

Education and Training Working Group

Background/terms of reference

GIF's Education and Training Working Group (ETWG) started as a task force in November 2015 and was elevated to a working group in 2020. It serves as a platform to enhance open education and training (E&T), as well as communication and networking of people and organizations in support of the Gen-IV International Forum. Several objectives of the working group focus on promoting E&T by developing the webinar series dedicated to Gen-IV systems and related cross-cutting topics, advertising these at the international level, converting all the archived GIF webinars to videos, and creating and maintaining a modern, social media platform (such as LinkedIn¹) to exchange information and ideas on GIF R&D topics, as well as on related GIF E&T activities.

Main achievements

Numerous tools exist today designed to increase knowledge on a specific study. There is the traditional curriculum developed at universities for undergraduate and graduate students. Distance learning is also used at different universities and is undertaken via various technological media where the training course can be delivered simultaneously to students off campus. Massive open online courses (MOOCs) are free online courses aimed at unlimited participation and open access via the Internet. Because of its easy access, the ETWG decided to create a series of webinars, exploiting this modern Internet technology, so as to reach a broader audience long before the pandemic obliged organizations to more widely use this technology. To promote training in Gen-IV systems and to ensure that a knowledgeable workforce exists, GIF's ETWG therefore created and made available to the public since September 2016 a series of webinars on topics specific to advanced reactor systems. These webinars are intended to be of interest not only to students currently pursuing formal education in universities but also to those already in the workforce, who may be in need of a refresher course or a better understanding of a specific topic, but most importantly to the more general public. GIF is therefore developing and proposing world-class webinars that will also be useful for people like quality assurance officers, data validators, technicians, managers, regulators and others who may benefit from an enhanced understanding of advanced reactor concepts in their work. Forty-eight webinars have been developed thus far (See Table ETWG-1), recorded and archived, and can be found at www.gen-4.org/gif/jcms/c_82831/webinars.

Involving the junior workforce is a priority for the ETWG, and consequently the winner of the American Nuclear Society (ANS) 2019 "Pitch your PhD competition", Dr Cuddy Wiggins, was

invited to present a webinar in December 2020 entitled "Development of Multiple-Particle Positron Emission Particle Tracking for Flow Measurement".

As depicted in Table 1, a total of 12 webinars were presented and archived in 2020, with subjects varying from Gen-IV reactor systems and fuels to the sustainability of the fuel cycle. Each presenter is a renowned expert on the subject matter and is internationally recognized as being so.

Twelve webinars are planned in 2021 and are displayed in Table ETWG-2. The presenter scheduled for December 2021 will be the winner of the first "Pitch your Gen-IV research competition", and will be announced at the next Experts Group/Policy Group meeting scheduled for May 2021.

Table ETWG-2. GIF Webinar Series (January 2021 to December 2021)

Presenter	Title of webinar	Webinar presentation
Dr. Nathalie Chauvin, CEA France	MOX fuel for advanced reactors	January 2021
Dr David Peeler, PNNL, US	Overview of waste treatment plant, Hanford site	February 2021
Prof. Nawal Prinja, JACOBS, UK	Introducing new plant systems design (PSD) code	March 2021
Mr Etsuo Ishitsuka, JAEA Japan	Experience of HTTR licensing for Japan's new nuclear regulation	April 2021
Dr Isabella Van Rooyen, INL, US	Advanced manufacturing for Gen-IV reactors	May 2021
Dr François Baque, CEA, France	In-service inspection and repair developments for SFRs and extension to other Gen-IV systems	June 2021
Ms Jessica Lovering, Carnegie Mellon University, US Winner of the ANS 2020 Pitch your PhD competition	Evaluating changing paradigms across the nuclear industry	July 2021
Mr Vince (Alois) Chermak, INL, US	Comparing and contrasting approaches to quality assurance for nuclear applications	August 2021
Dr Julia Kyzina, IPPE, Russia	Experimental R&D in Russia to justify sodium fast reactors	September 2021
Dr John Vienna, PNNL, US	Nuclear waste management strategy for molten salt reactor systems	October 2021
Dr Jun Wang, University of Wisconsin, Madison US	Geometry design and transient simulation of a heat pipe micro reactor.	November 2021
1 st Winner of the "Pitch your Gen-IV research 2021 competition"	To be determined.	December 2021

1. www.linkedin.com/groups/8416234.

Table ETWG-1. The GIF webinar series, presented and archived between 2016 and 2020

	2016 (4 webinars)	2017(12 webinars)	2018(8 webinars)	2019(12 webinars)	2020(12 webinars)
Introduction	Atoms for peace -John Kelly, US Introduction to nuclear reactor design - Claude Renault, France			European sodium fast reactor: An Introduction - Konstantin Mikityuk, Switzerland	
Gen-IV systems	Sodium-cooled fast reactor - Bob Hill, US	Lead fast reactor - Craig Smith, US Gas-cooled fast reactor - Alfredo Vassile, France Very-high-temperature reactors - Carl Sink, US Supercritical water reactors (SCWR) - Laurence Leung, Canada Fluoride cooled-high-temperature reactors - Per Peterson, US Molten salt reactors - Elsa Merle, France	MYRRHA: An accelerator-driven system based on LFR technology - Hamid Ait Abderrahim, Belgium Molten salt actinide recycler & transforming system with and without Th-U support: MOSART - Victor Ignatiev, Russia	Lead containing mainly isotope Pb-208: New reflector for improving safety of fast neutron reactors - Evgeny Kulikov, Russia Gen-IV coolants quality control - Christian Latge, France Czech experimental programme on MSR technology development - Jan Uhlir, Czech Republic	GIF VHTR Hydrogen Production Project Management Board - Sam Suppiah, Canada Thermal hydraulics in liquid metal fast reactor - Antoine Gerschenfeld, CEA, France Micro reactors: A technology option for accelerated innovation - D.V. Rao, US Overview of small modular reactor technology development - Frederik Reitsma, IAEA
Operational experience		Feedback Phenix and Superphenix - Joel Guidez, France	Design, safety features and progress of HTR-PM - Yujie Dong, China ASTRID: Lessons learned - Gilles Rodriguez, France Advanced Lead Fast Reactor European Demonstrator (ALFRED) project - Alessandro Alemberti, EC Russia BN 600 & BN 800 - Ilya Pakhomov, Russia	Safety of Gen-IV reactors - Luca Ammirabile, EC The ALLEGRO experimental gas-cooled fast reactor project - Ladislav Belovsky, Czech Republic Passive decay heat removal - Mitchell Farmer, ANL US	Molten salt SFR safety design criteria (SDC) and safety design guidelines (SDGs) - Shigenobu Kubo, JAEA, Japan Reactor safety evaluation: A US perspective - David Holcomb, ORNL, US
Gen-IV cross-cutting topics		Energy conversion - Richard Stainsby, UK Estimating costs of Gen-IV systems - Geoffrey Rothwell, NEA	Materials challenges for Gen-IV reactors - Stu Maloy, US Proliferation resistance and physical protection of Gen-IV reactor systems - Robert Bari, US		Maximizing clean energy integration: The role of nuclear and renewable technologies in integrated energy systems - Shannon Bragg-Sitton, INL, US Global potential for small and micro-reactor systems to provide electricity access - Amy Schweikert, US Neutrino and Gen-IV reactor systems - Jonathan Link, US
Fuel types		General considerations on thorium as a nuclear fuel - Franco Michel-Sendis, NEA Metallic fuels for SFRs - Steven Hayes, US		Advanced gas reactor TRISO particle fuel - Madeline Feltus, USA	Performance assessments for fuels and materials for advanced nuclear reactors - Daniel LaBrier, ISU, US
Sustainability and the fuel cycle	Closing the fuel cycle - Myeung Seung, Korea	Sustainability: A relevant approach for defining future nuclear fuel cycles - Christophe Poinssot, France		Scientific and technical problems of closed nuclear fuel in two-component nuclear energetics - Alexander Orlov, Russia	Comparison of 16 reactors' neutronic performance in closed Th-U and U-Pu cycles - Jiri Krepel, PSI, Switzerland
Winners of the Pitch 2018 competition				Formulation of alternative cement matrix for solidification/stabilization of nuclear waste - Matthieu de Campos, France Interactions between sodium and fission products in case of a severe accident in a sodium-cooled fast reactor - Guilhem Kauric, France Security study of sodium gas heat exchangers in the frame of sodium-cooled fast reactors -Fang Chen, France	Development of multiple particle positron emission particle tracking for flow measurement - Cody Wiggins, VCU, US

As of December 2020, attendance during the live webcasts totalled 3 990. It is worth mentioning that attendance during the calendar year (CY) 2019 was 2 179. The number of viewings of the recorded webinars in the online archive is 5 657, a strong increase when compared to attendance in CY 2020, which totalled 3 747. Total viewing over the four-year period was 9 647.

Participants in GIF webinars include representatives from organizations such as federal agencies, national laboratories, state agencies, universities, international organizations, contractors and commercial organizations. Figure ETWG-1 presents a comparison of GIF webinar attendance distribution for the 36 webinars presented at the end of CY 2019 against the 48 webinars presented in CY 2020. The figure shows an increase of viewing by international organizations (i.e. 35% of viewers were from international organizations in CY 2019, and this figure increased to 54% in CY 2020).

The increase of international participation is also reflected by an increase in the number of countries

that are participating in either the live webinar presentation or watching the recorded webinars (Figure ETWG-2)

GIF continues its efforts to advertize the webinars by presenting them at different venues. A paper summarizing the ETWG’s activities, entitled: “Gen-IV Education and Training Working Group Webinar Initiative” was presented at the virtual American Nuclear Society winter meeting (16-19 November 2020), paper No. 32874.

To facilitate the advertisement of the webinars, a handout containing a list of all the webinars that have been presented, as well as those proposed in future, has been created and is available during each live presentation. Participants can download the flyer as a PDF file (see Figure ETWG-3).

Looking ahead

The ETWG is planning to organize a “Pitch your Gen-IV research competition” that will be launched on 1 February 2021 (see Figure ETWG-4). The

Figure ETWG-1. Comparison of participants by organization type in 2019 and 2020

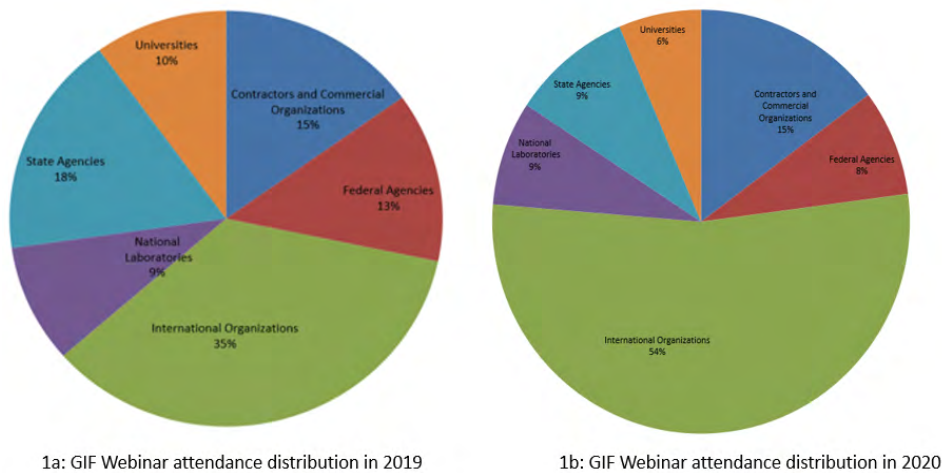


Figure ETWG-2. Comparison of international participation in the GIF webinar series

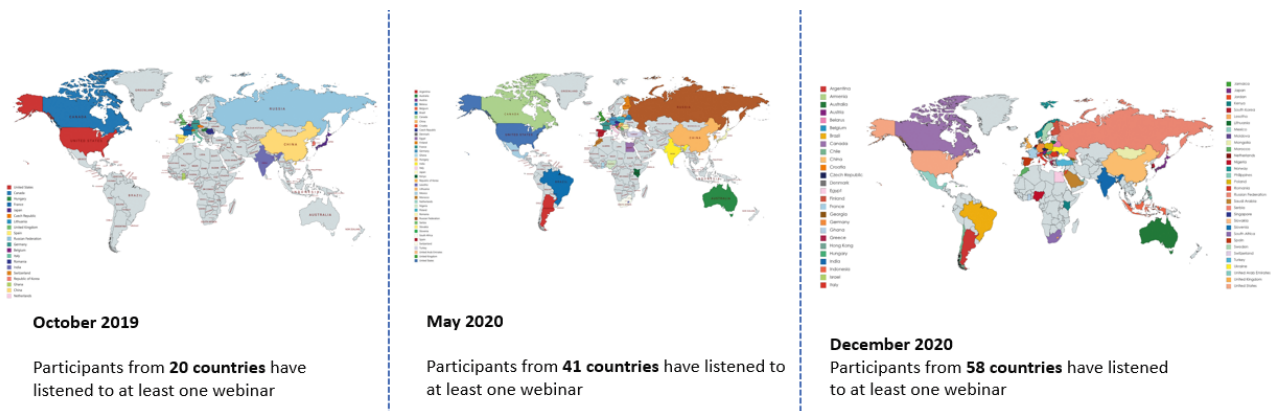


Figure ETWG-3. Handout advertising the GIF webinar series

Figure ETWG-4. Flyer announcing the “Pitch your Gen-IV research competition”

Pitch your Gen-IV research competition will be open to: a) currently enrolled PhD students and b) post-doctoral fellows and junior researchers who defended their PhD after 1 January 2019. The research must be related to GIF advanced nuclear energy systems and could be either an independent research project or one that concerns a research mentor. Participants will be asked to submit a short executive summary, and the 25 pre-selected candidates will be invited to record a three-minute video pitch of their project.

The expected schedule is as follows:

- 1 February 2021 – Executive summary submission opens
- 28 February 2021 – Executive summary submission closes
- Mid-March 2021 – 25 finalists selected
- 31 March 2021 – Video submission due

- 1 April 2021 – Popular voting begins
- 30 April 2021 – Popular voting ends
- May 2021 – Winners announced at the EG/PG meeting



Patricia Paviet
Chair of the ETWG, with contributions from ETWG members