GIF Risk and Safety Working Group Update

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GIF Risk & Safety Working Group Co-chair

GIF-IAEA Interface Meeting
IAEA, Wien
18-19 March, 2019
Goal of RSWG [Risk and Safety Working Group]

• Promote a consistent approach on safety, risk, and regulatory issues between Generation IV systems
• Propose safety principles, objectives, and attributes based on Gen-IV safety goals to inform R&D plans
• Support implementation of technology-neutral Integrated Safety Assessment Methodology (ISAM)
• Collaborate with System Steering Committees, consult with other methodology working groups and task forces
• Interface with IAEA (INPRO, Safety), OECD/NEA (WGSAR) and other regulatory stakeholders
Membership

• Representatives from Canada, China, E.U., France, Japan, S. Africa, S. Korea, Russia, and U.S.
  – GIF member + National Regulatory bodies (S. Korea, S.Africa) + International Organization (IAEA Safety Division)
  – Technical Secretary support from OECD/NEA
  – Switzerland and U.K. representatives are currently inactive

• Three co-chairs, each focusing on two Gen-IV systems to coordinating the collaborations with respective SSCs

• Semiyearly meetings from 2005;
  Recent meetings
  – Beijing, China (October 2017) — VHTR topical focus
  – Paris, France (April 2018) — LFR topical focus
  – Paris, France (October 18-19, 2018) — GFR topical focus
  – ANL, USA (April 11-12, 2019) — MSR topical focus
Ongoing RSWG activities

- RSWG collaborations with the GIF System Steering Committees (GFR, LFR, MSR, ScWR, SFR, VHTR)
- GIF Basic Safety Approach report update
- Training seminar of ISAM (Integrated Safety Assessment Methodology for Gen-IV reactor systems)
- GIF Webinar on RSWG activities
- Other
RSWG collaborations with GIF System Steering Committees

• “White papers” on pilot application of ISAM
  – Demonstrate applicability of ISAM for self-assessment of Gen-IV design tracks

• System Safety Assessment Reports
  – Summary for current state of high-level safety design attributes & challenges
  – Overview of remaining R&D needs, after decade of system development under GIF

• Contributions to development of safety design criteria (and guidelines)
### Status of RSWG collaboration with Sys-SC*

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<td>SFR</td>
<td>Completed</td>
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<td>SDC —Completed</td>
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<td>Safety Approach SDG —Completed</td>
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<td>Struc./Sys./Comp. SDG - Ongoing</td>
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<td>VHTR</td>
<td>Completed</td>
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<td>IAEA-CRP for HTGR</td>
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<td>SDC as starting point</td>
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<td>LFR</td>
<td>Completed</td>
<td>Being proceeded to EG approval process</td>
<td>SDC pending Sys-SC update</td>
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<td>SCWR</td>
<td>Completed</td>
<td>Completed</td>
<td>SDC (Fast reactor) development being considered</td>
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<td>GFR</td>
<td>Completed</td>
<td>Pending Sys-SC update per RSWG review</td>
<td>SDC pending Sys-SC update per RSWG review</td>
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<td>MSR</td>
<td>Pending Sys-SC update</td>
<td>Planned by Sys-SC</td>
<td>Pending proposal to develop “MSR safety approach“</td>
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Sys-SC: System Steering Committee

*GIF RSWG documents on https://www.gen-4.org/gif/jcms/c_9366/risk-safety
GIF Basic Safety Approach (BSA) Update

• BSA revisions ten years after its first issuance in 2008

• Focus on integrating post-Fukushima recommendations and requirements to ensure a level of safety compatible with the expectations of the safety authorities

• Efforts to harmonize differing positions of GIF members to converge on a common vision for a safety approach

• Now under development by RSWG
Key Contributions to BSA update (so far)

• France:
  – Safety level of Gen-III and Gen-IV reactors
    » Post-Fukushima Gen-III safety objectives are sufficiently ambitious
  – Revisions to safety objectives, safety demonstration/robustness
  – Definition and identification of “practically eliminated” cases

• EURATOM:
  – Compliance with post-Fukushima recommendations and requirements issued by regulators and international organizations
    » Insights into their applicability in design and safety assessments
  – Assessment of safety architecture and DiD through use of PSA

• Japan:
  – New regulatory requirements reflecting the lessons-learned from Fukushima accident and their implementation
    – Influence of Fukushima accident on safety regulations
  – New probabilistic assessment approach for external hazards
Status of BSA Update

• Reflect the lessons learned from Fukushima accidents
  – Reexamination of external hazards
  – Robustness of the electrical systems and ultimate heat sink
  – Increased emphasis on common cause and common mode failures
  – Protection of spent fuel in storage
  – Multi-unit sites and other nuclear/non-nuclear facilities

• Clarifications for practically eliminated accident situations
  – Objectives and principles of practical elimination
  – Definition of a list of situations considered for practical elimination

• Foreseen schedule
  • RSWG-System Steering Committees iterations in 2019
  • GIF approval and open on GIF Web site in following years
GIF Webinar and ISAM training

• GIF Webinar on RSWG activities
  – Webcasted on Feb. 19, 2019
    Video records on https://www.gen-4.org/gif/jcms/c_82831/webinars
  – Topics:
    – GIF safety goals
    – Risk and Safety Working Group mission and scope
    – Basis of safety approach for Gen IV concepts
    – Integrated Safety Assessment Methodology (ISAM)
    – Summary of ISAM application to Gen-IV systems

• ISAM training for engineers
  – December 11-15, 2017 in Paris (L. Ammirabile, Y. Okano)
  – July 2018 in Beijing (G. L. Fiorini, N. Thambiayah)
Other ongoing RSWG activities

• RSWG Interactions with IAEA
  – HTGR Safety Design Criteria (CRP)
  – Development of EPZ reduction approaches/methodologies
• RSWG presentation at the 4th GIF symposium (Oct. 2018)
  • ISAM features, Five individual tools and their combination
• Potential interface with OECD/NEA’s WGSAR on establishing a risk-informed approach for event selection and structures/systems/components classification
  – Structured approach for incorporating risk insights to supplement deterministic approach
    » Less prescriptive approach for LBE selection and SSC classification
  – Common definitions for plant states corresponding to different defense-in-depth levels
• Interactions with PR&PP WG on safety/security interfaces