Status of the High Flux Isotope Reactor and the Reactor Scientific Upgrades Program

Douglas Selby

March 13, 2007

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

HFIR history (1)

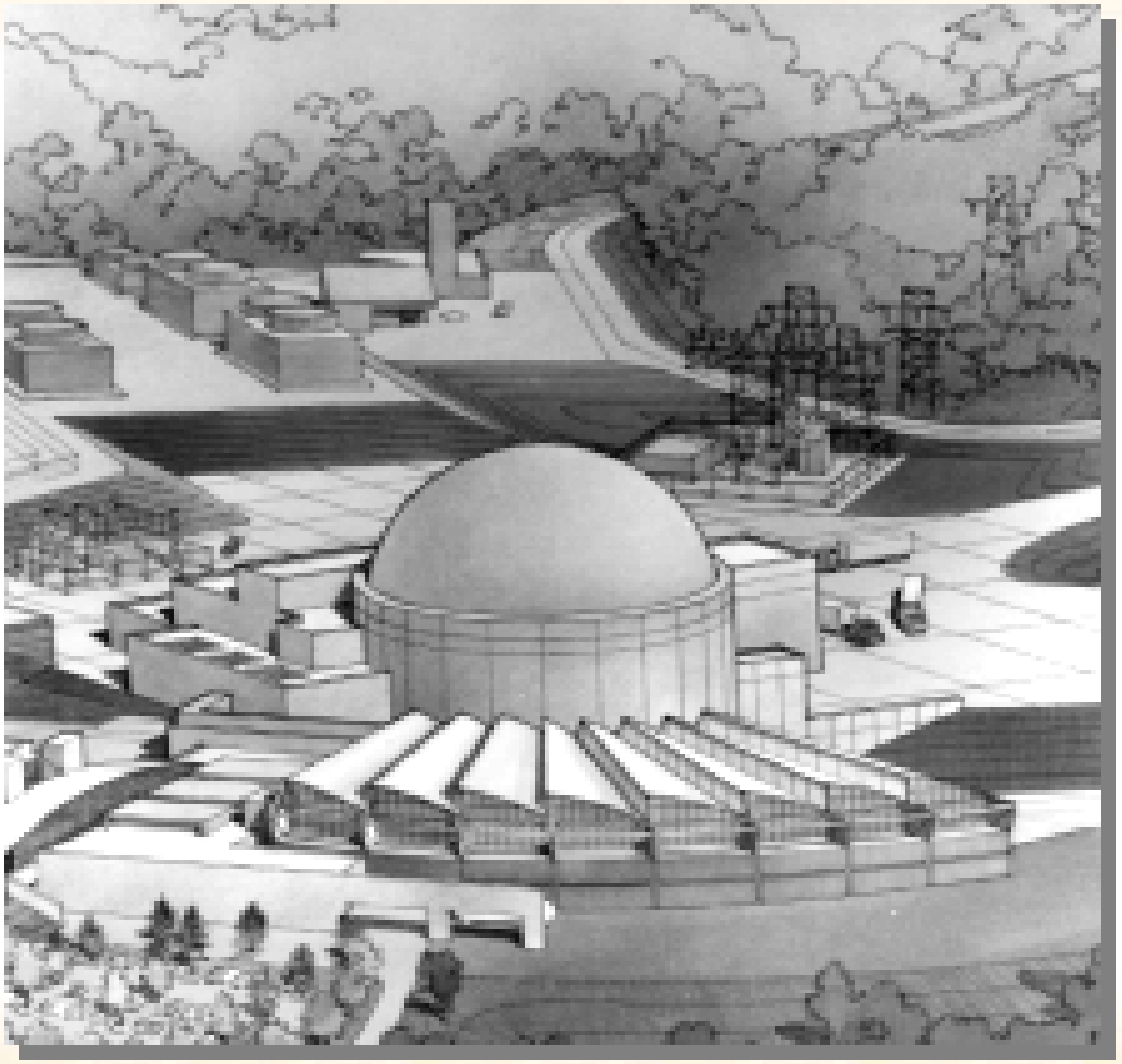
- **The US AEC made a recommendation to build a high flux research reactor at ORNL in November of 1958**
- **HFIR Construction began in June of 1961**
- **Initial reactor criticality was achieved in August of 1965**

HFIR history (2)

- **100th fuel cycle was completed in December of 1973**
- **In November of 1986 the reactor was shutdown to address a pressure vessel embrittlement issue**
- **Reactor was restarted in May of 1990 with a lower operating pressure and a 15% reduction in the full power level**

HFIR history (3)

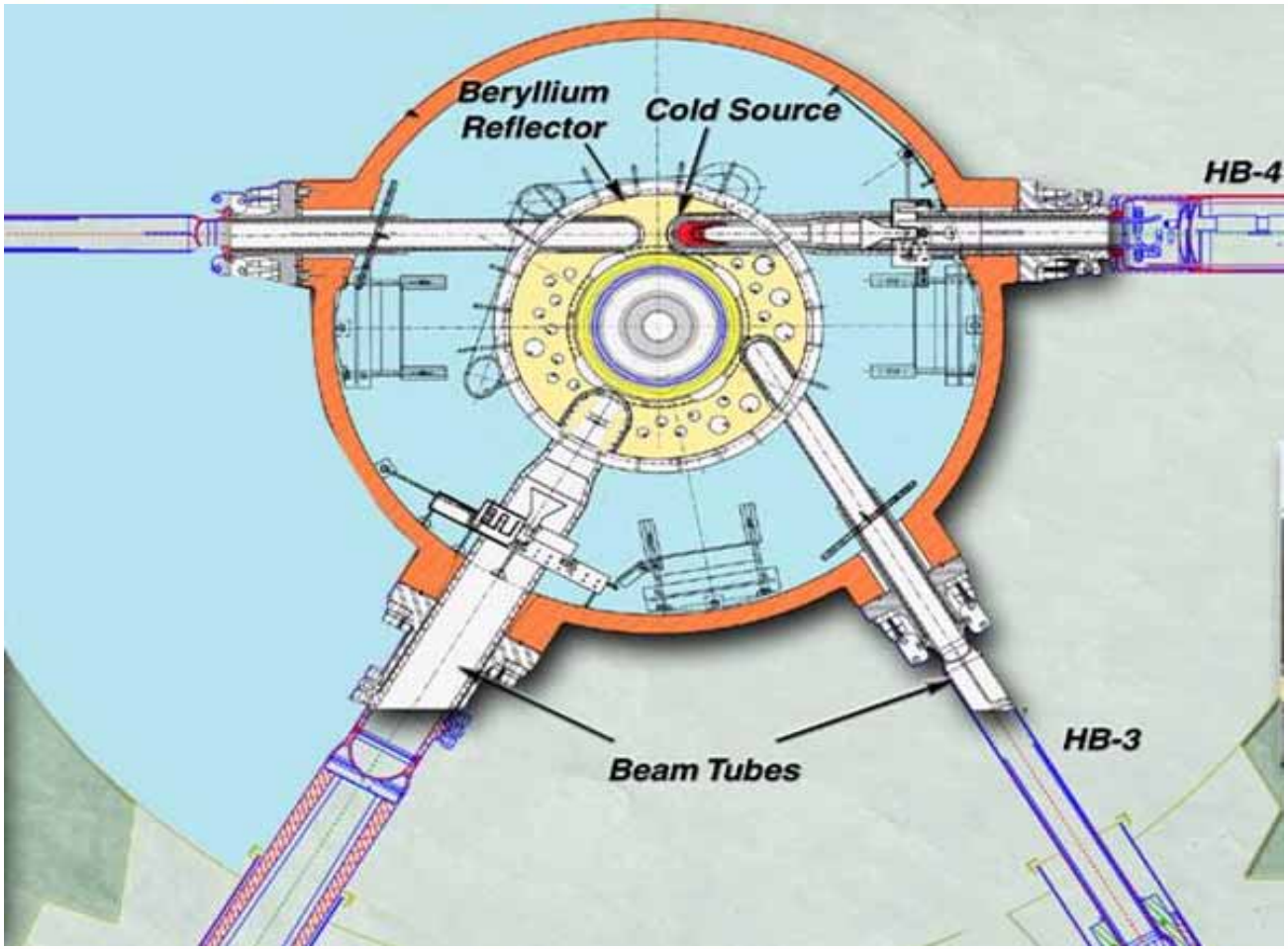
- **In the late 1980s a proposal was made to replace the HFIR with a new 300 MW Reactor (the Advanced Neutron Source)**
- **Project was eventually canceled due to cost and issues associated with the use of high enriched fuel and was replaced with the Spallation Neutron Source project**



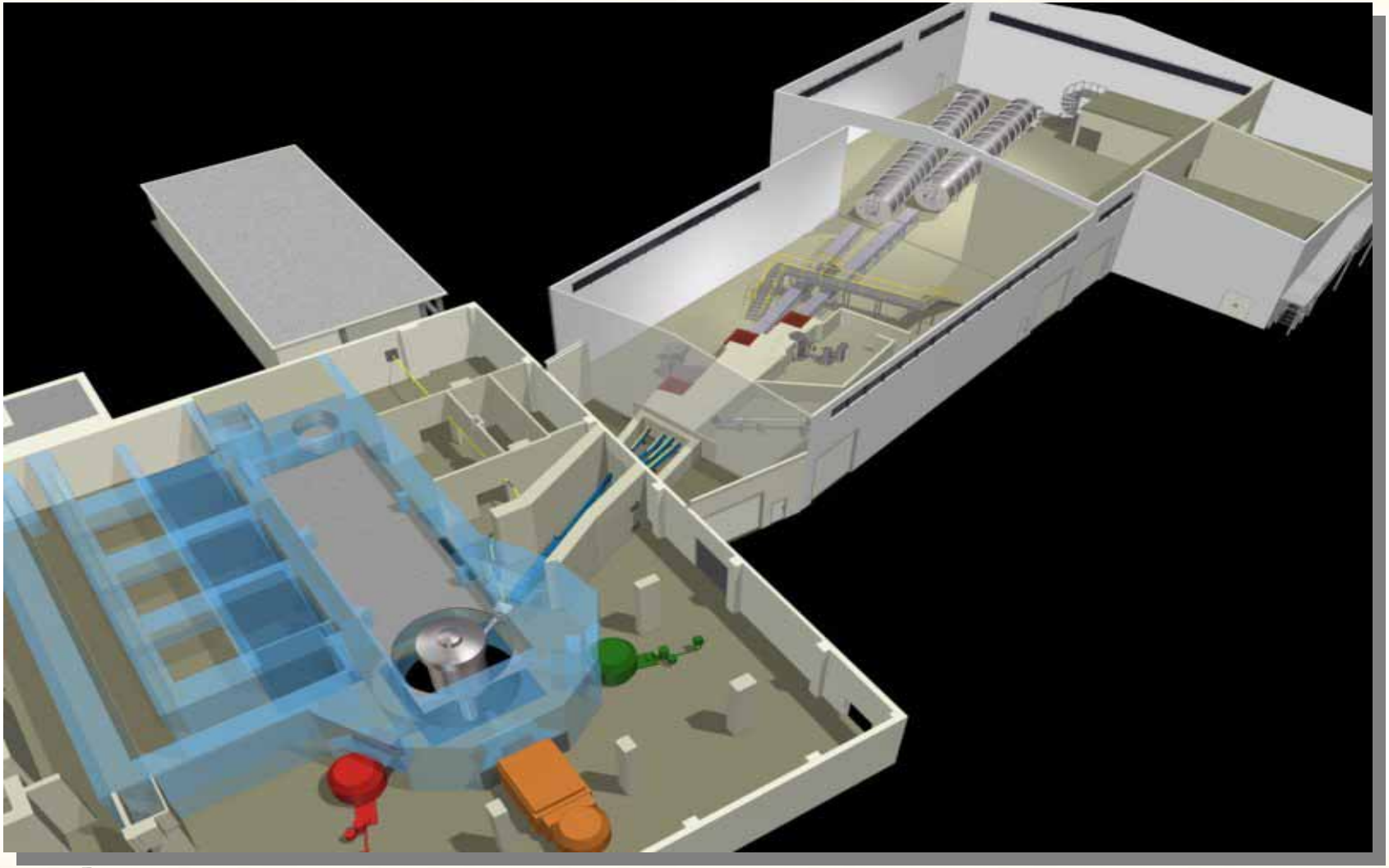
HFIR history (4)

- **HFIR scientific upgrades program was initiated in 1998 to increase the neutron scattering science capabilities**
- **400th HFIR fuel cycle was completed in May of 2004**
- **HFIR was shutdown January 2006 for the cold source installation**

HFIR includes 4 beam tubes and a number of irradiation and isotope production positions

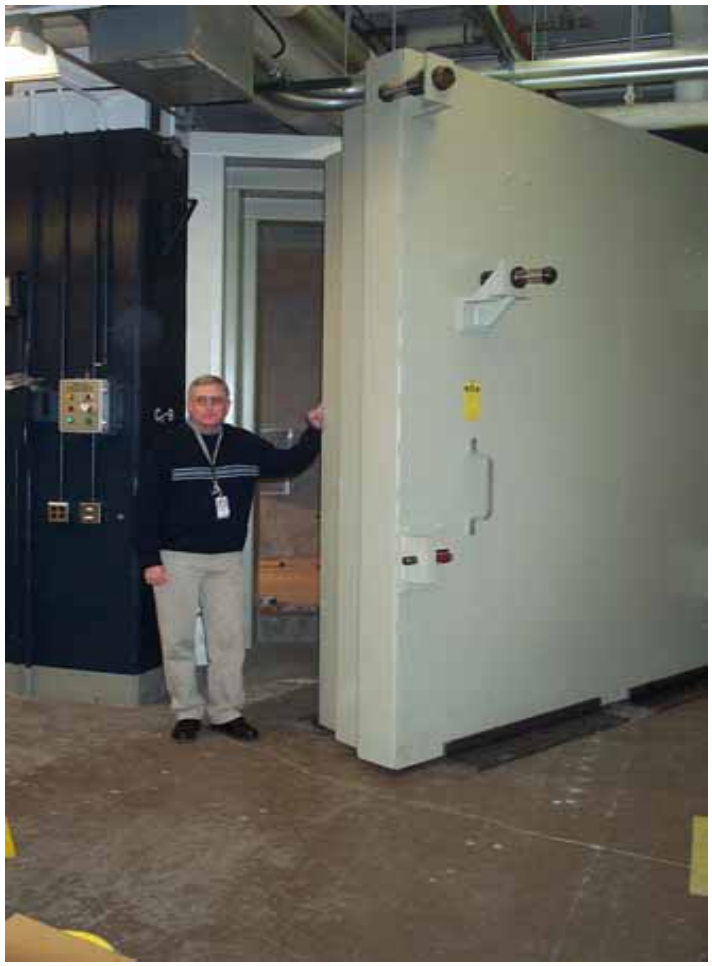


New HFIR Look Following Upgrades



Shielding in Beam Room is Complete

- **Shield walls in the beam room are approximately 81 cm of high density hematite concrete**
- **The nearly 30,000 Kg door to the shield tunnel is installed and can be opened or closed by a single person.**



HB-4 Guidehall, December 2006

Guidehall Shield Tunnel, January 2007

The 7 Year Scientific Upgrades Plan is Nearing Completion

- **Planned Upgrades at HB-1, 2, and 3 are completed.**
- **Reactor Startup with operating cold source at HB-4 is scheduled for April of this year.**
- **HB-4 guides and their shielding have been installed.**
- **SANS instruments are ready for beam and commissioning with beam should be completed by the end of the summer**

Additional upgrades to the HFIR scientific facilities are being proposed

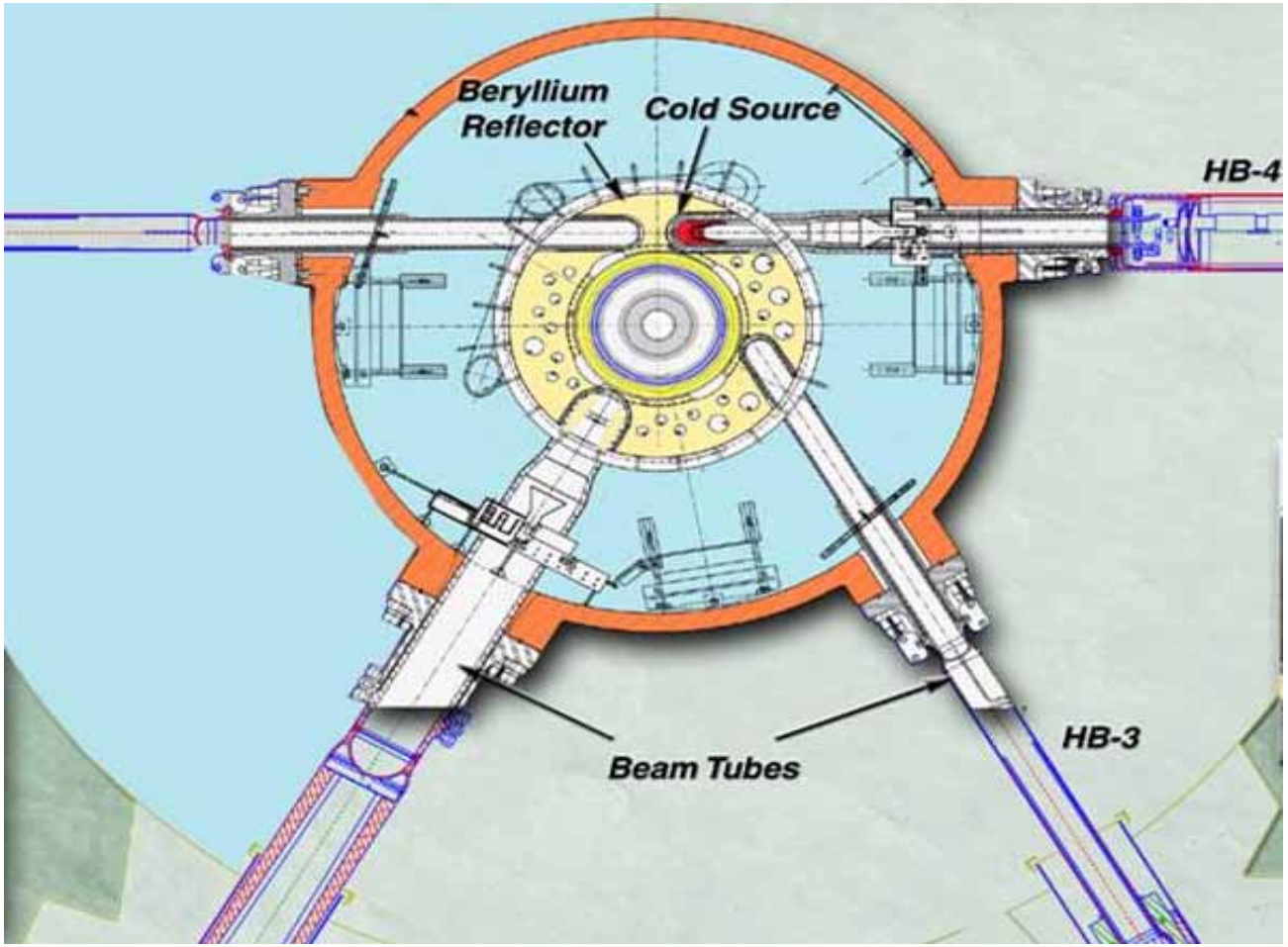
- **The success or failure of the new cold source and its associated instruments and beam lines will be a major contributor to our ability to obtain funding for these additional upgrades**

Concept of new user facility and entrance way at HFIR

Proposal has been made to DOE to build a second cold source at the HB-2 beam tube and a second Guidehall

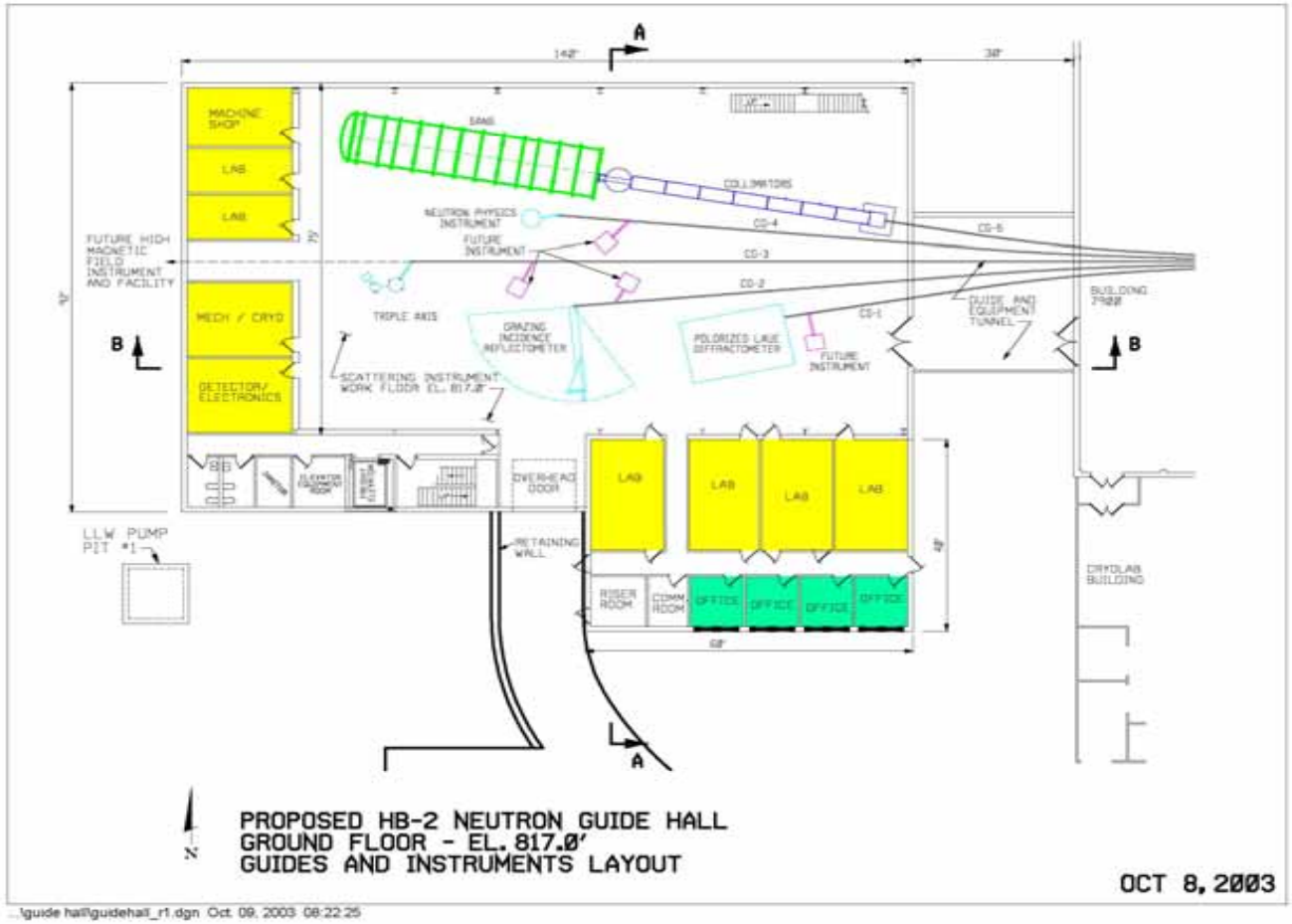
- **If approved, project might start as early as 2013**
- **Cold source at HB-2 could support 5 guides and up to 10 instruments**

HFIR includes 4 beam tubes and a number of irradiation and isotope production positions



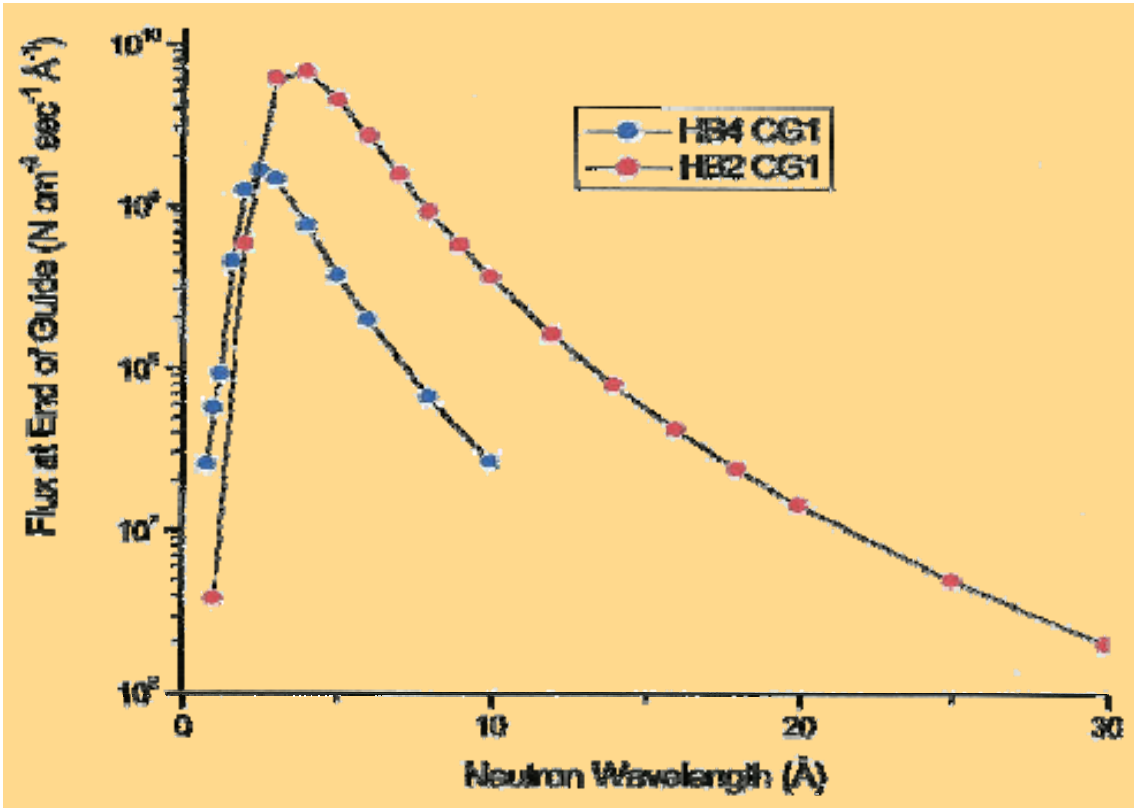
Concept of future project Of HB-2 guidehall

Lower Ground Floor of HB-2 Neutron Guide Hall



Guide system could provide even more enhancement to the beams

- **With five supermirror guides starting 2.5 m from the cold source Neutron flux at the end of the guides the performance of an HB-2 cold source could be significantly better than the HB-4 cold source.**



The outlook for the future of HFIR is positive

- **Seven thermal instruments presently operating or being commissioned and seven cold instruments on the way.**
- **Next major outage not necessary until 2021 for beryllium reflector change out**
- **Pressure vessel good at least until 2040**
- **Additional site, reactor, and scientific facility upgrades identified as part of a new 10 year plan**