U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Computational and Experimental Benchmarking for Transient Fuel Testing

OVERVIEW

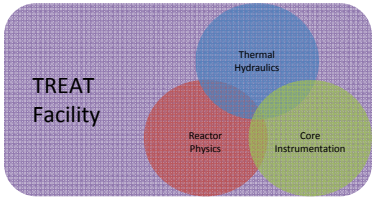
Purpose: Support the transient fuel testing and Transient Reactor Test (TREAT) Facility Research efforts through comprehensive computational and experimental benchmarking. This includes both reactor physics and thermal hydraulics benchmarking efforts.

Objectives: This integrated research project contains four clear objectives:

- A comprehensive evaluation of existing TREAT Facility neutronics data using next generation reactor core neutronics codes.
- A complete thermal hydraulic characterization of existing sodium loop experimental data will be performed and documented.
- The collection of and benchmarking against new experimental thermal hydraulic data of a representative TREAT Facility water flow loop.
- A comprehensive instrumentation plan for the TREAT Facility that objectively aligns with the technical and functional requirements needed to maximize impact.

IMPACT

Logical Path:



Outcomes: Each objective will yield its own high-impact outcome:

- A fully characterized reactor core which may be utilized to support the safety case for the TREAT Facility research and future experiment design analysis efforts.
- A documented basis for developing future sodium flow loops to be utilized within the TREAT Facility.
- A documented water flow loop design and demonstration that is representative of a prototypic configuration for the TREAT Facility to provide benchmarking insights.
- A documented and demonstrated basis for the selection of in-pile instruments within the TREAT Facility that satisfies steady-state and transient test needs.

DETAILS

Principal Investigator: Wade Marcum

Institution: Oregon State University

Collaborators: UM, MIT, INL, ORNL, ANL, HTTP, TerraPower

Duration: Three Years **Total Funding Level:** $4,000,000

TPOC: Nick Woolstenhulme

Federal Manager: Rob Versluis

Workscope: IRP-NE

PICSNE Workpackage #:
NU-15-OR-OSU_-0701-01

RESULTS

Results:

- Preliminary reactor physics k-eigenvalue calculations have been performed on a steady state TREAT core configuration.
- Design-base thermal hydraulic predictions have been successfully completed using RELAP5-3D to support design of the water flow loop to be constructed at Oregon State University
- Preparation for irradiation tests at the MIT Research Reactor including scoping of reactor low-power, preliminary scheduling for reactor experiment and survey of available core positions has been completed.

Accomplishments:

- The project team is presently on track with respect to the contracted schedule and scope of work.
- A kick off meeting took place at the Idaho National Laboratory with all collaborating institutions.
- All collaborators from participating institutions have become thoroughly familiarized with the TREAT Facility operations and configuration to successfully complete future tasks.