

MSR MODELING CAPABILITIES AND DEVELOPMENT WITH THE MELCOR REACTOR SIMULATION CODE

D. L. LUXAT
Sandia National Laboratories
Albuquerque, United States of America
Email: dlluxat@sandia.gov

M. S. CHRISTIAN
Sandia National Laboratories
Albuquerque, United States of America

B. A. DE LUNA
Sandia National Laboratories
Albuquerque, United States of America

T. C. HASKIN
Sandia National Laboratories
Albuquerque, United States of America

L. I. ALBRIGHT
Sandia National Laboratories
Albuquerque, United States of America

Abstract

Assessing the response of liquid-fueled Molten Salt Reactors (MSRs) during accidents is essential for ensuring their safety and operational reliability. The MELCOR nuclear system accident modeling program offers robust capabilities for simulating both steady-state operations and accident scenarios specific to MSRs. It effectively targets critical chemical processes relevant to safety, such as the transport mechanisms of radionuclides, including deposition and volatilization, throughout the reactor system. While significant progress has been made in understanding the chemistry of primary MSR salts and their corrosion impacts, there remains a need for focused research on fission product chemistry. This presentation will provide an overview of MELCOR's functionalities in modeling MSR plant responses, accident progression, and source term evaluations. Additionally, we will introduce upcoming features planned for implementation in the code that will enhance its modeling capabilities. A broader discussion will also address current knowledge and existing gaps in chemical understanding related to MSR nuclear accidents. SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.