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Status of Input Data Development for Severe Accident Calculation in Kozloduy NPP

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The development of MELCOR 1.8.4 input data for units 5&6 of "Kozloduy" NPP (KNPP), for severe accident calculations, was initiated at Argonne National Laboratory (USA). After a transferring program performance, the input data was delivered to KNPP. The current activities continue in analytical studies of MELCOR capabilities to calculate VVER-1000 severe accidents. The status of development allows pursuing of two goals: The first one is testing of MELCOR Computer Code capabilities to model VVER-1000 equipment. The second one is: training of plant analysts to perform safety analyses and self-teaching on the obtained results reading for the purpose of their analytical skills improvement.

The presented nodalization scheme of detailed input data includes four loops modelling of primary, secondary circuits and detailed nodalizaton of containment. Implementation of such expanded of size input data was possible after extension of MELCOR computer code internal arrays. In order to analyze the results of calculation, seven new variables were implemented in the code. To distinguish the expanded version from standard MELCOR v1.8.4, it was named MELCOR/ANL.

Initialization procedure, which includes the use of CVHTENDINI variable, is presented. The total initialization time duration is 2500s. Two groups of cases are analyzed. The first one is related to use of non-equilibrium CVH switch in Steam Generators (SG) modelling. The second one is related to use of CVH equilibrium switch in SGs model. Each group consists of three analyzed cases, where CVHTENDINI is equal correspondingly to: 0.0s, 900.0s, 1500.0s. Comparison of calculated and measured parameters at nominal power conditions is performed. The conclusion is that calculated values are very close to designated uncertainty ranges of measured parameters. The SGs flow rate demonstrates an exception, because it shows significant deviation from the designed values. Currently, there is no explanation for relative deviations of 14.8/14.7%.

Discussion about the transferring of power to SG, total energy error in COR package, primary pressure, coolant level in pressurizer during initialization addresses specific issues to MELCOR input data for VVER-1000. The corresponding conclusions are withdrawn.

Keywords: MELCOR, nodalization, CVHTENDINI, VVER, accident, self-initialization