Foreword

Special issue on Restarting the Transient Reactor Test Facility

Guest Editor

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This special issue of *Nuclear Technology* features discussion of the process of restarting the Transient Reactor Test (TREAT) facility in support of the resumption of transient testing of nuclear fuels and materials. The issue starts with a very brief introduction to transient testing and the history of TREAT, followed by a critical review by Woolstenhulme et al. on developing irradiation test devices for transient testing. Since the testing devices are required to contain the fuel specimens even when severely melting the specimens, the availability of these test devices is critical for a successful transient testing program.

As noted in the introduction by Bumgardner and Wachs, the TREAT reactor was maintained in standby from 1994 until the restart effort was initiated in 2014. Modernizing the safety basis of the reactor was a resource-intensive, time-consuming process that was essential for restarting the reactor. The paper "Safety Strategy and Update of the TREAT Facility Safety Basis," by Gerstner et al., provides detail on the approach taken to update the safety basis of the reactor to meet the regulator (U.S. Department of Energy) requirements.

Once all the systems had been evaluated and updated, repaired, or replaced as needed, the approval to restart the reactor was received from the regulator. The actual restart of the reactor began with an approach to critical as described in "Transient Reactor Test (TREAT) Facility Initial Approach to Restart Criticality Following Extended Standby Operation," by LaPorta. After the approach to critical, a heat balance reactor run and control rod worth measurements were performed as described in "Transient Reactor Test (TREAT) Facility Restart Heat Balance Calibration and Rod Worth Measurements," by Willcox and Parry. The final operation required to characterize the TREAT core for unrestricted operations was the performance of three progressively larger step insertion of reactivity transients used to determine the reactivity limits associated with the TREAT safety limit and limited control setting, as described in "Analysis of Core Characterization Transients for TREAT Restart," by Chase et al.

A successful and productive transient testing program requires more than just an operating transient reactor. "Restart of the Transient Reactor Test (TREAT) Facility Neutron Radiography Program," by Jensen et al., describes the recovery of the TREAT neutron radiography capability; additionally, "Metrology for Transient Reactor Characterization Using Uranium Wires," by Holschuh et al., describes the efforts to recover the capability to measure a power coupling factor between the reactor and experimental specimen. A demonstration of the versatility of the reactor control system to provide transient testing conditions needed for a variety of nuclear fuel testing needs is presented in "Transient Reactor Test Facility Advanced Transient Shapes," by Holschuh et al. The paper "The Development of Advanced Instrumentation for Transient Testing," by Jensen and Fleming, provides an overview of the in-test instrumentation designed to provide high-confidence test data of the actual specimen test conditions.

The final two articles are technical notes: one to provide an overview of the whole restart process in "TREAT Restart Project," by Heath and Race, and one to provide an overview of the TREAT facility in "Transient Reactor Test (TREAT) Facility Design and Experiment Capability," by Pope et al.

This special issue of *Nuclear Technology* is provided to inform the nuclear community and the broader scientific community of the capabilities and opportunities available with the successful restart of the Transient Reactor Test facility. It is our hope that researchers take advantage of this renewed opportunity to perform transient testing on new reactor fuels and materials to further the knowledge of the nuclear community.