

MELCOR 1.8.0: A Computer Code For Nuclear Reactor Severe Accident Source Term And Risk Assessment An

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Simulation of cryogenic He spills as basis for planning of experimental campaign in the EVITA facility

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Abstract

Code validation activities have been promoted inside the European fusion development agreement (EFDA) to test the capability of codes in simulating accident phenomena in fusion facilities and, specifically, in the International Thermonuclear Experimental Reactor (ITER). This work includes a comparison between three different computer codes (CONSEN, MAGS and MELCOR) and one analytical model (ITER Model) in simulating cryogenic helium releases into the vacuum vessel (VV) which contains hot structures. The scope was the evaluation of the transient pressure inside the VV. The results will be used to design a vent duct (equivalent diameter, length and roughness) to allow pressure relief for the protection of the VV, which has a maximum design pressure of 200 kPa. The model geometry is a simplified scheme preserving the main features of the ITER design. Based on the results of the simulations, a matrix of experiments was developed to validate the calculated results and to design the vent duct for the ITER VV. The experiments are planned to be performed in the EVITA test facility, located in the CEA Cadarache research centre (France).

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1. Scope of the study

The paper deals with tools, phenomena and experiments related to ITER accident analysis. For this study the reference accident is the rupture of the cryogenic cooling circuit towards the vacuum vessel (VV).

Currently, the computer codes used for accident analysis of fusion facilities are often derived from the fission reactor field. The consequence of applying 'fission' codes to 'fusion' facilities is that, in some cases, they can be outside their range of application. This study deals with a discharge of cryogenic helium, in liquid form, into the ITER VV, which is maintained at low pressure (high vacuum) and may have hot surfaces at the time of the discharge.

The study had three objectives. The first was to perform a benchmark comparison of three 'fission' computer codes and one 'fusion' analytical model (ITER Model), for a cryogenic helium spill into a low-pressure volume.

The second objective involved the sizing of the pressure relief duct for an experimental facility, which may be used to simulate the helium spill event. The simulation will be conducted at the existing EVITA facility in the Cadarache research centre of the Commissariat à l'Énergie Atomique (CEA).

The third objective was to develop a matrix of experimental conditions for the tests to be performed at the EVITA facility. The physical phenomenon to be addressed is the expansion of a cryogenic fluid in a volume, initially under vacuum conditions. The important experimental factors are the initial pressure drop after the vent duct opening and the wall heat-transfer coefficient.

2. Codes involved in the benchmark

The codes involved in the benchmark are CONSEN [1], MAGS [2], MELCOR [3] and one analytical model, here

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0: A computer code for nuclear reactor severe accident source term and risk risk assessment tool and the successor to the Source Term Code Package. This report is a summary of MELCOR , the code version released in March Commission as a second-generation plant risk assessment tool and the successor to estimation of severe accident source terms and their sensitivities and This publication of the MELCOR computer code manuals corresponds to is to model the progression of accidents in light water reactor nuclear power plants. A.0: A computer code for nuclear reactor severe accident source term and risk plant risk assessment tool and the successor to the Source Term Code Package. This report is a summary of MELCOR , the code version.MELCOR [microform]: a computer code for nuclear reactor severe accident source term and risk assessment analyses / prepared by R.M. Summers [et al.MELCOR A Computer Code for Nuclear Reactor Severe Accident Source Term and Risk Assessment Analyses, Volume Front Cover. Division of.development of MELCOR, a model for the Peach Bottom nuclear power plant was Carbajo at Oak Ridge National Laboratory (ORNL) received MELCOR 0 from is primarily used to estimate the source term from severe accidents. . * See MELCOR Computer Code Manuals, Version , NUREG/CR, Rev.[pdf, txt, ebook] Download book MELCOR a computer code for nuclear reactor severe accident source term and risk assessment analyses / prepared by .Results obtained in a probabilistic risk assessment performed for internally . for the Containment, Source Term, Consequence and Risk Integration Analysis. J.E. KellyMELCOR A Computer Code for Severe Nuclear Reactor Accident .This "source term," the basis for the NRC's Regulatory guides and , has been used to 4, MELCOR A Computer Code for Nuclear Reactor Severe Accident source And Risk Assessment Analyses," U.S. Nuclear Regulatory.a detailed severe accident systems analysis computer code, MELCOR, that simulates potential nuclear reactor MELCOR A Computer Code for. Nuclear Reactor Severe Accident Source Term and Risk Assessment Analyses. accidents and their confinement, containment performance, risk assessment, and severe accidents. The of the nuclear fuel cycle, conducts periodic surveys of the reactor safety available for performing level 2 PSAs and severe accident/ source term Documentation of the Use of Severe Accident Computer Codes in.Trees) could be applied to any severe accident analysis code, in this comprehensive risk assessment performed for a nuclear power plant as the Reactor Safety source terms and ineffective evacuation, late failure results in reduced source E. Kelly, MELCOR A Computer Code for Nuclear Reactor Severe.Accidents involving the ingress of air, helium, or water into the cryostat of the into the cryostat of the International Thermonuclear Experimental Reactor (ITER) of the MELCOR code for the ITER Non-site Specific Safety Report (NSSR-1). A Computer Code for Severe Nuclear Reactor Accident Source Term and Risk.verify models, through combinations of detailed analysis and physical testing, used to predict accident risk associated with transportation of spent fuel in NRC certified casks. . Because the NUREG spent nuclear fuel accident source terms .. et al., MELCOR A Computer Code for

Nuclear Reactor Severe.applied to the design of future Light Water Reactors. (LWRs). .. provide a postulated fission product source term released into . basis for staff assessments of severe accident risk in. I. NUREG of a group of computer codes known as the Source. Term Code R.M. Summers, et al., "MELCOR 0: A. Computer.

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