Foreword

Special issue on SAM Code Development, Validation, and Applications

Guest Editor

Rui Hu

Argonne National Laboratory

The global energy landscape is undergoing a transformative shift, with advanced nuclear reactor technologies poised to play a pivotal role in achieving sustainable and reliable energy solutions. Recent developments underscore the accelerating momentum in advanced reactor deployment, highlighting the critical need for robust analytical tools to ensure the safety of these systems and facilitate their deployment. The System Analysis Module (SAM) code, developed by Argonne National Laboratory and its partners, emerges as an important tool in this context, offering modern system-level modeling, simulation, and safety analysis capabilities tailored to the unique challenges of advanced reactor designs.

This special issue of *Nuclear Technology* is dedicated to recent SAM code development, validation, and diverse applications. The collection of articles herein provides insights into the code's foundational goals and functional requirements, as well as the physical models that underpin its current capabilities. Validation remains a cornerstone of SAM's evolution, ensuring that it remains a trusted tool for its intended uses under various operational and accident conditions pertinent to advanced reactor designs. The versatility of SAM is demonstrated through its applications across multiple reactor concepts. The technical topics covered in this issue also contribute to broader understanding in the safety analysis of various advanced nuclear reactors.

By focusing on the SAM code's development, validation, and applications in this special issue, we aim to provide valuable insights that will support the safe and efficient deployment of advanced nuclear reactors worldwide. The contributions within this issue highlight SAM's current strengths and set the stage for future enhancements. To further elevate SAM's capabilities, several avenues merit exploration, including enhanced physical models, user-friendly interfaces, integration with artificial intelligence and machine learning, and integration with other simulation tools for multiscale multiphysics simulations.

In conclusion, while SAM has made substantial strides in reactor safety analysis, ongoing research and development are essential to fully harness its potential. We anticipate that the insights and findings presented in this special issue will inspire continued innovation and collaboration in this critical field.

Finally, I'd like to extend my gratitude to the contributing authors for their meticulous research and to the reviewers for their invaluable feedback. Their collective efforts have culminated in this special issue, which I believe will serve as a significant resource for researchers and practitioners engaged in the ongoing R&D and application of the safety analysis codes for advanced nuclear reactors.

ORCID

Rui Hu http://orcid.org/0000-0002-3771-2920