

MELCOR Integrated Severe Accident Code for Non-LWR applications

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ABSTRACT

MELCOR is an integrated severe accident code used for source term analysis that has been developed at Sandia National Laboratories (SNL) for the United States Nuclear Regulatory Commission (USNRC) since the early 1980s. Though MELCOR originated as a light water reactor (LWR) code, development over the past decades has advanced its application for non-LWR reactor concepts. Models for thermal hydraulics, core heat-up, core degradation, radionuclide release and transport, and ex-vessel/containment phenomenon (molten core concrete interactions, melt spreading, sodium fires, etc.) have been developed for application to light water reactors (LWRs), spent fuel pools (SFPs), high temperature gas reactors (HTGRs), heat pipe reactors (HPRs), sodium fast reactors (SFRs), fluoride salt-cooled high temperature reactors (FHRs) and molten salt reactors (MSRs). Most recent model advancements for non-LWR application have been added to MELCOR to extend the Equation of State (EOS) for non-LWR coolants as well as models for fission product diffusion and release in TRISO particles, fission product retention in molten salts, sodium fire models, heat pipe models, etc. These new non-LWR models have been successfully exercised in demonstration calculations for the USNRC.

This paper discusses the MELCOR code modelling objectives, recently added code physics modelling for advanced reactors, and presents examples of preliminary demonstration non-LWR reactor analyses.

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