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Numerical Study and Transient Analysis of NuScale Power Parameters during a Steam Generator Tube Rupture Accident using PCTRAN and RELAP/SCDAPSIM3.4 computer codes

This study conducts a numerical investigation and transient analysis of key parameters associated with a steam generator tube rupture (SGTR) scenario in a NuScale Power small modular reactor (SMR). The NuScale [1] is a unique SMR reactor, differentiated by design features such as submerging the containment vessel in the reactor pool, having an integrated loop, using a natural circulation cooling system, and providing flexible safety functions [2], [3]. The Steam Generator Tube Rupture is a postulated accident caused by a rapid propagation of a circumferential crack that leads to a double-ended rupture of the tube [4]. The Reactor coolant passes from the primary side of the SG into the secondary side and travels through the main steamlines to the turbine into the environment. The analysis of this accident employs PCTRAN [5], [6] and RELAP/SCDAPSIM3.4 [7],[8] codes to simulate the transient behavior of the reactor system during the SGTR event. The focus is on understanding the response of NuScale parameters, including coolant flow, temperature distribution and pressure variations, under such severe accident conditions. The study aims to provide insights into the safety performance and response mechanisms of the NuScale design during SGTR scenarios, contributing to enhanced safety assessment for NuScale.

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Yes

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