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Evaluation of Multiple Steam Generator Tube Rupture Events for KNGR

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Abstract

The likelihood that steam generator tube ruptures (SGTR) will result in containment bypass is reduced by specific Korean Next Generation Reactor (KNGR) design features. Added features, relative to the Korean Standard Nuclear Power Plant (KSNP) Nuclear Steam Supply System (NSSS) Design, include modifications to assure continuity of steam bypass capability following a safety injection actuation signal. These changes significantly enhance the capability to avoid containment bypass via opening of the Main Steam Safety Valves (MSSVs) during a SGTR relative to the KSNP design. Thermal-hydraulic analyses are performed using RELAP5/MOD3 to evaluate the effectiveness of the added features. The significant result of the analyses is the length of time between event initiation and opening of the MSSVs. With only automatic response of plant systems, this time varies from greater than 4 hours for rupture of one tube to 30 minutes for rupture of five tubes. This paper presents the results of the analyses for 1 tube rupture and 5 tubes rupture cases.