

# Molten Salt Reactor Technology Working Group (MSR TWG)

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## Molten Salt Reactor Technology Working Group (MSR TWG)

- 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

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## MSR Molten Salt Reactor TWG

Terra Power	Thorcon	Terrestrial Energy	Flibe Energy	Transatomic Power	Elysium Industries
Fast Breeder Liquid Fuel Salt Cooled Uranium (Could use Th)	Thermal Breeder Liquid Fuel Salt Cooled Thorium	Thermal Breeder Liquid Fuel Salt Cooled Uranium (Could use Th)	Thermal Breeder Liquid Fuel Salt Cooled Thorium	Hybrid Breeder Liquid Fuel Salt Cooled Uranium	Fast Breeder Liquid Fuel Salt Cooled Uranium



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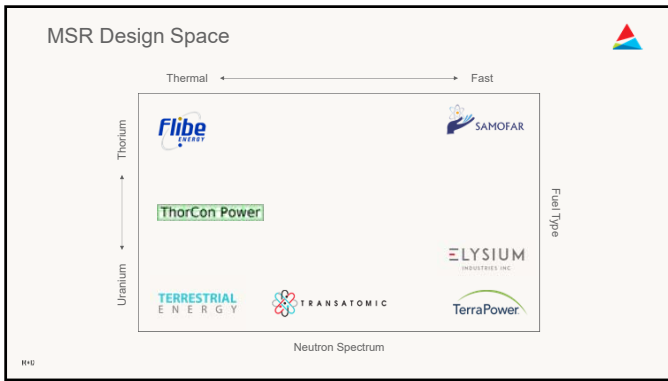
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### The NEA: A Forum for Co-operation for the Most Advanced Countries in the World

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

**Steering Committee for Nuclear Energy**

<b>CSNI</b> Committee on the Safety of Nuclear Installations	<b>CNSA</b> Committee on Nuclear Regulatory Activities	<b>RWMC</b> Radiation Waste Management Committee	<b>CFPPH</b> Committee on Radiation Protection and Public Health	<b>NSC</b> Nuclear Science Committee	<b>NDC</b> Committee for Nuclear and Economic Studies on Nuclear Energy Development and the Fuel Cycle	<b>NLC</b> Nuclear Law Committee
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Executive Group of the NSC (State Bank Management Committee)

DEPARTMENT OF ENERGY | BROOKHAVEN NATIONAL LABORATORY | Slide Courtesy of Dr. Upendra Singh Rohatgi | 70 YEARS OF DISCOVERY | BROOKHAVEN NATIONAL LABORATORY

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### 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



Slide Courtesy of Dr. Upendra Singh Rohatgi  
Brookhaven National Laboratory



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### 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



Slide Courtesy of Dr. Upendra Singh Rohatgi  
Brookhaven National Laboratory



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### Engagement with NEAMS



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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*

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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*
- *15.17 : Fire Protection Program Criteria 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*

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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*

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What is it going to take to move forward?



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- *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.*



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