U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Clean. Reliable. Nuclear.

Nuclear Energy University Programs (NEUP) Fiscal Year (FY) 2020

RC-5 Experimental Validation for High Temperature Gas Reactor Simulations
&
RC-6: Fluoride Salt Cooled High Temperature Reactors

RC-5 Experimental Validation of High Temperature Gas Reactor Simulations

- FY20: Two scenarios of interest to core designers and safety analysts involve disruptions of the nominal helium flow rate and transition to either the Pressurized or Depressurized Conduction Cooldown (PCC/DCC) events. This work scope seeks the evaluation of degraded or asymmetric RCCS performance and a plenum-to-plenum natural circulation characterization. We are seeking proposals including scope to:
  - » Characterize impact of degraded/ asymmetric operation on localized vessel and concrete temperatures
  - » Assess impact of slow, medium, and fast blowdown
  - » Assess natural convection regime due to break location
  - » Experimentally characterize low-velocity (natural circulation) plenum-to-plenum gas flow at prototypical conditions.

Federal POC – Diana Li: Diana.LI@nuclear.energy.gov

National Technical Director – Gerhard Strydom: Gerhard.Strydom@inl.gov

RC-5 Experimental Validation of High Temperature Gas Reactor Simulations

- Requirements:
  - A literature review of previous experimental work performed and the HTGR community V&V needs, specifically for CFD codes, would be expected to leverage previous recommendations and lessons-learned.
  - All experiments must be performed to NQA-1 standards.
  - Data, experiments, and calculations shall be submitted to the Idaho National Laboratory's NGNP Data Management and Analysis System (NDMAS).
- Recommendations:
  - Principal Investigators are encouraged to consult with US-based HTGR vendors (Framatome, X-Energy, etc.) to refine the experiment design and test matrix.
  - General Atomics 350 MWt MHTGR should be used as basis for scaling experimental facility.

RC-6: Fluoride Salt Cooled High Temperature Reactors

- **RC-6.1: Optimized fluoride salt pipe joints for Fluoride Salt cooled High Temperature Reactors**

  Optimized fluoride salt pipe joints are sought that:

  – Are suitable for both large and small pipes,
  – can be repeatedly joined and disconnected,
  – can be tested prior to filling with salt,
  – function when subjected to repeated thermal cycling,
  – do not require internal pressure for sealing, and
  – are tolerant of common engineering tolerances (roughness and alignment) of mating surfaces.

Federal POC – Diana Li: Diana.LI@nuclear.energy.gov

Technical POC – David Holcomb: holcombde@ornl.gov

RC-6: Fluoride Salt Cooled High Temperature Reactors

- **RC 6.2 Pump scaling technology for Fluoride Salt cooled High Temperature Reactors**

Development and demonstration of salt pump component technologies (seals and bearings) are requested. The components should:

  - Be scalable from laboratory to industrial scale,
  - Be compatible with fluoride salts
  - Prevent contamination of salt
  - Minimize radionuclide release

Federal POC – Diana Li: Diana.LI@nuclear.energy.gov

Technical POC – David Holcomb: holcombde@ornl.gov