Building safeguards into the design of spent fuel storage facilities

By Adem Mutluer

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—Jeremy Whitlock, Head, Concepts and Approaches Section, Department of Safeguards, IAEA

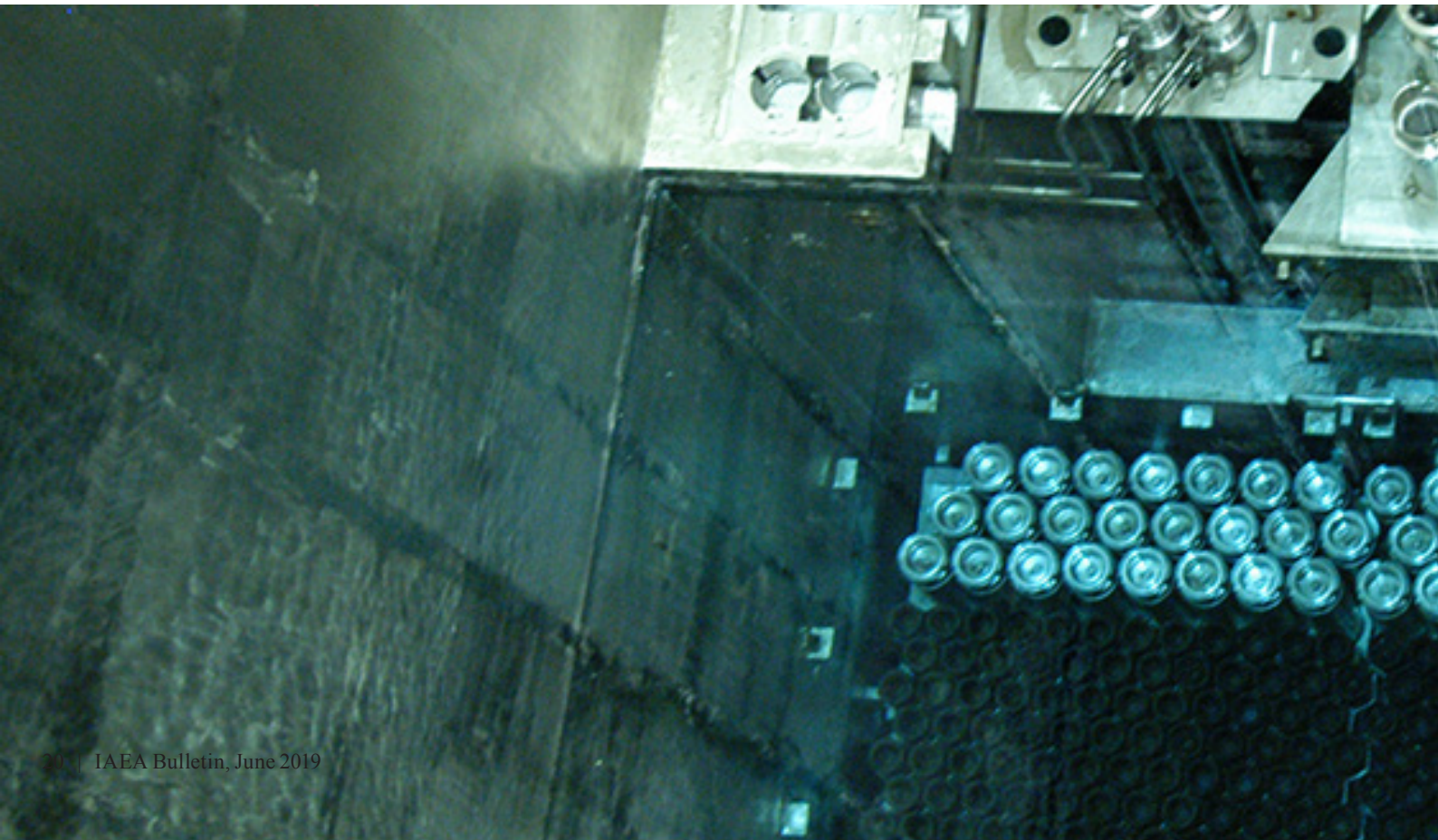
The IAEA works to enhance the contribution of nuclear technology to peace and prosperity around the world, while verifying that nuclear material is not diverted from peaceful use. IAEA safeguards, an important part of the global nuclear non-proliferation regime, provide for independent verification of States' compliance with their international legal obligations. To help with this, the IAEA issues guidance through its safeguards by design (SBD) document series to assist nuclear facility designers and operators in contemplating, at an early stage of the design process, the safeguards activities relevant to nuclear facilities, including spent fuel storage facilities.

Consideration of safeguards requirements prior to embarking on the construction or modification of a facility, a concept known as SBD, is voluntary and aims to facilitate the improved implementation of existing safeguards requirements. However, if SBD is applied, safeguards inspections can be implemented more effectively and efficiently, while reducing the burden on the operator of a facility.

"The intention is for new spent fuel facilities to be built with safeguards-enabling features," said Jeremy Whitlock, Head of the Concepts and Approaches Section at the IAEA's Department of Safeguards. "By considering these features in the design and building of spent fuel facilities, safeguards activities can be carried out with minimal disruption to the operations of an inspected facility."

Acknowledging safeguards early in the design and construction process facilitates open dialogue among stakeholders on facility operation, safeguards requirements and related topics. This allows for the development of verification methods that will minimize the impact of safeguards implementation on the operator, without reducing the effectiveness of the safeguards activities performed. Furthermore, these methods will improve the efficiency of safeguards by helping the IAEA carry out its verification activities in an optimal way.

Armed with an understanding of safeguards activities, a designer can also plan more effectively for expected verification activity



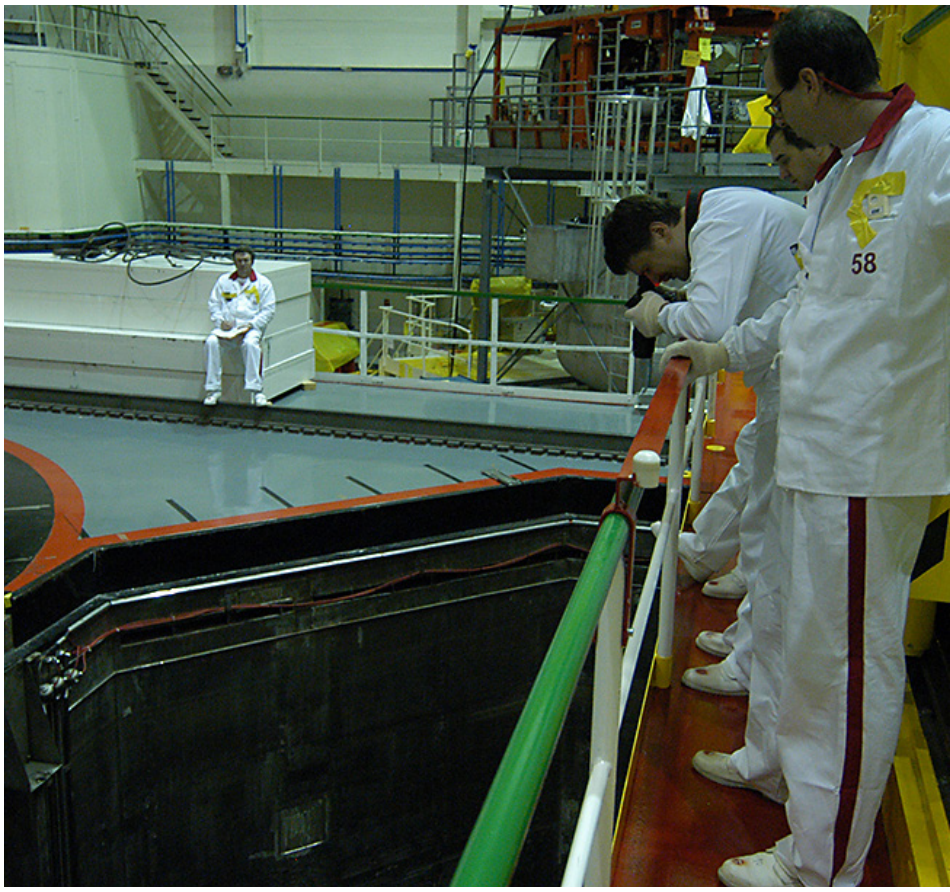
needs. This includes minimizing the exposure of inspectors to radiation, enhancing access to safeguards equipment for maintenance, ensuring capabilities for on-site remote data transmission and mitigating the impact of events that may disrupt verification.

Spent fuel storage facilities are a vital part of the nuclear fuel cycle and IAEA safeguards will continue to evolve to address the associated verification challenges. Applying safeguards to spent nuclear fuel storage facilities is also a substantial part of the IAEA's verification work. In 2018, safeguards were applied to 82 spent nuclear fuel storage facilities in more than 25 States around the world. Around 57 000 significant quantities of nuclear material were being held at these facilities.

In drawing a blueprint for spent nuclear fuel storage facilities, it is particularly important that the designers recognize the lifetime of spent fuel. Spent fuel facilities can be required to ensure that material be retrievable for a long period of time, for example 100 years.

"From a design perspective, there is value in understanding the full range of potential safeguards activities and their impact on a spent fuel facility design before design choices are finalized", said Whitlock. "Early planning can incorporate flexibility into the facility's infrastructure in order to support future technology innovations that may benefit both the operator and safeguards implementation."

The SBD document series is available on the IAEA website.



Inspector training at the spent fuel storage facility at the Mohovce Nuclear Power Plant in Slovakia.
(Photo: D. Calma/IAEA)