

Numerical Analysis of Containment and Advanced Reactor Unit VVER-1000 Behaviour under large LOCA with Blackout

ABSTRACT

In Russian design of the new generation enhanced safety nuclear power plant with VVER-1000 the new passive safety systems are envisaged to prevent the evolution of beyond design accidents into severe stage with core damage. Among them are: second stage low pressure hydroaccumulators (HA-2) and passive heat removal system (PHRS) with air heat-exchangers. They deliver coolant to the core and provide cooling of the fuel in the core and removal of thermal energy from containment to the environment under beyond design loss of coolant accidents with failure of ECCS active part (for example, total loss of ac power, including diesel-generators) during not less 24 hours.

The beyond design basis accidents - LB LOCA at the inlet and outlet of the reactor with total loss of ac power are considered in the report. These accidents determine the design bases for these passive safety systems.

The numerical analysis of thermal-hydraulic processes in the reactor unit and the containment compartments, that form accident localization area, has been performed by Russian computer codes TECH-M and ANGAR.

It is shown that passive systems keep design limits for the fuel and provide integrity and tightness of containment under beyond design accident conditions.