

Status of MELCOR-Na Code Development

David L.Y. Louie
Sandia National Laboratories
Albuquerque, New Mexico USA

Larry L. Humphries
Sandia National Laboratories
Albuquerque, New Mexico USA

ABSTRACT

A sodium coolant accident analysis code is necessary to provide regulators with a means of performing confirmatory analyses for future sodium reactor licensing submissions. MELCOR and CONTAIN, which are currently employed by the U.S. Nuclear Regulatory Commission (NRC) for light water reactor (LWR) licensing, have been traditionally used for level 2 and level 3 probabilistic analyses as well as containment design basis accident (DBA) analysis. To meet future regulatory needs, new models will be added to the MELCOR code for simulation of sodium reactor designs. Existing models developed for separate effects codes will be integrated into the MELCOR architecture. Sodium properties and equation of state (EOS) had been implemented into MELCOR to replace the water properties and its EOS. After the success of this implementation, additional specific sodium-related models to deal with DBA can be implemented into MELCOR. To simplify the sodium model development, the sodium models from CONTAIN-LMR are integrated into MELCOR. Although the codes are very different in the code architecture, the feasibility fit is being investigated, and the models for sodium spray fire and sodium pool fire have been integrated into MELCOR. Although MELCOR code requires the ambient condition to be above the freezing point of the coolant (e.g., sodium or water), the necessary steps are needed to enable MELCOR to handle these situations, particularly in the containment and experiments, where the ambient temperatures are usually at room temperatures. In this paper, we are addressing and describing the integration of the sodium models from CONTAIN-LMR, and the testing of the sodium chemistry models in MELCOR-Na, a version of MELCOR that handles sodium type reactor accidents, using available sodium experiments on spray fire and pool fire. In addition, the description of the anticipated sodium models to be done in the coming year, such as sodium-concrete interaction is provided.