

INL's Fuel Conditioning Facility supports work to demonstrate the technical feasibility of a nuclear recycling technique called pyroprocessing.



Fuel Conditioning Facility

The Fuel Conditioning Facility (FCF) at Idaho National Laboratory's Materials and Fuels Complex supports nuclear energy research and development for the U.S. Department of Energy and other customers. Its unique capabilities make FCF an ideal facility for its primary mission to support treatment of DOE-owned sodium-bonded metal fuel.

In a secondary role, FCF also supports work to refine the technical feasibility of pyroprocessing technology for treating used nuclear fuel for DOE's Fuel Cycle Research and Development Program. Pyroprocessing refers to a family of technologies involving high-temperature chemical and electrochemical methods for separation, purification,

and recovery of fissile elements from used nuclear fuel.

FCF has two hot cells. The air atmosphere cell is where fuel assemblies are disassembled

into individual fuel elements. The argon atmosphere cell is where the spent fuel elements are prepared and treated. There

Continued next page



FCF is equipped with heavily shielded hot cells and remotely operated manipulators, which enable researchers to safely handle irradiated fuels and materials.

The Energy of Innovation



Continued from previous page

is a hot repair area located in the basement where contaminated equipment can be washed and repaired. FCF also has engineering-scale equipment for treatment of sodium-bonded metallic fuel to deactivate the reactive sodium metal, recover fissionable uranium, and separate fission and activation products for incorporation into solid waste forms suitable for geologic disposal.

Key Capabilities

- Two heavily shielded hot cells, one round with a dry argon gas atmosphere, and the other rectangular with regular air. Both are equipped with remotely operated manipulators to safely handle irradiated fuels and materials.
- Instruments used to prepare and size elements for treatment, such as element choppers, vacuum inspection, and the Vertical Assembler/Dismantler.
- Systems to support handling of heavily shielded shipping casks for fuel receipt and waste disposal.
- Hot repair area equipped with remotely operated decontamination equipment, a specialized manipulator repair facility, and other maintenance and waste-handling equipment.
- Pneumatic “rabbit” system for transfer of material samples to and from MFC’s Analytical Laboratory (AL) or its Hot Fuel Examination Facility (HFEF).
- Mock-up area to allow thorough testing of new remotely operated systems prior to their installation into FCF, HFEF or AL hot cells.

History

Originally called the Fuel Cycle Facility, the Fuel Conditioning Facility was first activated in 1963 by Argonne National Laboratory-West (ANL-W, now known as MFC), with a mission to demonstrate the feasibility of on-site reprocessing and fabrication of fuel for the adjacent Experimental Breeder Reactor II (EBR-II), which was a prototype for the Integral Fast Reactor (IFR) concept — a sodium-cooled, metallic fuel, fast breeder reactor with inherent, passive safety features.

- The original FCF demonstration was successfully carried out from 1964 to 1968. Following the demonstration, the facility was refitted for post-irradiation examination of EBR-II irradiation experiments and it served in this role until 1975, providing

both nondestructive and destructive examinations of EBR-II experiments, as well as loop experiments received from the Transient Reactor Test Facility (TREAT).

- Refurbishment of the FCF hot cells, including the remotely operated overhead handling equipment, was conducted in the late 1970s and early 1980s after the new HFEF became operational and capable of accommodating the post-irradiation examination mission. Major modifications to FCF were made again in the late 1980s and early 1990s to support the IFR Program and the historic tests of its passive safety features in EBR-II.
- Upon shutdown of the IFR program in 1995, the facility name was changed to its current name, the Fuel Conditioning Facility. The process equipment was repurposed to treat sodium-bonded metallic fuel.

For more information

Nora Heikkinen
(208) 533-7783
nora.heikkinen@inl.gov

A U.S. Department of Energy
National Laboratory



FCF includes a mock-up shop where technicians can build and test new hot cell equipment before installing it into the hot cell.

