Molten Salt Reactor Technology Working Group (MSR TWG)

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Molten salt reactors represent the future of nuclear energy on the basis of being clean, safe and cost-effective means of meeting increased energy demands on a sustainable basis.

The six member companies of the MSR TWG collaborate to influence policy makers and work on common R&D scope.

Active projects include:
- Engagement with international partners through Nuclear Energy Agency (NEA)
- The International Experimental Thermal-Hydraulic Systems Database (TIETHYS)
- Participation in NEAMS Executive Advanced Reactor Industry Council (NEARIC)
- Review of consensus standards and guidelines related to MSR licensing
International Collaboration with the Nuclear Energy Agency

The NEA: A Forum for Co-operation for the Most Advanced Countries in the World

- Founded in 1958
- 31 member countries
- 7 standing technical committees
- 75 working parties and expert groups
- 21 international joint projects

Slide Courtesy of Dr. Upendra Singh Pehalvi
Brookhaven National Laboratory
Framework for International Thermal Hydraulic Databases for Validation (TIETHYS)

Objective
- Create dynamic expandable relational database for retrieval of thermal/hydraulic data (SET and IET) for code validation for different reactor types and different M&S tools (system codes and CFD)
- Mechanism to obtain and preserve data from US and International sources
- Qualify existing database with additional information-measurement uncertainty, scaling, etc. for modern validation and uncertainty evaluation.
- Set up guidelines for documentation for future tests

Challenge
- Data distributed across multiple sources, at different scales and in varying formats
- Availability and quality of data and documentation varies greatly

MSR Information
- Thermo-physical properties of fluoride/ chloride solutions; Heat capacity, Melting points, Equilibrium data, Heat of transition, Enthalpies, Vapor pressure, Viscosity, Density, Thermal conductivity
- Analytical Tools-codes, i.e. TRACE-PARC, NETFLOW++, etc
- Licensing
  - Safety parameters
  - Accident Scenarios, Reactivity Insertion, Loss of Flow, LOCA, etc. and corresponding PIRT
- Data (SET and IET)
  - Loop data-forced flow and natural circulation
  - Drain Tank Cooling

Engagement with NEAMS
MSR Consensus Standards Review

ANS 6.4 Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants

- MSR would utilize an update to this standard
- New temperature requirements, different spectrum
- Changes calculation of both dose and concrete thickness
- Referenced by RG 1.69
ANS 15 Series Standards for the Operation of Research Reactors

- Need to be re-examined for applicability to MSRs
- Referenced by NUREG-1537

Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors

ANS 15 Series Standards for the Operation of Research Reactors

- 15.1: The Development of Technical Specifications for Research Reactors
- 15.4: Selection and Training of Personnel for Research Reactors
- 15.7: Research Reactor Site Evaluation
- 15.8: Quality Assurance Program Requirements for Research Reactors
- 15.10: Decommissioning of Research Reactors
- 15.11: Radiation Protection at Research Reactor Facilities
- 15.12: Design Objectives for and Monitoring of Systems Controlling Research Reactor Effluents
- 15.15: Criteria for the Reactor Safety Systems of Research Reactors
- 15.16: Emergency Planning for Research Reactors
- 15.19: Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactor Facilities
- 15.20: Criteria for the Reactor Control and Safety Systems of Research Reactors
- 15.21: Format and Content for Safety Analysis Reports for Research Reactors

ANS 20.2 Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten-Salt Reactor Nuclear Power Plants

- Request that NRC endorse this standard
- Alternative to Appendix A of 10 CFR Part 50
- Equivalent of standards referenced in DG-1330 for HTGRs and SFRs
What is it going to take to move forward?

• People, not organizations or initiatives, get things done.
• Nothing worthwhile can be accomplished without extended effort and force of will.
• The men who built MSRE recognized the value of hard work, attention to detail, personal responsibility, and determination.
• There is no backup plan. Find a way to get it done.