Asociación Argentina
de Mecánica Computacional

Resúmenes de Mecánica Computacional Vol I, pp. 185-185
C.I. Pairetti, M.A. Pucheta, M.A. Storti, C.M. Venier (Eds.)
S. Corzo, J. Ramos Nervi (Issue eds.)
Rosario, November 5-8, 2024

THE KIT CALCULATION PLATFORM FOR IMPROVING THE RELIABILITY OF THE ANALYSIS OF THE RADIOLOGICAL CONSEQUENCES OF HYPOTHETICAL SEVERE ACCIDENTS IN WATER-COOLED NUCLEAR POWER PLANTS

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Keywords: Severe Accident, Computational Methods, Source Term, Uncertainty and Sensitivity Methods, Risk Analyses.

Abstract. Reliable evaluations of the radiological consequences of hypothetical severe accidents in nuclear power plants (NPPs) play a key role in supporting the emergency and preparedness plans during such abnormal events. Also triggered by the growing requests of the national regulators, one of the milestones of the Nuclear Safety Research program (NUSAFE) of the Karlsruhe Institute of Technology (KIT) is the improvement of the performance of the codes employed for such evaluations in the current and innovative NPPs, which are in operation and going to be built in EU and worldwide. Having this in mind, a calculation platform of state-of-art codes has been assessed at KIT to evaluate the accident progression, the radiological source term, and the behavior of the fission product dispersion to the environment by also taking into account the corresponding uncertainties. In particular, the CASMO5 lattice physics code, developed by Studsvik Scandpower, is used for a proper evaluation of the fuel inventory loaded in the reactor core. The European reference Accident Source Term Evaluation Code (ASTEC), developed by IRSN (France), is employed to evaluate the accident progression from the initiation to the fission produced release to the environment. The use of the KArlsruhe Tool for Uncertainty and Sensitivity Analysis (KATUSA), developed by KIT, aims at performing the uncertainty quantification of the source term. Finally, the Java Real-time On-line DecisiOn Support (JRODOS) is employed for analyzing the radiological consequences of the accident. The KIT platform has been employing since some years in the frame of the KIT participation to different European projects, i.e., MUSA, SASPAM-SA on SMRs, SANE. In the paper, an overall view of the KIT strategy on severe accident analyses will be provided, and examples of the application of the above-mentioned platform to generic NPPs will be provided, i.e., PWR Konvoi.

ISSN: 2591-3522