U.S. DEPARTMENT OF ENERGY | Office of Science

FY 2015 Budget Request to Congress for DOE's Office of Science

March 4, 2014

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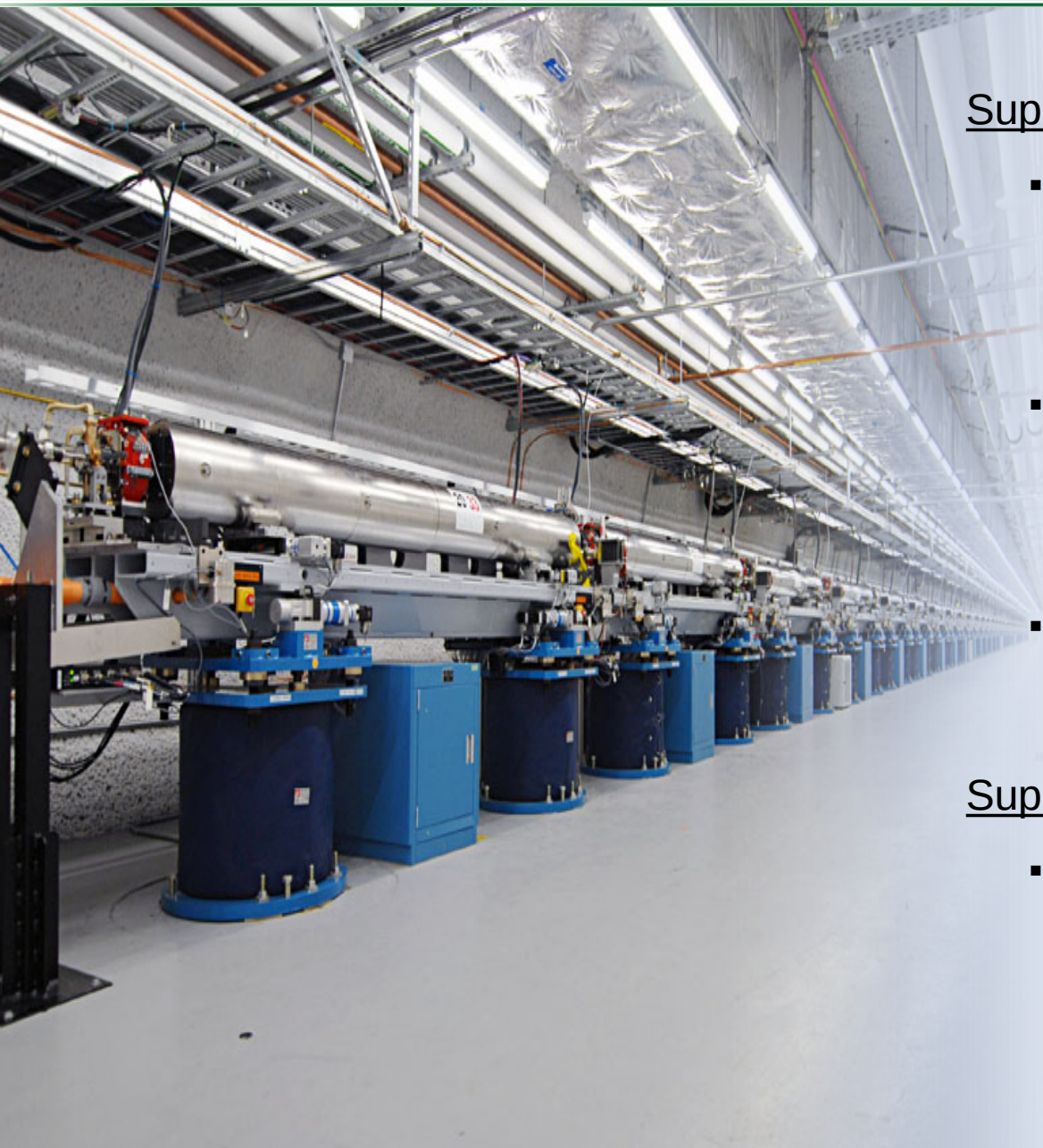
www.science.energy.gov

Office of Science FY 2015 Budget Request to Congress

(Dollars in thousands)

	FY 2013 Current (prior to SBIR/STTR)	FY 2013 Current Approp.	FY 2014 Enacted Approp.	FY 2015 President's Request	FY15 President's Request vs. FY14 Enacted Approp.	
Advanced Scientific Computing Research	417,778	405,000	478,093	541,000	+62,907	+13.2%
Basic Energy Sciences	1,596,166	1,551,256	1,711,929	1,806,500	+94,571	+5.5%
Biological and Environmental Research	578,294	560,657	609,696	628,000	+18,304	+3.0%
Fusion Energy Sciences	385,137	377,776	504,677	416,000	-88,677	-17.6%
High Energy Physics	748,314	727,523	796,521	744,000	-52,521	-6.6%
Nuclear Physics	519,859	507,248	569,138	593,573	+24,435	+4.3%
Workforce Development for Teachers and Scientists	17,486	17,486	26,500	19,500	-7,000	-26.4%
Science Laboratories Infrastructure	105,673	105,673	97,818	79,189	-18,629	-19.0%
Safeguards and Security	77,506	77,506	87,000	94,000	+7,000	+8.0%
Program Direction	174,862	174,862	185,000	189,393	+4,393	+2.4%
Subtotal, Office of Science	**4,621,075**	**4,504,987**	**5,066,372**	**5,111,155**	+44,783	+0.9%
Small Business Innovation Research/Technology Transfer	...	176,208	...	...	...	...
Use of Prior Year Balances	...	...	...	...	...	...
Total, Office of Science	**4,621,075**	**4,681,195**	**5,066,372**	**5,111,155**	+44,783	+0.9%

Office of Science



Support for Researchers

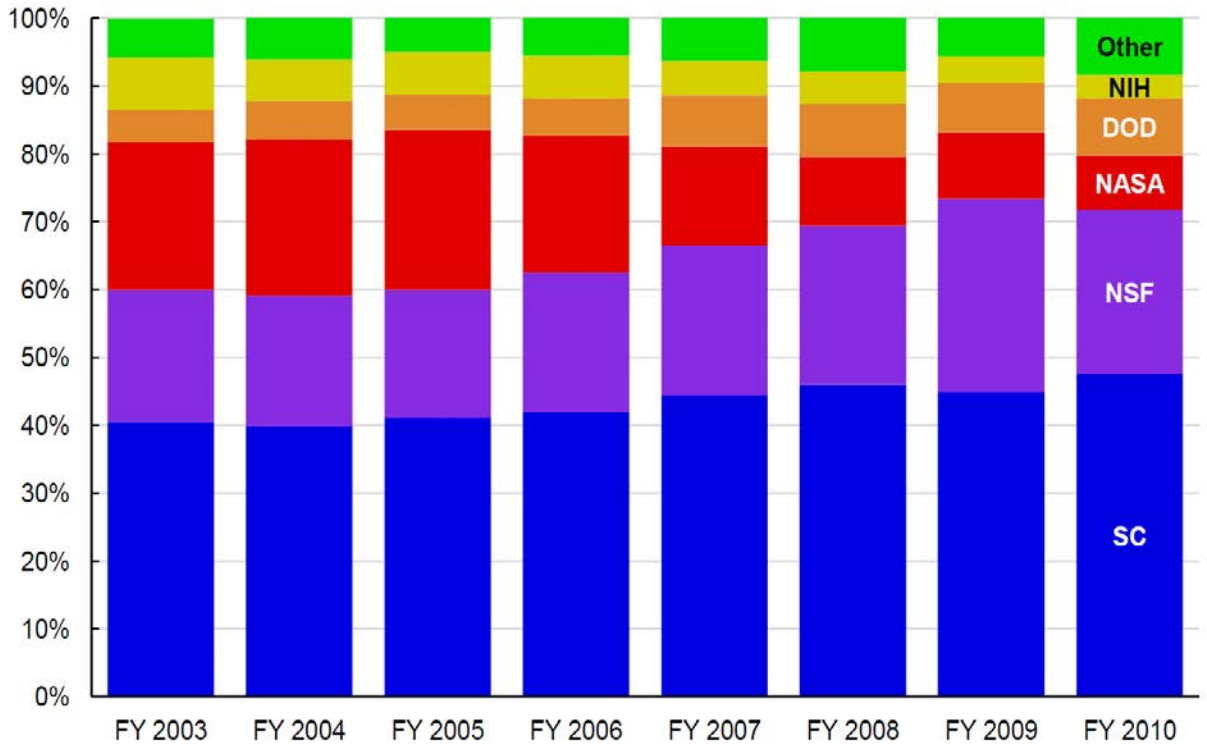
- Supports about 22,000 Ph.D. scientists, graduate students, undergraduates, engineers, and support staff at more than 300 institutions.
- Provides 47% of Federal support of basic research in the physical sciences and key components of the Nation's basic research in biology and computing.
- Supports research that led to over 100 Nobel Prizes during the past 6 decades—more than 20 in the past 10 years.

Support for Scientific User Facilities

- Provides the world's largest collection of scientific user facilities to nearly 28,000 users each year.

Agency Support of Basic Research in the Physical Sciences

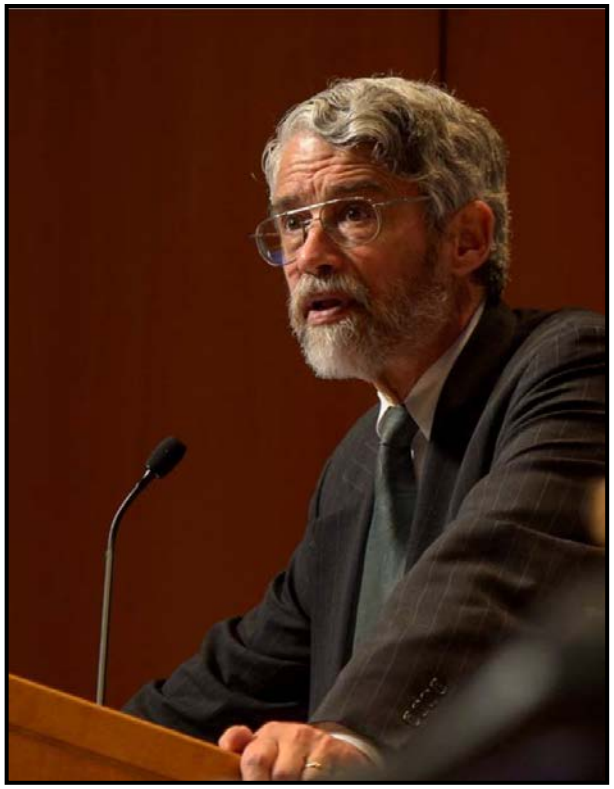
DOE/SC provides >45% of the nation's support for the physical sciences



Survey of Federal Funds for Research and Development (NSF): The Survey of Federal Funds for Research and Development is the primary source of information about federal funding for R&D in the United States. Federal funds data are collected annually for 3 fiscal years: the fiscal year just completed, the current fiscal year, and the next fiscal year. Actual data are collected for the year just completed; estimates are obtained for the current and next fiscal year. The FY 2010 data are the most recent data available for a year just completed. An update is expected later this year.

Strong Administration Support for Research

"History has shown that one of the most effective and efficient ways to invest in America—one of the best ways to assure that the Nation remains a magnet for new jobs and manufacturing and a fertile training ground for a new generation of innovators and entrepreneurs—is to invest in research and development (R&D)."



Statement of Dr. John P. Holdren, Director, Office of Science and Technology Policy
U. S. House of Representative Committee on Science, Space, and Technology United States House of Representatives, April 17, 2013

Highlights of the FY 2015 Office of Science Budget - 1

Research: Significant new investments are made in research underpinning next-generation computing and in the development of computational models for disciplinary computing in key SC programs.

BES	**+$24.2M**	**Computational materials sciences** to develop research codes for design of functional materials.
BER	**+$29.0M**	**Climate model development and validation** – combine advanced software code development and numerical methods with new ARM data to design an Earth system model with sub-10km resolution.
ASCR	**+$20.2M**	**R&D and data-intensive science** for prototypes in critical technologies such as processors, memory, and end-to-end data flow leading to the development of capable exascale systems.

Highlights of the FY 2015 Office of Science Budget - 2

Facility operations: The majority of the scientific user facilities operate at or near optimal levels—including the Leadership Computing Facilities and the light sources that together host more than half of all users at the facilities.

ASCR
- **NERSC and the Leadership Computing Facilities at ANL and ORNL** operate optimally. NERSC moves to the Computational Research and Theory Building at LBNL. Funds for the LCFs support the preparation of planned 75-200 petaflop upgrades.

BES
- **4 Light Sources, 2 Neutron Scattering Sources,** and **5 Nanoscale Science Research Centers** operate optimally. **NSLS-II** transitions to operations and **NSLS-I** ceases operation. With SNS operating at full power and nearly fully instrumented, operations at the **Lujan Center** cease.

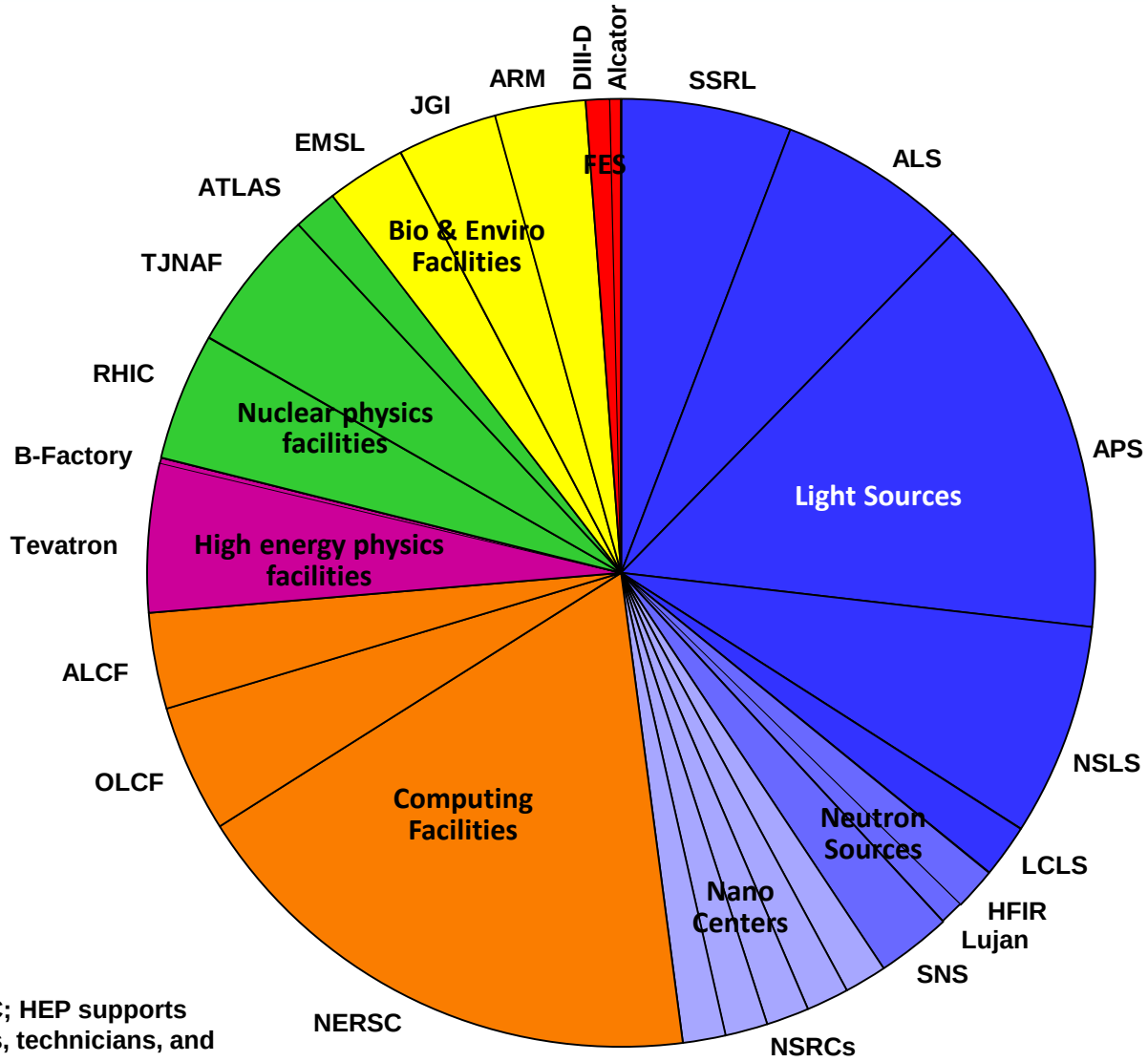
FES
- **NSTX** operates for an 18-week run following the 3-year-long upgrade.
- **Alcator C-Mod** operates for a 5-week run.

HEP
- The **Fermilab Accelerator Complex** operates to support experiments such as **NOvA, Minerva, MicroBoone, MINOS**

NP
- **RHIC** operates for 22 weeks, the same as FY 2014.
- **ATLAS** operates at 95% of optimal.

Distribution of Users at the ~30 SC Facilities 2013

Nearly ¾ of users do their work at ASCR or BES facilities



Does not include LHC; HEP supports about 1,700 scientists, technicians, and engineers at the LHC.

Highlights of the FY 2015 Office of Science Budget - 3

Construction: Several major projects are nearing successful completion, on time and within budget; new projects are initiated to address important science and infrastructure needs.

BES
- **NSLS-II** is transitioning from early operations to full operations; construction funding ended in FY 2014. The planned CD-4 date is June 2015.
- **LCLS-II** is in its second year of construction.

FES
- **ITER** funding supports continuation of in-kind hardware and cash contributions.

HEP
- **NOvA** is in its first full year of early operations; the planned CD-4 date is November 2014.
- **Muon to Electron Conversion Experiment** continues construction. The planned CD-2 date is 4Q FY 2014.
- **Long Baseline Neutrino Experiment** continues R&D.

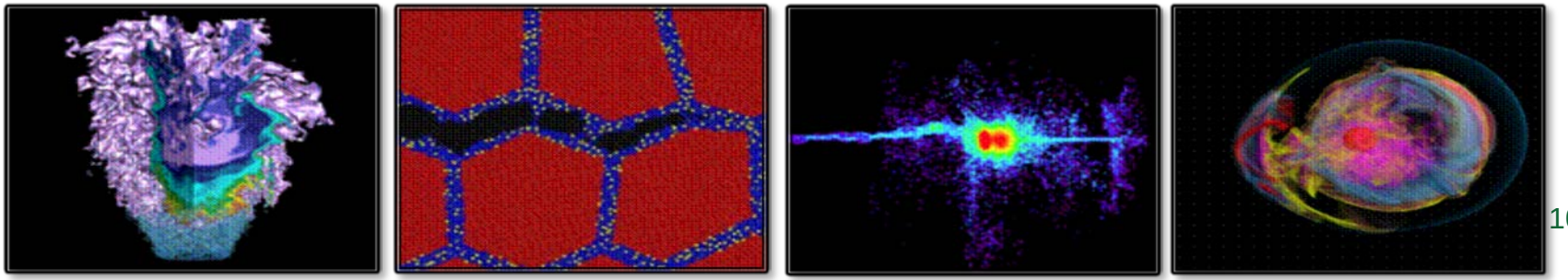
NP
- **12 GeV CEBAF Upgrade** is nearing completion. Activities at TJNAF focus on beam development and commissioning of the new machine.
- **Facility for Rare Isotope Beams** is in early civil and technical construction.

SLI
- **Science and User Support Building at SLAC** completes construction.
- **Infrastructure Improvements at PPPL; Materials Design Laboratory at ANL; Photon Sciences Laboratory Building at SLAC; Integrative Genomics Building at LBNL** all are initiated, with the PPPL project fully funded.

Advanced Scientific Computing Research

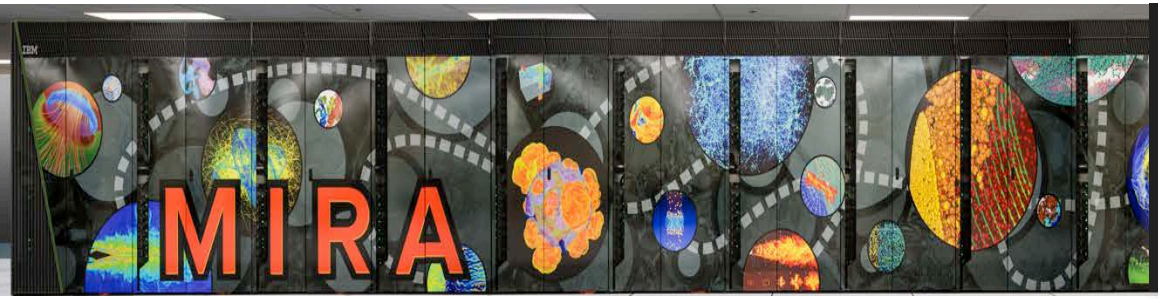
Computational and networking capabilities to extend the frontiers of science and technology

- **Mathematics research** to improve the fidelity and predictability of interactions across large time and length scales.
- **Computer science research** to support data management, analysis, and visualization techniques, including knowledge representation.
- **SciDAC partnerships** for data-intensive problems.
- **Exascale computing** research in programming models and runtime systems for energy-efficient, data-intensive applications; engagement with HPC vendors in R&D in critical technologies, system interconnects, and system-level challenges.
- **NERSC** and the **LCFs** operate at 90% availability.
- **Upgrades**: Begin deployment of 20-30 petaflop upgrade at NERSC and relocate NERSC to the new Computational Research and Theory building at LBNL; begin preparations for 75-200 petaflop upgrades at each LCF.
- Extend **Esnet.**
- Initiate a postdoctoral program at the ASCR facilities.



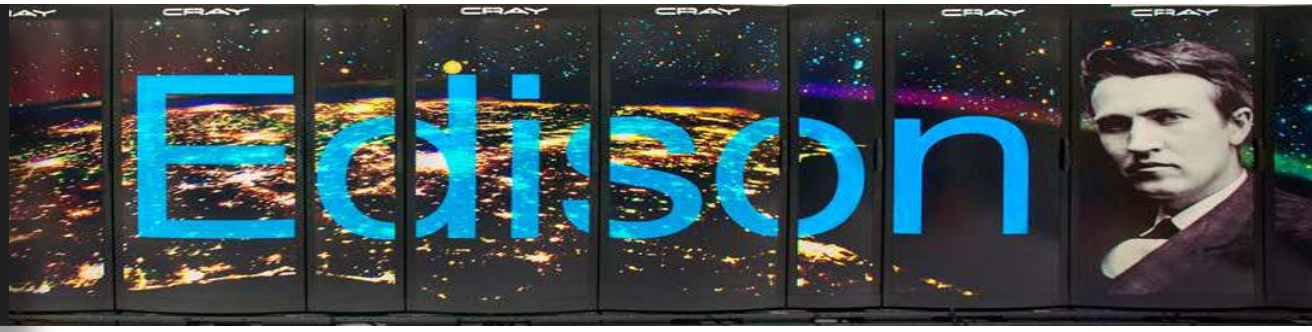
Leadership and Production Computing Facilities

Titan:
- Peak performance of 27.1 Pf
- 18,688 Hybrid Compute Nodes
- 8.9 MW peak power



Mira:
- Peak performance of 10 Pf
- 49,152 Compute Nodes
- 4.8 MW peak power

Edison XC30:
- Peak performance 2.4 Pf
- 124,608 processing cores
- 2.1 MW peak power



Path Toward Exascale in FY 2015

Mathematical, Computational, and Computer Sciences Research

- **Uncertainty Quantification:** Continues support for awards made in 2013 on "UQ methods for Extreme-Scale Science" These efforts will improve the fidelity and predictability of DOE simulations.
- **Extreme scale Advanced Architectures:** Supports new research addressing *in situ* methods, workflows, and proxy applications for data management, processing, analysis and visualization; continues support for research into advanced architectures, software environments and operating systems
- **Co-Design:** Continues support for Co-Design activities, including data-intensive science partnerships started in FY 2014

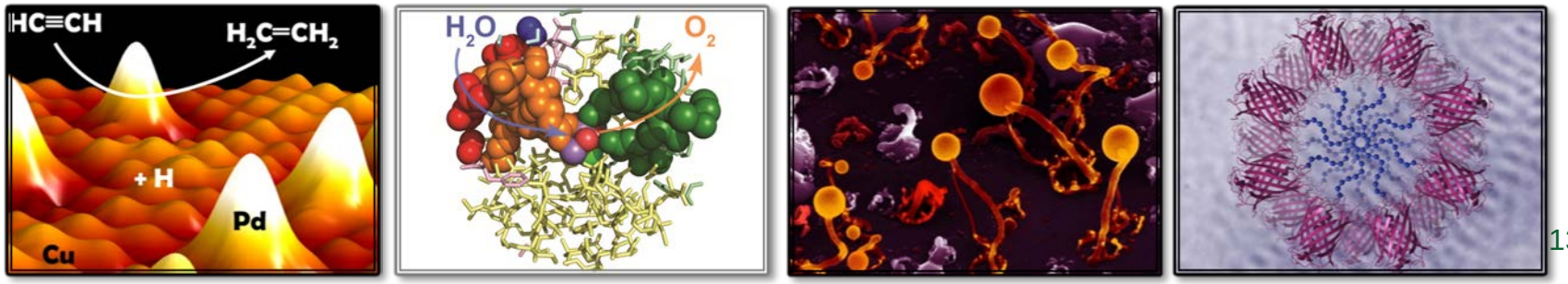
High Performance Computing and Network Facilities

- **Platform R&D and Critical Technologies:** Initiates conceptual design studies for prototypical exascale systems from application workflow to hardware structure and system software; continues support for Fast Forward investments in critical technologies and Design Forward investments in system-level engineering efforts with high performance computer vendors

Basic Energy Sciences

Understanding, predicting, and controlling matter and energy at the electronic, atomic, and molecular levels

- New **computational materials research** will develop codes for design of functional materials.
- **Energy Frontier Research Centers** (EFRCs) continue at the FY 2014 level.
- Two **Energy Innovation Hubs** continue:
  - Joint Center for Artificial Photosynthesis (JCAP) will be in its fifth project year.
  - Joint Center for Energy Storage Research (JCESR) will be in its third year.
- **National Synchrotron Light Source-II** (NSLS-II) transitions to operations; NSLS ceases operations.
- **Linac Coherent Light Source-II (LCLS-II)** construction continues.
- BES **user facilities** operate at optimum levels.
- Two **major items of equipment**: NSLS-II Experimental Tools (NEXT) and Advanced Photon Source Upgrade (APS-U).
- **Lujan Neutron Scattering Center** ceases operations.

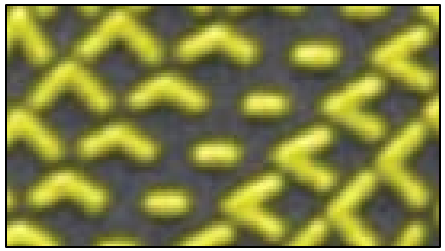


Computational Materials Sciences

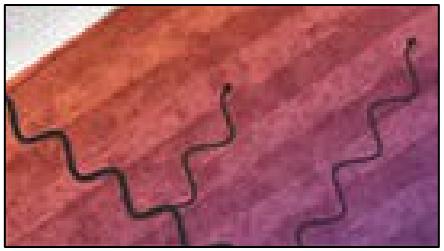
Accelerating Materials Discovery and Development

Deliverable: Open-source community codes and software packages that incorporate multiple length and time scales for discovery and prediction of materials functionality.

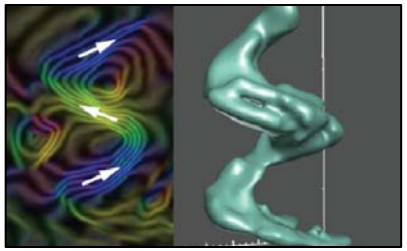
- Deliver research codes and data for design of functional materials to the materials sciences communities in academia, labs, and industry.
- Use integrated teams combining expertise in materials theory, modeling, computation, synthesis, characterization, and processing/fabrication.
- Use facilities and tools for materials synthesis, characterization, simulation, and computation, relying especially on the SC scientific user facilities.
- Support will begin in FY 2015 for up to four teams for multi-year awards.



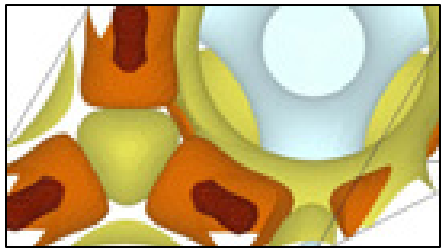
Tailored Surfaces for Advanced Electronics



Novel Thermal Transport



Next Generation Magnets



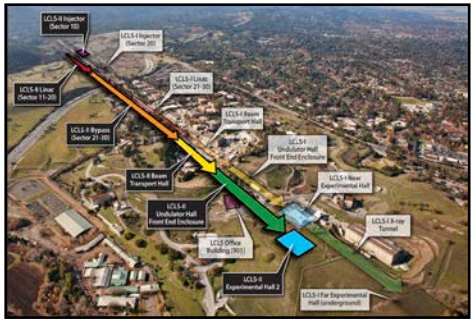
Enhanced Light Absorption

Maintaining World Leadership in Light Sources

Upgrades and instrumentation ensure that the facilities remain at the peak

National Synchrotron Light Source-II (NSLS-II)

- No construction funding request in FY 2015. CD-4 planned in 3Q FY2015. Start operations with six project beamlines.
- NSLS-II instrument MIE (NEXT) . CD-3 expected April 2014. Deliver 5-6 beamlines by FY 2017.
- NSLS operations cease in FY 2014 and will transition to safe storage in FY 2015. NSLS-II FY 2014 early operations $56M. FY 2015 requests funds for transition to operations.



Linac Coherent Light Source-II (LCLS-II)

- High repetition rate, ultra-bright, transform limited x-ray pulses with expanded energy range (200eV – 5keV), polarization control, and control pulse length down to ~1 femtosecond.
- New 4 GeV superconducting linac feeding two new independently tunable undulators and enhanced experimental stations.
- FY 2014 $85.7M; FY 2015 request funds R&D, design, prototyping, long lead procurement, and construction of technical systems.

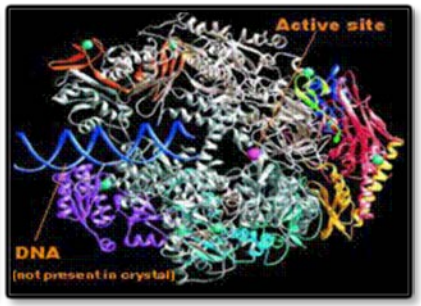
Advanced Photon Source Upgrade (APS-U)

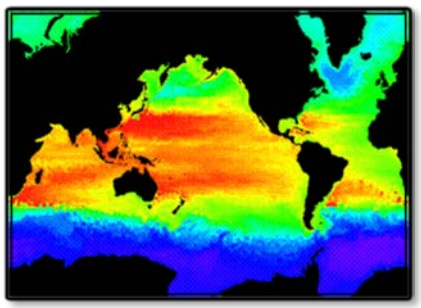
- Currently implementing recommendations from the July 2013 BESAC Report through initial design and component prototyping for installation of a Multi-Bend Achromat magnetic lattice.
- FY 2014 $20M; FY 2015 Request funds R&D, design, and limited prototyping.

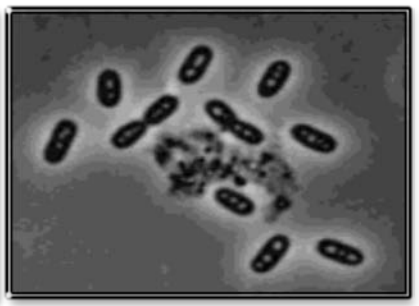
Biological and Environmental Research

Understanding complex biological, climatic, and environmental systems

- **Genomic sciences** is enhanced by computational biosciences and the Systems Biology Knowledgebase.
- **Mesoscale-to-molecules** research investigates scaling from molecular to mesoscale and multicellular organization.
- **JGI** provides new capabilities to sequence DNA and to interpret, manipulate and synthesize DNA.
- **Radiological sciences** decreases; radiological sciences targets radiotracer imaging; radiobiology links lab-based research with epidemiological studies on low dose effects.
- A new activity in **Climate Model Development and Validation** combines advanced code development and numerical methods with ARM data to design a next-generation Earth system prediction model platform to produce an Earth system model with sub-10 km resolution.
- **Environmental system science** emphasizes the relationships between climate and Arctic and tropical ecosystems.
- **ARM** continues measurements at fixed sites, and mobile facilities deploy to the Arctic, the tropics, and the Pacific Ocean. The Tropical Western Pacific site closes; instrumentation is moved to the Southern Great Plains site.
- A new **Climate and Environmental Data Analysis and Visualization** activity combines high resolution Earth system models with energy and infrastructure sector models, field observations, raw data from environmental field experiments, and new analytical tools.







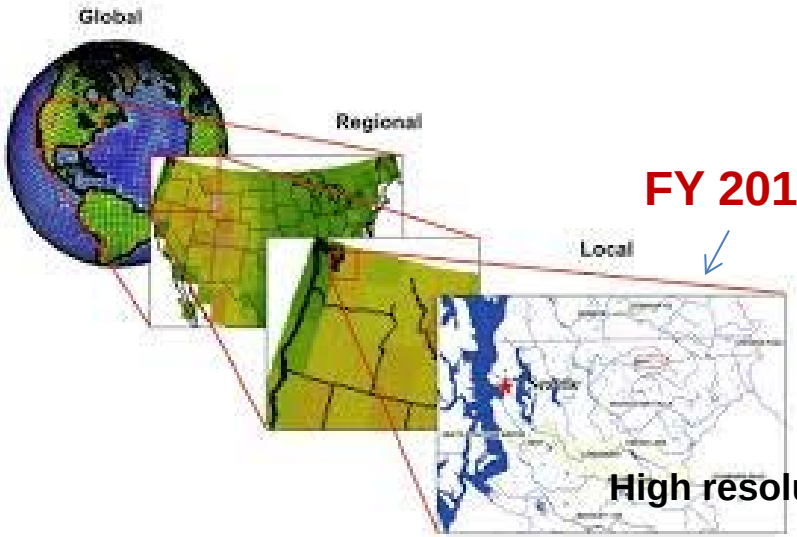
Climate Model Development and Validation

Model capabilities today

- Global and regional simulations to 50 km resolution.
- Poor representation of extreme events.
- No uncertainty quantification.
- DOE mission needs finer resolution of extremes and uncertainty resolved.

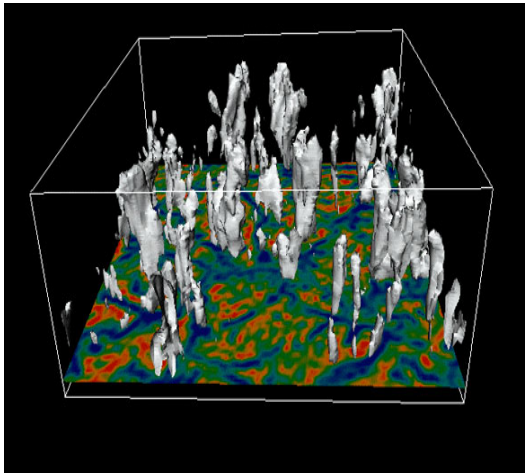
Future Scientific Needs and FY 2015 challenge/roadmap

- Produce new conceptual designs for a next-generation ultra-high-resolution Earth system prediction model platform.
- Combine major upgrades in advanced software code development, downscaling methodologies, and validation against ARM testbeds.
- In the long term, provide high resolution projections with 1 km resolution desired by major energy stakeholders.



FY 2015 focus

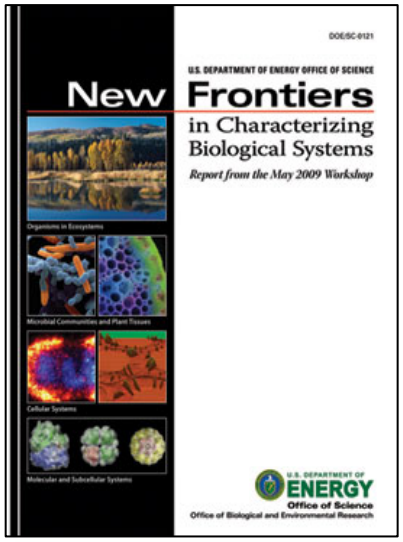
High resolution

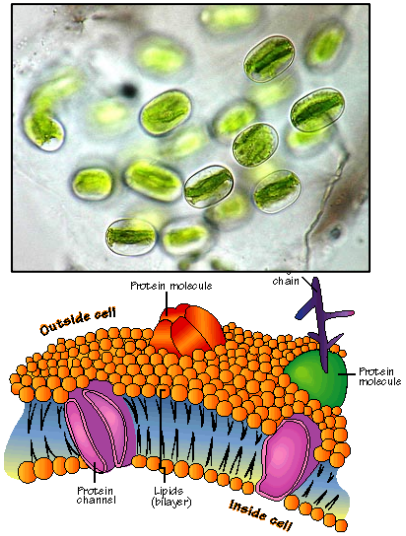


Extremes

Biological Systems Science: Mesoscale to Molecules

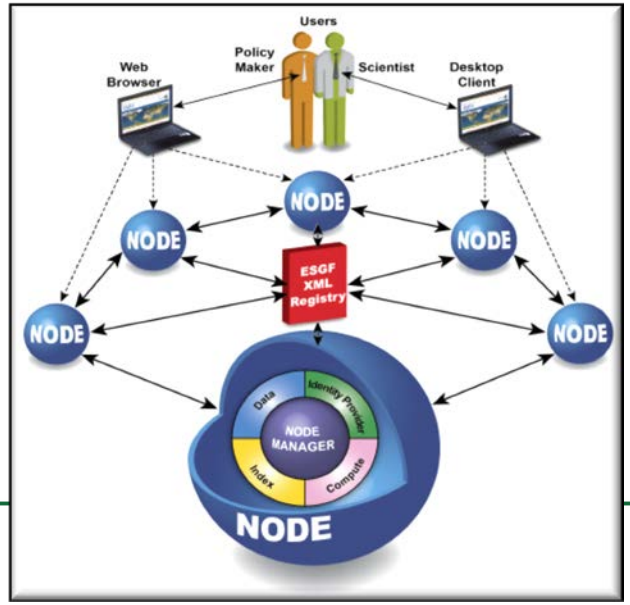
- Understanding translation of genomic information into the mechanisms that power living cells, communities of cells, and whole organisms in DOE relevant microbes and plants.
- Imaging approaches to understand the genomic and physical rules governing formation and functions of subcellular mesoscale structures, the organelles and membranes in DOE relevant plants and microbes.





Climate and Environmental Data Analysis and Visualization

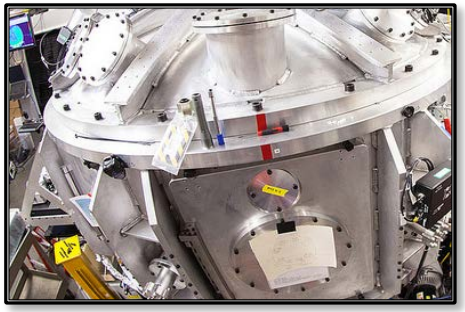
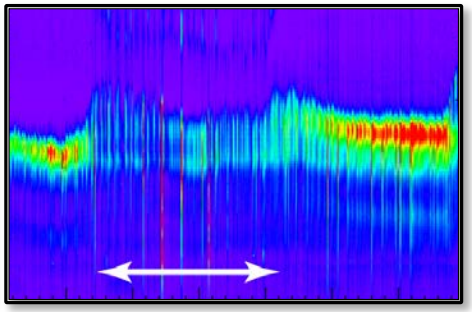
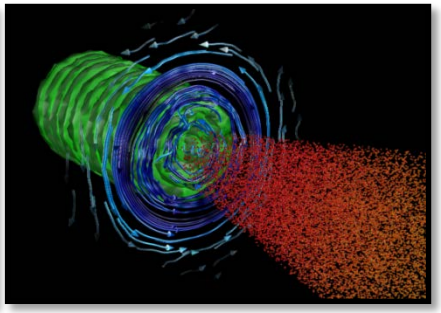
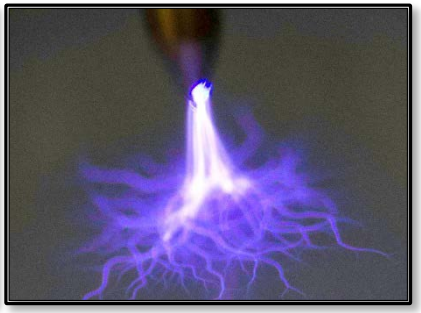
- Combines high resolution Earth system models with components from energy & infrastructure sector models, field observations, and experiments.
- Analytic tools for system diagnostics, validation, and uncertainty quantification.
- Adds value to high-resolution modeling needs and output, expanding observational data sets and extensive data from field and laboratory experiments and observations.



Fusion Energy Sciences

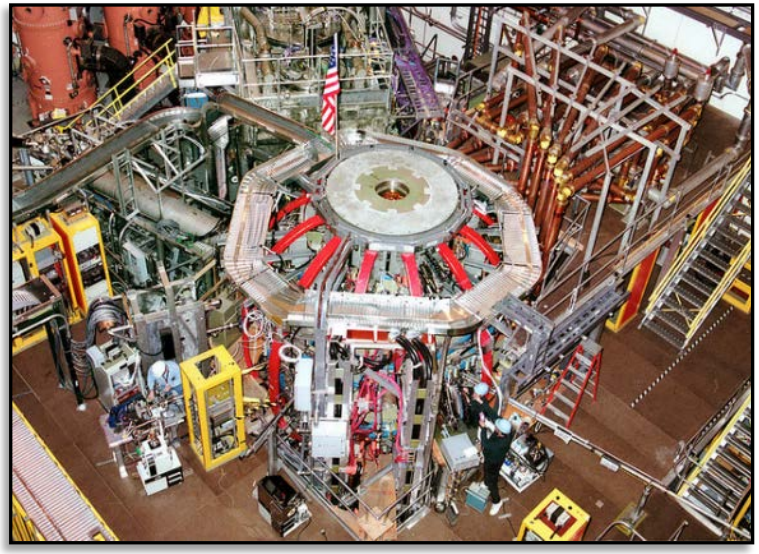
Matter at very high temperatures and densities and the scientific foundations for fusion

- Research is increased for the **DIII-D** and **NSTX-U** national programs.
- Support continues for U.S. involvement the international machines **EAST** (China); **KSTAR** (S. Korea); and **W7-X** (Germany).
- In **HEDLP** research, emphasis is on the MEC instrument at LCLS. **MEC** couples advanced diagnostics, long- and short-pulse high-power lasers, and coherent hard x-rays from LCLS; 4 weeks of stand-alone experiments (without the LCLS beam) also are supported.
- **General plasma science** activities continue, including the partnership with NSF.
- **NSTX** operates for 18 weeks; **DIII-D** operates for 15 weeks; and **Alcator C-Mod** operates for 5 weeks.
- The 3-year **NSTX upgrade** is completed in early FY 2015.
- U.S. contributions to **ITER** support USIPO; the U.S. cash contribution; and continued progress on in-kind contributions, including industrial procurements of central solenoid magnet modules and structures, toroidal field magnet conductor fabrication and diagnostics, and tokomak cooling water system procurement.

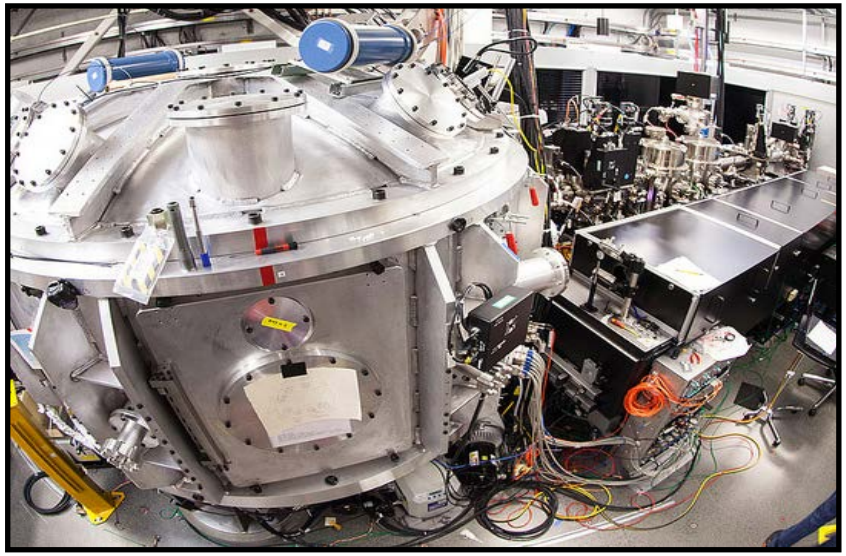
Major FES National Facilities

Recent upgrades and improvements make these national facilities best in class



NSTX-Upgrade (PPPL)

- Upgrade is complete and research resumes in early FY 2015.
- The upgrade doubles the magnetic field strength, the plasma current, and the externally applied heating power; the operations period increases from 1 to 5 seconds, making NSTX-Upgrade the highest-performance spherical torus experiment in the world.



Matter in Extreme Conditions (MEC) instrument on LCLS (SLAC)

- MEC provides access to high-energy-density regimes, coupled with the LCLS high-brightness x-ray source.
- A recent upgrade of the short-pulse lasers to 200 TW allows users to perform up to four weeks of stand-alone experiments on MEC, in addition to experiments with LCLS x-ray beam.

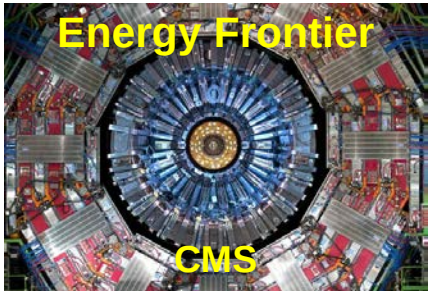
Overview of the ITER Complex

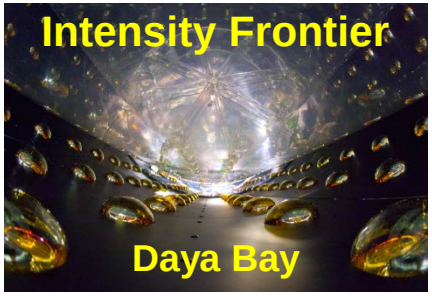
Aerial of the ITER complex, showing the Tokamak Building in the center.

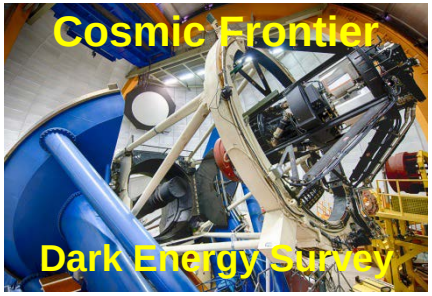
High Energy Physics

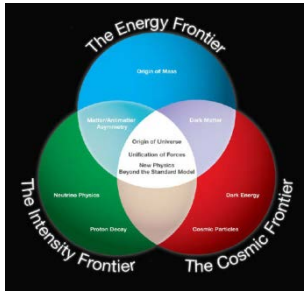
Understanding how the universe works at its most fundamental level

- Energy Frontier: LHC data taking resumes in 2015 at higher collision energy
  - The US will continue to play a leadership role in LHC discoveries and is actively engaged in the initial upgrades to the LHC detectors.
- Intensity Frontier: The Fermilab program continues its evolution as the leading accelerator facility on the intensity frontier
  - The newly completed NOvA detector begins taking physics data in FY2015.
  - Building several new experiments to access new phenomena that cannot be observed at the LHC, including the Mu2e, Muon g-2, and MicroBooNE experiments.
- Cosmic Frontier: Advancing our understanding of dark matter and dark energy
  - The recently-commissioned Dark Energy Survey continues its five-year mission, looking for the subtle effects of dark energy in shaping the evolution of universe.
    - This search will be significantly extended by the future Large Synoptic Survey Telescope, now under construction.
  - The search for dark matter will enter new territory with the R&D and design of selected next-generation direct detection technology that will advance sensitivity by an order of magnitude.







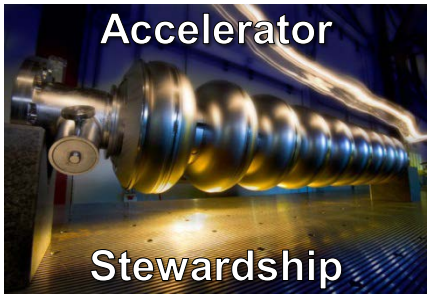


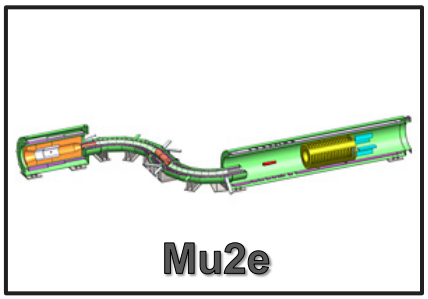
High Energy Physics

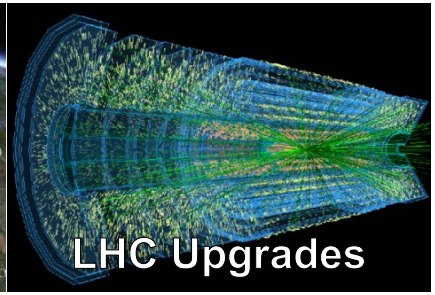
Understanding how the universe works at its most fundamental level

- Technology R&D:
  - A new HEP subprogram that focuses on the broader applications of HEP-developed accelerator technologies known as "accelerator stewardship" is expected to begin new pilot programs and open new funding opportunities in 2015 to address high-impact R&D topics.

- Construction/Major Items of Equipment (MIEs):
  - The Muon to Electron Conversion Experiment (Mu2e) will complete its design phase in FY2015 and move into full construction.
  - The Long Baseline Neutrino Experiment (LBNE) continues its design phase, which may include enhanced capabilities based on the level of partnership contributions. Potential LBNE collaborators in Europe, Asia, and South America have expressed interest.
  - Funding is provided to initiate fabrication for new MIEs for the LHC detector upgrades and continue planned funding profiles of existing MIE projects. Total MIE funding increasesin FY2015 to support these new investments.

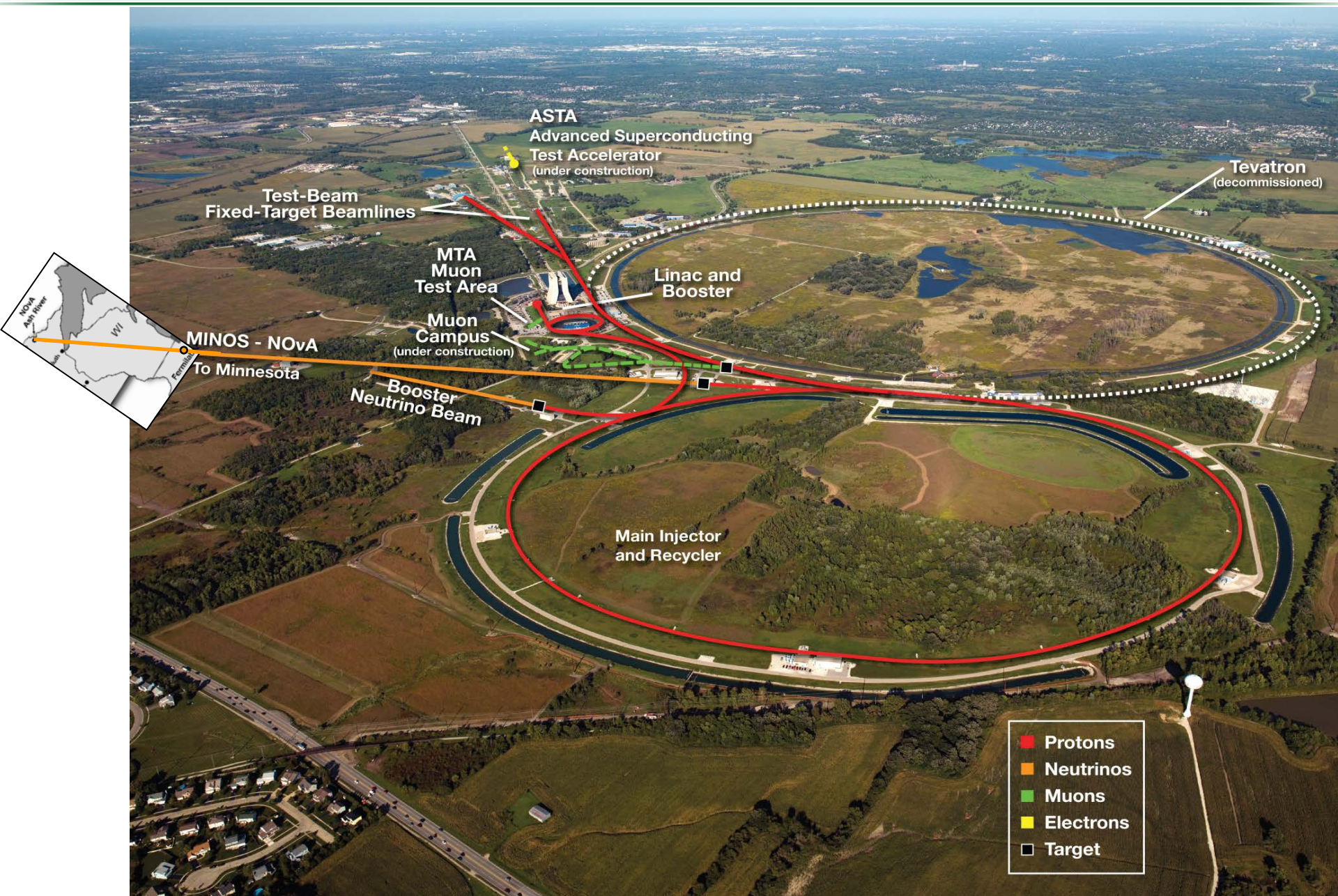




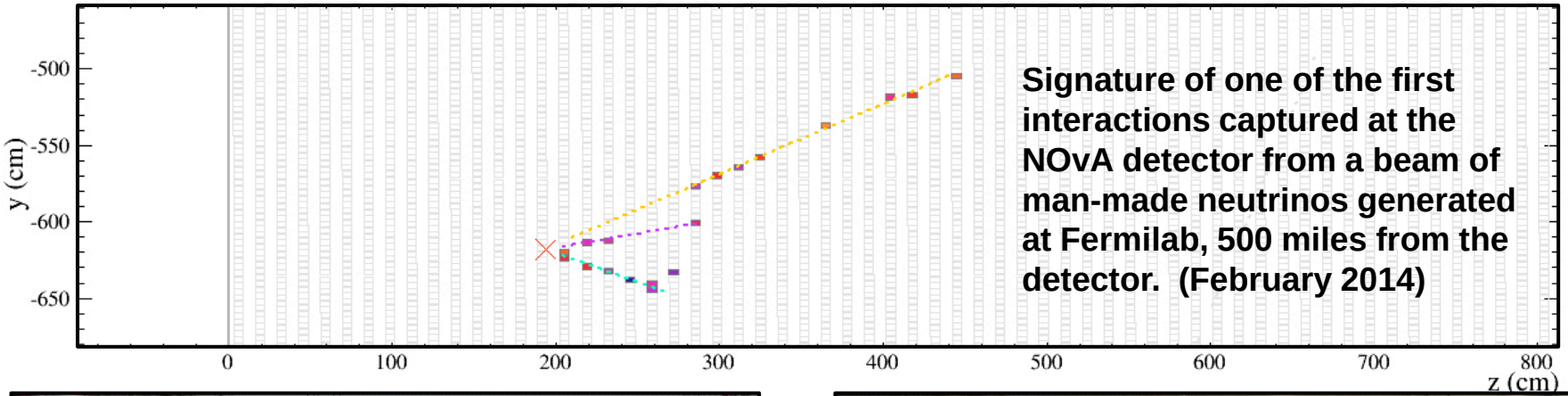


Fermilab Complex

The leading accelerator facility on the intensity frontier

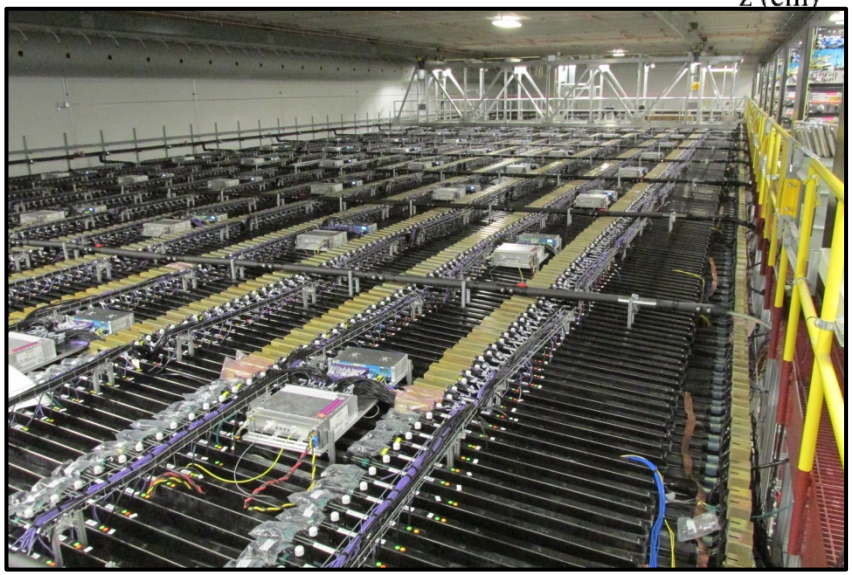


NOvA Experiment Sees First Long-distance Neutrinos



Signature of one of the first interactions captured at the NOvA detector from a beam of man-made neutrinos generated at Fermilab, 500 miles from the detector. (February 2014)

Workers at the NOvA hall assemble the final block of the far detector in early February 2014, with the nearly completed detector in the background. Each block of the detector measures about 50 feet by 50 feet by 6 feet and is made up of 384 plastic PVC modules, assembled flat on a massive pivoting machine.

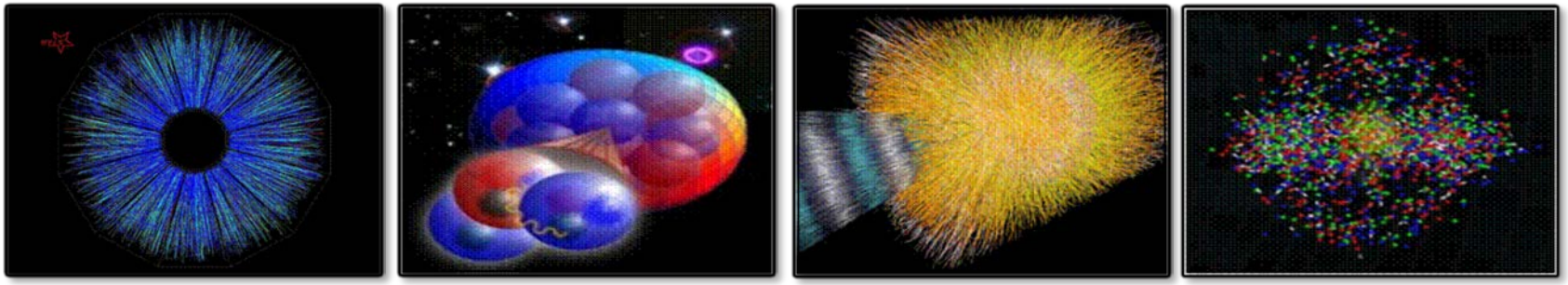


A view of the top of the nearly completed NOvA far detector. The detector is made up of 28 PVC blocks, each weighing 417,000 pounds, and spans 51 feet by 51 feet by 200 feet. When it is filled with liquid scintillator, the far detector will weigh 14,000 tons.

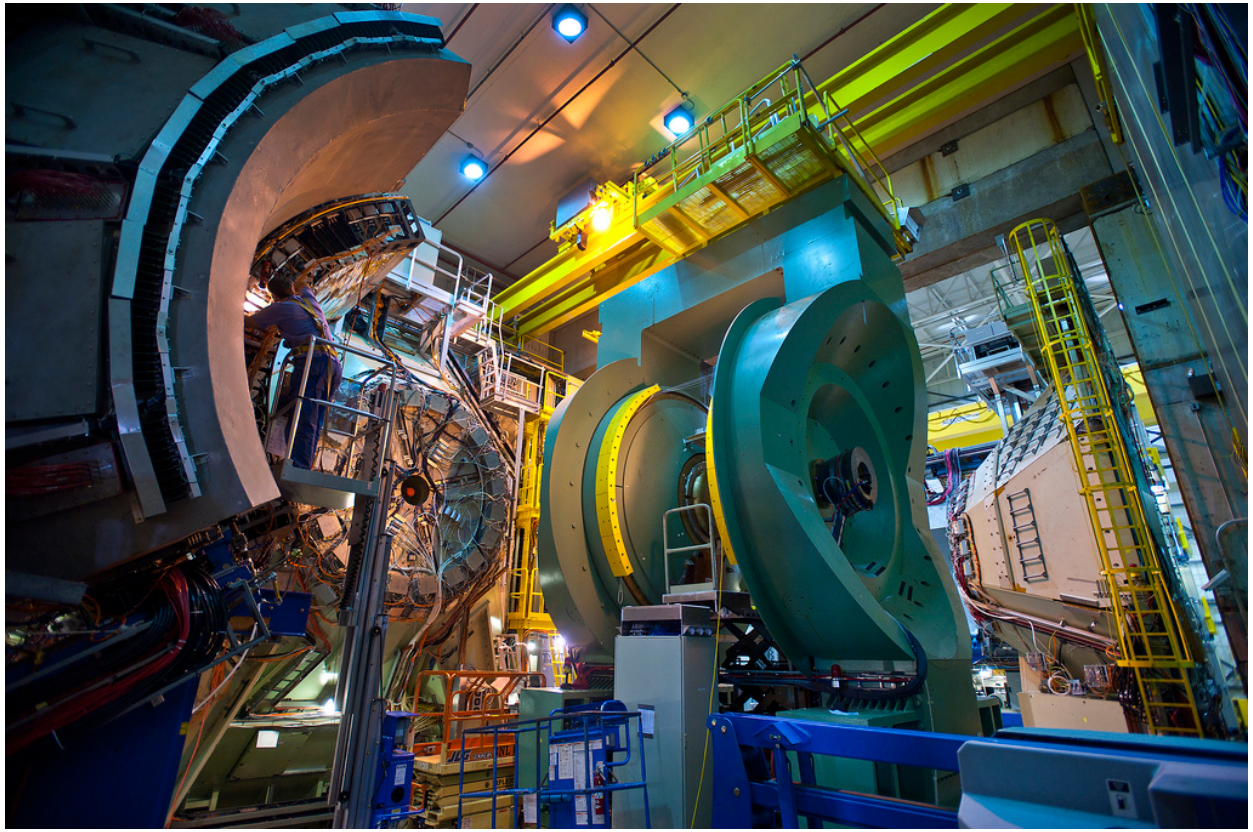
Nuclear Physics

Discovering, exploring, and understanding all forms of nuclear matter

- Research at **RHIC** capitalizes on new micro-vertex detectors to probe the properties of a new perfect Quark-Gluon liquid using charm and bottom quarks.
- Construction continues for the **Facility for Rare Isotope Beams** to study nuclear structure and nuclear astrophysics.
- The **12 GeV CEBAF Upgrade** to study the quark structure of nucleons and nuclei achieves CD-4A, Accelerator Project Completion.
- **ATLAS beams using the Californium Rare Isotope Breeder (CARIBU)** advance understanding of nuclear structure and the origin of the elements in the cosmos.
- Research, development, and production of **stable and radioactive isotopes** is provided for science, medicine, industry, and national security.
- **Core research** funding continues at the FY 2014 level.



RHIC Embarks on New Science Campaigns



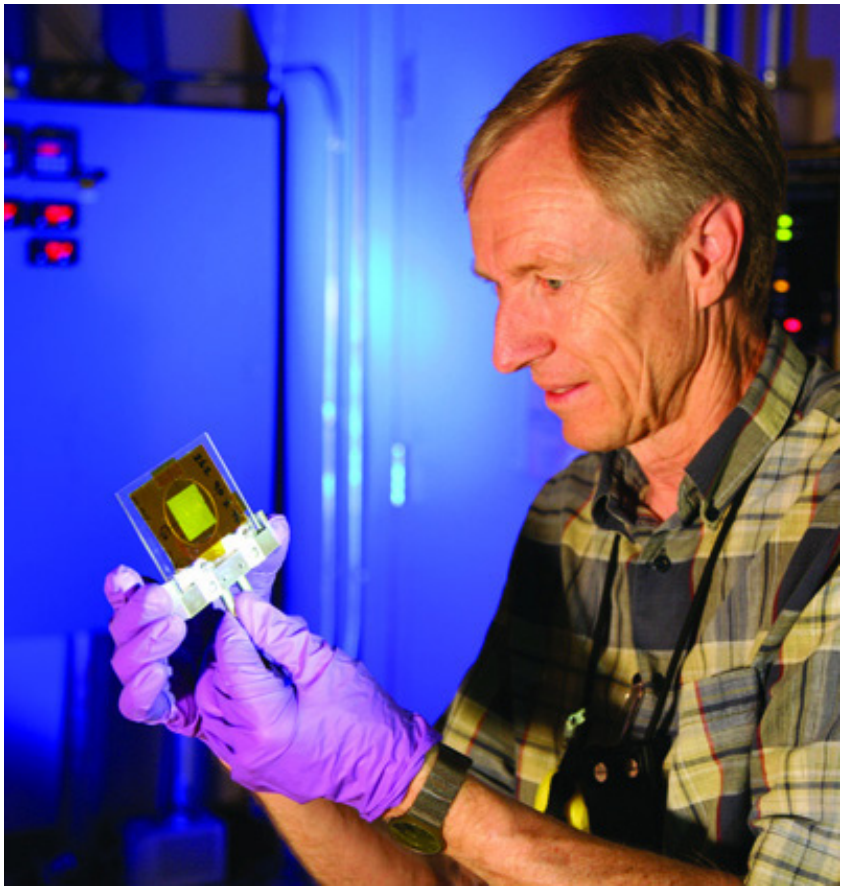
Components of the PHENIX detector at RHIC. PHENIX weighs 4,000 tons; it has large steel magnets and a dozen detector sub-systems that bend and track a wide range of particles while measuring their properties as they emerge from collisions.

- RHIC continues the exploration of the structure of nuclear matter using recently completed innovative machine and detector upgrades. RHIC will probe the structure of the quark-gluon plasma with heavy quarks, which serve as probes of the forces that govern the structure of the “perfect” liquid.

Research Develops New Method of Production of Ac-225

- Los Alamos scientist Meiring Nortier holds a thorium foil test target for the proof-of-concept production experiments.

- **Research shows that it will be possible to match current annual, worldwide production of Ac-225 in just two to five days of operations** using the accelerator at Los Alamos and analogous facilities at Brookhaven.



Workforce Development for Teachers and Scientists

Ensuring a pipeline of STEM workers to support the DOE mission

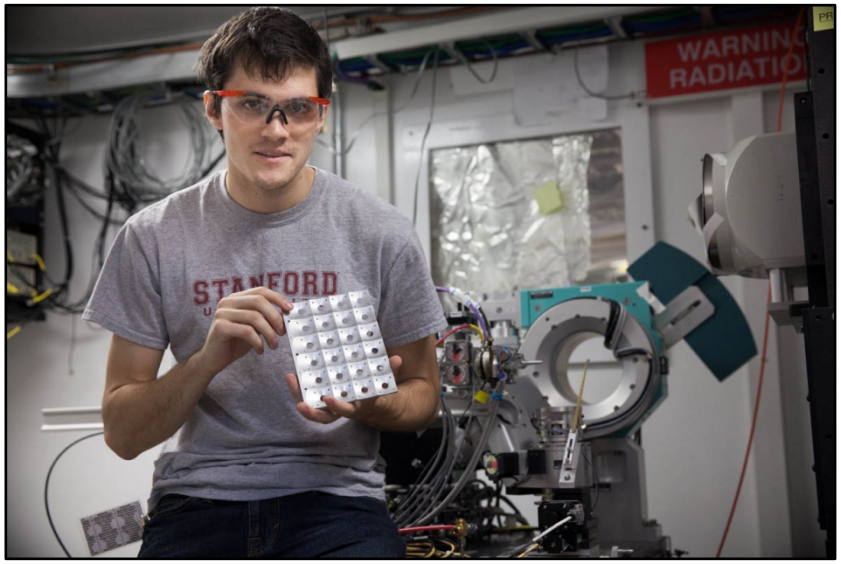
- At the DOE labs, WDTS supports more than 1,000 students and faculty annually
  - 760 Science Undergraduate Laboratory Interns (SULI)
  - 90 Community College Interns (CCI)
  - ~100 graduate students engaged in Ph.D. thesis research for 3-12 months at a laboratory
  - 65 faculty and 30 students in the Visiting Faculty Program (VFP)
- Support for the National Science Bowl
  - More than 20,000 students, coaches, and volunteers participate in the regional and final competitions.
  - In FY 2014, there are 115 regional events, involving 14,000 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. WDTS brings the regional winners, the top 4% of the teams, to Washington, D.C. for the final competitions.
- Support for ~6 Albert Einstein Distinguished Educator Fellows
- On-line business systems modernization
  - A new on-line application systems is fully operational; these systems also collect and archive deliverables and other participant data for program evaluation.
- Program evaluation and assessment
  - Based on a Reverse Site Visit of the Lab Education Directors (LEDs), Core Requirements are defined and implemented in FY 2014 for WDTS laboratory programs across the complex

Student Intern Participant (CCI & VFP) Pursues Graduate Studies in Key DOE Field

Jasmine Hatcher with Senior Chemist Dr. James Wishart in Brookhaven National Lab's (BNL) Chemistry Department.

- Working as a WDTS intern with James Wishart at BNL, Jasmine Hatcher became proficient in purifying ionic liquids (salts that are in a liquid state). Knowing how ionic liquids work may lead to separation processes that help safely dispose of nuclear waste.
- Chemistry wasn't in Hatcher's original study plan. "I always say that chemistry chose me," she said. "I originally wanted to be a nurse, but once I came to Brookhaven I became thoroughly intrigued by the wonders of science and I got hooked."
- Hatcher earned her Associates Degree from Queensborough Community College and her B.S. in Chemistry from Queens College.
- Hatcher is currently pursuing her doctorate in Chemistry at Hunter College, working on research that will remove technetium (^{99}Tc) from radioactive waste, allowing the waste to be stored safely for many years. ^{99}Tc is a major product of uranium and plutonium fission in nuclear power reactors and from weapons production during the Cold War. It has a half-life of 213,000 years, making safe storage an important issue.

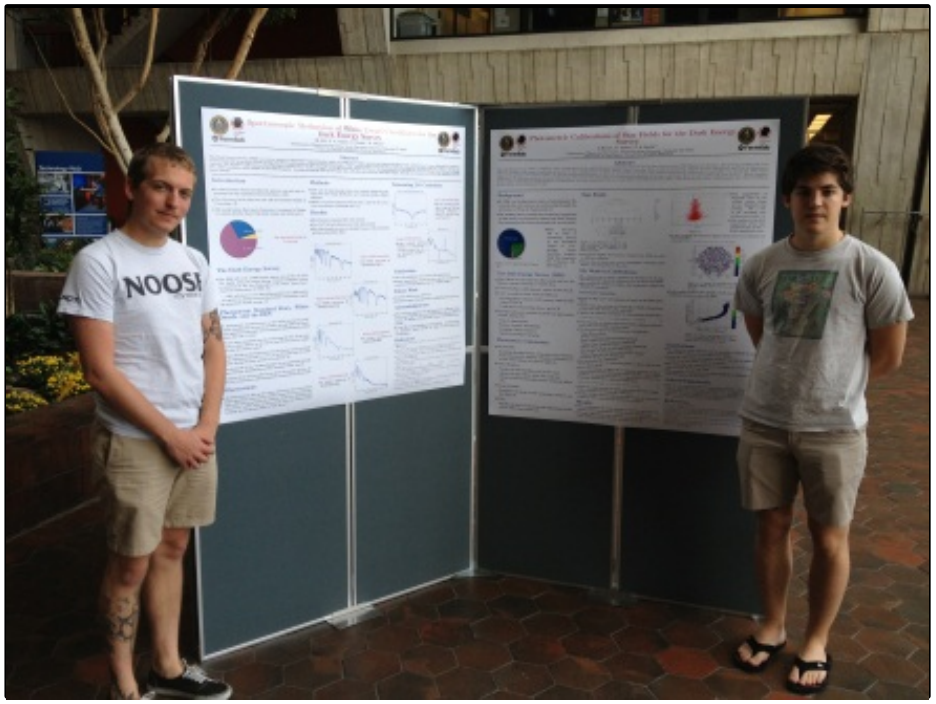
CCI Participant at SLAC Pursues Engineering Degree



Christopher Kleinsasser shown holding part of a prototype multiplex X-Ray sample holder that he helped develop during his CCI appointment.

- The Community College Internship (CCI) program project involved development of a next-generation X-Ray sample holder for to enable rapid throughput X-ray diffraction (XRD) of many samples. Academic, DOE laboratory, and industrial users all will benefit from this device.
- At the outset, the 24-year-old Mathematics/ Natural Science major at Delaware County Community College (PA) was ecstatic about the opportunity. “You are actually working one-on-one with a staff scientist,” Kleinsasser said. “I’m interested in potentially going into basic research and I’ll actually get an idea of what researchers
- Kleinsasser, winner of SLAC’s student intern award for altruism and leadership, credits his WDTS CCI experience based learning opportunity as being an important factor when deciding to pursue an engineering degree at Stanford University.

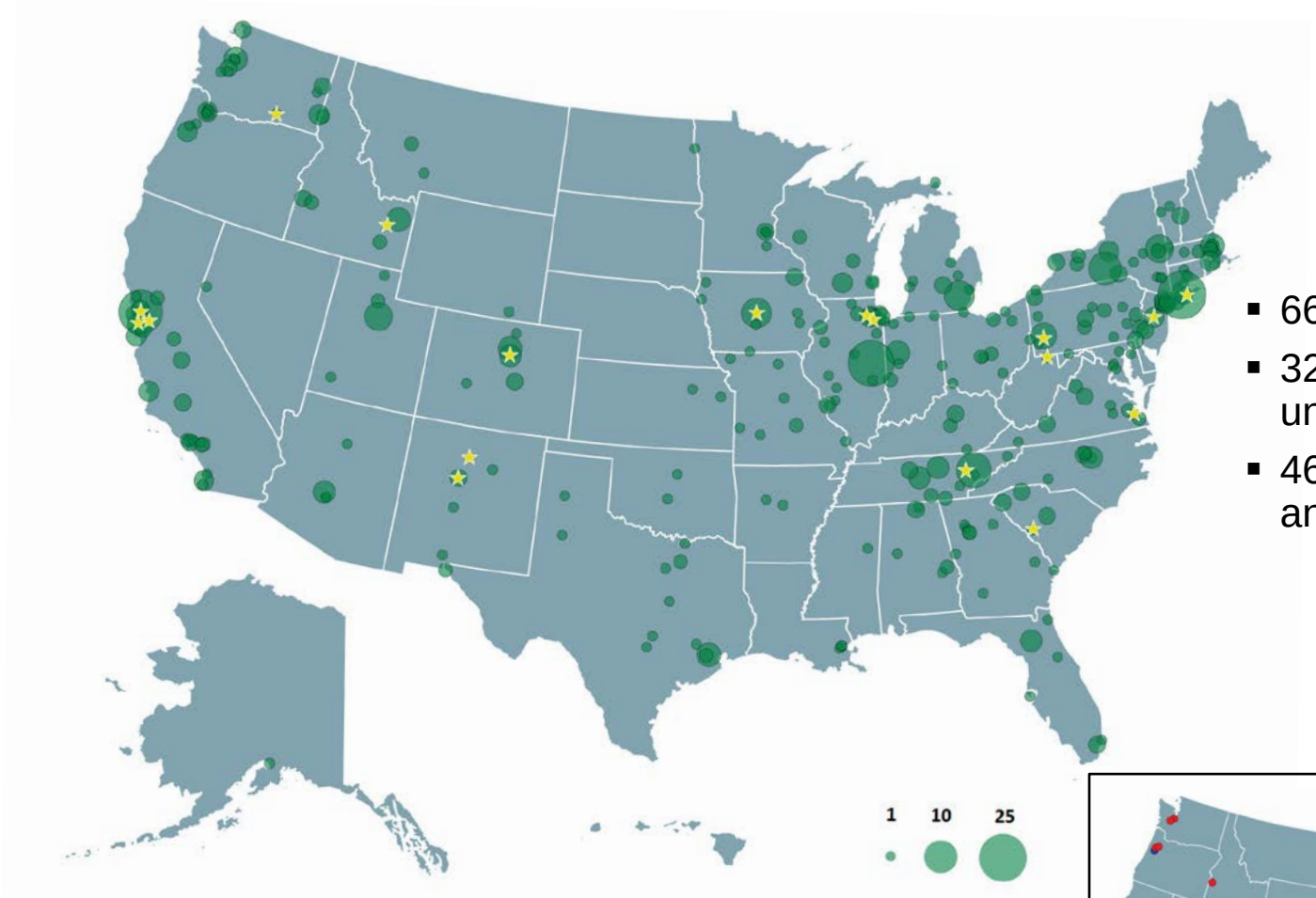
VFP Student Participant Discovers New Star while working on the Dark Energy Survey



Mees Fix, left, and Sam Wyatt, presenting their project results at Fermi National Accelerator Laboratory. A presentation is one required VFP-Student participant deliverable, in addition to a research report, a peer review, and a general audience abstract. These deliverables are intended to help prepare interns for future STEM professional careers.

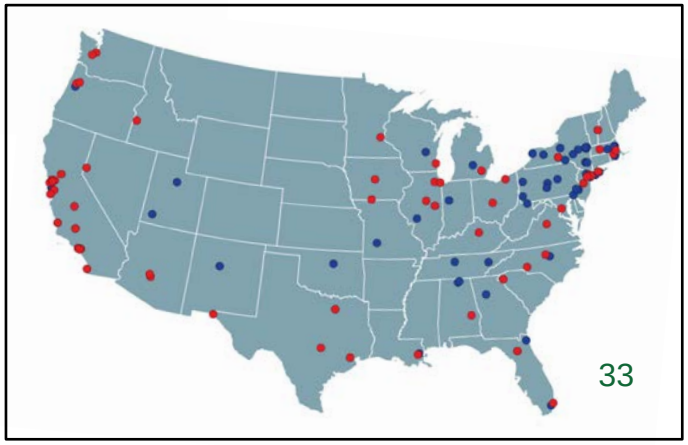
- Fermilab scientists Douglas Tucker and William Wester collaborated with visiting Professor J. Allyn Smith and student interns Samuel Wyatt and Mees Fix (all from Austin Peay State University) in a research project using Fermilab's unique "the cosmos as a laboratory" capability. This research directly supports ongoing Dark Energy Survey calibration studies, an experiment with the potential of discovering the nature of dark energy.
- Spectrographic data from many dozens of a certain type of star were collected and analyzed, where data from one star revealed a surprise when Mees Fix discovered that the emission spectrum had two components . . . one from the parent DA white dwarf and another component likely due to material from an unseen object falling into the white dwarf.
- The spectral data classifies the newly identified star as being a rare "cataclysmic variable star" — an object that warrants further studies.

2012 SULI Participant Undergraduate Institutions

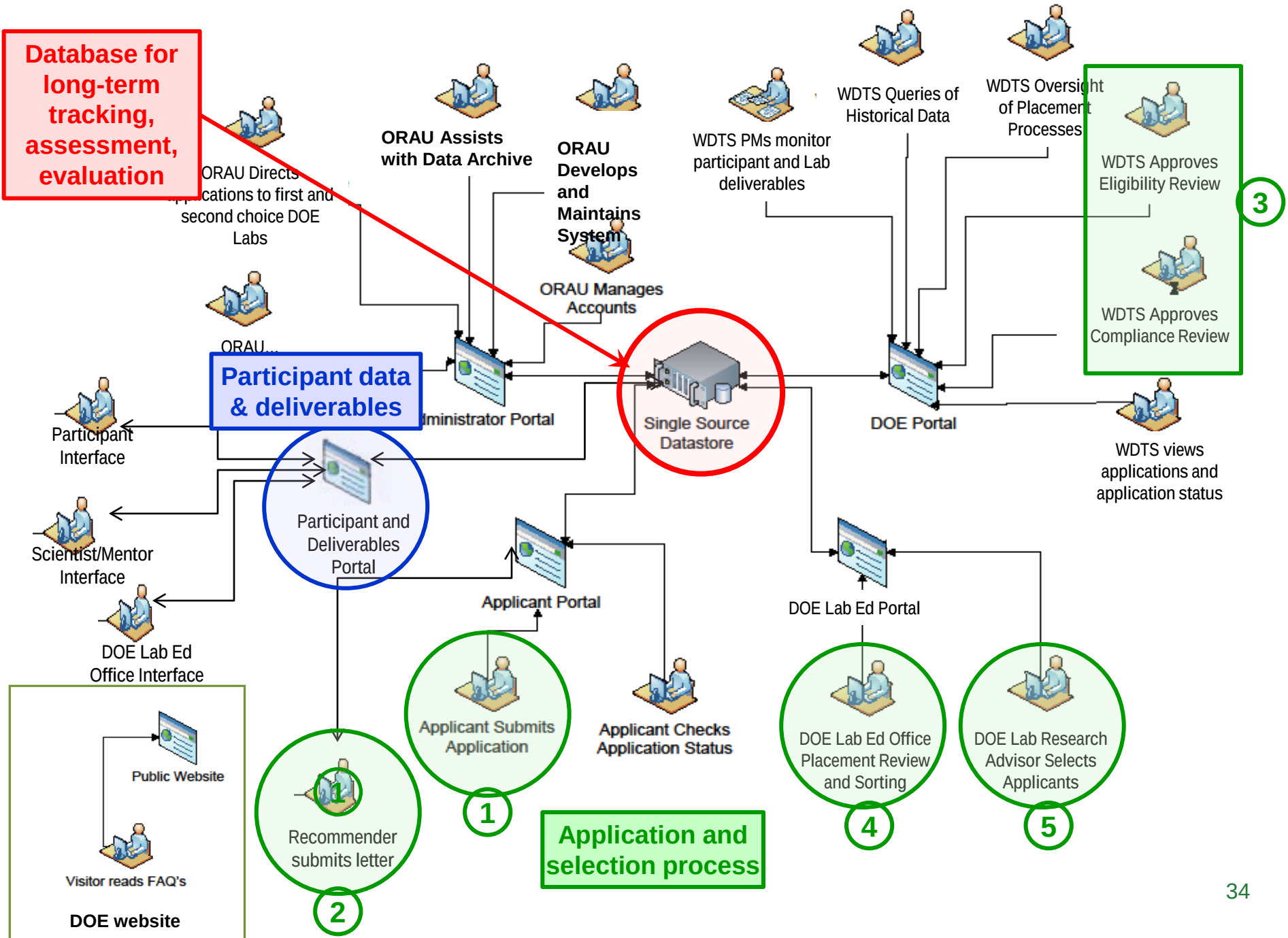


- 665 students
- 321 colleges/ universities
- 46 states, Puerto Rico and U.S. Virgin Islands

Inset at right shows home institutions of students who interned at two of the DOE labs: Lawrence Berkeley National Lab (red dots) and Brookhaven National Lab (blue dots)



Sample Schematic – Science Undergraduate Laboratory Internship



Science Laboratory Infrastructure

Supporting infrastructure at SC labs

Final funding for:

- **Science and User Support Building (SLAC):** This project houses the service and support functions for the growing number of researchers who come to use SLAC facilities as well as facilities to serve both the locals and visitors.

New funding for:

- **Infrastructure and Operational Improvements (PPPL):** This project will provide critical improvements to infrastructure and operations that support plasma and fusion-energy sciences research
- **Materials Design Laboratory (ANL):** This project will support research in materials science in energy and a range of other fields
- **Photon Science Laboratory Building (SLAC):** This project will provide centralized modern laboratory and office space to enable the development and expansion of SLAC's photon science programs.
- **Integrative Genomics Building (LBNL):** This project will relocate a significant fraction of the biosciences research currently located in commercially leased space onto the main LBNL campus.

Safeguards and Security

Supporting protection against unauthorized access, theft, or destruction of DOE assets

- Maintain adequate security for the special nuclear material housed in Building 3019 at the Oak Ridge National Laboratory.
- Consolidate Central Alarm Station activities at Oak Ridge National Laboratory, the East Tennessee Technology Park, and the Oak Ridge Federal Building.
- Support the CyberOne strategy--DOE's solution for managing enterprise-wide cyber-security for incident response and identity management to mitigate the risk of intrusion.

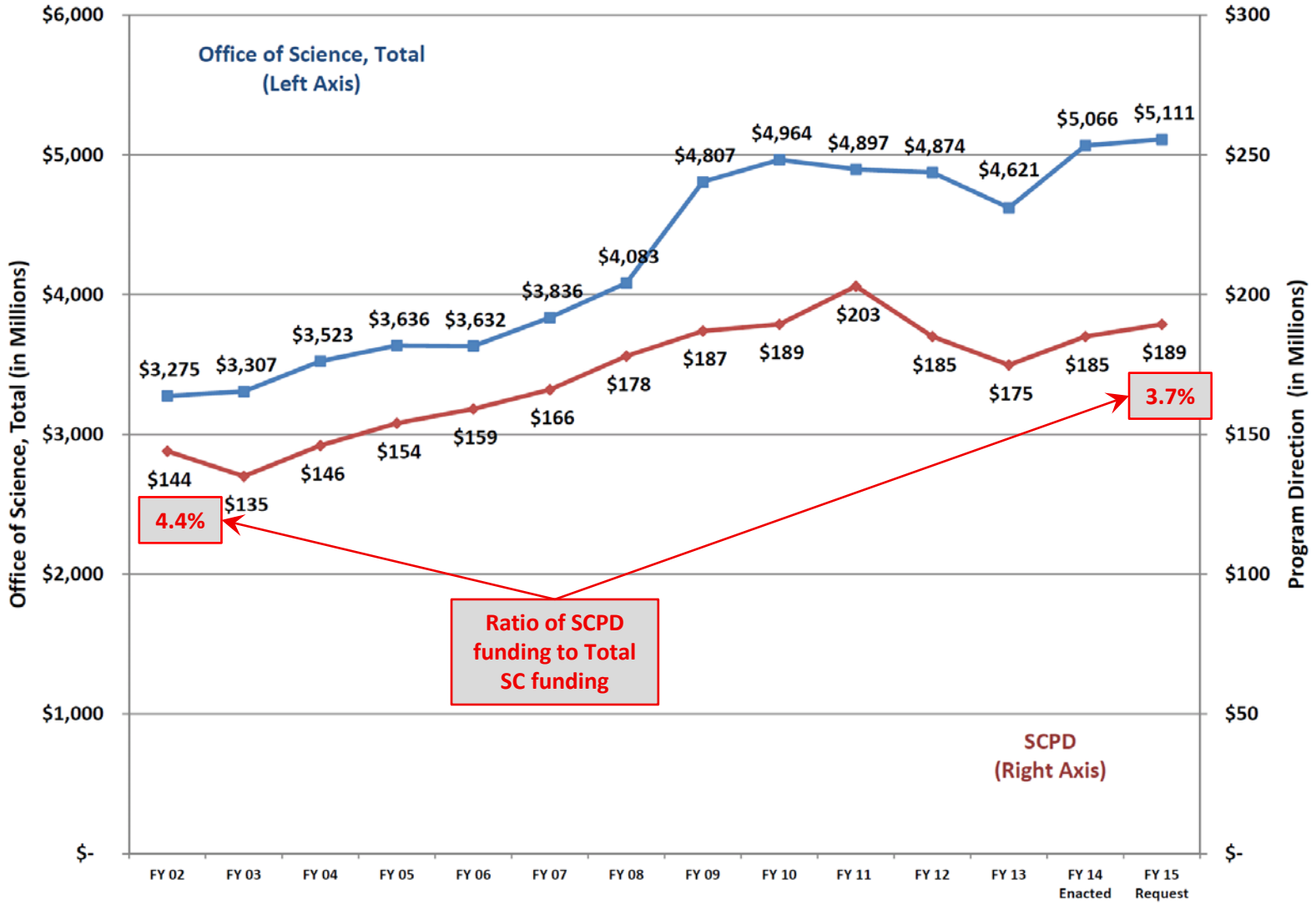
Program Direction

Supporting a Federal workforce to oversee SC investments

FY 2015 Budget supports 975 FTEs:

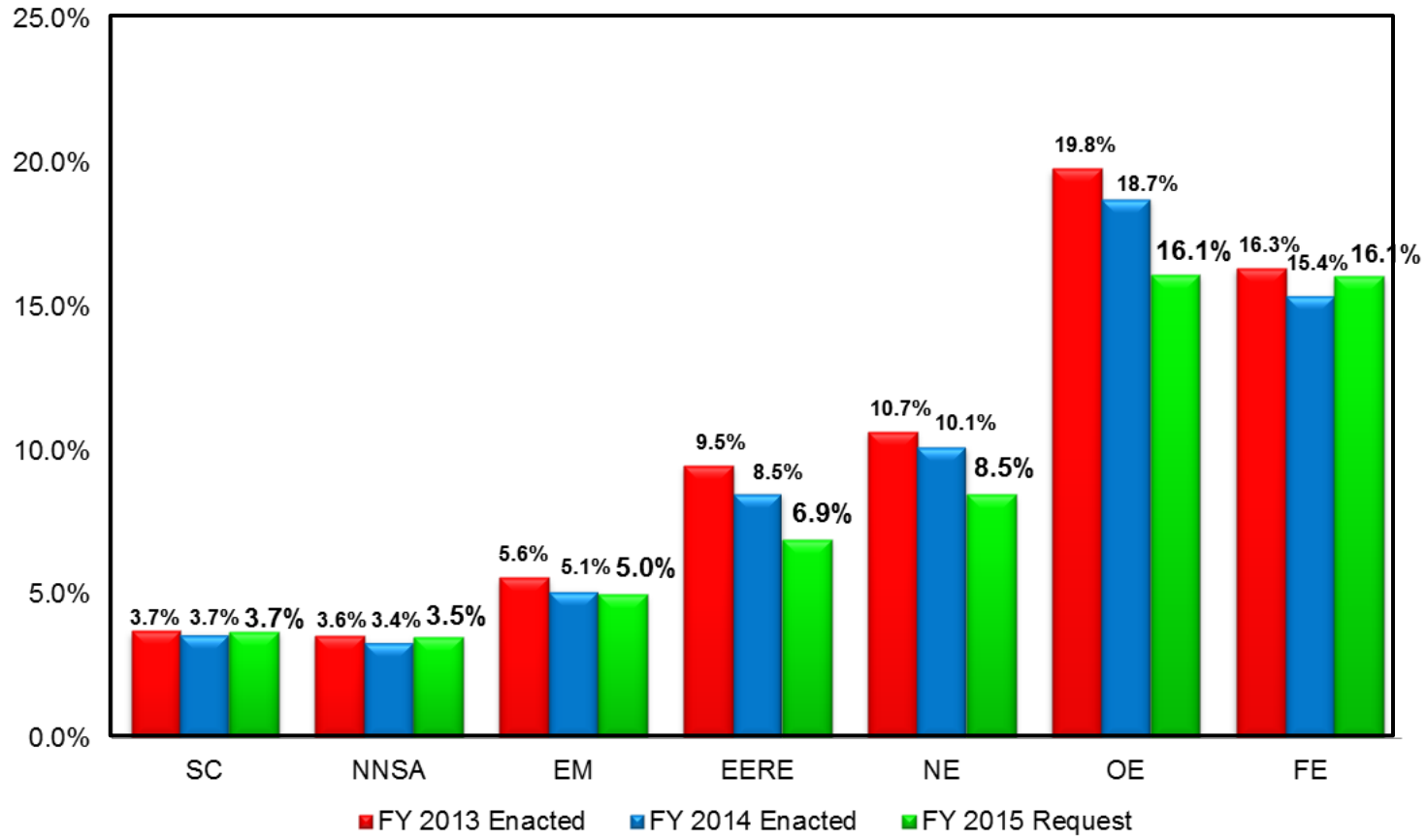
- Manage science programs, facilities, and projects; support operations associated with portfolio management; support the newly created Office of the Under Secretary for Science and Energy; and administer the President's Council of Advisors on Science and Technology (PCAST).
- Strategic hiring to backfill essential positions and to continue implementation of SC's succession planning strategy.
- SC Information Technology Modernization Plan (ITMP) – Savings in Support Services and Other Related Expenses resulting from the consolidation of data centers, IT support service contracts, and enhanced and more efficient technologies.
- Federal travel for scientific program oversight and mandatory site visits for health and safety inspection. Also supports required travel for PCAST activities.

Program Direction Funding History

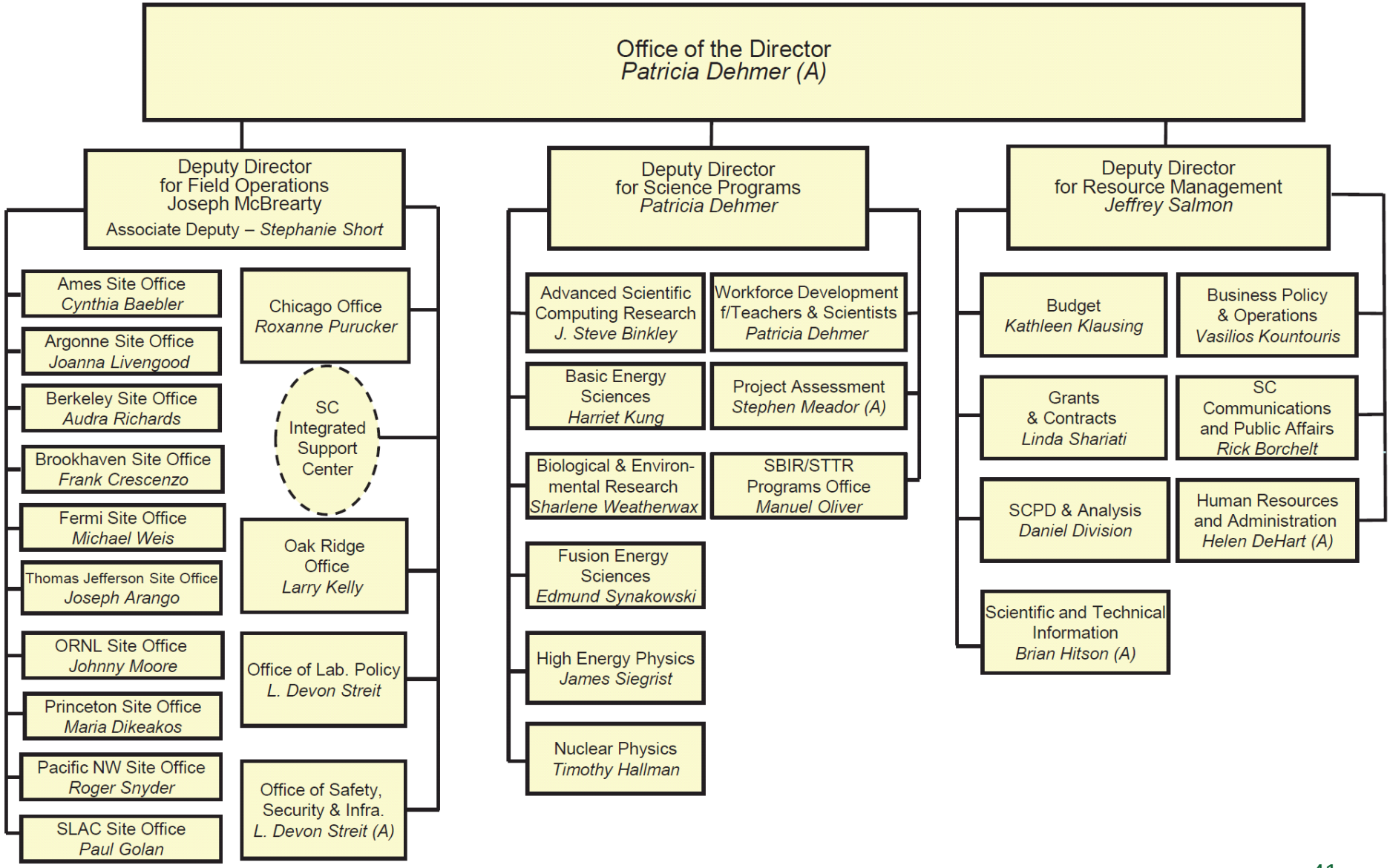


Office of Science Compared to Other DOE PD Budgets

SC and NNSA have the lowest PD/Total Budget Ratios in DOE



Backup



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