

# NSCL

National user facility for rare isotope research and education in nuclear science, astro-nuclear physics, accelerator physics, and societal applications

## Important recent developments:

- Dec. 11, 2008: DOE selects MSU to establish FRIB, the Facility for Rare Isotope Beams (FRIB)
- May 7, 2009: Roll-out of NSCL/FRIB Reorganization
- June 10, 2009: DOE and MSU sign corresponding cooperative agreement

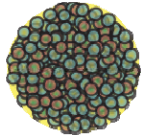
*Formation of FRIB-JOG (Joint Oversight Group DOE and NSF)*



National Science Foundation  
Michigan State University

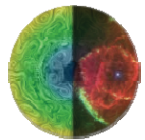
# NSCL Science Thrust is Aligned with FRIB

Endorsed by NSAC and NRC



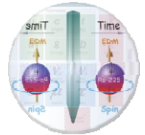
## Properties of nucleonic matter

- Classical domain of nuclear science
- Many-body quantum problem: intellectual overlap to mesoscopic science – how to understand the world from simple building blocks\*



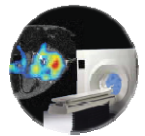
## Nuclear processes in the universe\*\*

- Energy generation in stars, (explosive) nucleo-synthesis
- Properties of neutron stars, EOS of asymmetric nuclear matter



## Tests of fundamental symmetries\*\*\*

- Effects of symmetry violations are amplified in certain nuclei



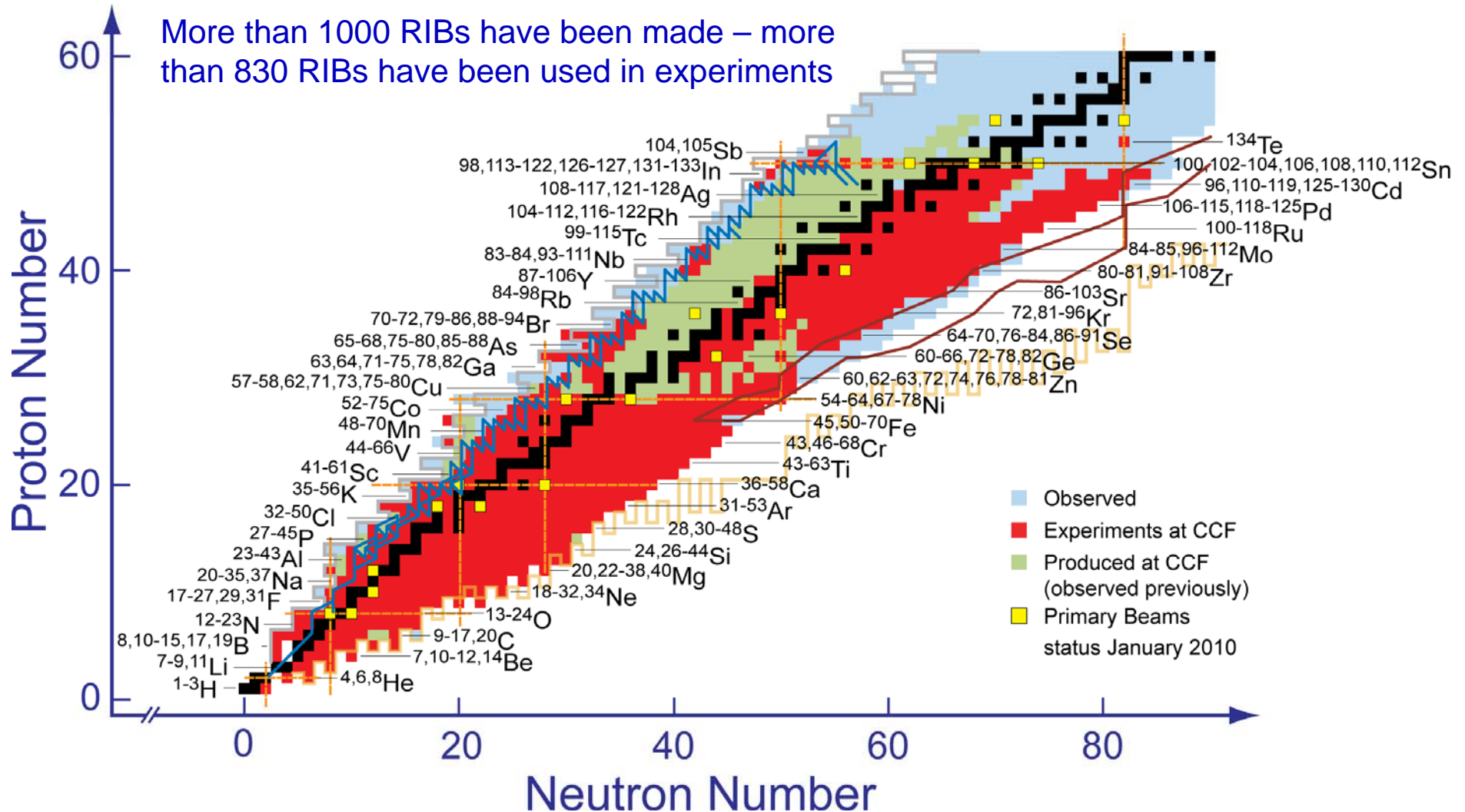
## Societal applications and benefits\*\*\*\*

- Bio-medicine, energy, material sciences, national security

- \* Mesoscopic Theory Center at MSU
- \*\* JINA (Joint Institute for Nuclear Astrophysics)
- \*\*\* New initiative (Oscar Naviliat, UMich, ...)
- \*\*\*\* Member of USPAS (U.S. Particle Accelerator School)

# Exotic Beams Produced at NSCL

92% facility availability in 2009



Research program requires large number of beam tunes and, hence, reliable and predictable operations



# Satisfying the Needs of the User Community

User group of over 700 registered users

- Demand exceeds beam time available by factor of two

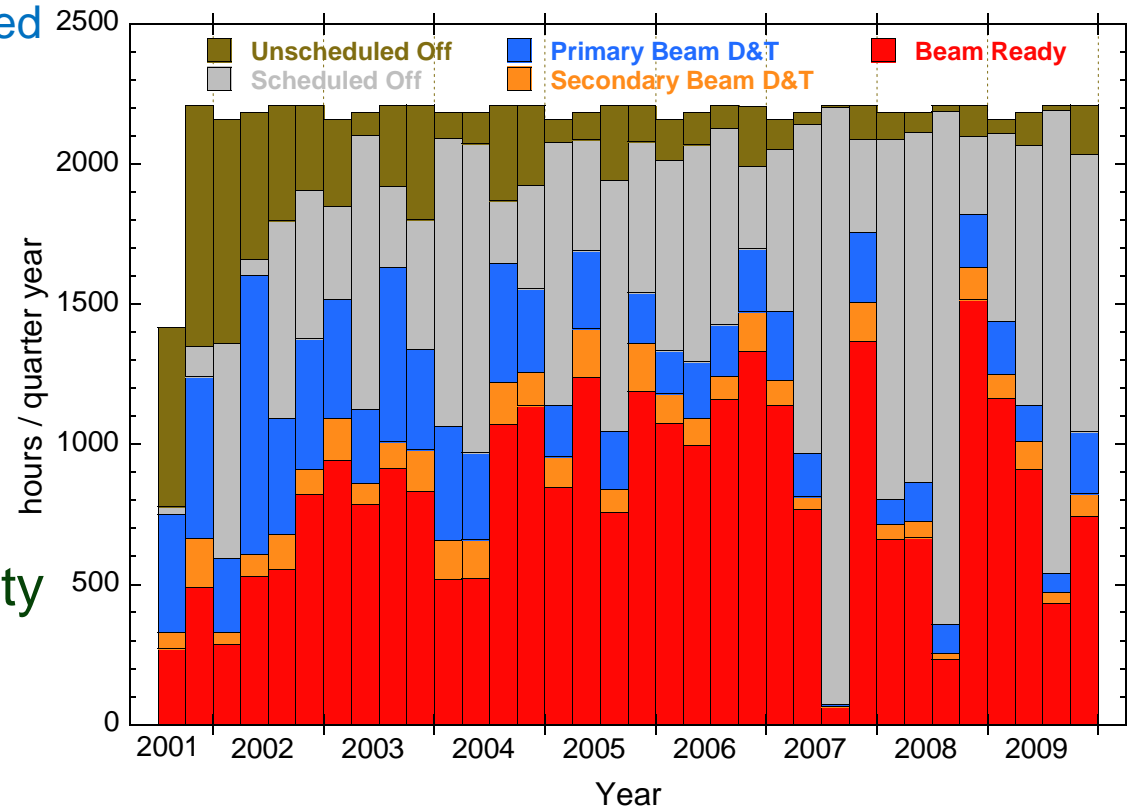
- Quality of proposals is very high
- Commitment by NSCL to schedule approved experiments
  - » Experiments must pass readiness review
  - » Approval expires after 2+1 years
- Amount of beam time is funding limited ~4,100 hrs in FY-2010

- Strong user interest in reaccelerated beams from ReA3

- 25 letters of intent for ReA3-based programs
- MSU leverages funds towards early science with ReA3 (required change of scope of NSF-NSCL CA)

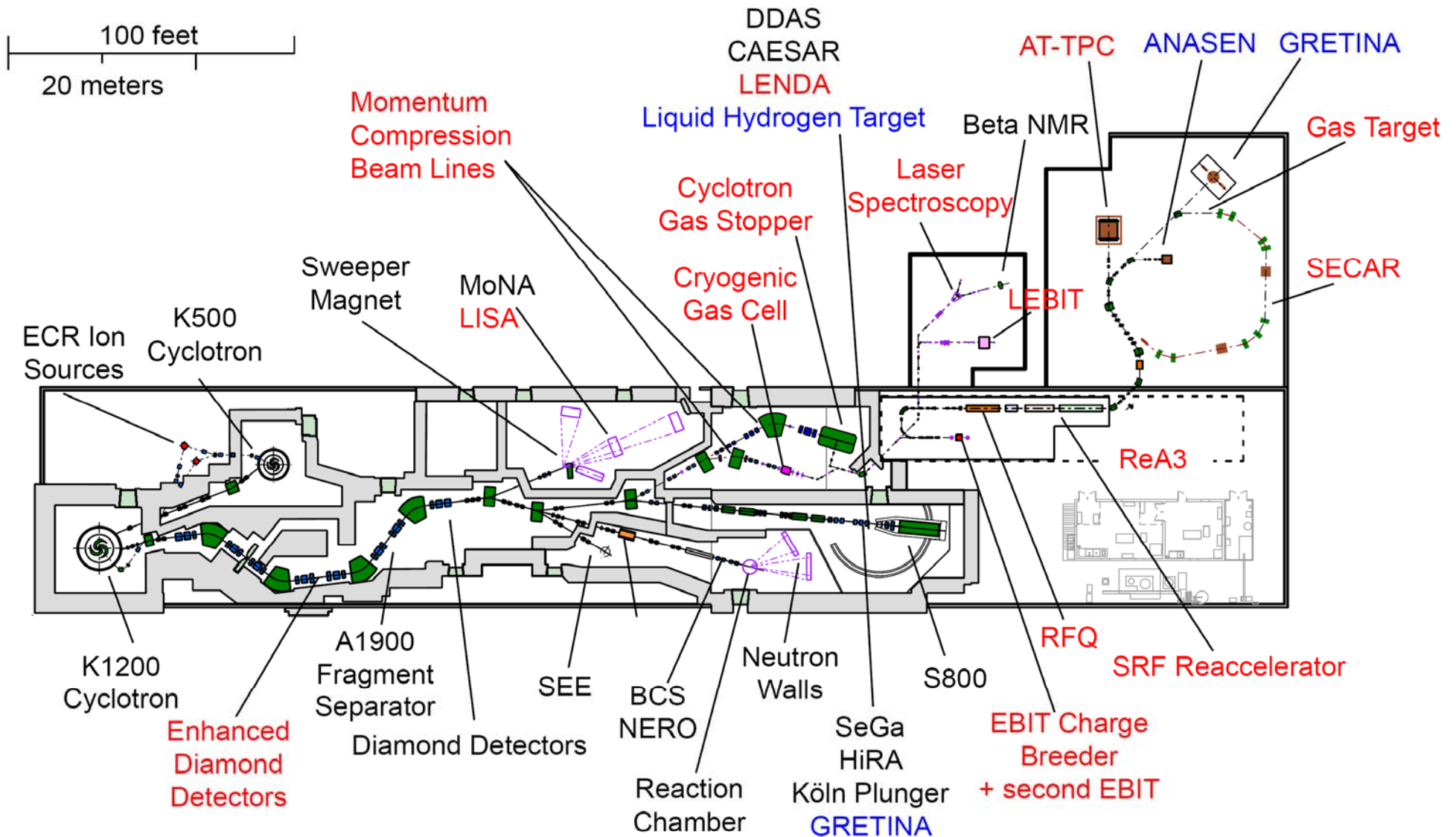
- Strong user interest in high-quality RIBs above Coulomb barrier

- Can be satisfied by early energy upgrade of ReA3



# NSCL's Pre-FRIB Facility Plan

Unique in the world: fast, stopped and reaccelerated rare isotope beams

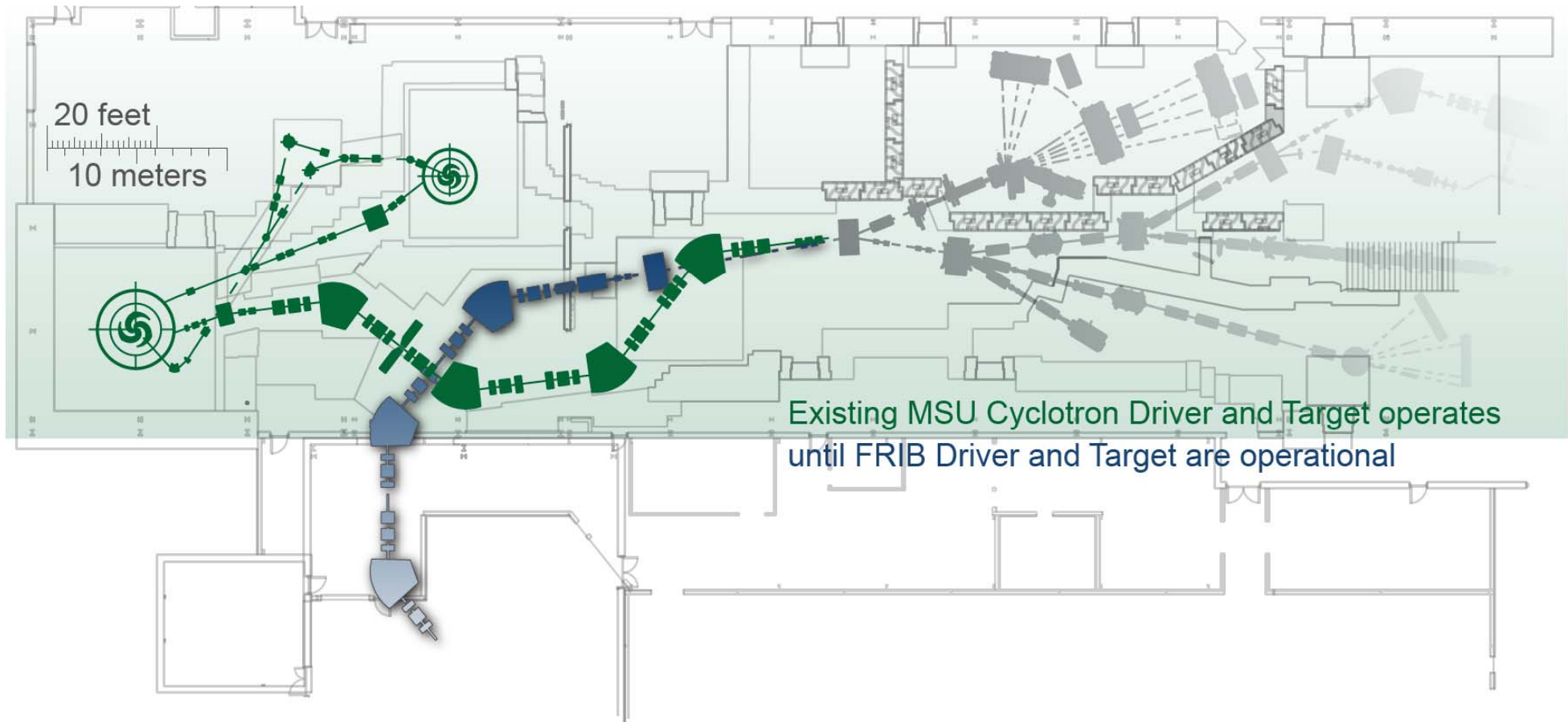


National Science Foundation  
Michigan State University

Equipment will be available for experiments with FRIB

# Transition from NSCL to FRIB Operations

- Minimal perturbation of the experimental area when transitioning from CCF to FRIB operations



# Planned User Operations for FY-10

- At the NSB approved funding level (\$21 M) NSCL is expected to operate for approximately 4,100 hrs
  - In 2006 the NSF operations review committee suggested that reprioritization of various proposed activities and additional efficiency gains should, over time, allow NSCL to increase CCF operations by an additional 500 hrs without additional funding
  - For FY2010, this efficiency gain is offset by larger than expected inflationary costs primarily in electricity and LHe
- The “operations cost slope” ( $\Delta\text{hours}/\Delta\text{funding}$ ) is approximately 900 hrs/ \$1 M
- All MSU funding resources are leveraged to implement new gas stopping, stopped beams, ReA3, and ReA3 beamlines, new cryo-plant, accommodation of first science campaign of GRETINA
- In addition, new projects are being launched
  - NSF MRI: AT-TPC, cyc-stopper
  - DOE FOA: SECAR, high-intensity EBIT
- Rate of progress on these projects is funding (= technical staff !) limited

# Summary and Outlook

MSU adds substantial value to NSCL and FRIB

- NSCL has undergone a significant internal reorganization into two separately funded units, FRIB and NSCL
  - Reorganization had negligible impact on CCF user operations – availability in 2009 was 92%
  - Newly hired faculty will provide continued science leadership
- MSU has made and continues to make major investments into NSCL that will benefit users
  - Construction of new office tower and experimental area for reaccelerated beams (second office tower under design)
  - Construction of EBIT and superconducting reaccelerator (ReA3)
  - Procurement of new cryoplant
  - New gas stopping area with improved momentum compression beam lines and infrastructure for next generation gas stoppers
  - Beamlines to stopped and reaccelerated beams areas, EBIT, and ReA3
- NSCL site review conducted by NSF (with DOE as an observer) Mar 1-2
- Current CA with NSF expires Sept 30, 2011. Renewal proposal will be written this year and will request funds for operating ReA3.

