

PRIMARY LOCA IN VVER-1000 BY PRESSURIZER PORV FAILURE

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ABSTRACT

The paper presents the calculations and analysis of the design basis accident of a standard VVER-1000/V320 reactor with inadvertent opening and stuck in open position of the pressurizer pilot operated relief valve (PORV). The objective is the independent assessment of this accident applying the French best estimate thermal-hydraulic computer code CATHARE 2 and verification to meet the safety criteria for such kind of the accident.

The “Inadvertent opening and stuck in open position of PORV” is a design basis accident classified as Medium Break Loss of Coolant Accident (MB LOCA) with the equivalent diameter of the break $D=68$ mm. This accident is particularly interesting to be calculated and analyzed, because it took place at operating NPP with VVER-1000 reactors (Rovno NPP) in 2009.

The calculations have been carried out with conservative conditions as usual for DBA analysis. The NPP model corresponds to a real VVER-1000/V320 configuration and comprises all safety systems, adopted for one of the latest CATHARE 2 versions.

The results of CATHARE 2 calculations are compared with available results of RELAP5 calculations. There is similarity of the thermal-hydraulic parameters behavior, but also some differences can be observed basically due to the break flow prediction, which causes differences in primary pressure evaluation. Both calculations show that there is no boiling crisis in the reactor core and reliable cooldown is achieved.

The calculations performed with CATHARE2 code demonstrate the ability of the code to predict reasonably the break flow, pressures, temperatures etc. for considered LOCA scenario and to be applied for safety studies.

References

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