OAK RIDGE National Laboratory

Scattering Beamlines and Irradiation Positions at the High Flux Isotope Reactor

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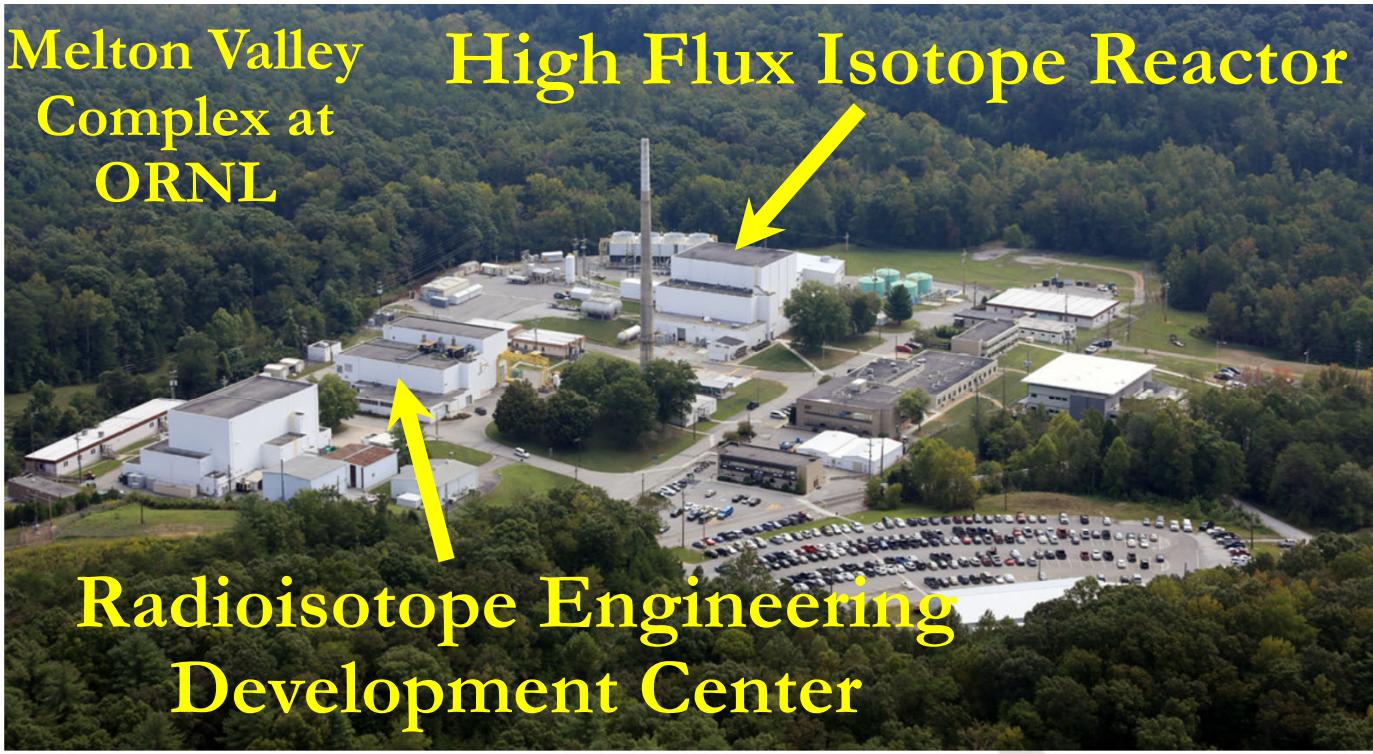
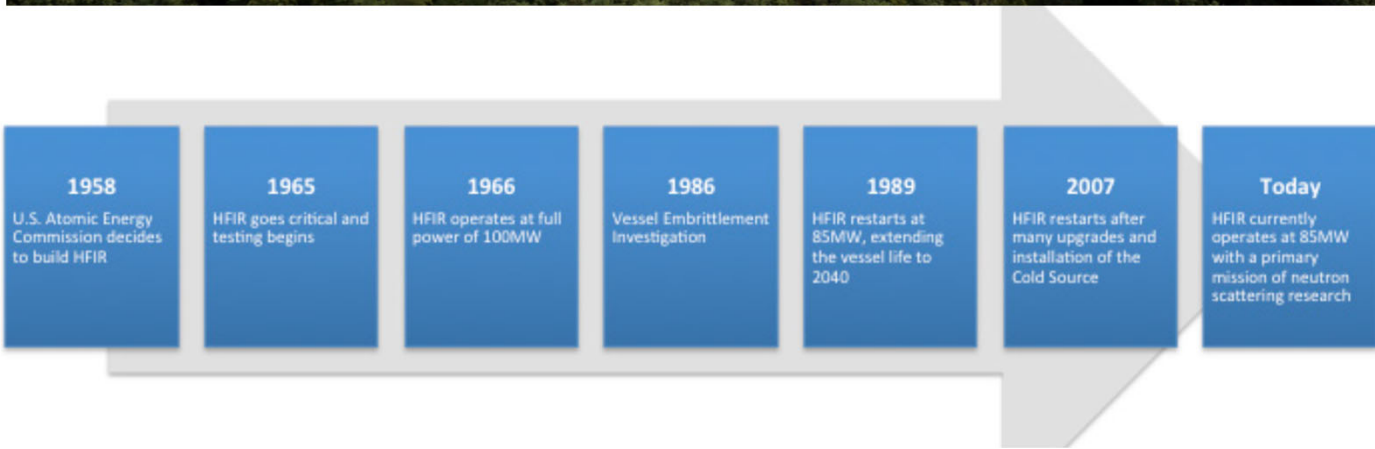
U.S. DEPARTMENT OF ENERGY

Quick Overview of the HFIR

- HFIR built in 1960s
- Critical in 1965 as the leading research reactor for isotope production
- Retains this title today
- Primary Role now: USDOE primary research reactor for neutron scattering research





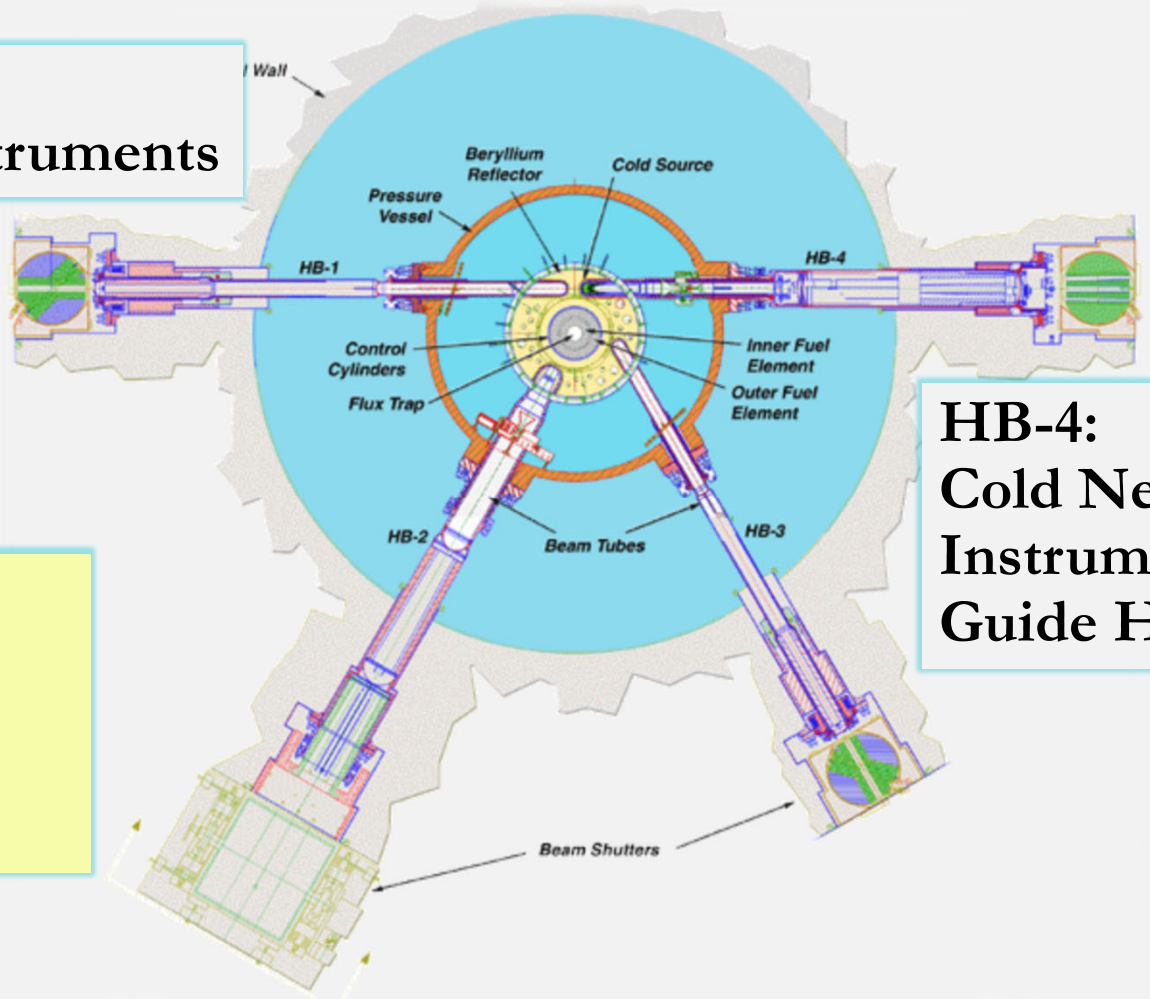
HFIR Operations and Experiments

- HFIR is operated by the ORNL Research Reactor Division, part of the Neutron Sciences Directorate, which also operates the Spallation Neutron Source.
- HFIR is primarily a Basic Energy Sciences User Facility: 12 of the HFIR Thermal and Cold Neutron Beamlines operate as part of the Neutron Sciences User Program
- HFIR currently operates about 7 cycles per year, running at 85 MW for about 25 days/cycle
- HFIR also has 4 neutron beamlines for development, for polarized neutrons, detectors and sample alignment
- HFIR Retains extensive irradiation capabilities, and the adjacent Radioisotope Engineering Development Center provides transuranic chemistry and handling capabilities

HFIR Horizontal Beam Tubes

Flux trap flux : 2.5 x 10^{15} thermal
Beam tube flux : 1.2 x 10^{15} thermal

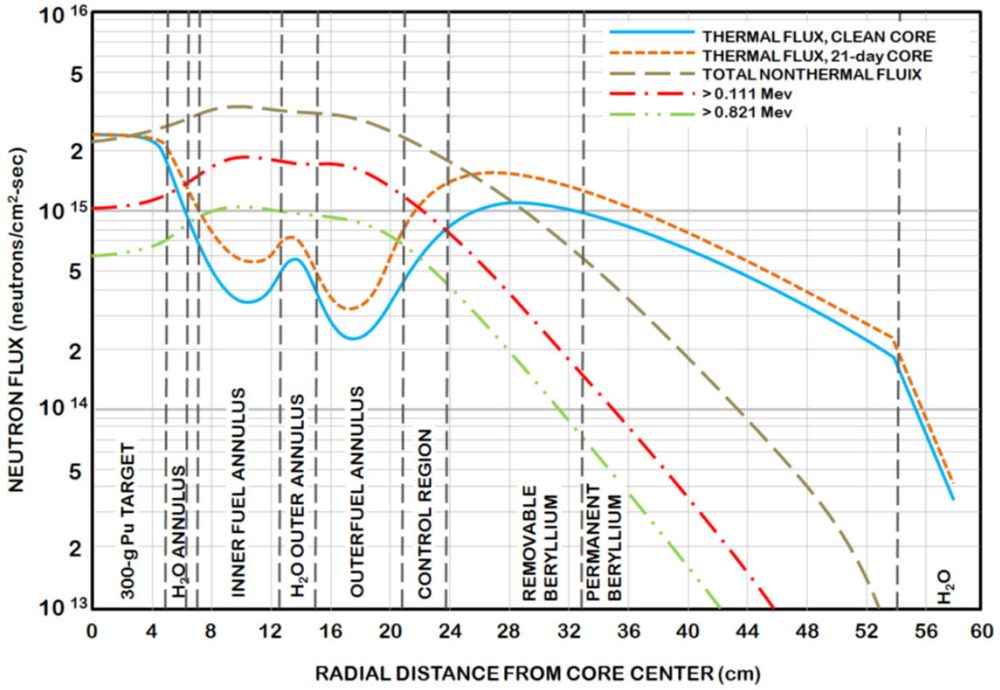
HB-1, 2, 3:
Thermal Neutron Instruments

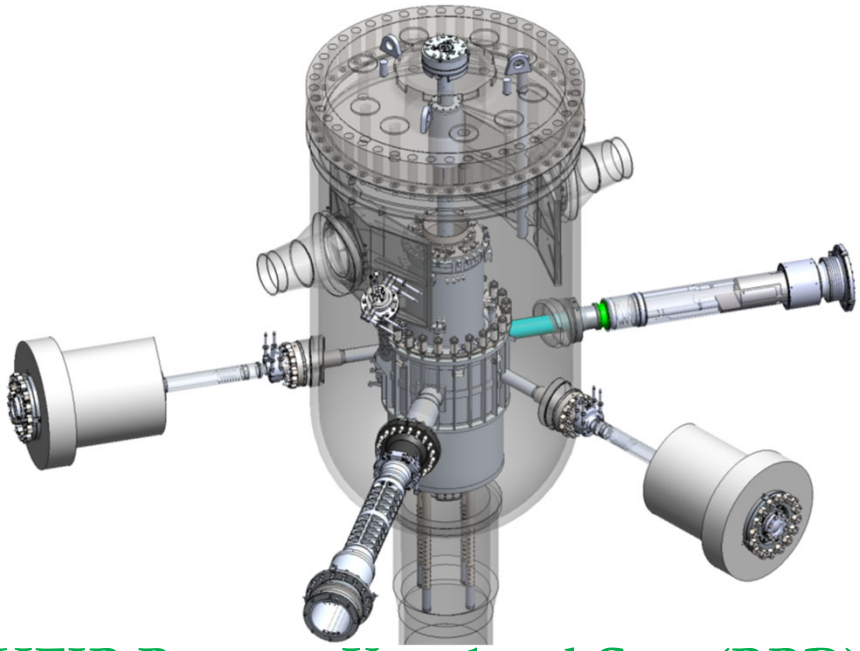


HB-4:
Cold Neutron Instruments in Guide Hall

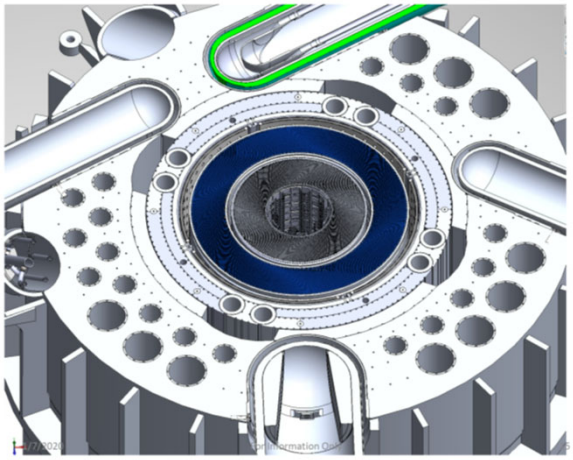
HB-2 – radial beam tube in a Beryllium reflected reactor
+ very high thermal flux
- very high fast flux
➔ ***Use a cooled Sapphire filter***
Supports 4 beamlines, including HB-2D Polarization Development

HFIR is light water moderated and beryllium reflected, with HEU fuel





HFIR Pressure Vessel and Core (RRD)



High Flux Isotope Reactor (HFIR) USER GUIDE
A guide to in-vessel irradiations and experiments

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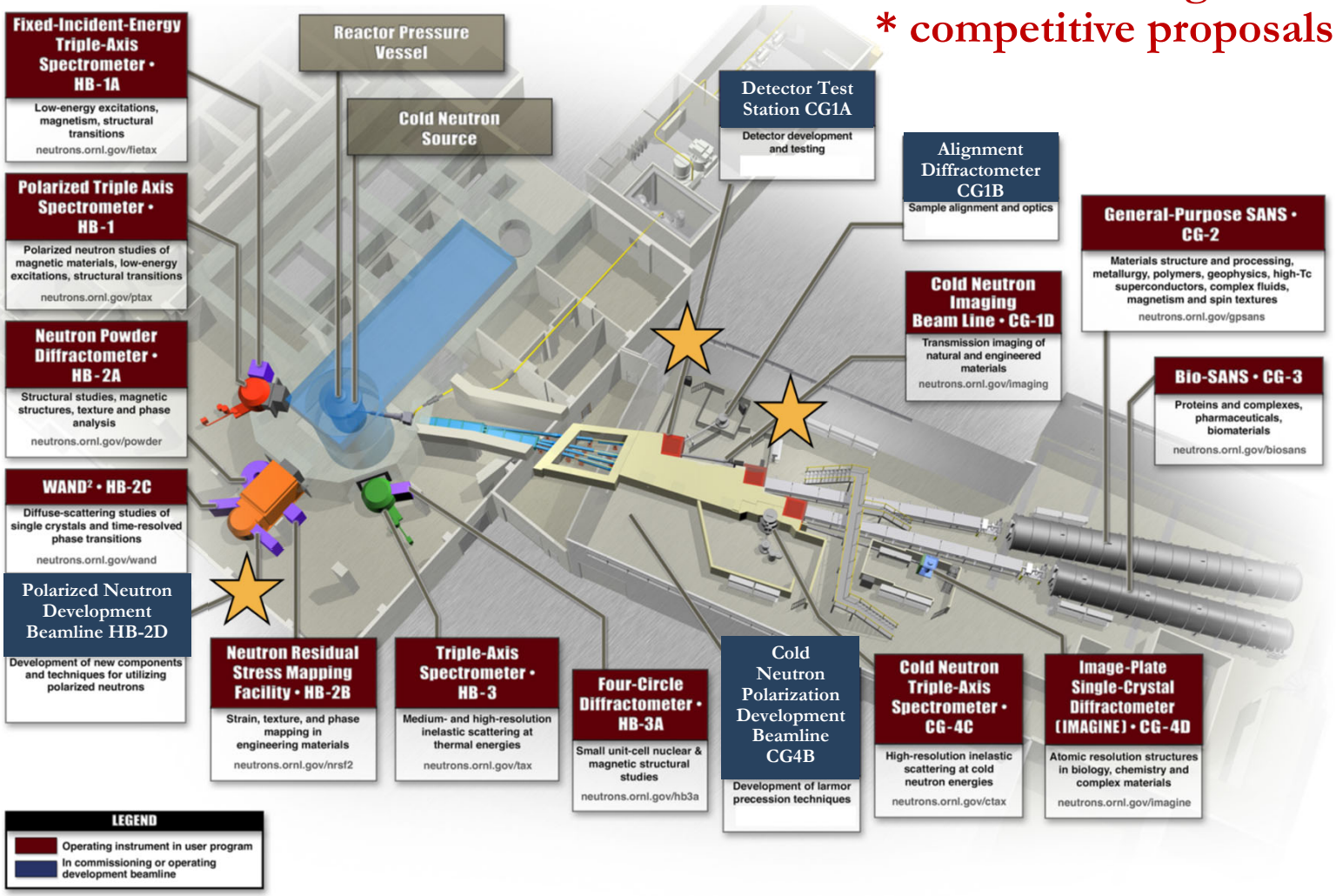
HFIR Thermal and Cold Beamlines

12 User Instruments run by Neutron Scattering Division
*** competitive proposals**

4 Development Instruments NTD/NSD



Possible Electron Measurement Locations

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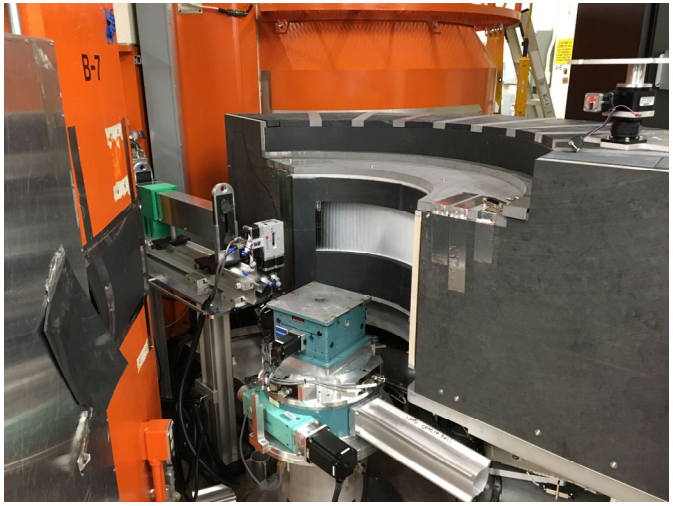
Views of HFIR Instruments

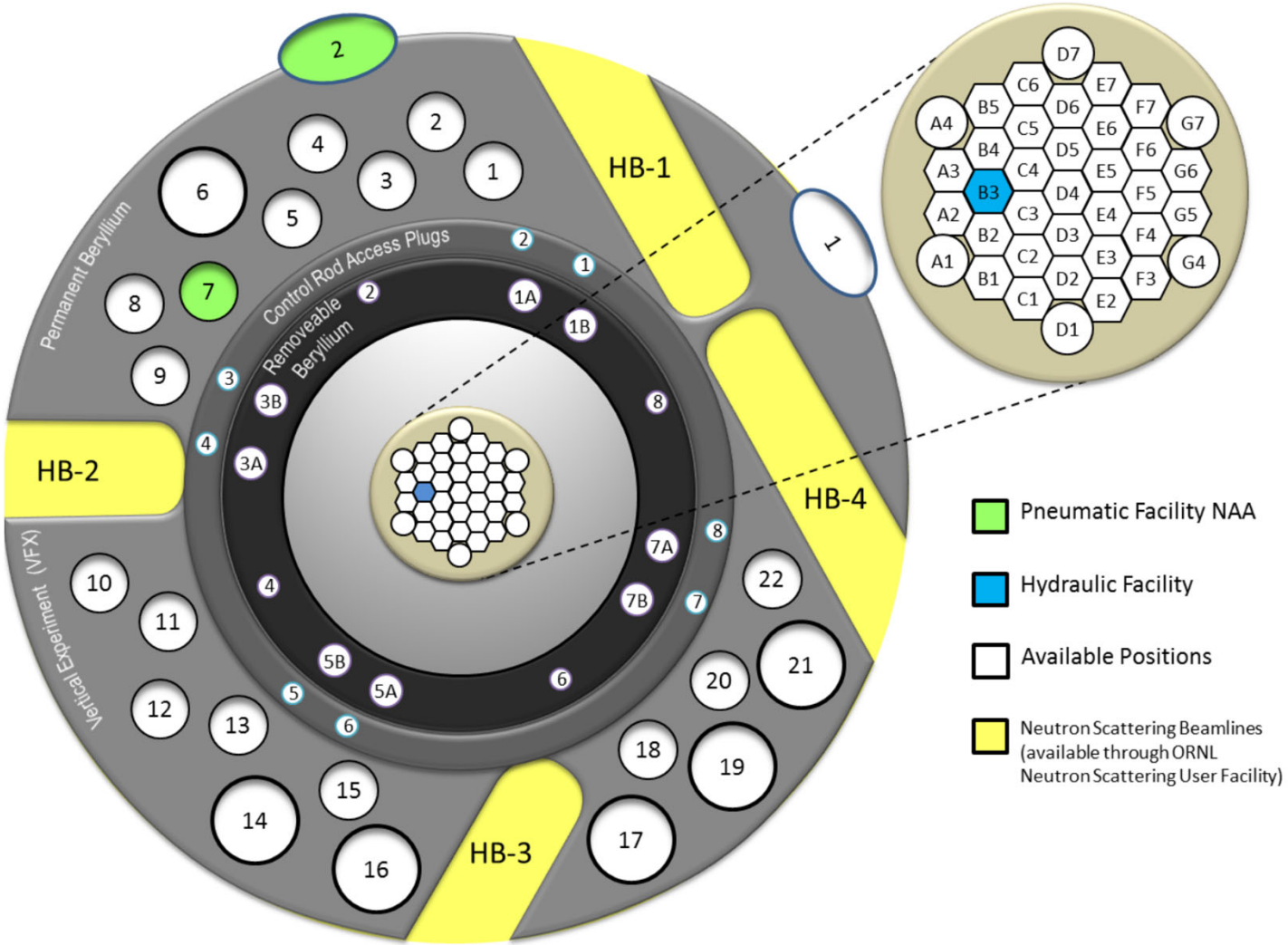


Other HFIR Missions

- Transuranic Isotope Production (HFIR's original mission)
  - Primary World Source for 252Cf, a spontaneous fission neutron source
  - Production of 238Pu for Radioisotope Thermal Generators for NASA
  - Production of other transuranics – Berkelium for Tennessine Discovery
  - Other isotope production
- Neutron Activation Analysis – Forensic Studies
- Materials Irradiation to support Nuclear Power and other applications
  - Fast and Thermal Neutron Positions
  - Gamma Irradiation Capability
- HFIR is also a Neutrino Source – Prospect Collaboration

HFIR Irradiation Positions

- Fixed Positions in beryllium reflector
- Fixed Positions in the Flux Trap
- Hydraulic Rabbit short Flux Trap irradiations
- Pneumatic Rabbit systems for Neutron Activation Analysis



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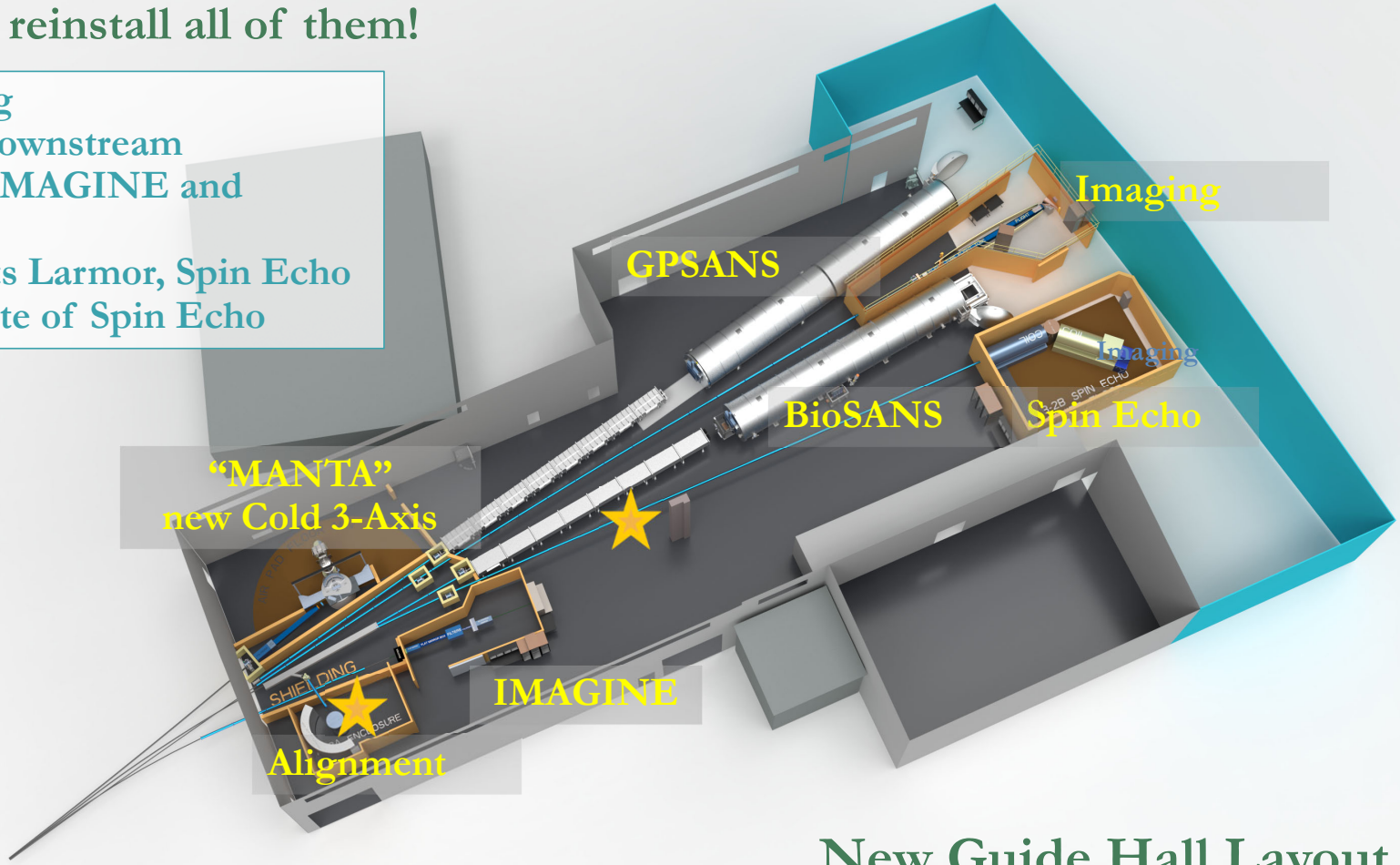
HFIR Beryllium Reflector Replacement ~2024-2025

In about 2024, all HFIR instruments come out, and we have to reinstall all of them!

- Extend the building
- Move both SANS downstream
- New locations for IMAGINE and Imaging
- New guide supports Larmor, Spin Echo
- Alignment is satellite of Spin Echo



New Guide Hall Layout

Cold Guide System will be reconfigured, user instruments will be replaced or renovated