



Department of Energy FY 2016 Budget

February 2, 2015



ENERGY.GOV

\$29.9 billion Budget Advances Nuclear Security, Science & Energy, and Environmental Cleanup

DOE is entrusted with a broad and diverse portfolio

Nuclear Security: \$12.8B

- Maintaining and modernizing the nuclear deterrent without testing
- In an age of global terrorism, controlling and eliminating nuclear materials worldwide and providing nuclear and radiological emergency response capabilities
- Propelling our nuclear Navy

Science and Energy: \$10.7B

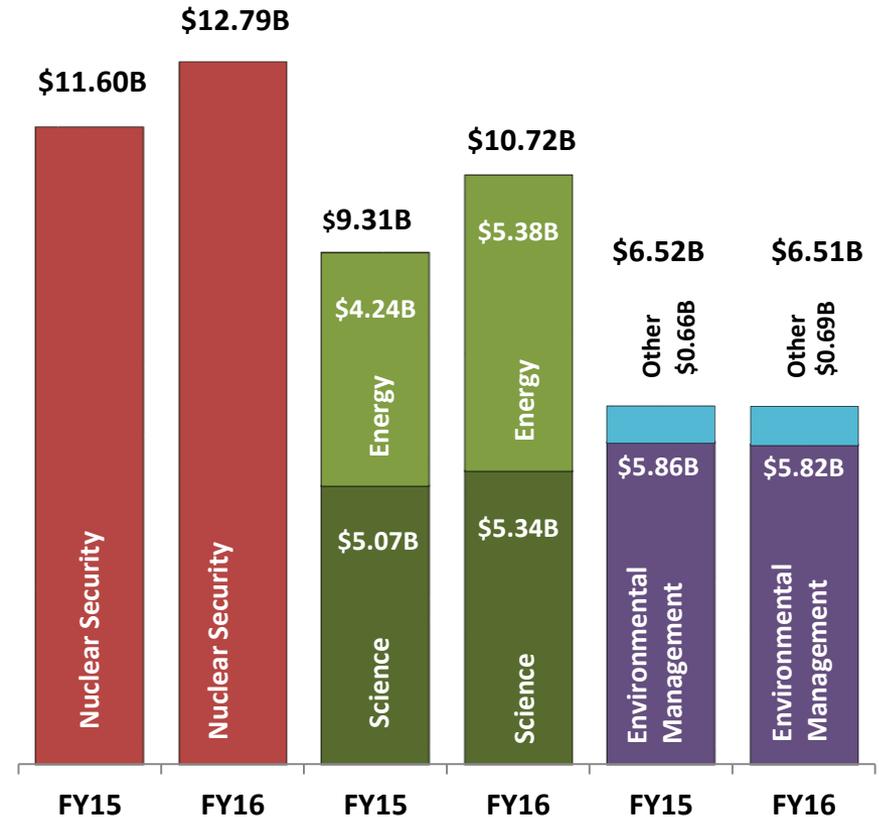
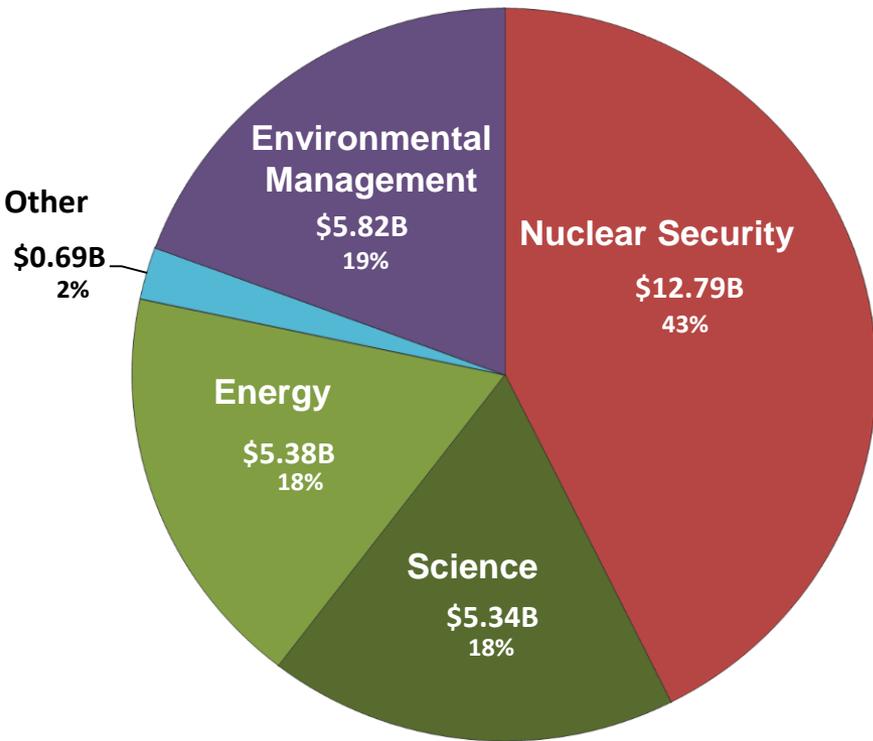
- Enabling the transition to a low-carbon, secure energy future with low-cost, all-of-the-above energy technologies
- Supporting a secure, modern and resilient energy infrastructure
- Providing the backbone for discovery and innovation, especially in the physical sciences, for America's research community

Environmental Management: \$5.8B

- Cleaning up from the Cold War legacy of nuclear weapons production



Advancing Nuclear Security, Science & Energy, and Environmental Cleanup: DOE \$29.9 billion FY 2016 Budget



The \$29.9 billion budget is a \$2.5 billion (9%) increase from FY 2015

Science: Leading Edge Research and World Class Research Infrastructure

Accomplishments, examples

- ✓ Completed construction on schedule and within budget of the National Synchrotron Light Source (NSLS-II) at Brookhaven; the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Accelerator Laboratory; and the National Spherical Torus Experiment (NSTX) at Princeton; commissioning underway
- ✓ Mapped the structure of a protein within a living cell using the Stanford Linac Coherent Light Source (LCLS)
- ✓ Developed a new class of polymer-based flexible electronics for solar cells and medical applications through DOE-funded university research
- ✓ Established traineeship programs to support students in 3 key research areas – high performance computing, advanced manufacturing and environmental management – and expanding to radiochemistry in FY 2016

FY 2016 Highlights

- Invest \$273M in a multi-year, joint Office of Science - NNSA effort to achieve exascale computing – a thousand-fold improvement over current high performance computers
- Initiate 5 new Energy Frontier Research Centers (EFRCs) and continue support for existing Centers (\$110M)
- Upgrade the LCLS-II (\$200M) and construct the Facility for Rare Isotope Beam (FRIB) at Michigan State (\$100M)
- Operate the NOvA neutrino experiment at Fermilab (\$135M total operations); and develop an enhanced Long Baseline Neutrino Facility (LBNF) with international partners (\$20M)
- Fund operations of National Laboratory User Facilities at 98% of capacity, up from FY 2015, supporting 31,000 researchers (\$2B)



Science: Leading Edge Research and World Class Research Infrastructure

\$ in millions

| Program | FY 2015 | FY 2016 | % Delta |
|---|--------------|--------------|-----------|
| Advanced Scientific Computing Research | 541 | 621 | 15% |
| Basic Energy Sciences | 1,733 | 1,849 | 7% |
| Biological and Environmental Research | 592 | 612 | 3% |
| Fusion Energy Sciences Program | 468 | 420 | -10% |
| High Energy Physics | 766 | 788 | 3% |
| Nuclear Physics | 596 | 625 | 5% |
| Workforce Development for Teachers and Scientists | 20 | 21 | 5% |
| Science Laboratories Infrastructure | 80 | 114 | 43% |
| Safeguards and Security | 93 | 103 | 11% |
| Program Direction | 184 | 187 | 2% |
| Rescission of Prior Year Balances | -3 | --- | |
| Total | 5,068 | 5,340 | 5% |



Energy: All-of-the-Above Approach for a Low-Carbon Economy

Accomplishments, All-of-the-above Approach

- ✓ Sequestered over 9 million metric tons of CO₂ through DOE-supported projects
- ✓ Commenced operation of 2 cellulosic ethanol facilities supported by grants and loan guarantees
- ✓ Issued a record 10 final appliance energy efficiency standards in 2014, with plans to issue 12 more in 2015
- ✓ Commissioned one of the world's largest battery storage systems at Tehachapi Wind Energy Storage Project
- ✓ Attracted \$625M in private follow-on funding to 22 ARPA-E projects; 24+ ARPA-E teams formed new companies
- ✓ Achieved 70% of SunShot goal of cost parity for utility scale solar energy
- ✓ Launched FORGE, a first-of-a-kind field laboratory to deploy enhanced geothermal energy systems
- ✓ Successfully completed the first 5-year program at the CASL nuclear modeling Hub at Oak Ridge
- ✓ Initiated design and licensing for a second small modular nuclear reactor with advanced safety features
- ✓ Achieved battery technology improvements that are projected to reduce battery costs by 40%
- ✓ Issued all-of-the-above loan guarantee solicitations for innovative technologies in renewable energy and energy efficiency (\$4B); fossil energy (\$8B); nuclear energy (\$12B); and advanced vehicle technology manufacturing (\$16B)



Energy: All-of-the-Above Approach for a Low-Carbon Economy

FY 2016 Highlights

■ **Advanced Manufacturing**

- ❖ Fully fund 2 new Clean Energy Manufacturing Institutes (CEMI) and continue funding 4 Institutes, as part of the larger National Network of Manufacturing Institutes (\$196M for CEMI; \$404M total for advanced manufacturing)

■ **Energy Efficiency**

- ❖ Accelerate emerging building technologies to reduce Nation's building energy use by 50% (\$264M, increase of \$92M)
- ❖ Increase weatherization retrofits to approximately 33,000 low-income homes nationwide (\$228M, increase of \$35M)

■ **Sustainable Transportation**

- ❖ Develop and demonstrate technologies to double freight truck efficiency by 2020 in the SuperTruck II (\$40M)
- ❖ Continue EV Everywhere program to enable domestic production of plug-in vehicles that are as affordable and convenient as gasoline vehicles by 2022 (\$253M)

■ **Biofuels**

- ❖ Jointly fund (with USDA and DOD) commercial scale biorefineries to produce military specification drop-in fuels (\$45M)
- ❖ Continue R&D efforts on converting cellulosic and algal-based feedstocks to bio-based gasoline and diesel (\$39M)

■ **Renewable Energy**

- ❖ Solar: Continue SunShot Initiative to achieve cost parity without subsidies by 2020 (\$337M, increase of \$104M)
- ❖ Wind: Continue first 3 off-shore wind projects to begin operation in 2017 (\$146M, increase of \$39M)
- ❖ Geothermal: Implement FORGE and pursue new approaches to hydrothermal development (\$45M)



Energy: All-of-the-Above Approach for a Low-Carbon Economy

FY 2016 Highlights

■ Fossil Energy

- ❖ Initiate efforts leading to a natural gas fired CCS technology demonstration (\$7M)
- ❖ Work with prospective applicants for \$8 billion of loan guarantee authority
- ❖ Propose a new refundable investment tax credit (\$2B) and expanded sequestration credit for commercial CCUS deployment

■ Nuclear Energy

- ❖ Continue cost shared licensing and technical support for small modular reactors (\$62.5M)
- ❖ Support R&D on reactor aging issues, accident tolerant fuels, and advanced reactor concepts (\$108M)
- ❖ Lay the groundwork for development of one or more facilities for management of used fuel and high-level waste using a consent-based siting program and preparation for large-scale transportation of used fuel (\$75M for waste R&D; \$33M for implementation)

■ ARPA-E

- ❖ Invest in early-stage innovation with the potential to lead to transformational energy technologies (\$325M, an increase of \$45M)

■ Loans and Loan Guarantees

- ❖ Issue new loan guarantee solicitation for new clean energy projects on Tribal Lands (\$9M for credit subsidy costs)
- ❖ Process new applications under existing solicitations for renewable energy, energy efficiency, fossil energy, nuclear energy and advance vehicle technology manufacturing solicitations (\$40B in loan volume)



Energy: Transforming Energy Systems, Investing in Resilient Energy Infrastructure

Accomplishments, examples

- ✓ Completed design for nation's first large-scale micro-grid to provide resilient electricity capability for the N.J. Transit system
- ✓ Completed nationwide public stakeholder process and analytical work in support of upcoming release of the first-ever Quadrennial Energy Review (QER) of U.S. energy infrastructures

FY 2016 Highlights

- Invest in technology development, enhanced security and modeling to enable the electricity grid of the future (\$356M)
- Develop advanced technologies to detect and mitigate methane emissions from natural gas transmission, distribution and storage facilities (\$15M); and improve methane leakage measurements (\$10M)
- Initiate a new R&D effort to improve resiliency of large-scale electricity transformers (\$10M)
- Provide competitive grants and technical assistance to state, tribal, and local governments to update energy assurance plans to address infrastructure resiliency (\$35.5M)
- Provide competitive grants to states and multi-state entities to address electricity reliability (\$27.5M; part of grid crosscut)
- Support integrated energy systems analysis and follow-on QER activities led by Office of Energy Policy and Systems Analysis (EPSA) (\$35M)



Energy: Enhancing Collective Energy Security

Accomplishments, examples

- ✓ Achieved G-7 Leaders Agreement on a new collective energy security framework
- ✓ Completed a 5 million barrel test sale for the Strategic Petroleum Reserve with valuable lessons learned
- ✓ Provided technical support to Ukraine in developing its first ever energy emergency management plan
- ✓ Entered into Memorandum of Understanding with Canada and Mexico to initiate improved coordination of North American energy data
- ✓ Initiated data reporting program on oil and natural gas production trends by region

FY 2016 Highlights

- Increase investments in improving operational readiness of the Strategic Petroleum Reserve (\$257M, an increase of \$57M)
- Strengthen international energy technology, information and analytical collaborations, coordinated by the Office of International Affairs (\$24M)
- Increase investment in EIA to fill gaps in current energy data including transportation of oil by rail and integrating energy data with Canada and Mexico (\$131M, increase of \$14M)



Energy: All-of-the-Above Approach for a Low-Carbon Economy, Resilient Energy Infrastructure

\$ in millions

| Program | FY 2015 | FY 2016 | % Delta |
|--|--------------|--------------|------------|
| Energy Efficiency & Renewable Energy | | | |
| Sustainable Transportation | 602 | 793 | 32% |
| Renewable Energy | 456 | 645 | 41% |
| Energy Efficiency | 642 | 1,030 | 60% |
| Corporate Support Programs | 237 | 255 | 8% |
| Rescission of Prior Year Balances | -23 | --- | |
| <i>Total, EERE</i> | <i>1,914</i> | <i>2,723</i> | <i>42%</i> |
| Electricity Delivery & Energy Reliability | 147 | 270 | 84% |
| Fossil Energy | 791 | 842 | 6% |
| Nuclear Energy | 833 | 908 | 9% |
| Office of Indian Energy Policy & Programs | 16 | 20 | 25% |
| Advanced Research Projects Agency - Energy | 280 | 325 | 16% |
| Energy Information Administration | 117 | 131 | 12% |
| International | 13 | 24 | 82% |
| Energy Policy and Systems Analysis | 31 | 35 | 12% |
| Loan Programs Office | 21 | 17 | -19% |
| Power Marketing Administrations | 80 | 82 | 2% |
| Total | 4,244 | 5,376 | 27% |



Strategic Partnerships with the National Laboratories to Advance DOE Missions

Accomplishments, examples

- ✓ National Laboratories Ideas Summit helped shape FY 2016 budget initiatives
- ✓ Oak Ridge National Laboratory led the Red Team review and restructuring of the Uranium Processing Facility (UPF)
- ✓ Savannah River National Laboratory led the forensics effort to investigate the cause of the failure of the waste canister at the Waste Isolation Pilot Plant (WIPP)
- ✓ 10 National Laboratories formed a special consortium arrangement to implement cross-cutting grid modernization research
- ✓ The Laboratory Operations Board (LOB) performed the first-ever uniform assessment of general purpose infrastructure at all Laboratories and NNSA plants

FY 2016 Highlights

- Target over \$100M in new investments to priority general purpose infrastructure projects guided by LOB assessments and avoid increased deferred maintenance
- Develop new strategies to strengthen institutional capability of the National Laboratory system based on advice from the Secretary of Energy Advisory Board (SEAB)



Enhancing Impact: Crosscutting Initiatives in Key Technology Areas

\$ in millions

| | FY 2015 | FY 2016 | DOE Offices |
|---|------------|--------------|---|
| Exascale Computing: investments to make progress toward a thousand-fold improvement over current high performance computers | 149 | 273 | NNSA, SC |
| Energy-Water Nexus: technology investment and analysis to increase efficiency of these interdependent resources | 16 | 38 | EERE, EPSA, FE, IA, IE, SC |
| Grid Modernization: technology development, enhanced security, and stakeholder support to enable evolution to the grid of the future | 196 | 356 | EERE, EPSA, IE, OE |
| Subsurface Engineering: investment in new wellbore systems, seismic research, and other areas supporting a wide variety of energy sources | 168 | 244 | EERE, EM, FE, NE, SC |
| Supercritical CO₂: establish a 10 MWe scale pilot Supercritical Transformational Electric Power facility | 33 | 44 | EERE, FE, NE |
| Cybersecurity: strengthen cybersecurity across DOE -- federal and lab; improve cybersecurity for the nation's electric, oil, and gas sectors | 312 | 306 | EERE, EHS&S, EIA, EM, FE, EA, LM, NE, NNSA, OCIO, OE, PMAs, SC, WCF |
| Grand Total (net of ~\$50M in Grid cybersecurity counted in both crosscuts) | 827 | 1,209 | |



Nuclear Security: Effective Stewardship of The Nuclear Deterrent

Accomplishments, examples

- ✓ Maintained a safe, secure, and effective nuclear weapons stockpile without testing (for over 20 years)
- ✓ Passed halfway mark in Life Extension Program (LEP) for the W76-1 warheads for Navy
- ✓ Conducted successful first integration testing of B61-12 LEP for Air Force
- ✓ Selected W80 as warhead for Air Force's Long Range Stand-Off system (LRSO)
- ✓ Completed the new Kansas City Responsive Infrastructure Manufacturing and Sourcing (KCRIMS) facility
- ✓ Significantly increased quarterly shot rate at the National Ignition (NIF) and achieved experimental results in closer alignment with modeling predictions

FY 2016 Highlights

- Complete production of W76-1 LEP warhead by FY 2019 (\$244M)
- Deliver B61-12 LEP First Production Unit (FPU) by FY 2020 (\$643M)
- Deliver W88 ALT 370 FPU (w/ conventional high explosives refresh) by FY 2020 (\$220M)
- Accelerate W80-4 LEP FPU by two years to 2025 (\$195M)
- Implement a disciplined, "modular" approach for constructing Uranium Processing Facility (UPF) at Y-12 (\$430M) and the Chemistry and Metallurgical Research Replacement Facility (CMRR) at Los Alamos (\$156M)



Nuclear Security: Controlling and Eliminating Nuclear Materials Worldwide

Accomplishments, examples

- ✓ Completed removal or disposal of a total of 190 kilograms of vulnerable nuclear material
- ✓ Helped prevent illicit trafficking of nuclear and radiological materials, technology and expertise by installing 37 fixed and 22 mobile radiation detection systems worldwide
- ✓ Obtained pledge from Japan at the 2014 Nuclear Security Summit in The Hague to remove and dispose of all highly-enriched uranium and separated plutonium from the Fast Critical Assembly in Japan

FY 2016 Highlights

- Increase overall funding for nonproliferation (\$1.9B)
- Reorganize program into four business lines: Global Material Security (\$427M); Materials Management and Minimization (\$312M); Nonproliferation and Arms Control (\$137M); and Nonproliferation Research and Development (\$419M)
- Strengthen Counterterrorism and Emergency Response by consolidating these efforts with Nuclear Nonproliferation programs in one account
- Continue mixed-oxide (MOX) project at the FY 2015 appropriation funding level while completing Congressionally-directed studies on plutonium disposition (\$345M)



Nuclear Security: Advancing Navy Nuclear Propulsion

Accomplishments, examples

- ✓ Provided technical resolution support while nuclear fleet steamed over 2 million miles
- ✓ Advanced the *Ohio*-Class Replacement and the S8G Prototype Refueling projects
- ✓ Delivered the first unit of the next-generation A1B aircraft carrier reactor plant for initial testing

FY 2016 Highlights

- Continue development of the *Ohio*-class Replacement Reactor (\$187M)
- Initiate Refueling of the Land-Based Prototype reactor (\$133M)
- Continue construction of a new Spent Fuel Handling Recapitalization Project (\$86M)



Nuclear Security: Investments in Nuclear Deterrent, Nuclear Nonproliferation, and Navy Nuclear Propulsion

\$ in millions

| Program | FY 2015 | FY 2016 | % Delta |
|----------------------------------|---------------|---------------|------------|
| Weapons Activities | 8,180 | 8,847 | 8% |
| Defense Nuclear Nonproliferation | 1,615 | 1,940 | 20% |
| Naval Reactors | 1,234 | 1,375 | 11% |
| Federal Salaries and Expenses | 370 | 403 | 9% |
| Total | 11,399 | 12,565 | 10% |



Environmental Management: Cleaning up Cold War Nuclear Weapons Legacy

Accomplishments, examples

- ✓ Completed demolition of the K-25 facility at Oak Ridge, the largest DOE demolition project
- ✓ Converted 15 million pounds of liquid waste into solid glass at the Defense Waste Processing Facility (DWPF) at Savannah River, enabling closure of 6 high level waste storage tanks
- ✓ Developed and implemented an alternative phased approach to completing the Hanford Waste Treatment Plant (WTP)
- ✓ Cleaned up of 479 of the 586 square mile area at Hanford, including 90% of the River Corridor

FY 2016 Highlights

- Implement WIPP recovery plan leading to initial resumption of waste emplacement in the 1st quarter calendar year 2016 (\$248M)
- Continue operations of the Integrated Waste Treatment Unit at Idaho and work towards closing tanks
- Construct the Low Activity Waste (LAW) facility at the Hanford Waste Treatment Plant, including design of a new pretreatment system; continue technical issue resolution
- Bring Plutonium Finishing Plant (PFP), once the highest risk nuclear facility at Hanford, down to slab-on-grade by the end of FY 2016
- Continue construction and prepare for commissioning of the Salt Waste Processing Facility at Savannah River on schedule to support 2018 start-up



Environmental Management: Cleaning up Cold War Nuclear Weapons Legacy

\$ in millions

| Program | FY 2015 | FY 2016 | % Delta |
|---|--------------|--------------|------------|
| Richland/Hanford | 1,007 | 914 | -9% |
| River Protection | 1,212 | 1,414 | 17% |
| Savannah River | 1,260 | 1,337 | 6% |
| Carlsbad/Waste Isolation Pilot Plant (WIPP) | 324 | 248 | -24% |
| Idaho National Laboratory | 405 | 367 | -9% |
| Oak Ridge | 431 | 366 | -15% |
| Paducah | 270 | 232 | -14% |
| Portsmouth | 276 | 227 | -18% |
| Los Alamos National Laboratory | 190 | 189 | -1% |
| Nevada | 65 | 62 | -4% |
| West Valley Demonstration Project | 60 | 61 | 1% |
| Energy Technology Engineering Center | 9 | 10 | 17% |
| Moab | 36 | 38 | 6% |
| Remaining Sites | 17 | 9 | -50% |
| Title X Uranium/Thorium Reimbursement Program | 10 | 33 | 230% |
| HQ and Program Direction | 310 | 311 | 1% |
| Adjustments | -21 | --- | -100% |
| Total | 5,861 | 5,818 | -1% |



Management and Performance: Improving Efficiency and Effectiveness

Accomplishments, examples

- ✓ Adopted Project Management Reforms, strengthening the Energy Systems Acquisition Advisory Board, establishing a Project Management Risk Committee, and improving the project peer review process
- ✓ Recruited 30 high-level Ambassadors from industry, academia, and nonprofits to increase participation of minorities in energy
- ✓ Resolved hiring issues at Bonneville Power Administration, providing additional Human Resources training and restoring hiring authority
- ✓ Reduced pension plan liability by \$100M through lump sum buyouts
- ✓ Established Health reimbursement accounts at 13 sites, reducing long term retiree liability by \$2.8B

FY 2016 Highlights

- Strengthen Departmental cybersecurity programs (part of cybersecurity crosscut)
- Implement a new Energy Jobs Council to improve energy jobs data and strengthen technical support for state workforce development programs
- Implement a new Human Resources service delivery model to eventually consolidate 17 current service centers to 5 (\$25M)



Management and Performance: Improving Efficiency and Effectiveness

\$ in millions

| Program | FY 2015 | FY 2016 | % Delta |
|--|------------|------------|-----------|
| Legacy Management | 172 | 167 | -3% |
| Environment, Health, Safety and Security | 181 | 184 | 2% |
| Chief Information Officer | 72 | 84 | 17% |
| Office of Management | 63 | 76 | 21% |
| Chief Human Capital Officer | 25 | 25 | 4% |
| Hearings and Appeals | 5 | 6 | --- |
| Small and Disadvantaged Business Utilization | 2 | 3 | --- |
| Economic Impact and Diversity | 9 | 10 | --- |
| Total | 529 | 555 | 5% |



Advancing the President's Vision: Implementing DOE's Strategic Plan

- **Continue implementing the President's Climate Action Plan**, to reduce emissions at home and around the globe
- **Pursue an all-of-the-above energy strategy**, to encourage innovation, create jobs, enable economic growth and contribute to domestic manufacturing and net exports
- **Continue leadership in basic research in the physical sciences**, develop the next generation of computation technology, and develop and maintain world-class scientific user facilities
- **Maintain a safe, secure and effective nuclear weapons stockpile in the absence of testing**, and manage the infrastructure needed to meet national security requirements
- **Reduce the global nuclear terrorism threat** through measures to identify, control and eliminate nuclear weapons worldwide
- **Address the legal and moral imperative of cleaning up legacy waste** to protect human health and the environment
- **Strengthen DOE and its national missions through cross-cutting initiatives** that leverage the science, technology and engineering capabilities across programs and National Laboratory partners
- **Improve DOE effectiveness and efficiency through project management reform** and constant attention to maintaining a safe and secure workplace

