# Brookhaven Site Report
# NLIT 2009

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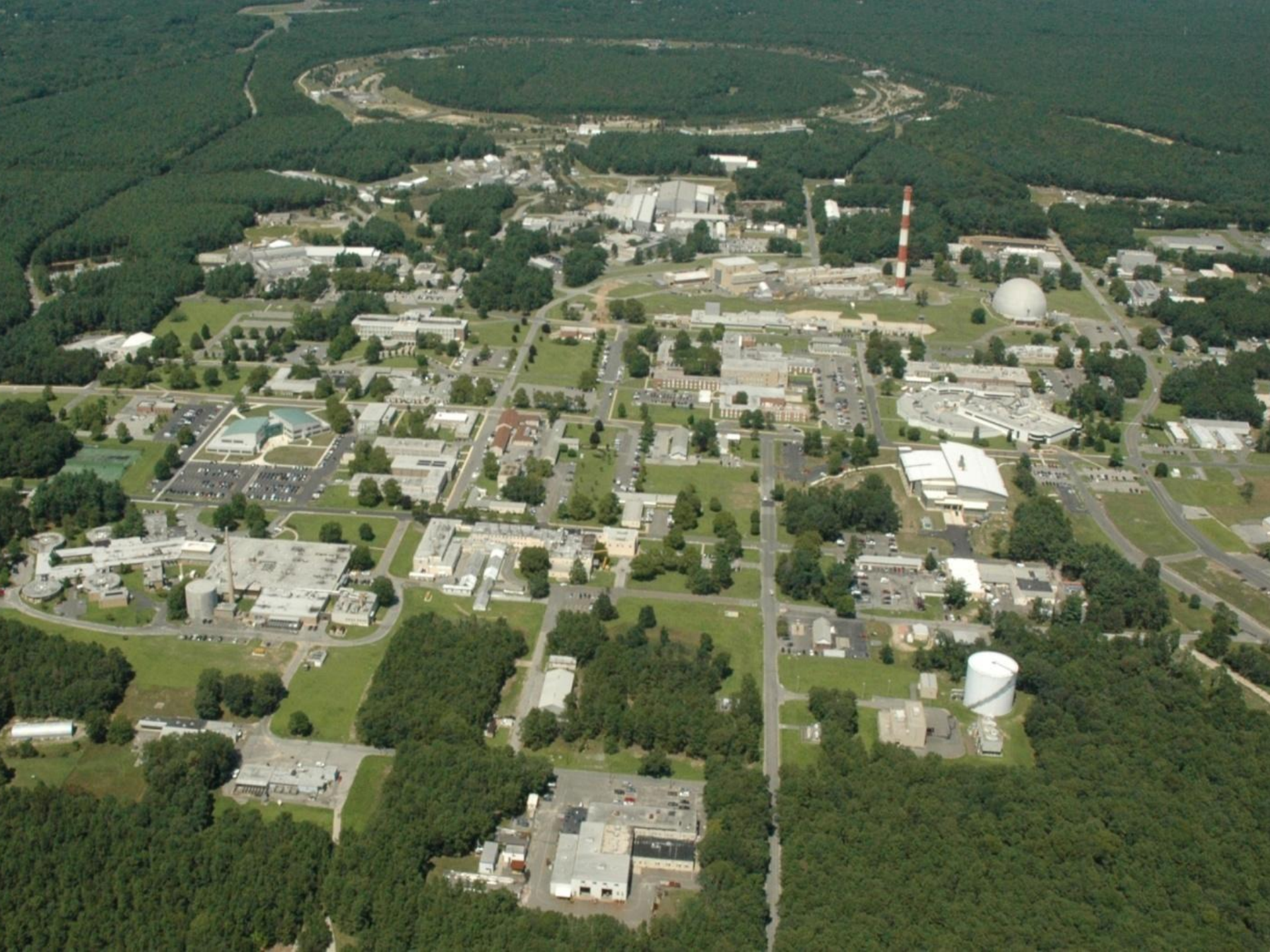
*Director, Information Technology Division*

*June 3, 2009*

BROOKHAVEN NATIONAL LABORATORY

*a passion for discovery*

Office of Science

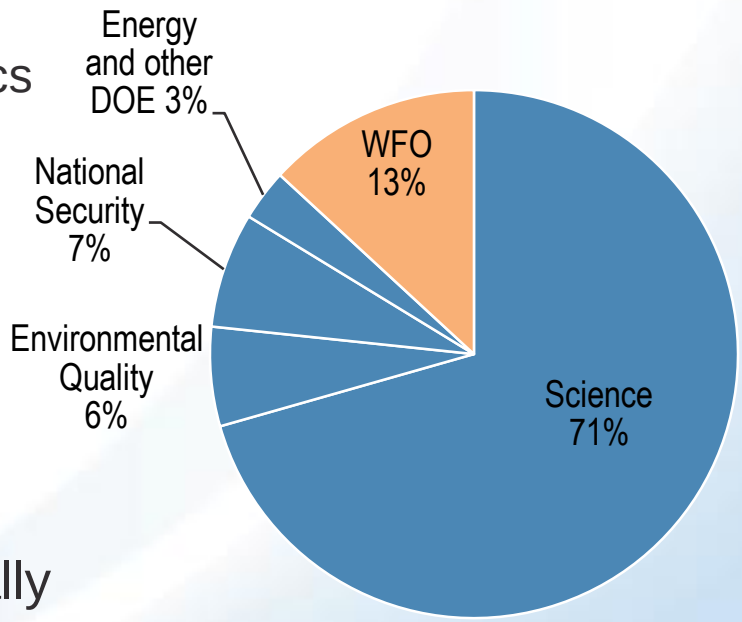


# Brookhaven National Laboratory

**Mission: Perform basic and applied research to explore the fundamental nature of matter and behaviors at the boundary of physical and life sciences**

**Six Nobel Prizes (latest in 2002 and 2003)**

- Key capabilities:
  - Accelerator science and technology
  - High-energy heavy ion and spin physics
  - Basic energy sciences
  - Light sources
  - Environmental sciences
  - Neuroimaging
  - Energy research
- Staff: 2,800 staff
- > 4000 scientific facility users annually
- FY09 revenue: $545M + $226M (ARRA)



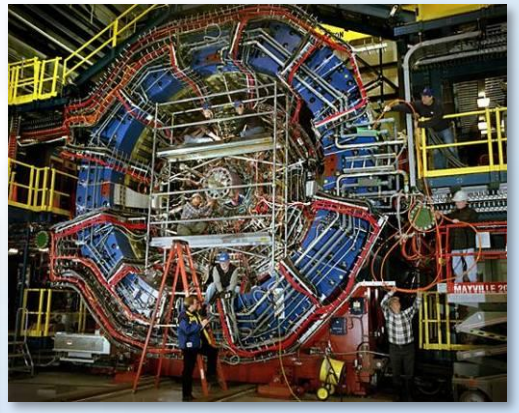
# Major research facilities at Brookhaven

Center for Functional Nanomaterials

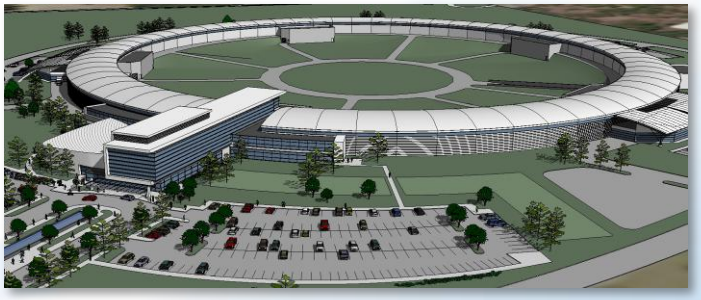

New York Blue
Blue Gene Supercomputer

Relativistic Heavy Ion Collider (RHIC)

National Synchrotron Light Source



STAR detector at RHIC



National Synchrotron Light Source II

# Center for Functional Nanomaterials

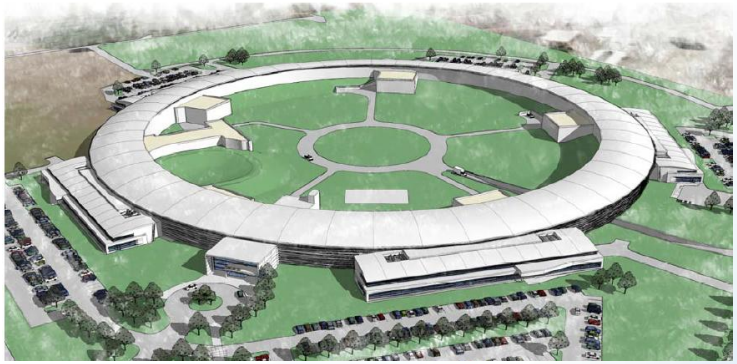
- Used to develop and understand nanoscale materials for energy applications
- Will play key role in processes and devices that are energy- efficient or alternatives to fossil fuels
- Leadership in Energy and Environmental Design (LEED) silver rating by U.S. Green Building Council

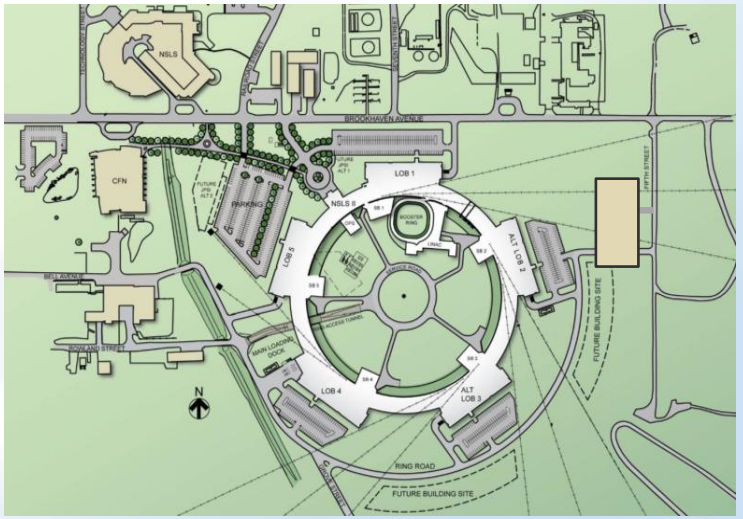
# National Synchrotron Light Source

- Attracts 2,100 users each year from over 400 national and international institutions
- Studies range from analyzing chemical composition of bones, which may aid in understanding arthritis and osteoporosis, to probing crystal structure of new materials that may lead to advanced electronic devices

# NSLS-II: Enable the Nanoscience Revolution

- NSLS-II will be brightest x-ray source in the world
  - 10,000 brighter than NSLS
  - 1 nm spatial resolution
  - 0.1 meV energy resolution
  - Synergy with the CFN
    - Dynamical characterization of new materials, reactions, processes
- Construction on $912-million project started in 2009
  - Full operations in FY2015
    - Comparable in scope to RHIC operations
- NYS allocating 15 MW of hydropower to BNL to support NSLS-II





# New York Center for Computational Sciences New York Blue

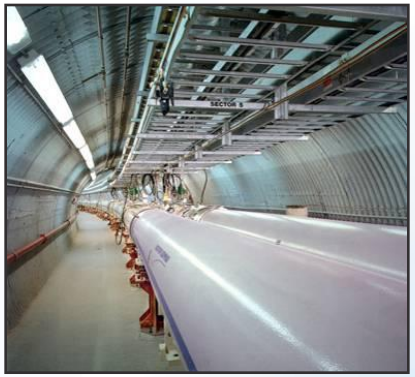
- 100 TF system
  18 racks of IBM Blue Gene/L system, 2 racks BG/P
- Supported by $26-million allocation from NYS
- Fostering scientific collaborations throughout the northeast and nation for research ranging from computational biology to climate science

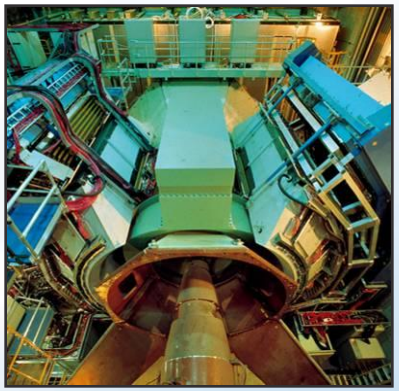
# BP Solar to provide 38 MW PV solar energy at BNL

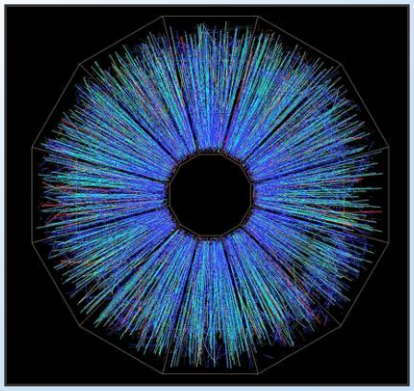
- Funded by New York to meet its goals to triple the state's solar energy production
- Two large-scale commercial solar PV, each sized at just over 18 MW, making BNL home to the largest solar photovoltaic site in New York.
- BP Solar and Brookhaven will also cooperate to construct solar panels for the laboratory and develop a solar photovoltaic R&D facility that will house research, education, and outreach efforts.

# Relativistic Heavy Ion Collider (RHIC)

- The world's highest energy machine for fundamental nuclear physics
- World-wide collaboration of more than 1000 scientists, engineers and students
- Probes the nature of the Universe at the birth of protons and neutrons after the Big Bang
- Data processing and analysis for STAR and PHENIX experiments performed at the RHIC Computing Facility (RCF)



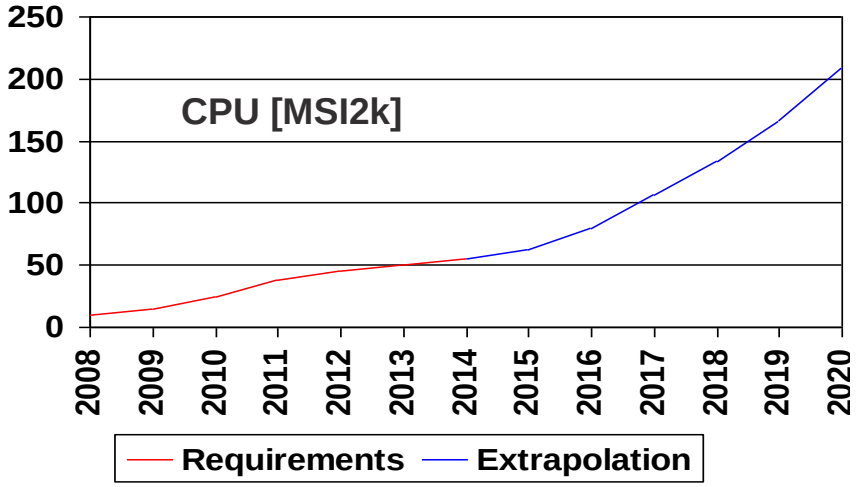


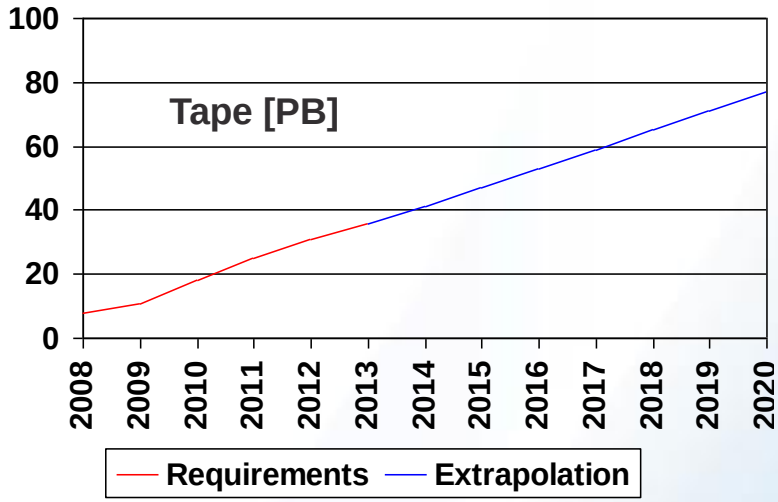


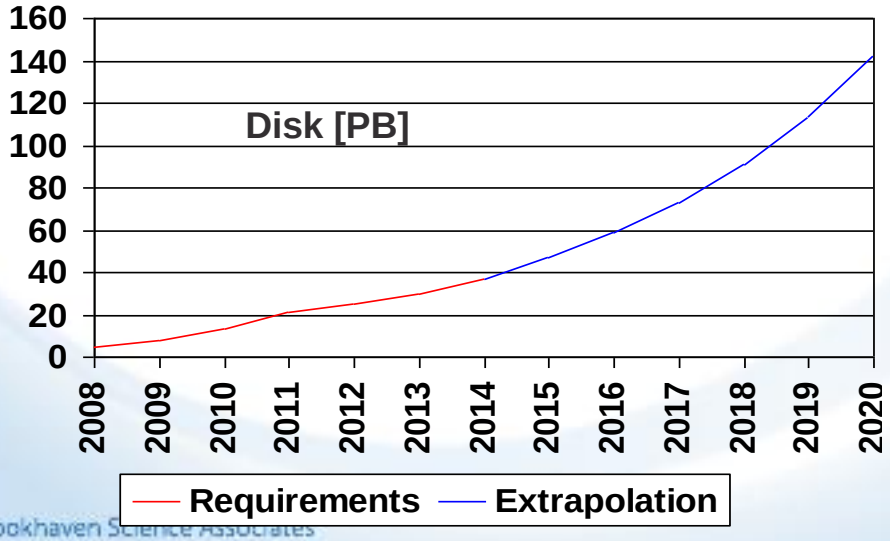
# RHIC and US ATLAS Tier 1 Computing Facilities
## Primary Driver of the Scientific IT Infrastructure

- Scalable “Farm” of Compute Servers
  - Presently ~2000 Systems used by RHIC and ATLAS providing ~15 MSI2k – ramping up to >50 MSI2k by 2012
- High Capacity, High Performance Disk Management Solutions
  - Presently providing ~6 PB of usable disk space to RHIC and ATLAS – ramping up to ~25 PB by 2012
  - Scalable storage management solutions providing access to data at n*GB/s data rate and standard interfaces for Wide Area Network data replication at GB/s data rates
- Scalable, high-performance Data Archive
  - Automated Magnetic Tape Libraries
    - 24 PB Total Capacity (based on LTO4/800GB per Cartridge)
    - More than 8 PB of “active” RHIC and ATLAS Data Inventory
    - Presently up to 1GB/s Migration/Retrieval Rate
  - Archive Inventory managed by HPSS (High Performance Storage System)
    - Scalable Data Mover Architecture
- High-Performance Networks – Local and Wide Area
  - Local: 60 Gbps for ATLAS by end of 2009
  - Wide Area: 20-30 Gbps (up to 10 Gbps General IP services plus 20 Gbps of dedicated circuits)

# RHIC/US ATLAS Tier 1 Computing
## Growth Estimates

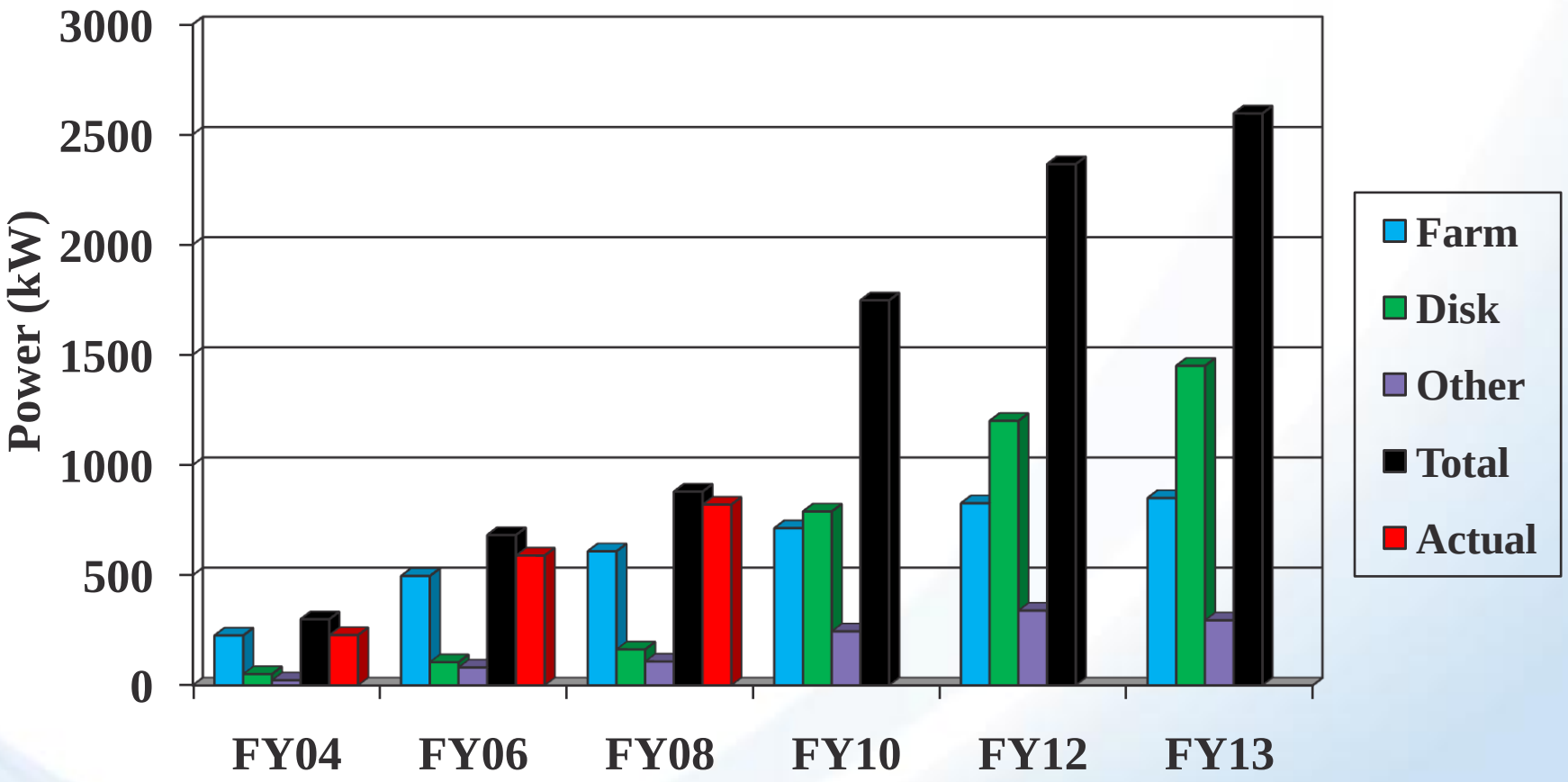


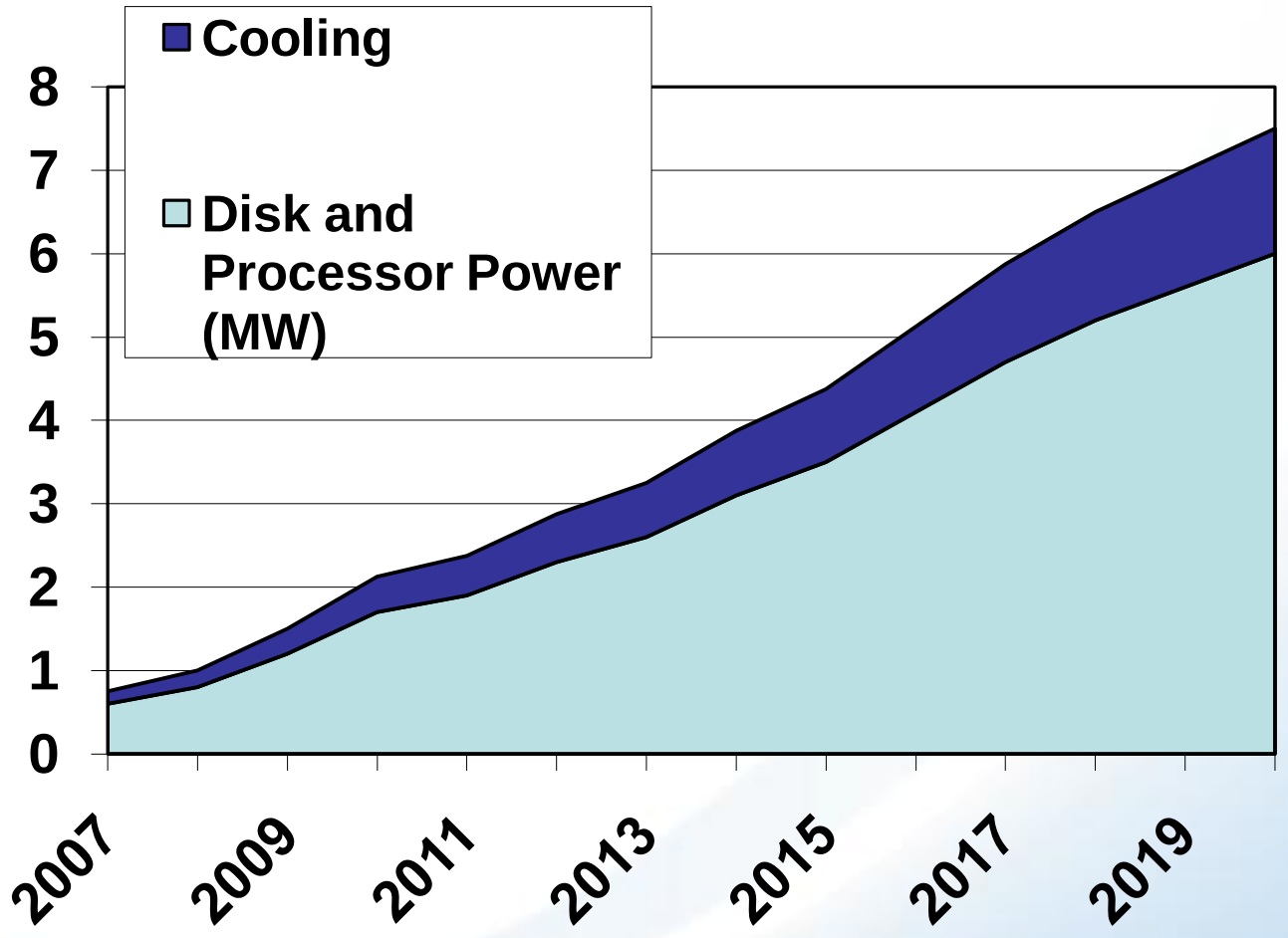




Computing for NSLS-II could be comparable to US ATLAS Tier 1 Computing requirements

# RHIC/US ATLAS Tier 1 Computing
## Equipment Power Usage Estimate



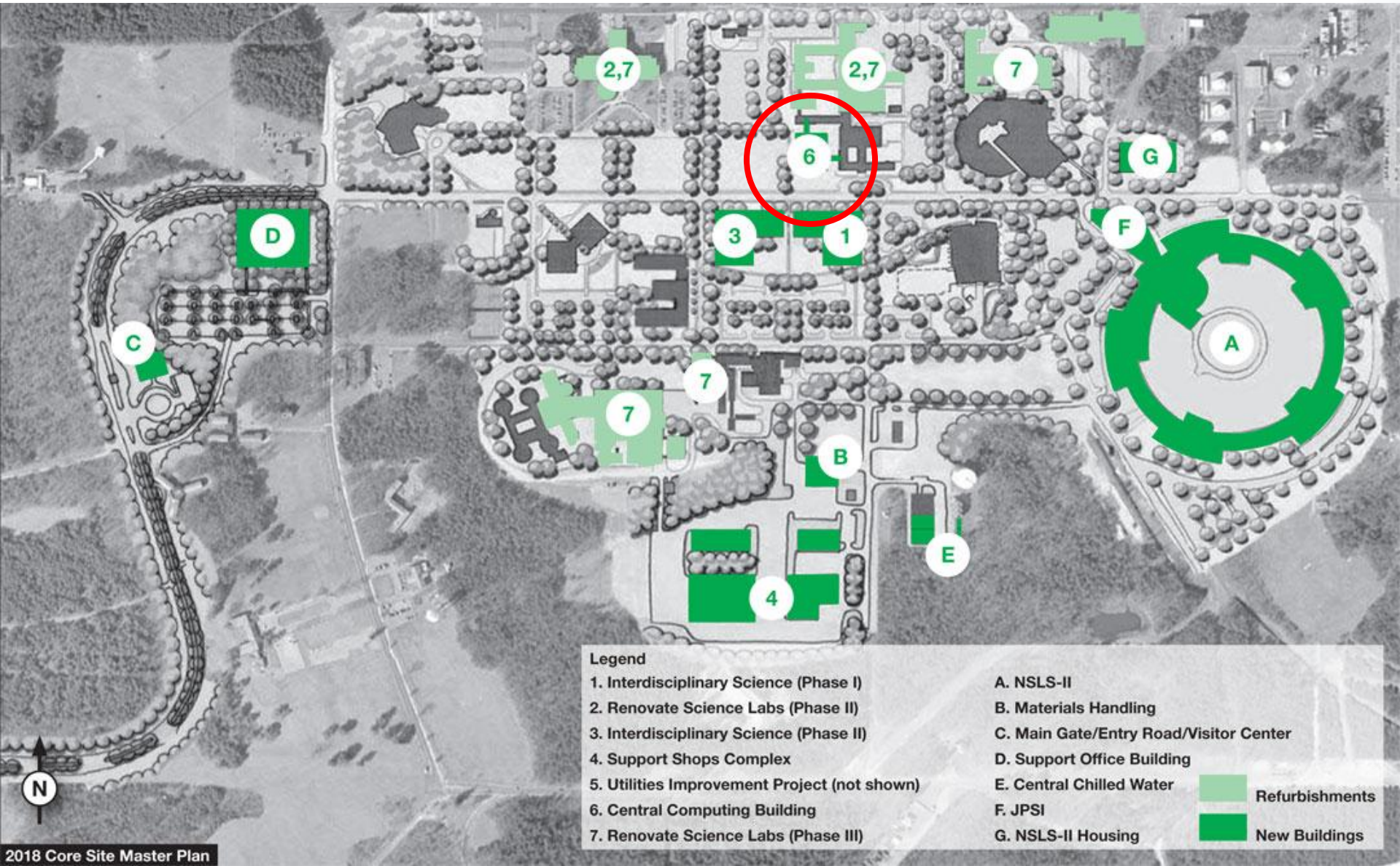
# RHIC/US ATLAS Tier 1 Computing
## Long Term Power Estimates



# Scientific Computing Data Center Expansion

- Building a 6400 sq. ft. addition to the main scientific data center. Completion expected by end of June 2009
- BNL is installing a 1 MW flywheel UPS for use by RACF. Power to be available by end of July 2009
- Growth projections show a new data center is needed sometime after 2015!

# BNL 2018 Core Site Master Plan



# Major IT projects

- NSLS-II & ISB-I Infrastructure Requirements
  - PBX and Cable Plant Upgrade – Opportunity for VOIP
- Re-engineer Customer Support
  - Insourced Help Desk/Desk Side staff
  - Standardize desktop hardware and system images
- Virtualization – early stages
  - DNS environment (UNIX)
  - Consolidating ~20 Windows servers
- Cyber Security
  - LINUX/UNIX Centralized Controls
  - FDCC on Moderate Impact Systems
  - Completed network segmentation
  - ATO Preparations

# BNL NLIT 2009 Attendees

- Lisa Soto
  Group Leader, UNIX Service
  “Linux/UNIX Centralization” talk, June 1
- Dave Cortijo
  Advanced Technology Engineer, UNIX Services


Save the Date
NLIT SUMMIT 2010
New York
May 23 - 26, 2010
NLIT Summit 2010 is hosted by the National Laboratories Information Technology Society and coordinated by
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