Contribution ID: **57** Type: **Oral**

A resilient back-end fuel cycle for managing spent fuel from nuclear power reactors

Thursday, 27 June 2019 15:00 (20 minutes)

Fukushima drew attention to the problem of "what to do with the spent nuclear fuels that are generated, stored, accumulated, or "stranded"at nuclear power plants?"This problem is not confined only to Fukushima, Japan, but is faced by all nuclear power programs. The debate on spent fuel management has centered on what to do with plutonium, a by-product of nuclear fission. Countries concerned with the possibility of plutonium misuse prefer a once-through approach including the direct disposal of spent fuel, while others considering plutonium as an energy resource advocate reprocessing and recycling.
Regardless of how spent fuel is managed, final disposal of spent fuel and/or radioactive wastes is necessary. The challenges with disposal are complex involving technological, political, and societal aspects of finding appropriate disposal sites. An example of this difficulty was the US repository program at Yucca Mountain, which was abandoned in 2009 after 20+ years of developmental effort. Despite the challenges, Finland and Sweden succeeded in locating their disposal sites and continue to develop repositories to dispose of their respective spent fuel.
In future global nuclear energy expansion, many emerging nuclear countries would like to have an assurance of fresh fuel supply, free of disruptions to fuel their reactors. Such assurance is emboldened by the IAEA fuel banks in Ust-Kamenogorsk, Kazakhstan and Angarsk, Russia. For the back-end it is equally important to provide assurance that the spent fuel could be managed properly. Such assurance would include spent fuel take-back/away, centralized/regional storage, advanced processing technologies, and multinational repository. These back-end provisions by cooperative consortia and endorsed by IAEA are essential in forming a resilient fuel cycle, which would decouple the power generation from long-term spent fuel management, enhance nuclear safety, reduce security and proliferation risks, as well as provide flexibility and retain options for future strategic changes.
A resilient back-end fuel cycle requires innovative technologies, which include novel material development for transportation, aging, and disposal (TAD) containers; proliferation-resistant reprocessing; and alternate disposal concept such as deep-bore holes. It also needs cooperative institutional frameworks to facilitate spent fuel take-back/away; centralized/regional storage; and multinational repository. This paper examines the technological and institutional requirements and shows how the resilient fuel cycle could provide flexibility and preserve options for spent fuel management, as well as support for future global nuclear energy expansion.

Do you wish to enter the YGE SFM19 Challenge?

Country or International Organization

United States of America

Primary author: Dr CHOI, Jor-Shan (Lawrence Livermore National Laboratory, retired)

Presenter: Dr CHOI, Jor-Shan (Lawrence Livermore National Laboratory, retired)

Session Classification: Session 7.1

Track Classification: Track 7: Challenges in an integrated approach for the back-end system (including storage, transport, recycling and disposal)