

Cryogenics at Jefferson Lab

- **Continuous operations of three cryogenic plants and unique technology transfer capabilities/activities:**
 - Plants operate at 2K and 4K with high availability (>99%)
 - Highly experienced staff continuously optimizes plant operations to support JLab programs
 - Lower manpower (~60%), lower utilities (~80%), and less major maintenance (~60%) than comparable helium plants in the US utilizing technologies developed at Jlab (patent pending)
 - Extensive industrial & lab experience staff (CTI, KOCH, Kennedy Space Center, Fermi, SSCL, ...) and systems provided to (Jlab, Fermi, BNL, LBL, LANL, ORNL, ARNL, SLAC..., and Industry ...) provides in house technology base and basis for technology transfer to other labs.
 - Continued on-going system improvement consultations, design and fabrication activities for: SNS, BNL/RHIC, Fermi, MSU and Linde Industries.

Cryogenics Successes in FY06

- **Construction Phase III of "RHIC Power Usage Reduction Program" approved by BNL based on JLab FY05 Phase III Study**
 - Earlier Phases I & II saved 2 MW of 9.2 MW of operational power
 - Phase III Study targeted additional 1.9 MW. Partial FY06 construction already saving 1.1 MW. 4Q FY06 actual savings will ~ 2.2 MW
 - Full program operating power savings ~\$365K/month
 - BNL reports improved system stability, greater reliability, reduced maintenance and improved beam quality as result of modifications

<http://www-conf.slac.stanford.edu/cryo2006/Default.htm>
- **FY06 JLab CHL Power Savings (1994 2.1K Helium Refrigerator)**
 - In house Technology capabilities helped to reduce input power by 1 MW, 6.5MW to 5.5 MW (Former Savings) from the manufactures design basis
 - Technology gained from performing engineering collaboration work for others, additional power reduction to 4.5MW from 5.5 MW in FY06 and increased reliability (99.7%) first 6 months of FY06 compared to FY05 (99.25%)

Cryogenics Successes in FY06 (cont.)

- **JLab Cryogenic Helium Refrigeration Cycle Patent**
 - Commercial license negotiation underway with Linde
- **External Commercial (Air Products) Evaluation of JLab Cryogenics**
 - Report to JLab/SURA Director highly complementary of cryogenic management and technical base
 - Expressed interest in JLab/AP technology exchange agreement
- **Provided “Design of Optimal Helium Refrigeration and Liquefaction Systems” Engineering Technical Course for Commercial Helium Plant Suppliers and End Users**
 - Presented at the 2005 Cryogenic Engineering Conference, <http://www.cec-icmc.org/shortcourses.asp>
- JLab Patent Disclosure: “Multi-Pass Heat Exchangers for Liquid Nitrogen Pre-cooling in Helium Refrigerators”, an increase over current commercial technology efficiency.