

The Analysis of ANGRA 2 Nuclear Power Plant Core during the for Small Break LOCAs in the top of the Vessel, using RELAP5 Code

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This work aims to verify the integrity in the core of Angra 2 facility, using RELAP5/MOD3.2.gama code, during the accidents of Small Break Loss of Coolant Accident (SBLOCA) in the top of reactor vessel. The accidents consist in three small ruptures in the top of the reactor vessel of Angra 2. The ruptures areas considered were: 0.1 cm², 1 cm² and 10 cm². These ruptures, in generally, occur due the control rod injection accidents. In this kind of accident the ruptures are much smaller when compared whit the primary circuit pipe flow area. The Emergency Core Cooling System (ECCS) efficiency is also tested in this accident. In these simulation, failure and repair criteria are adopted for the ECCS components in order to verify the system operation efficiency – preserving the integrity of the reactor core and guaranteeing its cooling – as expected by design. SBLOCA accidents are characterized by a slow blowdown in the vessel to values that activate the high pressure injection system followed by the water injection from the accumulators. The thermal-hydraulic processes inherent to the accident phenomenon, such as core vaporization cause inappropriate flow distribution in the reactor core that can lead to reduction in the core liquid level, up to the point that the ECCS is able to reflood it. This work showed the behavior of the core during the SBLOCAs in top of reactor vessel of Angra 2 was quite consistent. The results showed that the numerical simulations with RELAP5 were satisfactory and that the ECCS worked efficiently, guaranteeing the integrity of the reactor core, when subjected to these types ruptures.

Keywords: RELAP5, small break LOCA, vessel, Angra 2

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