

10-Year Strategic Plan

Community Advisory Council
February 10, 2011
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New Projects, New Capabilities



**Interdisciplinary
Science Buildings**



NSLS-II



Long Island Solar Farm



Our Mission

- Advance photon sciences, energy, and environment-related research and apply them to 21st century problems of critical importance to the nation
- Advance fundamental research in nuclear and particle physics to gain a deeper understanding of matter, energy, space, and time

Science Strategy

- Position BNL's two largest user facilities – National Synchrotron Light Source (NSLS) and Relativistic Heavy Ion Collider (RHIC) – for continued leadership roles
- Focus on five Major Activities built on Core Capabilities

12 Core Capabilities

1. Particle Physics
2. Nuclear Physics
3. Accelerator Science and Technology
4. Condensed Matter Physics and Materials Science
5. Chemical and Molecular Science
6. Climate Change Science
7. Biological Systems Science
8. Applied Nuclear Science and Technology
9. Applied Materials Science and Engineering
10. Chemical Engineering
11. Systems Engineering and Integration
12. Large-Scale User Facilities / Advanced Instrumentation

Seeds for Discovery to Deployment

Major Activity: Photon Sciences

- NSLS-II, a light source with world-leading sensitivity, will produce x-rays 10,000 times brighter than NSLS
→ **1 nanometer resolution**
- Scheduled for completion in 2015, NSLS-II will allow the characterization of the atomic and electronic structure, chemical composition, and magnetic properties of materials in a wide range of temperatures and environments
- Explore solutions to the grand energy challenges faced by the nation, and open up new areas of scientific discovery
- Discoveries in physics, chemistry, and biology — advances that will ultimately enhance national security and help drive the development of abundant, safe, and clean energy technologies



Major Activity: Photon Sciences

Clean and Affordable Energy

- New materials to split water with sunlight for hydrogen production and to harvest solar energy with high efficiency and low cost

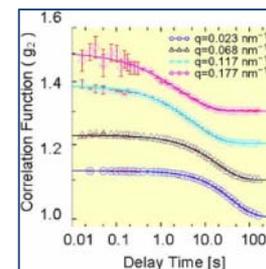
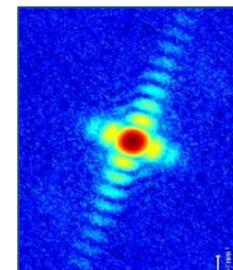
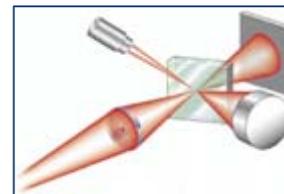
Molecular Electronics

- New electronic materials that scale beyond silicon and could be used for making faster and cheaper electronics which consume less power

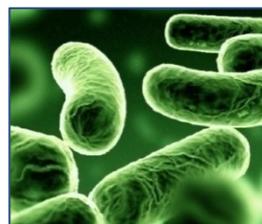
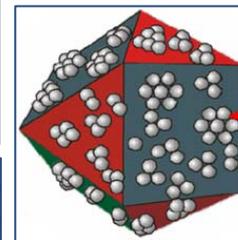
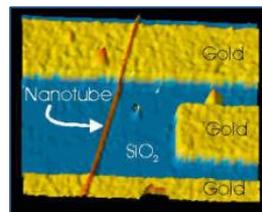
High Temperature Superconductors

- Materials that are superconducting at room temperature and allow efficient transmission of electricity

New Capabilities



New Science



Major Activity: QCD Matter

- Expand the Relativistic Heavy Ion Collider's (RHIC) precision studies of quantum chromodynamics (QCD) illuminating the evolution and current behavior of the universe
- Enhance RHIC capabilities with accelerator and detector upgrades
- Work with U.S. and international partners to build support for eRHIC – add an electron accelerator for high-energy electron-nucleus collisions
 - Precision understanding of the nature of all visible matter
- eRHIC is a natural extension of the Lab's existing core capabilities in nuclear physics, accelerator science, instrumentation, data distribution, and analysis



Major Activity: 21st Century Energy Security

- Research focused on the smart grid and energy capture and storage challenges
- Link scientific outcomes to key technical issues in partnership with industry, other national labs, and universities
- Deployment challenges in materials for solar energy, energy storage, electricity transmission, and sustainable chemical conversion
 - Superconducting Materials → Grid Cables
 - Thermoelectric Materials → Heat Recovery
 - Nanomaterials Science → Photovoltaics
 - In-situ Battery Materials → Grid Storage



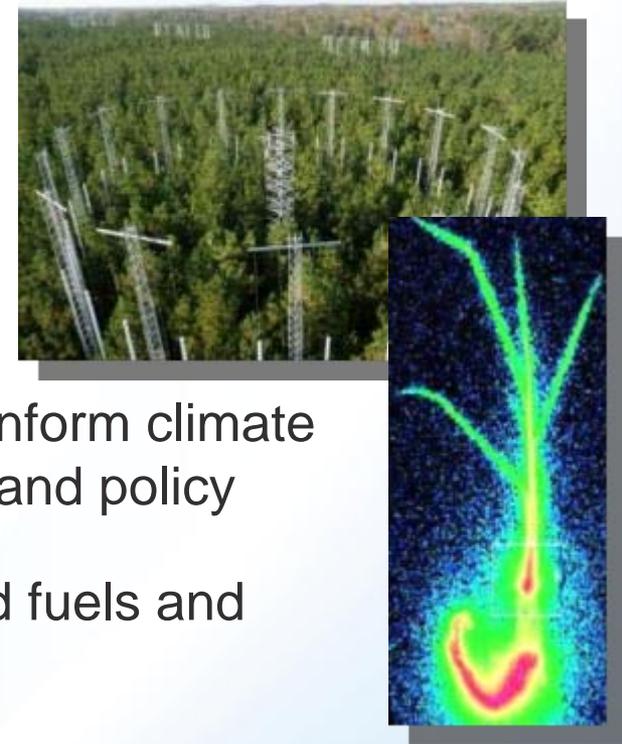
Major Activity: Physics of the Universe

- Leadership in particle physics probing the deepest secrets of the universe
- Tackle some of the most pressing questions about the nature of matter and the world around us
- Intellectual and technical leadership in experiments at 3 physics frontiers:
 - Energy (ATLAS/LHC)
 - Intensity (Neutrinos/DUSEL)
 - Cosmology (Dark Energy/LSST)



Major Activity: Climate/Environmental/BioSciences

- Leading cross-disciplinary R&D to understand relationships among climate change, sustainable energy, and ecosystems
- Understand role aerosols and clouds play in climate system; produce new, high-quality data, parameterizations, and field studies that inform climate change management, adaptation approaches, and policy
- Advance development of sustainable bio-based fuels and other high-value products from biomass
- Capabilities in atmospheric science, plant and microbial systems biology, genetics, structural biology, radiochemistry, biological imaging
- Leverage BNL and partner facilities, such as NSLS, NSLS-II, CFN, SBU Laufer Center, New York Computational Science Center



4 Related Opportunities

1. Accelerator Science & Technology

- National discovery to deployment center
- Work with industry on accelerator systems
- High-power electron Energy Recovery Linac (ERL) under development
- Training at BNL/SBU Center for Accelerator Science and Education (CASE)

2. Computation

- Grow computation and networking programs
- Provide computation platform and infrastructure for close-coupled theory-experiment for all major activities at BNL
- Serve university and industrial users primarily within NYS; serve as a gateway to DOE leadership-class machines

3. Biological Imaging

- Apply radiochemistry and PET/MRI capabilities to major biomedical challenges in disorders of the CNS, and in faster, better, cheaper development of effective drugs
- Develop new ligands and radiotracers
- Advance the state-of-the-art in imaging instrumentation
- Strategic partnerships with leading medical centers, and with industry

4. Homeland/National Security

- Develop detectors for portal and cargo monitoring
- Leverage expertise in materials synthesis & characterization, and advanced instrumentation

Budget Outlook



Budget Outlook

- Continuing Resolution from federal government funds operations at FY 2010
- Recommended DOE Office of Science funding for FY 2011
 - President Obama requested 6.1% increase
 - House Energy and Water Development Appropriations Subcommittee recommended essentially flat funding
 - Senate Appropriations Committee recommended 2.2% increase
- BNL proceeding cautiously with the expectation of continued growth

Lab Revenue Growth

New Funding					
	\$'s	FY07	FY08	FY09	FY10
Science		291.5	307.8	335.3	342.7
Other DOE		94.9	86.7	113.3	108.8
WFO's		66.5	64.6	84.2	88.2
Total operating		452.9	459.1	532.8	539.7
DOE cap/const		57.3	72.8	346.8	213.7
ARRA incl above		0	0	260.9	46.1
Non ARRA		510.2	531.9	618.7	707.3
rate of growth					
			FY08	FY09	FY10
Science			6%	9%	2%
Other DOE			-9%	31%	-4%
WFO's			-3%	30%	5%
Total operating			1%	16%	1%
DOE cap/const			27%	376%	-38%
Non ARRA			4%	16%	14%

- Non-ARRA revenue growth
 - 14% in FY 2010 (ending Sept. 30, 2010)
 - 16% in FY 2009 (ending Sept. 30, 2009)

- Lab needs 7.2% annual growth to double in 10 years
 - 15% average in FY 2009/2010 provides strong momentum for doubling in 10 years