SUMMARY OF THE PACIFIC RIM SPENT FUEL MANAGEMENT PARTNERSHIP WORKING GROUP MEETING

Organized by the Nuclear Threat Initiative (NTI) and Sandia National Laboratories (SNL)

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Sandia National Laboratories · Albuquerque, New Mexico, USA

Following a brief description of the Pacific Rim Spent Fuel Management Partnership, the objective of the workshop was laid out: operationalize working groups to address specific topics of mutual interest identified through preceding workshops:

- technical and non-technical aspects of repository siting;
- long-term monitored dry cask storage and transportation;
- knowledge management;
- underground research facility R&D.

To frame the ensuing discussion, a presentation was given on integration of the back end of the fuel cycle. In the United States, like elsewhere, utilities are forced to store their spent fuel on site in either pool or dry cask storage. Currently, roughly 60% of the commercial spent fuel inventory – ~80,000MT – is located in pool storage, but by 2022 the majority is expected to be in dry storage casks. The current practice is optimized for site operation but not for transportation or disposal. Placing spent fuel in dry storage in dual purpose canisters (DPCs) commits the US to some combination of three options: 1. repackaging spent fuel in the future, which is costly and time-consuming; 2. constructing one or more repositories that can accommodate DPCs; 3. storing spent fuel at surface facilities indefinitely, repackaging as needed. Each option is technically feasible, but none is what was originally planned. One possible approach to integration is to carefully evaluate technical, operational and regulatory "hand-offs" between storage, transportation and disposal.

The morning session of day one was dedicated to long-term monitored storage & transportation issues. The US primarily uses welded casks although a small percentage are bolted lid casks, the predominant system outside of the US, are designed by GNS and Orano TN. Valuable work has and is being done in the following areas:

- what happens to fuel after 10 years of storage (Canada, France, Japan, ROK, US)
- canister hardware R&D (Korea)
- direct disposal of welded steel canisters (US)
- direct disposal of bolted canisters (Germany)
- vitrified waste disposal (France, Germany, UK, US)
- rod consolidation (Germany, US)

- storage and decay heat calculations (Canada, Finland, France, Germany, Japan, Korea, Sweden, Switzerland, Spain, UK, US)
- spent fuel transportability following extended storage (Korea, Spain, US)
- drying (Canada, Germany, Korea, UK, US)
- retrievability (France, Germany, Japan, Korea, Switzerland, US)
- canister corrosion (Japan, Korea, Japan, Taiwan, US)
- seismicity (Japan, US)

Potential future topics for collaborative research include: storage and transportation cask regulations; disposal of dual purpose casks, particularly neutron absorber and filler R&D as well as potential impact on repository designs; design life of casks and associated equipment; and developing an international framework for security.

The first afternoon session of day one was dedicated to siting of disposal facilities. Technical issues identified for possible future collaborative work include: developing a methodology for the creation of a site characterization program and any necessary supporting technology; developing site-screening methodologies and criteria through comparison of candidate sites (e.g. multi-attribute analysis); and optimization of a repository concept for a given siting environment. The non-technical aspects of siting, however, are often the most challenging. The group also identified key cross-cutting issues, including: (a) the need for a science-based approach to understanding relevant public values that accounts for key differences across countries, and (b) the potential value of identifying the ways in which the engineered design of disposal facilities can critically enable (or disable) the narratives that emerge in different countries as they engage their publics about siting issues. Possible topics for collaborative research include: design of a platform for community engagement building on common themes and approaches from international experience; development of outreach programs; and evaluation of the added value of a repository to candidate communities. It is worth noting that these topics are closely related.

The Canadian approach to repository siting was discussed at length. As part of the *Nuclear Fuel Waste Act*, the not-for-profit Nuclear Waste Management Organization (NWMO) was established in 2002 by Canada's nuclear electricity producers to design and implement an approach for the long-term management of Canada's used nuclear fuel that is socially acceptable, technically sound, environmentally responsible, and economically feasible. NWMO is currently in its site selection process to identify an informed and a willing host by 2023. Operation of the Canadian repository is planned for 2043 once regulatory approvals are obtained and construction completed. NWMO is implementing a dialogue-driven approach through a comprehensive engagement program designed to build awareness of the project, build confidence in safety, identify socially acceptable potential repository sites and build supportive and resilient partnerships in the siting areas being currently considered. A compelling demonstration of willingness from the community will be required before a preferred site is selected.

In the second afternoon session, breakout groups focused on identifying potential siting and storage R&D topics. Key takeaways from those discussions were presented in the morning session of day two:

- The *Technical & Non-technical Aspects of Siting* breakout group agreed to develop a "common framework for the safe, secure and socially acceptable long-term management of spent fuel." This includes a baseline study that will address four topics: 1. lessons learned from failures and successes to identify best practices; 2. key safety attributes of containment and isolation of spent fuel; 3. common grounds that reflect the deeply held values in different host societies; and 4. common attributes of a successful frameworks for long term management of spent fuel.
- Starting out by cataloguing what R&D countries are currently doing and identifying gaps, the *Long-Term Monitored Storage & Transportation* breakout group developed a comprehensive list of research topics that would be of value to participants to be reviewed at the next workshop. The group singled out one product that would be particularly useful for nuclear newcomers and countries that are just beginning to develop back-end strategies, a "lessons learned" document covering such topics as:
    - long-lived poisons;
    - smaller canisters;
    - standardized canister sizes and shapes;
    - corrosion-resistant canisters;
    - direct disposal of dual-purpose canisters;
    - high burnup and thermal understanding.

Next Steps

For the *Technical & Non-technical Aspects of Siting* working group baseline study, a draft work plan and a preliminary set of tasks are being prepared for distribution. In support of this baseline study, a template will be developed for working group members to input key national siting experiences. For *Long-Term Monitored Storage & Transportation*, it was decided that operationalizing a working group would require further intersessional outreach and scoping at the next workshop. A URL collaborative R&D project will be scoped at the next workshop. Participants will continue to discuss how knowledge management can be integrated into the activities of all working groups.