



Function 250:  
**General Science, Space,  
and Technology**

# Return Funding for the Office of Nuclear Physics to FY 2008 Levels

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$95	\$96	\$96	\$97	\$99	\$101	\$104	\$106	\$109	\$111	\$483	\$1,014

## Heritage Recommendation:

Reduce funding for the Office of Nuclear Physics to FY 2008 levels. This proposal saves \$95 million in 2016, and \$1 billion over 10 years.

## Rationale:

The Office of Nuclear Physics supports theoretical and experimental research in the field. The Department of Energy and the National Science Foundation conduct nearly all basic nuclear physics research. Research groups at 90 public and private universities, and nine federally funded laboratories (including Brookhaven, Oak Ridge, and Los Alamos), are exploring heavy ions, medium-energy physics, low-energy research, theory, accelerators, and isotopes. Much like the High Energy Physics program, funding for the Nuclear Physics program has become excessive. Program funding should be returned to the FY 2008 amount of \$423 million.

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

## Calculations:

Savings are expressed as budget authority and were calculated by comparing current spending levels to estimated levels if FY 2008 had increased spending only for inflation. The FY 2014 funding level of \$569.9 million can be found on page 122 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. The 2008 spending level of \$423.7 million can be found on page 273 of “FY 2010 Congressional Budget: Nuclear Physics, Funding Profile by Subprogram,” [http://science.energy.gov/~media/budget/pdf/sc-budget-request-to-congress/fy-2010/Cong\\_Budget\\_2010\\_NP.pdf](http://science.energy.gov/~media/budget/pdf/sc-budget-request-to-congress/fy-2010/Cong_Budget_2010_NP.pdf). Estimated spending if held constant at the 2008 spending level was calculated by increasing the 2008 amount according to inflation in the CPI, as reported by the Bureau of Labor Statistics, from 2008 to 2013. Had spending increased only with inflation, spending in 2014 would have been \$476 million, as compared to the enacted level of \$570 million. The \$94 million difference between the two spending levels was increased at the same rate as discretionary spending in the CBO’s most recent August 2014 baseline spending projections.

# Return Advanced Scientific Computing Research to FY 2008 Levels

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$85	\$86	\$86	\$87	\$89	\$91	\$93	\$95	\$97	\$99	\$433	\$908

## Heritage Recommendation:

Reduce Advanced Scientific Computing Research spending to FY 2008 levels. This proposal saves \$85 million in 2016, and \$907 million over 10 years.

## Rationale:

This program under the Office of Sciences conducts computer modeling, simulations, and testing to advance the Department of Energy's mission through applied mathematics, computer science, and integrated network environments. These models can lay the foundation for scientific breakthroughs and are arguably some of the most important aspects of basic DOE research, but this program has also been the beneficiary of a consistently expanding budget, and in order to live within today's fiscal constraints, funding should be returned to the FY 2008 levels.

## Additional Reading:

- Nicolas Loris, "Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus," Heritage Foundation *Backgrounder* No. 2669, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departement-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

## Calculations:

Savings are expressed as budget authority and were calculated by comparing current spending levels to estimated levels, had FY 2008 spending increased only for inflation. The FY 2014 funding level of \$478.6 million can be found on page 116 of House of Representatives, 113th Congress, 2nd Session, "Energy and Water Development Appropriations Bill, 2015," <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. The 2008 spending level of \$351.2 million can be found on page 6 of Yukiko Sekine, "NERSC Users Group Meeting Department of Energy Update," U.S. Department of Energy Office of Science, October 3, 2008, <https://www.nersc.gov/assets/NUG-Meetings/2008/NERSC-NUG-yukiko-08.pdf>. Estimated spending, if held constant at the 2008 spending level, was calculated by increasing the 2008 amount according to inflation in the CPI, as reported by the Bureau of Labor Statistics, from 2008 to 2013. Had spending increased only with inflation, spending in 2014 would have been \$395 million, as compared to the enacted level of \$479 million. The \$84 million difference between the two spending levels was increased at the same rate as discretionary spending in the CBO's most recent August 2014 baseline spending projections.

# Eliminate the Advanced Research Projects Agency–Energy (ARPA-E) Program

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016–2020	2016–2025
\$284	\$285	\$286	\$289	\$296	\$302	\$309	\$317	\$323	\$329	\$1,440	\$3,020

## Heritage Recommendation:

Eliminate the Advanced Research Projects Agency–Energy (ARPA-E) program. This proposal saves \$284 million in 2016, and \$3 billion over 10 years.

## Rationale:

The Advanced Research Projects Agency–Energy (ARPA-E) is another energy program designed to fund high-risk, high-reward projects on which the private sector would not embark on its own. ARPA-E also has the goal of reducing energy imports, increasing energy efficiency, and reducing energy-related emissions, including greenhouse gases.

The problem is that ARPA-E does not always seem to follow its own clear guideline: The federal government has awarded several ARPA-E grants to companies and projects that are neither high-risk nor something that private industry cannot support. These problems with ARPA-E were recently identified by the Government Accountability Office (GAO), the Department of Energy’s Inspector General (DOE IG), and the House Science, Space, and Technology Committee staff. Of the 44 small and medium-size companies that received an ARPA-E award, the GAO found that 18 had previously received private-sector investment for a similar technology. The GAO found that 12 of those 18 companies planned to use ARPA-E funding to either advance or accelerate prior-funded work.

High-risk, high-reward programs are not necessary, especially when there is a bias to fund technologies that have already received funding to make the program appear successful. Congress should restructure the DOE to conduct the basic research that the private sector would not undertake and create a system that allows the private sector, using private funds, to tap into that research and commercialize it. Federal labs should allow basic research to reach the market organically.

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.
- Matthew Stepp, Sean Pool, Jack Spencer and Nicolas Loris, “Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy,” The Information Technology & Innovation Foundation, June 19, 2013, <http://www.itif.org/publications/turning-page-reimagining-national-labs-21st-century-innovation-economy>.

## Calculations:

Savings are expressed as budget authority and were calculated by using the FY 2014 enacted spending levels as found in page 123 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. The FY 2014 enacted spending was increased at the same rate as discretionary spending for 2016–2025, according to the CBO’s most recent August 2014 baseline spending projections.

# Eliminate the Biological and Environmental Research (BER) Program

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016–2020	2016–2025
\$619	\$621	\$623	\$630	\$645	\$659	\$673	\$691	\$705	\$718	\$3,138	\$6,584

## Heritage Recommendation:

Eliminate the Biological and Environmental Research (BER) program. This proposal saves \$619 million in 2016, and \$6.6 billion over 10 years.

## Rationale:

The BER program funds research for a variety of energy-related subjects including biology, radiochemistry, climate science, and subsurface biogeochemistry. At a basic research and development level, the funding for some of the research endeavors is valid, but climate change should not be one of them, because it is not part of the DOE's mission. Furthermore, the BER program also supports such activities as how plants and microbes “can be manipulated to harness their processes and products that contribute to new strategies for producing new biofuels, cleaning up legacy waste, and sequestering carbon dioxide.”<sup>36</sup>

The entrepreneur who can make a biofuel product that is cost-competitive with oil does not need government funding. The need to capture and sequester CO<sub>2</sub> is questionable because the policy goal of reducing carbon dioxide itself is questionable. Even so, carbon capture and sequestration is a technological hurdle that the private sector should overcome without the government's help. Many BER programs should be cut drastically or entirely because they are private-sector activities, duplicative of other research, or do not align with the DOE's mission. Cuts should be made to the:

- The Climate and Environmental Science program
- Biological Systems Facilities and Infrastructure program
- Bioenergy Research Centers program
- The Foundational Genomics Research program
- The Genomics Analysis and Validation program
- The Metabolic Synthesis and Conversion program
- The Computational Biosciences program

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

## Calculations:

Savings are expressed as budget authority and were calculated by using the FY 2014 enacted spending levels as found on page 164 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. The FY 2014 enacted spending was increased at the same rate as discretionary spending for 2016–2025, according to CBO's most recent August 2014 baseline spending projections.

# Reduce Basic Energy Sciences (BES) Funding

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$301	\$302	\$302	\$306	\$313	\$320	\$327	\$336	\$342	\$349	\$1,524	\$3,198

## Heritage Recommendation:

Reduce funding for the Basic Energy Sciences (BES) program. This proposal saves \$300 million in 2016, and \$3.2 billion over 10 years.

## Rationale:

BES is a legitimate program that investigates “fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels in order to provide the foundations for new energy technologies and to support other aspects of DOE mission in energy, environment, and national security.”<sup>37</sup> However, many of the BES subprograms stray from fundamental research into commercialization. The government should eliminate such aspects of these programs, since private companies are capable of fulfilling these roles, whether through their own laboratories or by funding university research. On areas that focus on fundamental research and not commercial activities, the funding has simply become too excessive. While there is reason to phase out all Basic Energy Science funding, proposed cuts would eliminate some subprograms entirely, and return others close to FY 2008 levels.

### Programs for Elimination:

- The Experimental Program to Stimulate Competitive Research (EPSCoR)
- The Solar Photochemistry program
- The Photosynthetic Systems program
- The Geosciences program

### Programs for Reductions:

- The Experimental Condensed Matter Physics program
- The Theoretical Condensed Matter Physics program
- The Mechanical Behavior and Radiation Effects program
- The Neutron and X-ray Scattering and the Electron and Scanning Probe Microscopies program
- The Synthesis and Processing Science program
- The Materials Chemistry and Biomolecular program
- The Atomic, Molecular, and Optical program
- The Chemical Physics Research program
- The Catalysis program
- The Separations and the Heavy Element Chemistry program

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.



## Calculations:

Savings are based on the recommended \$287.6 million in spending cuts as found in Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/department-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>. This level of cut is increased for inflation through 2014 and compared to the budget authority enacted for FY 2014 of \$1.713 billion found on page 117 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. Both the FY 2014 enacted level of spending and the alternative, lower, spending levels are increased at the same rate as discretionary spending for 2016–2025, according to the CBO’s most recent August 2014 baseline spending projections. Savings represent the difference between these two spending levels.

# Eliminate Energy Information Hubs

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$24	\$24	\$24	\$25	\$25	\$26	\$26	\$27	\$28	\$28	\$122	\$257

## Heritage Recommendation:

Eliminate Energy Information Hubs. This proposal saves \$24 million in 2016, and \$259 million over 10 years.

## Rationale:

Energy Information Hubs create multidisciplinary teams to overcome obstacles in energy technologies. The Department of Energy should create multidisciplinary teams across offices and different agencies to reduce bureaucracy and pull valuable knowledge into different disciplines of research. The problem with the Energy Information Hubs is that they focus on promoting specific energy sources and technology developments.

Government projects that have become commercial successes—the Internet, computer chips, the global positioning system (GPS)—were not initially intended to meet a commercial demand but were developed for national security needs. Entrepreneurs saw an opportunity in these defense technologies and created the commercially viable products available today. The role of the DOE should be to conduct the basic research that the private sector would not undertake and create a system that allows the private sector, using private funds, to tap into that research and commercialize it. Federal labs should allow basic research to reach the market organically.

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

## Calculations:

Savings are expressed as budget authority and were calculated by using the FY 2014 enacted spending levels as found in page 37 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” [http://science.energy.gov/-/media/budget/pdf/sc-budget-request-to-congress/fy-2015/FY\\_2015\\_Budget\\_Basic\\_Energy\\_Sciences.pdf](http://science.energy.gov/-/media/budget/pdf/sc-budget-request-to-congress/fy-2015/FY_2015_Budget_Basic_Energy_Sciences.pdf). The FY 2014 enacted spending was increased at the same rate as discretionary spending for 2016–2025, according to the CBO’s most recent August 2014 baseline spending projections.



## Reduce Fusion Energy Sciences (FES) Spending to FY 2008 Levels

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$178	\$178	\$179	\$181	\$185	\$189	\$193	\$198	\$202	\$206	\$901	\$1,889

### Heritage Recommendation:

Reduce Fusion Energy Sciences (FES) spending. This proposal saves \$178 million in 2016, and \$1.9 billion over 10 years.

### Rationale:

Fusion technology has much potential to offer inexhaustible quantities of energy without the byproduct of spent nuclear fuel that results from nuclear fission—the way that conventional nuclear power plants produce electricity. While research on fusion should continue, the question is whether the federal government should be involved and to what extent. Currently, there are 63 public and private universities, 11 national laboratories (eight belong to the DOE), and 29 international institutions that have fusion or plasma physics programs. Furthermore, at least 10 private companies are pursuing their own means to develop fusion technologies. The basic science for fusion energy already exists, which is why several start-up companies are raising capital for their own fusion reactors, and why bigger companies are investing in fusion technologies.

Although the universities and private companies have received federal funding, now is the time to reduce the DOE's involvement in studying plasmas. The DOE should remain involved, perhaps by continuing to participate in the International Thermonuclear Experimental Reactor (ITER) program, an effort to advance fusion technology, but more of the research should be driven by the private sector. One area to cut would be the Enabling R&D program, which develops and improves “the hardware, materials, and technology that are incorporated into existing fusion research facilities, thereby enabling these facilities to achieve higher levels of performance.”<sup>38</sup>

### Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

### Calculations:

Savings are expressed as budget authority and were calculated by comparing current spending levels to estimated levels, had FY 2008 spending increased only for inflation. The FY 2008 spending level of \$294.3 million is found on page 16 of Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 26, 2012, [http://thf\\_media.s3.amazonaws.com/2012/pdf/bg2668.pdf](http://thf_media.s3.amazonaws.com/2012/pdf/bg2668.pdf). The FY 2014 funding level of \$505.7 million can be found on page 164 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. Estimated spending for 2014, if held constant at the 2008 spending level (plus CPI inflation as reported by the Bureau of Labor Statistics), would have been \$331 million, as compared to the enacted level of \$506 million. The \$175 million difference between the two spending levels was increased at the same rate as discretionary spending in the CBO's most recent August 2014 baseline discretionary spending projections.

# Reduce High Energy Physics (HEP) Program Funding

SAVINGS IN MILLIONS OF DOLLARS

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2020	2016-2025
\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$11	\$11	\$11	\$50	\$103

## Heritage Recommendation:

Reduce funding for the High Energy Physics (HEP) program. This proposal saves \$10 million in 2016, and \$102 million over 10 years.

## Rationale:

The HEP program has the mission of uncovering “how our universe works at its most fundamental level.” In effect, HEP exists to explore how space, matter, time, and energy interact with one another. Financial support from the HEP goes to 10 national laboratories and more than 100 public and private universities to study proton-accelerator-based physics, electron-accelerator-based physics, non-accelerator physics, theoretical physics, and advanced-technology research and development.

Understanding these issues is an area of research that the private sector would likely not undertake, so it is an appropriate endeavor for America’s research labs and universities—but it is certainly not a critical function of government, especially considering America’s fiscal situation. HEP is an area in which universities would strive to be the best and attract young talent and private funding.

## Additional Reading:

- Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 23, 2012, <http://www.Heritage.org/research/reports/2012/03/departments-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus>.

## Calculations:

Savings are expressed as budget authority and were calculated by comparing current spending levels to estimated levels had FY 2008 spending increased only for inflation. The FY 2008 spending level of \$701.5 million is found on page 16 of Nicolas Loris, “Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus,” Heritage Foundation *Backgrounder* No. 2668, March 26, 2012, [http://thf\\_media.s3.amazonaws.com/2012/pdf/bg2668.pdf](http://thf_media.s3.amazonaws.com/2012/pdf/bg2668.pdf). The FY 2014 funding level of \$797.5 million can be found on page 120 of House of Representatives, 113th Congress, 2nd Session, “Energy and Water Development Appropriations Bill, 2015,” <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-energywater.pdf>. Estimated spending for 2014, if held constant at the 2008 spending level (plus CPI inflation as reported by the Bureau of Labor Statistics), would have been \$788 million, as compared to the enacted level of \$797 million. The \$9 million difference between the two spending levels was increased at the same rate as discretionary spending in the CBO’s most recent August 2014 baseline discretionary spending projections.



## Endnotes: General Science, Space, and Technology

36. Department of Energy, "FY 2012 Congressional Budget Request: Science," February 2011, p. 10, <http://energy.gov/sites/prod/files/FY12Volume4.pdf> (accessed December 15, 2014).
37. Ibid.
38. Nicolas Loris, "Department of Energy Budget Cuts: Time to End the Hidden Green Stimulus," Heritage Foundation *Backgrounder* No. 2668, March 23, 2013, <http://www.Heritage.org/research/reports/2012/03/departement-of-energy-budget-cuts-time-to-end-the-hidden-green-stimulus#>.