G4SR-2 International Conference Preliminary Technical Program Tracks

Safety Assessment & Licensing of Advanced Reactors and SMRs
- Graded approach or alternative approaches for establishing technical and safety analysis requirements;
- Application of GIF’s Integrated Safety Assessment Methodologies (ISAM) for Generation IV nuclear systems;
- Relevance of past design/operating data and OPEX;
- Identification of principal design criteria and/or licensing basis events;
- Advancement of Probabilistic Safety Assessment (PSA) methods and their application;
- Environmental assessments and impact assessments for SMRs and advanced reactors;
- Methodologies for Emergency Preparedness and Response (EPR);

Research & Development (R&D) supporting Advanced Reactor and SMR Deployment
- R&D for the verification of innovative passive and inherent safety features;
- Materials and structural issues for advanced reactors;
- R&D into high-level safety, safeguards, and security features, particularly for remote applications (e.g. abnormal intrusion detection and mitigation, security by design models, etc.);
- Development of Instrumentation and Controls (I&C) technologies, including monitoring for fitness for service, autonomous control and operation for remote applications (e.g. abnormal incident monitoring, safe operation envelope with power reduction and shutdown criteria);
- Modelling & simulation tool and capability development, e.g., coupled safety analysis codes, dynamic system modelling (simulators);
- Research on innovative reactor design concepts, reactor core physics, thermalhydraulics, Advanced Technology Fuel or Accident Tolerant Fuel (ATF);
• Dry Cooling technologies to allow SMR deployment with little water usage;
• Other thermal cycles (e.g. Brayton cycle) as alternatives to Rankine steam cycle to improve thermal efficiency;
• Inspection, testing technologies, smart conditioned based maintenance methodologies;
• Updates on nationally and internationally managed R&D programs

First-Of-A-Kind (FOAK) Reactor Demonstration and Prototype Testing

• Site assessment and selection for prototype or demonstration reactors;
• Updates on projects currently under assessment or construction;
• Management approach for engaging the regulator, operator, vendor, and supporting R&D organizations in a manner that supports timely deployment;
• Special licensing, safety, and risk assessment considerations for prototypes and demonstration reactors;
• Practical applications for a FOAK reactor beyond technology demonstration, e.g. electricity generation, district/process heating, neutron source, etc.
• Potential applications for off-shore or floating SMR.

Decommissioning, Waste Management, and Fuel Cycle for Advanced Reactors and SMRs

• Identification and characterization of waste streams from advanced reactors and SMRs;
• Long-term strategy and public policy for dispositioning future waste streams, including the possibility of used fuel recycling;
• Decommissioning strategies for advanced reactors;
• Policy considerations for nuclear liabilities applicable to very small or micro SMR operation;
• Recent developments and innovations in reactor decommissioning and site remediation, and their applicability to SMRs;
• Advanced technologies for used fuel recycling and applications of advanced fuel cycles;

SMR Manufacturing and Supply Chain

• SMR design standardization and licenses for factory manufacturing;
• Applications of additive manufacturing (“3D printing”) in a SMR factory or “assembly line”;
• Current nuclear supplier capabilities and preparations for advanced manufacturing of SMRs;
• Innovative approaches and challenges to modular manufacturing;
SMR Economics, Financing, and Business Models

- Assessing “economy of multiples” vs. “economy of scale”;
- Cost estimation for SMRs, fabrication facilities, and/or centralized operation & maintenance facilities;
- Economic estimates for non-electrical applications of SMRs and advanced reactors;
- Economic impacts on remote/northern communities, including greenhouse gas reductions, jobs, quality of life, etc.;
- Public-private partnership business models that enable investment;
- Innovative financing and investment mechanisms that reflect the evolving electricity marketplace;
- Business model enabling a “fleet approach” to SMR deployment;
- Operational management models for outages and maintenance planning;

Public Policy & Engagement

- Public perceptions of risk, and how they may differ in remote/northern communities;
- Strategies for effective public engagement, including indigenous engagement, for the successful deployment of SMRs and advanced reactor technologies;
- Security of power supply and definition of an optimal portfolio in energy planning;
- Cultural considerations and how they may vary from community to community;
- Requirements for public infrastructure to support remote SMR deployments, e.g., roads, hospitals, etc.
- Ongoing activities at international organizations, e.g. IAEA, NEA, GIF, etc.

Skill Development & Nuclear Knowledge Management

- Identifying skills necessary for successful SMR and advanced reactor technology deployment;
- Recommendations for academic/research program enhancements;
- Recommendations for training activities related to advanced reactors and SMRs, including training on SMR operations, use of Computer-Aided Engineering (CAE) tools for design evaluation and optimization, validation of new technologies, and applications beyond grid-connected electricity generation;
- Knowledge management for the large number of advanced reactor and SMR technologies;

Nuclear-Hybrid Energy Systems and Co-generation

- Integrating renewables and variable energy sources with SMRs;
- Energy storage solutions and their role in enabling nuclear-hybrid systems
• Design and operation of microgrids incorporating SMRs in remote communities, mines, etc.
• Hydrogen generation with SMRs and advanced reactor technologies;
• Innovation and collaboration with other sectors for decarbonisation, e.g. transportation, mining & resource extraction, petroleum refining, etc.

Research Reactors

• Advances in research reactor design and capability;
• Applications of research reactors to support R&D for SMRs and advanced reactors;
• Decommissioning of small research reactors and lessons learned;

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