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Simulation-based analysis of reliability and availability for the Vessel Cooling System in the High Temperature Engineering Test Reactor: Implications for safety and profitability

Abstract:

This seminar presents the results of a comprehensive analysis that evaluates the life-cycle reliability and availability of the Vessel Cooling System (VCS) of the High Temperature Engineering Test Reactor (HTTR), taking into account both normal and emergency conditions. To achieve this, the study utilized analytical techniques such as Fault Trees (FT) and Reliability Block Diagrams (RBD), supported by insights from Failure Mode and Effect Analysis (FMEA). Specifically, the study evaluates the VCS's reliability for cooling the biological shield surrounding the Reactor Pressure Vessel (RPV) during normal operation, and its availability for removing residual heat from the RPV and reactor core during emergency conditions. The findings of this work have significant implications for the safety and profitability of the HTTR-based electricity-hydrogen cogeneration plant (HTTR-GT/H₂). The analysis confirms the high reliability of the VCS during emergency conditions, which provides valuable information for probabilistic safety assessment (PSA). Additionally, the study determined the fraction of Forced Outage Rate (FOR) attributable to VCS failures, a crucial factor for evaluating plant profitability.

Serdecznie zapraszamy
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Bio:

Mina Torabi is a PhD candidate at the National Centre for Nuclear Research. Her research is focused on the Probabilistic Safety Assessment (PSA) of High-Temperature Gas-Cooled Reactors (HTGRs).