Hot Cells

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The Hot Fuel Examination Facility (HFEF) is one of the largest hot cells dedicated to radioactive materials research at Idaho National Laboratory (INL). The nation's lead laboratory for nuclear energy research and development utilizes HFEF capabilities for remote handing of highly irradiated materials to support research and development of safer and more efficient fuel designs and to evaluate material performance after irradiation.

Current Missions

HFEF provides shielding and containment for remote examination, processing and handling of highly radioactive TRU-bearing materials. Its shielded argon-atmosphere hot cells, unshielded labs, support areas and special equipment for handling, examining and testing highly radioactive materials make HFEF an invaluable part of the nation's nuclear research infrastructure.

Modifications to the facility now allow for receipt of almost any over-the-road commercial shipping cask and partnering with the commercial industry to test used commercial Light Water Reactor nuclear fuel rods.

HFEF provides support to a variety of programs including, but not limited to, DOE's Fuel Cycle Research & Development program, Generation IV technologies and Space Nuclear programs.

Key Capabilities

Using HFEF's extensive array of research tools, INL scientists can conduct non-destructive examination of irradiated samples, such as dimensional measurements and neutron radiography. The facility also enables destructive examination, such as mechanical testing or metallographic/ceramographic characterization. Development at HFEF also supports fuel processing activities at the Fuel Conditioning Facility.

Significant aspects of HFEF include:

- **Air and Large Inert Atmosphere Hot Cells:** HFEF has

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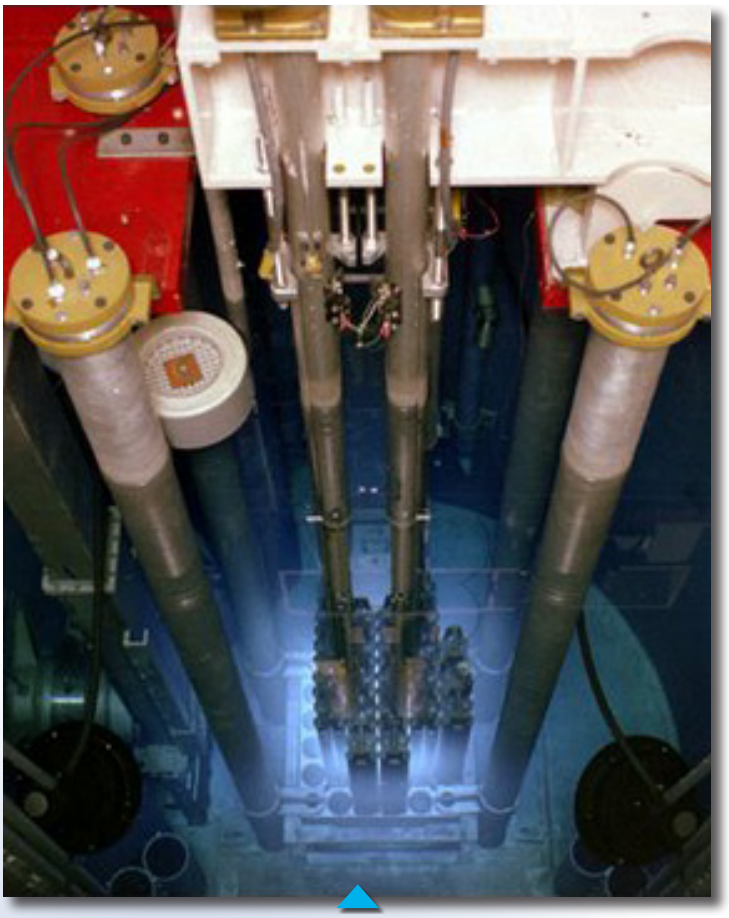
two large, highly shielded hot cells with handling and loading facilities capable of receiving large shipping casks and fuel assemblies up to 12 feet long. The main cell, which is stainless steel-lined and gas tight, has 15 workstations, each with a 4-foot thick window of oil-filled, cerium-stabilized glass and a pair of remote manipulators.

- **Neutron Radiography:** The Neutron Radiography reactor is a 300 kW TRIGA reactor in the basement of HFEF. It is equipped with two beam tubes and two separate radiography stations that make it one of the finest facilities in the world for neutron radiography irradiation of small test components, a process not possible using conventional X-ray methods.
- **Precision Gamma Scanning:** This type of scanning allows scientists to precisely determine the quality and location of radioactive elements in fuel and material samples. This knowledge is needed to design safer, more efficient fuels.
- **Visual Examination and Eddy Current Examination:** The equipment supports non-destructive examination of samples, enabling researchers to evaluate a fuel or material's performance and detect material surface defects.
- **Gas Sampling:** Laser puncture and gas collection from fuel samples helps researchers gain needed information on fission gas and helium release.



The NRAD reactor is a small TRIGA reactor that uses neutron radiography to examine the integrity of test materials without physically damaging them. It also serves as a neutron source for isotope production.

- **Accident Simulation Testing:** HFEF's Fuel Accident Condition Simulator (FACS) furnace provides the capability to test fuel and material samples under worst-case scenarios involving temperatures of 2,000 degrees Celsius or more for extended periods of time, allowing scientists to understand performance and improve the safety of fuel designs.
- **Full Suite of Metallic and Ceramic Sample Preparation Capabilities:** In addition to the non-destructive PIE tools, HFEF operators are able to disassemble fuel assemblies and prepare mounted samples for examination, radiological and chemical analysis.

History

Located at INL's Materials and Fuels Complex, HFEF began operations in 1975, providing a two hot-cell complex and radiation-shielded rooms for handling irradiated reactor fuel and structural materials. HFEF hosted examinations providing data used to determine the performance of fuels and materials irradiated in EBR-II and other facilities.

For more information

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