

Assessment of ASTEC 2.1 capability to predict reactor core behavior at the late phase of severe accident progression based on QUENCH-12

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Abstract

The presented paper discusses capability of recently developed version 2 revision 1, patch 1 of ASTEC computer code to predict a fuel behaviour at late phase of severe accident progression. The conducted assessment is part of the ASTEC validation based on available information from performed tests in QUENCH program for these purposes. It has been selected QUENCH-12 experiment for simulation of investigated phenomena as fuel cladding, oxidation and hydrogen generation, including temperature escalation during heat up followed by quenching overheated surface fuel cladding.

The QUENCH-12 experiment was proposed by FZK together with RIAR Dimitrovgrad and IBRAE Moscow (Russia). The test was conducted at Forschungszentrum Karlsruhe on 27 December, 2006 in the frame of EC-supported ISTC program.

The selected QUENCH-12 experiment was performed to extend knowledge gathered in previous QUENCH test to fuel behaviour in other LWRs slightly different from well investigated western type PWR with squared lattice. Using hexagonal lattice and known as VVER reactors and to investigate the behaviour of VVER fuel assemblies with a hexagonal lattice and containing fuel rod claddings made of Zr1%Nb (E 110) as used in eastern VVER reactors.

The developed QUENCH-12 model for ASTEC code successfully predicted the entire sequence from initial heat-up to quench phase of experiment, except hydrogen generation during quenching phase at the end of transient.

Keywords: Severe Accident, Reactor Core, Hydrogen production, VVER Fuel Analysis, QUENCH