GIF Industry Forum: International Knowledge Management and Preservation – SFR Example (TS 10)

Background Information

Date & Venue: Thursday, October 6 at 10:15-12:00, Room Halton, Delta Hotel, Toronto, Canada.

Objectives: The objective of this session is to assemble an international SFR panel which discusses the lessons learned on the design, construction, and operation of SFRs (Phénix/Superphénix, Monju/Joyo, and Fast Flux Test Facility) and how the transfer of knowledge is passed on in an international context to companies planning on building SFRs ranging in power from 300 to 1,200Mwe. Our international panel consists of three senior SFR subject matter experts from France, Japan and the United States who have worked on past SFRs or current SFR projects. Our international panel also includes two engineers from Canada and the United States involved with designing/constructing either large or small SFR.

Participants:

- Joel Guidez (retired from CEA, France)
- Hiroki Hayafune (JAEA, Japan)
- Ron Omberg (PNNL, USA)
- Cal Doucette (ARC Clean Technology, Canada)
- Patrick Alexander (TerraPower, USA)

Each speaker made a short presentation. The three senior panelists presented their experience, how their respective country has done to preserve the knowledge from these SFRs and how it is transferred to the next generation. Then two industry panelists explained the project they are working on, they also provided their vision for SFRs over the coming decades, and the challenges faced by their respective company, such as people and infrastructure. This was followed by a panel discussion moderated by Patricia Paviet.

Key messages of the presentations

Opening remarks: Patricia introduced each panelist to the audience and gave the floor for presentations. After the presentations, the panel discussion started, and questions came from the audience. Good and dynamic conversation took place.

Phenix/Superphenix and ESFR: ESFR- SMART project allows small teams of experts from different countries to remain involved with the subject on SFR, to have a global common approach and, project after project, to improve the design and the knowledge. A significant part of the project is dedicated to the dissemination of this knowledge to juniors. All this work will allow, if positive political decisions are taken one day, to restart a project quickly and with the best design available. However, SFRs are more expensive and need a continuous investment during several decades for the countries involved. In the short term , and with uranium at low cost, hope is pretty low of an industrial project before the end of this century in Europe.

Monju and JSFR: Highlighted the importance of knowledge management and preservation to prevent knowledge impairment and to support the plant system designers. Several examples were provided. The development of "ARKADIA" (***A**dvanced **R**eactor **K**nowledge- and **A**I-aided **D**esign **I**ntegration **A**pproach through the whole plant lifecycle)* is a platform being developed to transfer knowledge, help in developing the technology, and cultivate human resources. The importance of education and training was also emphasized for operators and technicians.

FFTF: Knowledge consists of up to 80,000 drawings and 500,000 records about FFTF which are located in Multiple Record Holding Areas (RHAs) on the Hanford Site. The value of the lessons learned approach was identified and ways to implement this approach were proposed. First digitalization of all documents and secondly creation of small reports associated to pertinent topics that would be easier to find and read.

ARC-100: Advanced Reactor Concepts (ARC) set up in 2006 has developed a sodium-cooled fast reactor based on the EBR-II and incorporated lessons learned from the significant past and current operating experience. Leveraging GEH Intellectual Property to accelerate ARC-100 preliminary and detailed design. U.S. Department of Energy (DOE) national laboratories historically provided technical support to promoted development of fast reactors and several countries/companies entered into agreements. Design information, operating reports and issues as well as decommissioning information are readily available through the IAEA, US DOE, OSTI , INL, ORNL, ANL as well as research papers on various aspects of SFR technology

Natrium: There are three methods for effective knowledge capture employed on the Natrium project: 1- utilizing personnel who have previous SFR experience, 2- reviewing previous SFR design documentation, OE, and lessons learned, and 3- strategic partnerships. TerraPower has a database of historical SFR design documents, operating experience and lessons learned. This historical information is key to ensuring the design on solid data and provides the ability to better model the system.

Outcomes of the panel discussion

Formal knowledge transfer: Each new hired engineer in both companies gets an on-boarding packet with a series of general historical documents about SFR and reviewing the reference documentations is a part of the procedure.

Retainment of talent: The junior generation has a different point of view in valuing things, and what they consider most is whether their expertise is valued or not. We can retain talent by showing their contribution is valued. If they don't feel like they are getting the value or being integrated, they tend to move on and leave.

Management and teamwork: Teaming up a senior engineer with a junior one working on the same task would be the best option, however because of cost and availability of funding it seems pretty difficult to do that. However both companies try as much as possible to do their best to team up senior and junior.

Education and training: There is a sodium school in France for technicians and operators to learn how to work with sodium. The USA, and Japan have also invested to train new generation of engineers specially in handling sodium. Natrium has been building a sodium test facility in a while and it will have capabilities to teach future operators with maintenance and operation.

Actions and next steps

The event was advertised via LinkedIn and Patricia has received several requests if this particular session would be recorded and would be available. Consequently, Patricia has asked the panelist of they would be willing to participate in a GIF webinar featuring them. They have all agreed to participate in a GIF webinar which is planned for June 2023.

Until now, the GIF ETWG has not invited industry to present the development of advanced reactor systems. There are two options to have industry more involved

Option 1: organize panel session with several developers who would present their design and where they stand in the development of their concept. We could have a panel on MSR, another on SFR

Option 2: organize a webinar on concept supported by GIF member countries. As an example, DOE-NE is supporting two advanced reactor systems development through the Advanced Reactor Development Program, the Natrium project from TerraPower and the Xe-100 from Xe Energy. We could envision a GIF webinar on both projects. Patricia will have to explore with her team members if we have similar situation in GIF member countries.