GEN IV International Forum

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GEN IV International Forum

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Generation-IV International Forum Achievement

Robert Hill
Generation IV Industry Forum

Toronto

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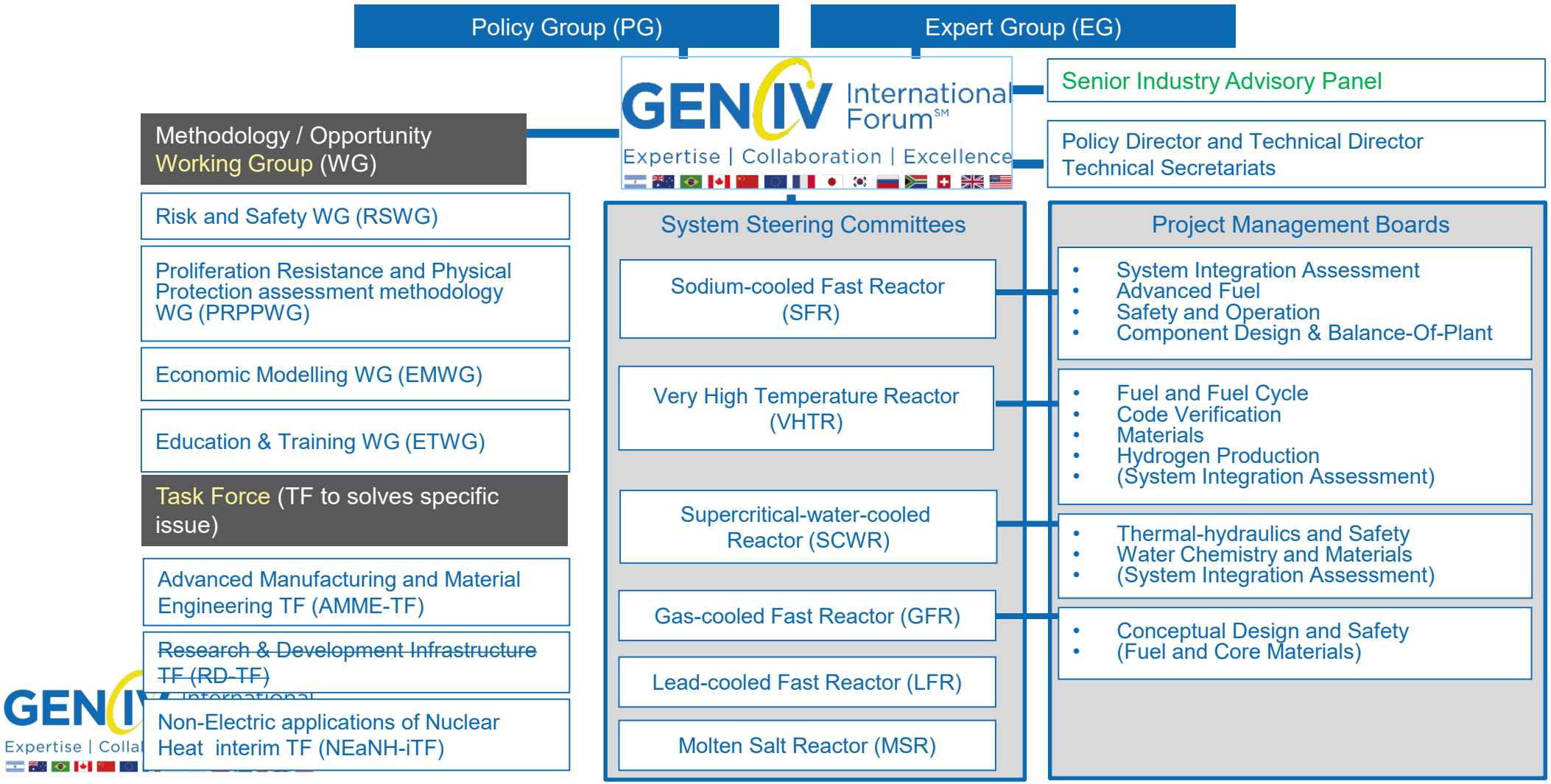
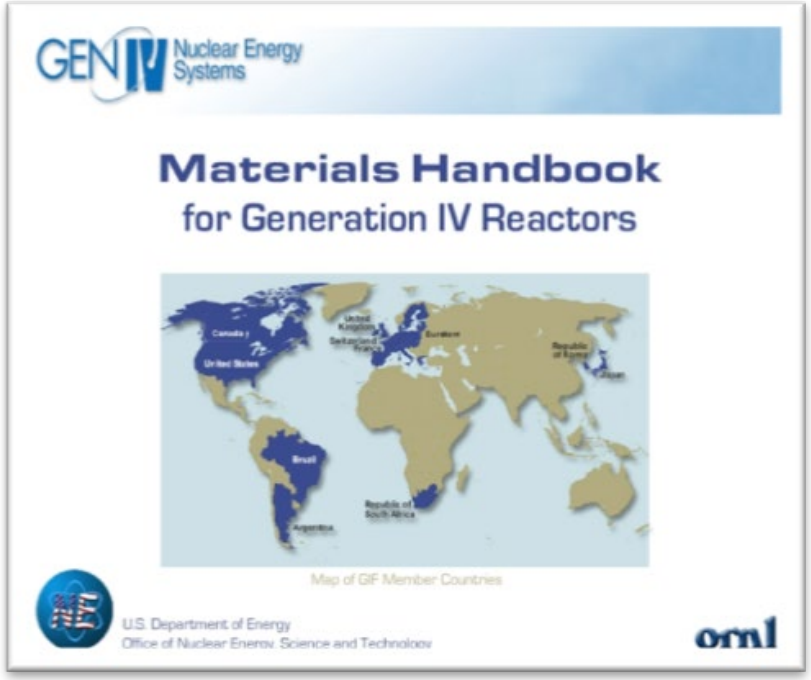
GIF Organization



R&D Results from VHTR Materials Project Arrangement Shared among All Signatories Using Materials Handbook (1/2)

- **Gen IV Materials Handbook is digital database system used to collect and manage well over $250M GIF VHTR materials data**
  - Includes graphite, metals, and ceramics & composites data
  - Includes technical reports, test data, materials pedigrees, microstructures, data analysis & comparison tools, etc.
  - Authoritative single source of Gen IV VHTR materials data
  - Controlled access: Information available to PA Signatories and their authorized representatives



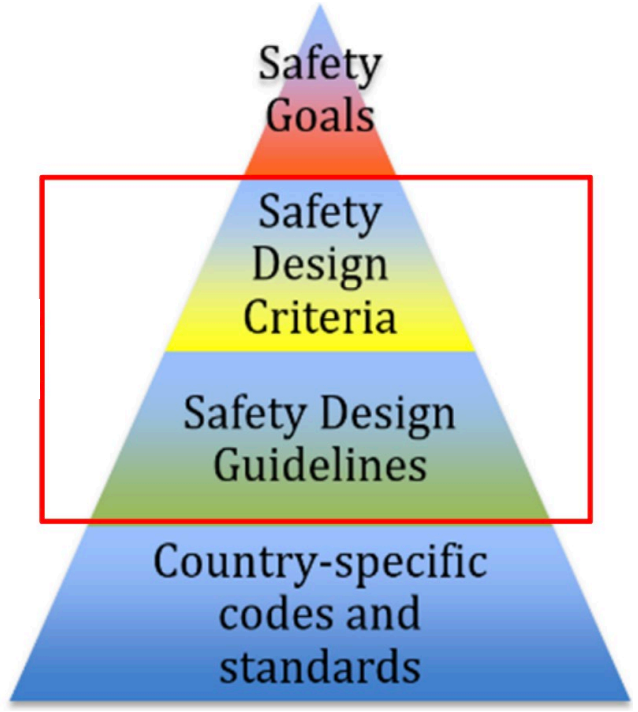
R&D Results from VHTR Materials Project Arrangement Shared among All Signatories Using Materials Handbook (2/2)

Data from GIF VHTR Materials provides technical basis for improved codes and standards

- **First new high-temperature construction material in 20 years added to ASME Code**
  - Alloy 617, high-temperature nickel-based alloy approved for ASME Section III Division 5 for High Temperature Reactor Construction Materials
  - Technical bases largely provided by joint CEA, DOE, and KAERI data
- **Graphite and Ceramic Composites rules added to Section III Division 5 and ASTM testing standards**
  - Based on technical input largely provided by joint DOE, EU, JAEA, KAERI, and PBMR
  - Includes novel rules for non-ductile materials design and usage, including environmental and irradiation effects

Safety Design Criteria and Guidelines for select Gen-IV Systems

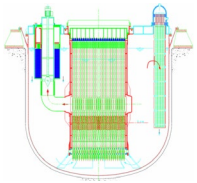
- **GIF RSWG collaborated with system steering committees for development of safety design criteria and guidelines**
  - To establish the requirements for design, fabrication, construction, inspection, testing, and operation of Generation-IV systems
  - Intended to fill the gap between the high-level Gen-IV safety goals and the country-specific regulatory requirements
  - Criteria and guidelines maintain the structure of IAEA safety standards and adopt a minimalist approach for revisions warranted for only specific Gen-IV design tracks
- **To date, requirements for three fast-spectrum systems (SFR, LFR and GFR) are completed, SDC for VHTR and SCWR systems are under development**
- **Two SFR safety design guidelines reports are also published**
  - https://www.gen-4.org/gif/jcms/c_93020/safety-design-criteria
- **Published reports formally reviewed by NEA/WGSAR and IAEA's Nuclear Energy and Safety & Security Departments**



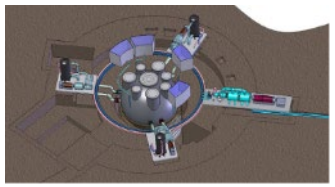
PRPP Working Group Impact on Industry

A key goal of the Proliferation Resistance and Physical Protection (PR&PP) working group is to facilitate introduction of PRPP features into the design process at the earliest possible stage of concept development → PRPP by Design

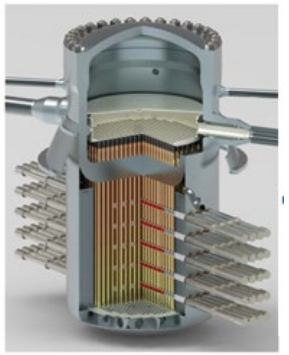
- **Examples of PRPP by Design:**
  - The GFR and LFR fuel cycles were designed with no separation of Pu from the reprocessing stream to enhance PR.
  - Canada decided to employ batch refueling (instead of continuous) for their pressure-tube SCWR to reduce opportunities for access.
  - Framatome decided to use a prismatic core instead of pebble bed core for their HTGR design after considering PR&PP.
- **PR&PP system white papers available at** : https://www.gen-4.org/gif/jcms/c_9365/pr-pp



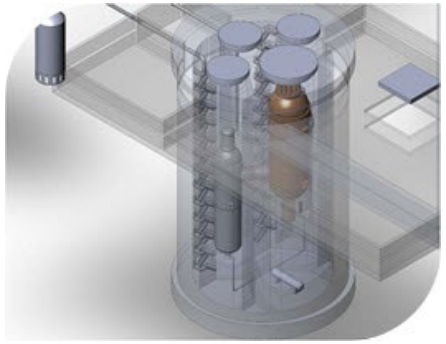
ELFR (EU)



GFR Reference Design



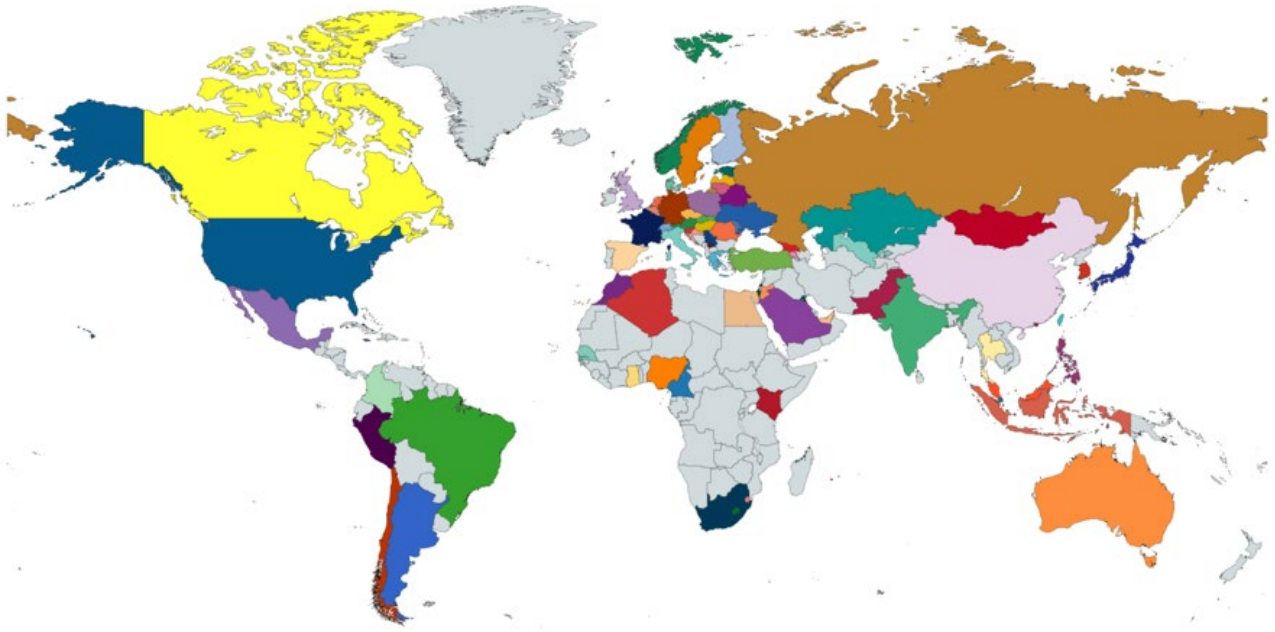
Canada's Pressure-Tube Type SCWR Core Concept



Framatome SC-HTGR

GIF Education and Training Working Group (1/2)

The Generation IV International Forum (GIF)-Education and Training Working Group (ETWG) was launched in 2015 to enhance open education and training as well as communication and networking of people and organizations in support of GIF



GIF webinars have been viewed in 76 countries

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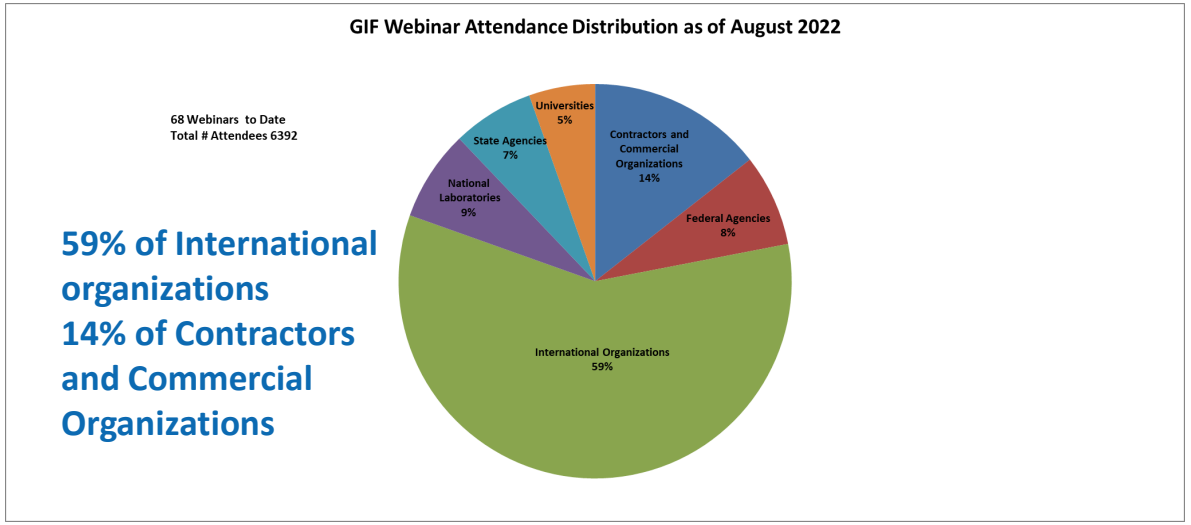
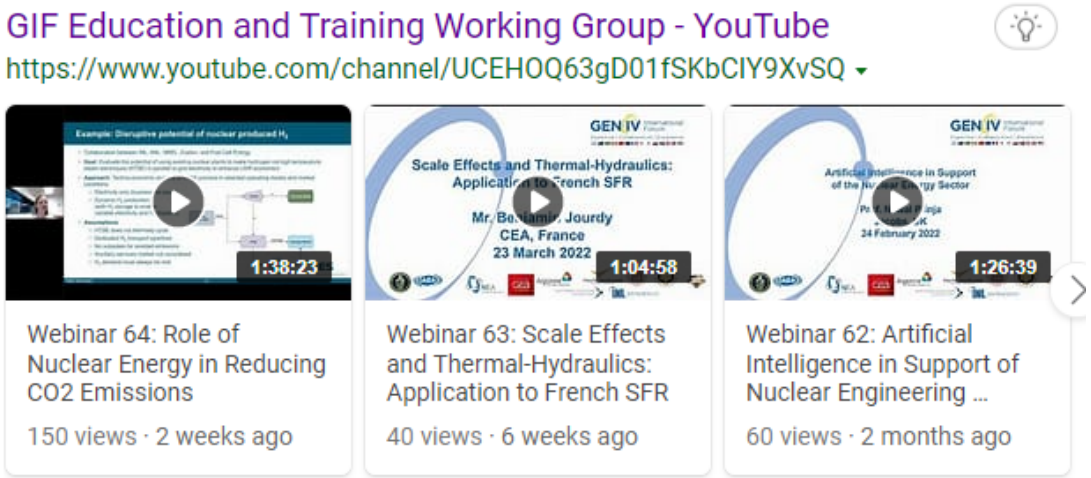
GIF Education and Training Working Group (2/2)

- The development of webinars is intended to stimulate the interest of, and to inform not only the young scientists, but also managers, key decision makers, and the general public on the advantages of innovative reactors and related key R&D topics.
- After six years of non-stop presentations, the very successful GIF ETWG webinars' series has demonstrated a strong need for such a resource for the nuclear energy community to maintain its level of expertise in Gen IV reactor systems, increase interest in advanced reactors, and fill the expanding need for nuclear engineers in the workforce. All the webinars are archived on the GIF portal.
  - https://www.gen-4.org/gif/jcms/c_84279/webinars
  - https://www.linkedin.com/groups/8416234





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Evolving Mission of GIF

- **Generation-IV reactor technologies have matured over last 20 years**
  - Several System types are entering the Demonstration Phase
  - R&D on six Gen-IV Systems has helped prepare these technologies
  - BUT, collaborations need to adapt to reflect deployment challenges
  - Enhanced interaction with industry designers, operators, and regulators is vital
- **Continue Working Groups on key GIF Goals**
  - Risk and Safety Working Group
  - Proliferation Resistance and Physical Protection Working Group
  - Economic Modeling Working Group
- **Task Forces formed to pursue innovative application and deployment issues**
  - Education and Training: knowledge management and sustained expertise
  - Advanced Manufacturing: how to utilize modern AM and materials in Gen-IV reactors
  - Non-Electric Applications: extending the flexibility and impact of nuclear heat