

Senior Industry Advisory Panel report

SIAP 2020 charge and response

ASMRs are gaining recognition from both governments and the private sector. Over the years, GIF has created a significant knowledge base of Gen-IV systems and a unique global network of experts that could help accelerate the commercialization of the ASMR technology. In 2019, SIAP explored how interactions with the private sector could take place. The main outcomes that arose from this exploration include:

- due diligence in relation to ASMR concepts is needed;
- intellectual property rights could hinder collaboration, especially at high technology readiness levels;
- the need to go beyond technology-specific R&D, focusing on cross-cutting initiatives and support for research on processes and methods.

Furthermore, some ASMR designs may not be fully aligned with GIF goals, and the conditions for interaction with the private sector should be carefully defined. The GIF February 2020 workshop was a good opportunity to let the industry know that GIF is reviewing its activities and would like to create a perennial collaboration framework with the nuclear industry, and particularly with ASMR vendors.

The private sector's expectations of GIF, reflected in the 2020 SIAP Charge, cover four main areas:

- public and governmental recognition and acceptance;
- research and data structuring;
- technology acceptance and multinational pre-licensing;
- the global Gen-IV research infrastructure.

Public and governmental recognition and acceptance

If ASMR technology gains public and governmental recognition and acceptance, new policies could emerge to facilitate ASMR industrial development. GIF therefore needs to create a new narrative to explain to policymakers the role that ASMRs could play in the energy transition, and particularly in scenarios with high shares of variable renewables. To increase its policy impact, GIF could actively engage with organizations with high visibility at the policy level – for example the IEA; the Nuclear Innovation: Clean Energy Future (NICE Future) initiative; the IAEA; the Nuclear Energy Agency (NEA) and the World Nuclear Association (WNA) – and contribute to their publications. A recent

example is the GIF contribution to a recent report released by the NICE Future initiative on the flexibility of nuclear systems⁵. Overall knowledge dissemination efforts should increase at the same time so as to reach out to universities and industry, attracting the necessary talent and building skills. GIF could also be involved in the knowledge management regional workshops that are organized periodically by the IAEA.

Research and data structuring

Examples already exist in relation to the consolidating and structuring of data to support the qualification of Gen-IV systems. In the United States, a topical report on tri-structural isotropic particle (TRISO) fuel has been elaborated for the US NRC following this approach. This project involved national laboratories, vendors and regulators with the Electric Power Research Institute (EPRI) working as an integrator (see Figure SIAP-2). Most of the data used for the elaboration of this topical report was already in the public domain, but additional efforts were needed in terms of formatting and making it more accessible to regulators and vendors. Similar initiatives are already underway within GIF. The *Gen-IV Materials Handbook* developed under the VHTR materials project arrangement gathers and structures research data that is then used by the American Society of Mechanical Engineers (ASME) to update codes and standards. GIF should communicate more on these examples and propose new initiatives on data structuring and qualification to the member countries. Joint projects could be set up around non-technology-specific materials, components, processes and fuels, such as graphite, liquid-fuel properties, mixed oxide (MOX) fuel or heat exchangers at high temperatures.

Technology acceptance and multinational pre-licensing

The ASMR vendor community could benefit from very early interactions with regulators in order to have an appreciation of their designs and the associated time to market. The GIF Risk and Safety Working Group (RSWG), in collaboration with the NEA Working Group on Safety of Advanced Reactors (WGSAR), could offer this type of service, based on documentation provided by interested vendors on how to comply with design guidelines and the criteria of a given system. These early safety evaluations could then be used to develop harmonized and internationally recognized design criteria and guidelines for Gen-IV systems in collaboration with the IAEA. Some vendors may nevertheless be reluctant to participate in these type of initiatives.

Opportunities in the pre-licensing arena are also important, and GIF should identify pre-licensing safety issues (e.g. licensing of verification codes, experimental data for validation, bounding severe

accident cases for ASMRs) and explore the potential for developing a common pre-licensing base for ASMRs. A technology-neutral approach, which properly addresses the necessary adaptations from LWR-based regulations, could be used. Existing initiatives on licensing harmonization, such as the WNA Cooperation in Reactor Design Evaluation and Licensing Working Group (CORDEL) and the NEA Multinational Design Evaluation Programme (MDEP), may provide valuable lessons.

Global Gen-IV research infrastructure

While most of the ongoing research within GIF is focused on developing a mechanistic understanding of the Gen-IV systems, new research opportunities are emerging in relation to design and manufacturing processes and methodologies. Some areas of interest for GIF involve system engineering and risk-informed approaches, as well as the application of digital technologies and advanced manufacturing processes. Moreover, the development of technology readiness levels tailored to advanced reactors remains key to adequately assess which technologies could be adopted by Gen-IV systems.

Based on the success of the February GIF 2020 workshop, GIF should continue to interact periodically with the private sector, organizing dedicated meetings/workshops in order to identify critical research areas and priorities, and match emerging experimental and qualification needs with existing or future R&D infrastructure capabilities.

SIAP intentions for 2021

Since its inception, GIF has been focusing on and supporting the necessary R&D elements to support Gen-IV systems. The recent commercial thrust towards SMR development has awakened more interest in nuclear power in general. The Senior Industry Advisory Panel will continue to advise and support GIF so as to harness this new momentum.

It will stand ready to offer advice on how to interact with the private sector and implement some of the recommendations of the 2020 SIAP charge. SIAP will also continue to provide industrial insight for GIF activities and strengthen its collaboration with the GIF Economic Modelling Working Group (EMWG) to assess cost reduction and safety improvement opportunities arising from new design methodologies for Gen-IV concepts.



Eric Loewen

Chair of the SIAP, with contributions from SIAP members

5. www.nice-future.org/sites/default/files/document/Generation%20IV%20-%20Web%20Page.pdf.