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

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High Flux Isotope Reactor (HFIR) Status

• In July 2005, the HFIR’s 406th operating fuel cycle was completed.

• Following this cycle the reactor was shutdown for a long outage in preparation for the installation of the new cold source.

• The reactor is expected to resume operation at 85 MW in December.

• However, a normal schedule of operating cycles is not expected to occur until fall of 2006.
History of the HFIR Scientific Upgrades Program

• The HFIR Scientific Upgrades Program was initiated in the mid 1990’s following the cancellation of the Advanced Neutron Source Project when money was supplied to develop a cold source concept.

• Plans for improvement in performance at all four beam lines were developed.
Planned Scientific Upgrades at HB-1 are Completed

• A new larger beam tube was installed.

• New monochromator drum was designed, fabricated, and installed to accommodate the larger neutron beam.

• HB-1 Triple Axis Spec. is operating as part of the user program with a factor of ~ 2-3 improvement in signal.
Extensive Changes Were Made to the HB-2 Capabilities (1)

- Size of HB-2 beam tube was increased and a beryllium insert was designed to increase the neutron beam brightness.

- A shield tunnel at HB-2 was designed and fabricated to bring the HB-2 beam out into the beam room where it could be accessed by four instrument ports.
Extensive Changes Were Made to the HB-2 Capabilities (2)

• Activities also included the installation of a neutron guide to support the portion of the beam feeding the HB-2D location at the end of the tunnel.
Fully Assembled Shield Tunnel at HB-2
New HB-2 Layout
Residual Stress Instrument At HB-2B
Reflectometer (MIRROR) at the HB-2D Beam Line
SNS Detector Test Station at the HB-2D Beam Line

- SNS test station uses the top 1 cm of the HB-2D beam.

- Flux is about $10^5$ with nominal neutron wavelength of 4.25 Å (4.5 meV).
HB-2C is the Home for the WAND Instrument Which is Presently in the Commissioning Phase
Scientific Upgrades at HB-3 Should be Completed This Calendar Year

• New larger beam tube has been installed.

• New monochromator drum has been installed to accommodate the larger neutron beam.

• The HB-3 Triple Axis Spectrometer is operating as part of the user program with a factor of 3-4 improvement in flux.
**Estimated/Measured Performance Gain Factors for Instruments at HB-1, 2, and 3 (1)**

<table>
<thead>
<tr>
<th>Beam Line</th>
<th>Instrument</th>
<th>Estimated Performance Improvement Factor</th>
<th>Measured Performance Improvement Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB-1</td>
<td>Triple Axis</td>
<td>2.5</td>
<td>2 to 3</td>
</tr>
<tr>
<td>HB-1A</td>
<td>Double Crystal Triple Axis</td>
<td>2.5</td>
<td>2 to 3</td>
</tr>
<tr>
<td>HB-2A</td>
<td>Powder Diffractometer</td>
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<tr>
<td>HB-2B</td>
<td>Residual Stress</td>
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<td>8 to 10</td>
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</table>
## Estimated/Measured Performance Gain Factors for Instruments at HB-1, 2, and 3 (2)

<table>
<thead>
<tr>
<th>Beam Line</th>
<th>Instrument</th>
<th>Estimated Performance Improvement Factor</th>
<th>Measured Performance Improvement Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB-2C</td>
<td>WAND</td>
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<tr>
<td>HB-2D</td>
<td>Triple Axis</td>
<td>3.5</td>
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</tr>
<tr>
<td>HB-3</td>
<td>Triple Axis</td>
<td>2</td>
<td>3 to 4</td>
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<tr>
<td>HB-3A</td>
<td>Four-Circle Diffractometer</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
HB-4 Layout
Pour-In-Place Portion of the Shield Tunnel has been Completed

- Pour-in-place shield tunnel in beam room was a massive undertaking, but it is now completed with the exception of the door installation.
Neutron Guide System Has Been Delivered and Installation is Underway (1)

- Guide installation began in January of this year
- The common casings have been installed and CG-1, 2 and 3 have been installed in the first common casing.
Neutron Guide System Has Been Delivered and Installation is Underway (2)

- At this time CG-1 and CG-2 have been installed through the Guidehall.

- Guide installation should be completed by the end of the calendar year.
Construction of the HB-4 Guidehall Buildings Was Completed in 2003
Design of Portable Shield Sections for the Guidehall Is Underway
SANS-1 and SANS-2 Flight Tubes Have Been Delivered
Guidehall is Starting to Look Like a Guidehall