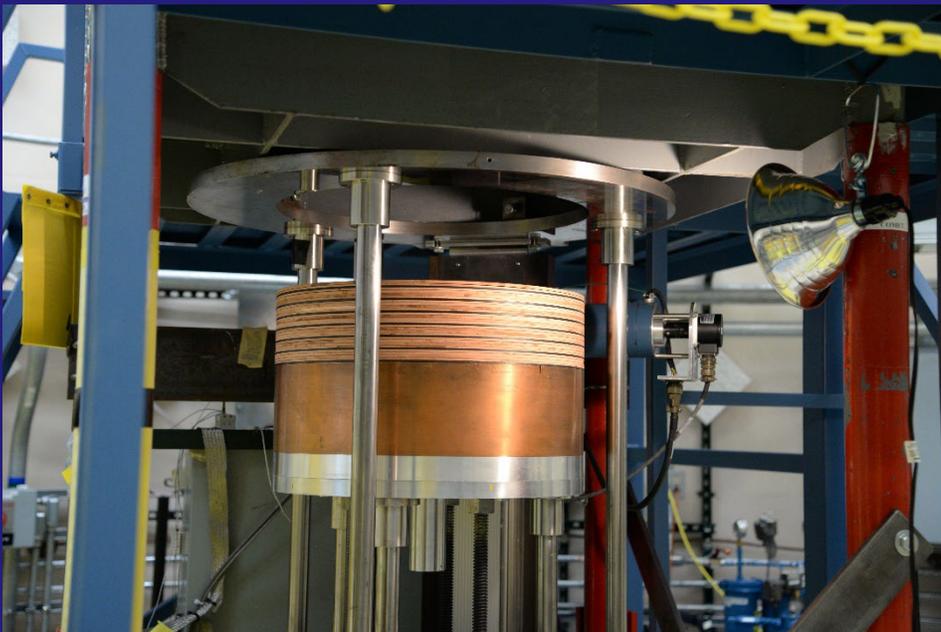


#NEUTRON PULSE



3RD QUARTER 2023 EDITION

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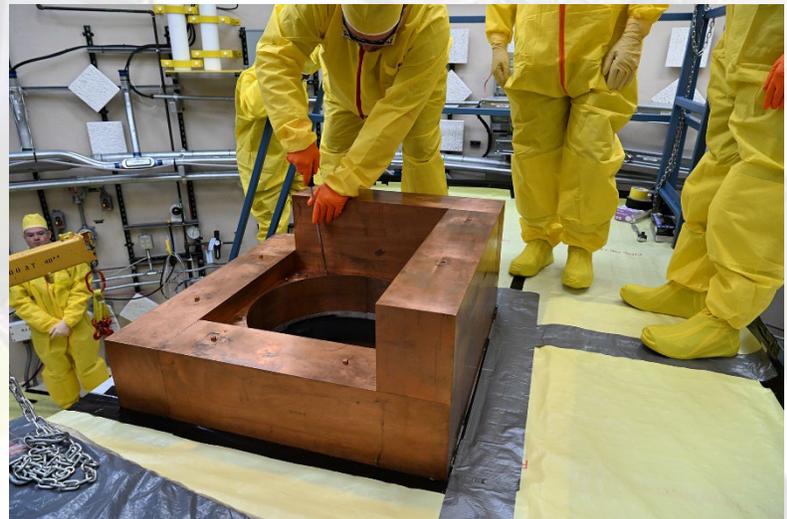
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OPERATIONS SUMMARY

Experimenters performed eleven weeks of critical assembly operations including Critical Experiment Reflected By copper to bEtteR Understand Scattering (CERBERUS) and Thermal-Epithermal eXperiments – Plutonium – Hanford (TEX-Pu-Hanford). Additionally, Planet, Flat-Top and Godiva-IV operations were conducted in support of four criticality safety training classes.

CERBERUS ON COMET

A gap currently exists in the International Criticality Safety Benchmark Project (ICSBEP) Handbook for benchmark configurations sensitive to both intermediate energy neutrons and copper elastic scattering. The CERBERUS integral experiment was designed to close this gap by improving copper nuclear data and refining intermediate energy benchmark data from previous experiments like Zeus. This goal established the CERBERUS three-part design criteria: high sensitivity to copper elastic scattering cross sections, large intermediate range neutron flux, and well characterized materials that minimize deviations in copper cross section data. Prior to assembly, extensive physical measurements were taken on the experiment components using calipers and the Coordinate Measurement Machine (CMM) to minimize experimental uncertainty. Three critical configurations were successfully built and measured: bare highly enriched uranium (HEU) Jemima plates, copper interstitial plates, and copper reflector blocks. A complete evaluation of the CERBERUS experiment will be submitted to ICSBEP in 2025.



▲ Experimenters stack the copper reflectors on the Comet upper-core fuel support platform.

▼ Kristin Stolte (NEN-2) utilizes the CMM to three-dimensionally measure a HEU Jemima plate.



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UNIVERSITY RESEARCH OPPORTUNITIES

The Defense Nuclear Nonproliferation (DNN, NA-22) University Consortia Program and the Dr. G. Robert Keepin Nonproliferation Science Summer Program visited NCERC for an opportunity to measure radiation signatures of special nuclear material (SNM) and witness various criticality demonstrations. University Consortia Program participants continued with their eighth measurement campaign on NCERC uranium, plutonium, and neptunium to gain valuable experience on material detection and discrimination methods. Keepin Program students participated in hands-on demonstrations with the BeRP Ball and Np Sphere, witnessed a Flat-Top free run demonstration, and visited the historic Sedan Crater. These experiences aid in establishing a pipeline for students to work at national laboratories while promoting nuclear nonproliferation to future generations.

CRITICALITY SAFETY CLASSES

NCERC hosted four Criticality Safety Classes: one for the Nuclear Criticality Safety Program, one for PF-4 personnel, and two for emergency responders. These classes provided a hands-on experience to understand the effects of changing parameters important to nuclear criticality safety. Participants used the approach-to-critical experiment methodology to guide the construction of a critical configuration.

ADDITIONAL ACTIVITIES

Preventive maintenance, surveillance, and in-service inspection procedures were performed on schedule. NCERC hosted several tours including for Westinghouse and the Naval Nuclear Laboratory to discuss NCERC capabilities for future projects.



▲ Jesson Hutchinson (NEN-2) demonstrates effects of reflection on system neutron multiplication using a hands-on demonstration with the BeRP Ball.



▲ Keepin Program participants at Sedan Crater.