Contribution ID: **1267** Type: **not specified**

P3.220 Modifications to the MELCOR-TMAP code to simultaneously treat multiple fusion coolants

Wednesday, 19 September 2018 11:00 (2 hours)

This paper describes recent progress at the Idaho National Laboratory (INL) in developing the MELCOR-TMAP computer code for fusion. The MELCOR-TMAP for fusion computer code is being developed by the INL's Fusion Safety Program (FSP) [1] by modifying the US Nuclear Regulatory Commission's (NRC's) MELCOR [2] computer code for fission reactor severe accident analyses. The MELCOR code was chosen for application to fusion accidents because it is a well-established validated computer code that possesses the basic capabilities of predicting thermal-hydraulic transients while self-consistently accounting for aerosol transport in nuclear facilities and reactor cooling systems. Recently the INL FSP completed the process of merging INL's Tritium Migration Analysis Program (TMAP) with MELCOR to provide the US fusion community with a more comprehensive tool for analyzing accidents in future fusion reactors. However, prior to the present modifications, a MELCOR-TMAP user could only substitute one of a number of available fusion coolants for MELCOR's default coolant of water. The present version allows two additional coolants, plus water, to be included in a given accident analysis, provided that these coolants reside in different cooling loops or systems. This new capability corrects a modeling gap that is needed for fusion reactor safety assessments that contain more than a single coolant. In this article, we discuss the present code modifications, benchmarks MELCOR-TMAP against predictions from previous versions of the MELCOR code, illustrates the application of the code to analyzing an accident in a multiple fluids reactor concept, and describes plans for future modification of the MELCOR-TMAP code.

Note:
1This work was prepared for the U. S. Department of Energy, Office of Fusion Energy Sciences, under the DOE Idaho Field Office contract number DE-AC07-05ID14517.
2 Sandia National Laboratory in New Mexico (SNL-NM) is developing the MELCOR code for the US NRC.

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Session Classification: P3