MISSION

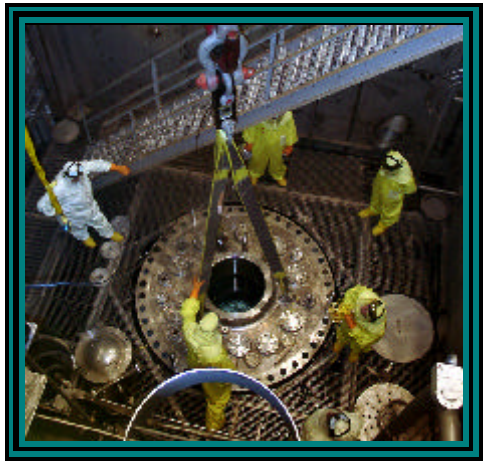
"To operate, maintain, and support Oak Ridge National Laboratory's High Flux Isotope Reactor for the Department of Energy in a safe, reliable, predictable, and efficient manner and in compliance with applicable regulations and requirements."

HISTORY

The High Flux Isotope Reactor (HFIR) first operated on August 25, 1965, when criticality was achieved. The HFIR ran successfully until late 1986. During this period and since, the HFIR achieved a record unsurpassed by any other reactor in the United States.

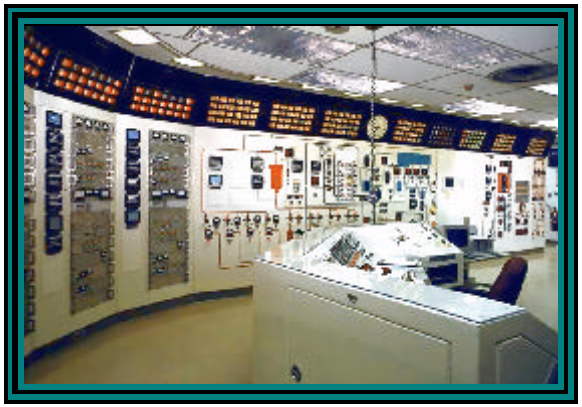
The reactor was shut down from 1987 through 1989 to allow for an extensive review and evaluation of pressure vessel embrittlement and questions about procedural adequacy.

The reactor was restarted in January 1990 and continued operating until a scheduled maintenance outage began in October 2000 to replace the beryllium reflector (performed every ten full-power years). The purpose for the shutdown is to make major upgrades to the facility and to extend the HFIR's operating life for 30 years.



HFIR Vessel Head Removal

HFIR CONTROL ROOM



DESCRIPTION

The HFIR is one of the most powerful research reactor facilities. It is a versatile 85-MW isotope production and test reactor, with the capability and facilities for performing a wide variety of irradiation experiments. It has a peak thermal neutron flux of 2.6×10^{15} neutrons per square centimeter per second, which is the highest in the western world. The HFIR is a beryllium-reflected, light water-cooled and moderated flux-trap type swimming pool reactor that uses highly enriched uranium-235 as the fuel.

A fuel cycle normally consists of full-power operation for a period of 23 to 27 days at 85 MW, followed by an outage that lasts approximately 6 to 9 days.

PURPOSE

The HFIR has three main missions. The first purpose of the reactor is its neutron scattering capabilities. This activity has grown in both scientific and economic importance and today provides much of the knowledge about the molecular and magnetic structures and behavior of materials, including high-temperature superconductors, polymers, metals, and biological samples.

The second key function of the HFIR is to provide isotopes, including Californium and other transuranium isotopes. These isotopes are used for research, industrial, and medical applications.

The third purpose of the reactor is to provide facilities that have the unique capability for instrumented and uninstrumented materials irradiation and neutron activation analysis.

EXPERIMENT FACILITIES

HB-3 Triple Axis Spectrometer

HFIR FACTS

- ! Has through neutron scattering:
- S developed better superconducting materials to provide cheaper electrical transmissions.
- S developed better magnetic recording media for computer hard drives.
- S made improvements in the material characteristics and production of plastics.
- S mapped weld stresses in materials such as jet engine turbines and disc brakes.

- ! Produces 35 primary isotopes:
- S **Palladium-103** (for aid in the treatment of prostate cancer).
- S **Rhenium-188** (for the treatment of cancer and arthritis).
- S **Iridium-192** (for cancer treatment therapy to reduce metastasis, for preventative treatment of post- vascular surgery complications related to angioplasty, for oil-well exploration, conduct of geological surveys, and radiographic inspection of components).
- S **Sn-117m** (for pallative bone cancer treatment).

- ! Is the western world's sole producer of **Californium-252**. Californium is used as a neutron source for reactor startups, in nondestructive examination of welds in oil and gas pipelines, for determining metal stress in military aircraft, for detecting explosive devices in aircraft luggage, and in treating certain types of cervical and brain cancer.

- ! Provides support for forensic science, environmental soil monitoring, non-proliferation, and basic research.
- S proved that President Zachary Taylor did not die of arsenic poisoning.

- ! Determines the effects of neutron irradiation on materials through materials testing.

HFIR's FUTURE

Upgrades will:

- ! Extend HFIR's operating life for an additional 30 years.

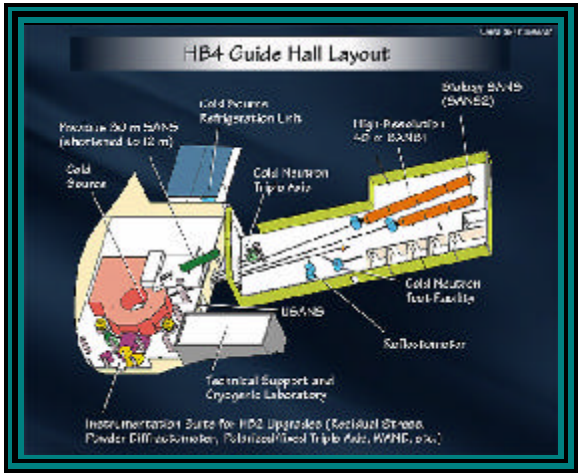
- ! Improve neutron-scattering capabilities.

- ! Add a high-performance cold neutron source with neutron brightness comparable to the best cold source in the world.

- ! Install enlarged beam tubes and neutron guides, resulting in a thermal neutron flux available to users two to three times greater than those at any other facility.

- ! Achieve higher operational efficiency, resulting in more neutrons/year for researchers.

- ! Not affect existing irradiation facility capabilities.



INFORMATION

Research Reactors Division Director
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831-6398
Fax: 865-574-0967 / Phone: 865-574-1301

OAK RIDGE NATIONAL LABORATORY

UT-BATTELLE
Management Contractor for DOE's Oak Ridge National Laboratory

Research Reactors Division

High Flux Isotope Reactor

"If at sometime a heavenly angel should ask what the laboratory in the hills of East Tennessee did to enlarge man's life and make it better, I daresay the production of radioisotopes for scientific research and medical treatment will surely rate as a candidate for the very first place."

Alvin Weinberg