



Contribution ID: 371

Type: Oral

Design of a reusable Materials Irradiation Device (MIDI) in High Flux Reactor in Petten for testing and qualification of SMR materials

Irradiation testing of novel and established materials is a crucial step to enable the deployment of SMRs utilizing new materials and/or manufacturing processes to meet hypothetical SMR construction timeframes and realize the complex integrated features of several designs. The High Flux Reactor (HFR) in Petten has played a substantial role in contributing to the irradiation testing of materials and fuels. Several hundred irradiation experiments have been performed over the decades, including the LYRA irradiations. LYRA was a re-usable irradiation facility in the HFR which has been extensively used for irradiation of pressure vessel steels and other structural materials to support LTO-research and qualification of new materials. After its 10th irradiation campaign, the LYRA facility was dismantled and a project begun to replace it that incorporated this multi-year learning. This new, reusable Materials Irradiation Device (MIDI) is being designed and developed in collaboration with the Joint Research Centre (JRC) Petten as part of the Dutch government funded PIONEER program. This paper will present the work to-date in developing the engineering design and specifications of the MIDI device, how learning from LYRA has been incorporated, and how the MIDI facility will support the irradiation testing of materials for selected SMR concepts.

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Track Classification: Topical Group A: SMR Design, Technology and Fuel Cycle: Track 3: Engineering, Codes & Standards, Supply Chain, Operation and Maintenance of SMRs