Storage capacity enhancement of SFISF at Paks in Hungary

Tuesday, 25 June 2019 18:10 (20 minutes)

Spent fuels (SF) assemblies from Paks Nuclear Power Plant (Paks NPP, Hungary) are placed in Spent Fuel Interim Storage Facility (SFISF) since 1997. The SFISF is a modular vault dry storage (MVDS) type design accommodating SF after a minimum of a few years of cooling time in the reactor decay pool. The SFs are stored individually and separately in the vault modules (VM) in airtight sealed fuel storage tubes (FST) filled with inert gas. Decay heat rejection is achieved by buoyancy driven air flow through the vault, passing over the exterior of the array of storage tubes.

The capacity of the SFISF was planned on the total amount of the SFs arising from the planned 30-year lifetime of Paks NPP. To store these SFs a 33-vault facility was designed with 450 FST in each vault. Until now all together 24 vaults have been constructed.

Sixteen vaults were built with 450 FST in each vault. To make the storage economically more efficient the number of FSTs was increased from 450 to 527 in the last eight vaults. This was provided by use of the built-in reserves of the design and the development of analyses techniques making it possible to reduce the conservatism in calculations. According to this modification the total capacity of the SFISF was increased by around 9%.

At the millennium a decision was made to extend the lifetime of the Paks NPP with addition 20 years, resulting a significant growth in the amount of the SFs. In order to adjust the storage capacity a review of the design was carried out. The structural analysis showed that a number of 703 FSTs could be installed into the same geometry by modifying the charge face structure (CFS). Based on this number the total capacity could be increased by almost 20% compared to the original design.

Considering the initial few years of cooling period and applying it for the whole storage facility the heat load could be higher than the design criteria. However, with the rearrangement of the SFs cooled for many years in the FSTs it is possible to solve this issue. The decay heat production of SFs stored for many years decreased to a level at which it is possible for them to be placed in a higher density redesigned vault with the new CFS design. By transferring the older SFs to the higher density vaults there will be enough free positions to place the newer SFs arriving from the NPP. Construction license with the newly increased storage arrangement was issued by the nuclear authority in 2017.

The paper describes the design, modelling and licensing process of this capacity enhancement.

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Hungary
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Session Classification:  Session 2.4

Track Classification:  Track 2: Spent Fuel and High Level Waste storage and subsequent transportability