is also possible to highlight:

- A good part of R&D will continue investigating on SA mitigation, in particular on feasibility/development of “new” mitigation measures,.
- An increased investigation is on the floor about very near-term deployment systems, like PW-SMRs, with a major take on “safety demonstration” and current analytical tools drawbacks for “very innovative” systems and the potential ways to overcome some of these limits. Additionally, it will be necessary to identify experimental data needs in pursuing the aim of studying non-LWR designs and, in the longer term, the V&V of codes for the licensing of such systems.
- Efforts should be also oriented to widen the range of applicability of the SA codes both to Gen-IV technologies and to further improve the modelling of specific components in deployed systems. It is also considered timely to soundly set of SA research needs and priority towards new technologies, e.g. SMRs, ATFs and find the best use possible in the area of AI/machine learning, with focus on safety-relevant phenomena (“risk informed”).

In the closing session, ERMSAR2024 was announced to be organized in the frame of the SEAKNOT project by KTH in Stockholm on the week of May 17th 2024.