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Department of Energy Spending Cuts: A Guide to Trimming President Obama's 2012 Budget Request

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Abstract: *Government spending has been spiraling upward in nearly all areas—and spending by most government agencies can, and should, be cut. President Obama recently submitted his 2012 budget request to Congress, providing fertile ground for spending cuts. One of the fastest-growing federal agencies, the Department of Energy (DOE), with its numerous research, development, and grant programs, offers many opportunities for savings. While there is an important role for DOE in energy security and environmental management, many DOE projects fall outside its mission, supporting everything from commercialization of technologies to non-critical research—which can be conducted, usually much more efficiently, by the private sector. This paper provides a commonsense guide to trimming $6 billion from the President's budget for FY 2012, while maintaining funding for the DOE's real mission.*

Government spending has increased considerably over the past decade, and unless a dramatic shift occurs, spending will continue to grow at unsustainable rates. Alleviating the huge debt burden that the government is placing on future generations, and thus reining in federal spending, must be a priority for Congress. Congress must make prudent cuts in the fiscal year (FY) 2012 budget and examine the role of each government agency. One good place to start is to cut the wasteful, inefficient, and unnecessary spending at the U.S. Department of Energy (DOE).

Congress's ultimate objective should be to eliminate any Department of Energy function that does

Talking Points

- Reining in federal spending is a national priority, and Congress must make prudent cuts in the FY 2012 budget, examining the role of each government agency. One good place to start is with the wasteful and unnecessary spending at the U.S. Department of Energy (DOE).
- Congress's objective should be to eliminate any DOE function that does not support a critical national interest, and return the DOE to its traditional mission of promoting national and economic energy security.
- The budget cuts proposed in this paper apply to President Obama's 2012 request for $29.5 billion for the Department of Energy—a 12 percent increase from 2010. The proposed cuts would cost taxpayers $6 billion less this year than the President's requested level of spending.
- The DOE has ballooned by subsidizing and forcing energy technologies into the marketplace. The private sector has demonstrated countless times that it is far better equipped than the federal government to allocate resources and develop commercially viable technologies.

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not support a critical national interest unmet by the private sector. This objective will require a broad re-organization, and could very well result in the elimination of the entire department. Elimination, however, should not be the immediate policy goal. A graduated approach that begins with reining in spending would provide a foundation for further reform.

The Department of Energy's budget grew from $15 billion in FY 2000 to $26.4 billion in FY 2010—a staggering 76 percent increase in only one decade. Many government programs included in Presidents' annual DOE budgets evolved from basic research and development to attempts at commercialization better left to the private sector. Other programs are politically correct pet projects of various Members of Congress that have little business being supported by taxpayers. The private sector is much better at allocating resources and developing energy technologies than government-directed initiatives. Such wasteful use of taxpayer money provides Congress an opportunity to significantly scale back or eliminate a number of government energy programs and return the Department of Energy to its traditional mission of promoting national and economic energy security and focus on areas that meet a critical national objective.[1]

The budget cuts proposed in this paper apply to President Barack Obama's 2012 budget proposal of allocating $29.5 billion to the Department of Energy, a 12 percent increase from 2010.[2] The proposed cuts would save $6 billion this year.

Defining the DOE Mission

The Department of Energy bases its mission on five core strategic themes: (1) energy security, (2) nuclear security, (3) scientific discovery and innovation, (4) environmental responsibility, and (5) management excellence. This paper focuses on cuts to energy security[3] and scientific discovery and innovation with consequent reductions in overall DOE personnel. More specifically, programmatic cuts focus on spending on energy and related issues rather than cuts to Environmental Management or National Nuclear Security Administration programs.

- **Energy Security:** President Obama's FY 2012 budget discusses the importance of reducing America's dependence on foreign oil and investing in clean energy and non-petroleum fuels that will reduce America's reliance on oil from terror-supporting countries. Typically, the ideas for improving energy security are either protectionist or attempts to deploy uncompetitive technologies. Improving energy security should not be an excuse for the DOE to invest in commercialization projects (biofuels, for instance) when the private sector is much better equipped to determine their ability to compete in the market. Most of the good administrative decisions to improve energy security, such as allowing easier access to America's own energy supply, fall under the purview of the Department of the Interior.
- **Nuclear Security:** A large part of the Department of Energy's nuclear security mission is nuclear deterrence and keeping nuclear materials secure. Many of these national security needs fall under the purview of the National Nuclear Security Administration (NNSA).While reforms to NNSA may well be appropriate, traditional national security questions are beyond the scope of this paper.
- **Scientific Discovery and Innovation:** Some argue that the DOE has a role to play in basic research—investing in ideas that can provide benefits but are too financially risky for the private sector to undertake. But just because an endeavor is too financially risky for a company to undertake does not mean it is something the government should pay for. It could be argued that government can have a role in basic

1. U.S. Department of Energy, "About DOE," at *http://www.energy.gov/about/index.htm* (March 20, 2011).
2. U.S. Department of Energy, "Department of Energy FY 2012 Congressional Budget Request: Budget Highlights," February 2012, at *http://www.cfo.doe.gov/budget/12budget/Content/FY2012Highlights.pdf* (March 20, 2011).
3. Energy security is often used to promote politically favored energy sources. Policies to advance energy security and energy independence should not supplant markets as the overarching principle for sound energy policy because they come as a huge cost to the taxpayer and produce poor results, such as subsidized synthetic fuels.

research that ultimately may have commercial value—but that should not be the purpose of the research. Government research programs should advance a specific critical national interest that is not being met by the private sector. Defense programs often fall into this category. The DOE's basic energy research for developing new commercial energy technologies is not in this category.

This does not mean that no research should be conducted by the Department of Energy, but it is strongly questionable whether the DOE, or the government, is best suited to oversee that research. Energy production is a viable commercial enterprise, so the U.S. does not need a government agency dedicated to advancing this activity. Predictably, the Department of Energy expanded its role beyond basic research to technology development, demonstration, and commercial application, which interferes with the marketplace. At these stages of development, profits and losses are a better indicator of whether a project or an idea should move forward than continued use of taxpayer money to force products into the marketplace or to offset investment that the private sector would have made without the government subsidy. In the near term, Congress should make immediate cuts to the programs that fall under scientific discovery, innovation, and applied-research categories. Congress should then phase out federal funding for basic research.

- **Environmental Management:** As a result of government-funded defense and civilian nuclear activities, the Department of Energy created the Office for Environmental Management (EM) to clean up the environmental legacy of the Cold War era. EM hires contract workers for much of this work. Environmental management activities are valuable, but this program needs structural reform to remove inefficiencies from contract work. Reforms are likely necessary, but also beyond the scope of this paper.
- **Management Excellence:** DOE stresses that to effectively carry out its mission, it must have sound management. While the soundness of that management is questionable, the focus of this paper will remain on programmatic cuts. (Any budget reductions for personnel will be a result of programmatic cuts.)

The Proper Role of the Department of Energy

Policymakers frequently create a sense of urgency for the particular government programs that they support, and such is the case with many energy projects. But the United States enjoys robust domestic energy resources (nuclear energy, oil, coal, and hydroelectric power). The energy market can be diverse and competitive without government interference. While some government research can spur new breakthroughs, those should not be the main objective of DOE programs (since the private sector has proven its competence in innovation and commercialization).

Critically, government programs that became commercial successes—the Internet, computer chips, the global positioning system (GPS)—were not intended to meet a commercial demand. They were each the result of defense-related programs that were created to meet national security requirements. Entrepreneurs saw an opportunity in these defense technologies and created the commercially viable products available today.

The reality is that when it comes to energy policy, the free market works. Indeed, the business environment for energy is robust despite seemingly endless forays by policymakers and bureaucrats into the energy industry. But those attempts to control energy markets do have an effect: They result in higher prices, fewer available energy sources, reduced competition, and stifled innovation. As federal interventions increase, so do the—almost always negative—effects. As a result, the U.S. is now dangerously close to a point where meddling from Washington could have a long-term negative impact on the standard of living of every American.

By attempting to force government-developed technologies into the market, the government diminishes the role of the entrepreneur and crowds out private-sector investment. This practice of the government picking winners and losers denies energy technologies the opportunity to compete in the marketplace, which is the only proven way to

develop market-viable products. When the government attempts to drive technological commercialization, it circumvents this critical process. Thus, almost without exception, it fails in some way.

The DOE may not be explicitly involved in commercialization, but the agency has fostered it through applied research, technology development, and demonstration activities, such as carbon capture and sequestration and biomass infrastructure. With respect to the DOE budget, necessary reforms generally fall into two major categories: (1) programs that the DOE should eliminate or privatize, and (2) programs for which the DOE should scale funding back significantly because they evolved well beyond the scope of basic research.

Eliminating Applied-Research Programs (Savings: $4.03 billion)

The DOE budget funds applied-research programs on fossil fuels, renewable energy sources, and nuclear energy. But the development of such technologies is done at least as well—usually much better—by the private sector. The DOE also funds technologies that, if they cannot survive without the government crutch, should not be in the marketplace to begin with. Furthermore, many of these DOE endeavors have the dubious goal of reducing carbon dioxide emissions. The DOE budget reiterates President Obama's goal of reducing CO_2 emissions by more than 80 percent by 2050 and states that the DOE will help meet that goal by investing "in the research, development, and deployment of technologies that will position the United States to lead international efforts to confront climate change now and in the future." Even if reducing CO_2 emissions were a worthy goal, the private sector would achieve it better than a government agency.

The DOE's approach to reducing CO_2 emissions includes research on energy efficiency, renewable energy sources, carbon capture and sequestration, clean coal technologies, nuclear energy, new vehicle technologies, and loan guarantees for carbon-free sources of energy. All these energy sources and technologies are available today, but they are not commercially viable, whether due to burdensome regulations or simply because they are still prohibitively expensive. The government is not equipped to determine commercial viability and can *retard* the process by misallocating resources to inefficient uses. The following reforms should be made to the Department of Energy's applied-research programs:

- **The Office of Energy Efficiency and Renewable Energy (Savings: $3.2 billion).** The Office of Energy Efficiency and Renewable Energy (EERE) funds research and development of what the government deems "clean energy technologies"—hydrogen technology, wind energy, solar energy, biofuels and biorefineries, geothermal power, vehicle technology, and building and weatherization technologies, most of which have been in existence for decades. Promoting these technologies is not an investment in basic research, but commercialization. In fact, the biomass and biorefinery section of the budget calls for the "development and transformation of domestic, renewable, and abundant biomass resources into cost-competitive, high performance biofuels, bioproducts and biopower through targeted research, development, and deployment (RD&D), which leverages public and private partnerships." It is neither the DOE's responsibility nor the role of government to make projects cost-competitive. The company that can make biofuels or any of these other alternative technologies cost-effective and environmentally efficient will reap the rewards for doing so with high profits. Increased competition will directly benefit the consumer, and the DOE should not artificially prop up these technologies and energy sources. Congress should deny the complete $3.2 billion requested, and eliminate the EERE.
- **The Office of Fossil Energy (Savings: $399 million).** Most of the funding for fossil-energy research and development focuses on technologies that will reduce carbon dioxide emissions. This program includes a clean coal power initiative, research on fuels and power systems to reduce fossil power plant emissions, innovations for existing plants, integrated gasification combined cycle (IGCC), advanced turbines, carbon sequestration, and natural gas technologies. The Administration proposed a phase-out of fossil-fuel subsidies, and significantly cut funding for

the Office of Fossil Energy. But the Administration is doing so less as a good economic policy (which it is) and more as an environmental policy to promote Administration-preferred "renewable" energy sources. The President's budget makes a good first attempt at reducing the Office of Fossil Energy budget by decreasing its size by $417.8 million below the FY 2010 appropriation, but it does not go far enough. The only funding should be to maintain the Strategic Petroleum Reserve, for which the President's budget requests $121.7 million, an appropriate amount. Eliminating all other funding would save $399 million.

- **The Office of Nuclear Energy (Savings: $235 million).** Funding to promote nuclear energy development should be reduced from the $755 million requested by the President to $520 million. Specifically, research, development, and demonstration of reactor concepts should be reduced by $65 million to $60 million to include only enough funds to maintain the Next Generation Nuclear Plant project. The Office of Nuclear Energy also includes $30 million for small modular reactor (SMR) programs. While SMRs have great potential, commercialization must be shouldered by the private sector. A related request for $67 million to support SMR licensing should also be cut, and a portion should be redirected to the Nuclear Regulatory Commission for SMR-licensing preparation. This does not preclude the DOE from engaging in SMR-related work. The President's Nuclear Energy Enabling Technologies (NEET) program is charged with investigating the crosscutting of technologies with applicability to multiple-reactor designs, including SMRs. Cuts to the NEET budget should include $24 million from the unnecessary modeling and simulation hub, and $15 million from the National Scientific User Facility, which supports work that should be funded by the Science budget, if at all. That still leaves $59 million to fund NEET projects. Fuel-cycle research and development should also be cut by $35 million, leaving $120 million, which should be dedicated almost entirely to restarting the Yucca Mountain project for storing spent nuclear fuel. Finally, $29 million should be cut from the Program Direction budget to account for Office of Nuclear Energy downsizing.
- **The Innovative Technology Loan Guarantee Program (Savings: $200 million).** The Innovative Technology Loan Guarantee Program includes loan programs for renewable energy projects, advanced nuclear facilities, coal gasification, carbon capture and sequestration, and energy efficiency. The program, under which the government guarantees bank loans for power projects, is sold as a way to help move new, clean energy sources to market viability. Loan guarantees distort normal market forces and encourage dependence on government because the government subsidizes a portion of the actual cost of a project and directs capital away from more competitive projects.[4] The market should determine if these projects are truly viable. The loan guarantee program should not be expanded and all subsidy costs for existing loan guarantee authorizations should be paid by loan applicants. This would allow the elimination of $200 million from the President's request.

The Office of Science (Savings: $1.59 billion)

The Department of Energy's Office of Science (SC) is very different from the applied-research programs where many of the technologies already exist and are ready to be tested in the marketplace. The Office of Science is meant to bring about groundbreaking discoveries and inventions as well as conduct basic research on energy sources and employ computational modeling for a wide variety of research.[5]

The FY 2012 presidential request for Science is $5.4 billion, an increase of $500 million over 2010. Even though the goal of the Office of Science is to deliver major scientific discoveries, it, too, has

4. Jack Spencer, "The Problem with Increasing Energy Loan Guarantees," Heritage Foundation *WebMemo* No. 2277, February 6, 2009, at *http://www.heritage.org/research/reports/2009/02/the-problem-with-increasing-energy-loan-guarantees*.
5. U.S. Department of Energy, "Department of Energy FY 2012 Congressional Budget Request: Science," February 2011, at *http://www.cfo.doe.gov/budget/12budget/Content/Volume4.pdf* (March 20, 2011).

evolved into a program that offsets research investment that should be undertaken by the private sector. Given the problems with overspending by Washington, Congress should take this opportunity to return the Office of Science to its original mission. The Office of Science budget more than doubled from FY 1997 to FY 1998 and has grown rapidly ever since. The Office of Science received an additional $1.6 billion from the American Recovery and Reinvestment Act in 2009.[6]

Reductions in federal research funding for energy need not result in fewer worthwhile projects. It simply means that research institutions will have to find greater efficiencies, drop less promising research, or find alternative sources of funding. Moreover, removing government funding from research will remove meddlesome political and special interest motivations with it. Instead of lobbying Congress for more funds, research laboratories and universities can search more heavily for private donors and alumni. Unique and distinguished science programs at universities will attract bright students and professors, and will also encourage alumni and other philanthropists to donate to these programs. For instance, United Technologies Research Center, Aspen Technology, General Motors, Caterpillar, and the American Chemical Society Petroleum Research Fund are all funding biofuels research at the University of Massachusetts Amherst.[7] Similar cases can be made for other renewable energy technologies, fossil fuel research, nuclear energy, and advanced technology vehicles.[8]

Even for technologies that are not yet commercially feasible, the private sector is making financial investments. One clear instance in which the DOE dedicates a section of its Science budget is fusion power, but there are many businesses undertaking fusion research. General Fusion, a small startup company in Vancouver, is a prime example. The funding does not come from the government but is driven by the motivation of profits—providing unlimited amounts of clean energy. General Fusion CEO Doug Richardson says, "There's a feeling that the research has to be done by a government, that it costs billions of dollars and that 3,000 smart people can't be wrong. People have a mindset that this can't be done by a small company."[9] General Fusion is one of several companies proving that sentiment wrong. Helion Energy is another fusion startup seeking capital funds to build a full-scale model of its fusion reactor;[10] Tri-Alpha Energy is a third fusion startup that recently raised $50 million from venture capitalist firms.[11]

Fusion technology is not the only groundbreaking idea receiving private support. Kenneth Rines, a physics and astronomy professor at Western Washington University, for instance, received a grant from the privately funded and operated Research Corporation for Scientific Advancement to "prob[e] dark energy and galaxy cluster evolution with optical spectroscopy."[12]

While the DOE may be in a better position to prioritize certain parts of a smaller budget, there are numerous justifications for significantly scal-

6. *Ibid.*
7. The Institute for Massachusetts Biofuels Research (TIMBR), University of Massachusetts Amherst, "Partners," 2007, at *http://www.ecs.umass.edu/timbr/sponsors.html* (March 20, 2011).
8. Jack Spencer and Nicolas D. Loris, "Washington Subsidies Not Necessary to Rebuild U.S. Nuclear Industry," Heritage Foundation *Backgrounder* No. 2207, November 10, 2008, at *http://www.heritage.org/research/reports/2008/11/washington-subsidies-not-necessary-to-rebuild-us-nuclear-industry*.
9. Warren Frey, "Big Bang from a Small Company," *H+ Magazine*, March 2, 2010, at *http://www.hplusmagazine.com/articles/energy/big-bang-small-company* (March 22, 2011).
10. Justin Moresco, "Helion Energy Seeks $20M for Fusion Engine," Gigaom, April 24, 2009, at *http://gigaom.com/cleantech/helion-energy-seeks-20m-for-fusion-engine/* (March 22, 2011).
11. "Tri Alpha Energy Gets $50M," SocalTech.com, July 26, 2010, at *http://www.socaltech.com/tri_alpha_energy_gets___m/s-0030022.html* (March 23, 2011).
12. Research Corporation for Science Advancement, "Cottrell College Science Awards: Single Investigator Awards 2010 Spring," at *http://www.rescorp.org/cottrell-college-science-awards/single-investigator-awards/recent-awardees/2010-spring* (March 23, 2011).

ing back the programs and subprograms within the Basic Energy Sciences program and the Biological and Environmental Research program. Funding for the Advanced Scientific Computing Research, Fusion Energy Science, High Energy Physics, and Nuclear Physics programs should all return to FY 2008 levels. The Workforce Development for Teachers and Scientists program should be cut entirely. Overall, $1.59 billion can be cut from these SC programs:

- **Basic Energy Sciences (Savings: $506 million).** Basic Energy Sciences (BES) is a 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 missions in energy, environment, and national security."[13] Unfortunately, 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. The excerpted quotations from each subprogram below are not the complete descriptions, but they are clear illustrations of the kinds of activities the DOE should *not* be funding—because they seek to advance specific technologies and goals, such as photovoltaics, batteries, nuclear energy, carbon capture and sequestration, transportation fuels, and increasing energy efficiency, that are much better suited to the private sector. 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, these proposed immediate cuts would eliminate some sub-programs entirely, and return others close to FY 2008 levels:
  - The DOE has four Energy Innovation Hubs. The Materials Sciences and Engineering Division funds the Batteries and Energy Storage Hub, which should be cut entirely. The Chemical Sciences, Geosciences, and Biosciences subprogram funds research for the Fuels from Sunlight Hub. Eliminating both hubs would save $58 million.
  - The Experimental Condensed Matter Physics research area includes research on "the elementary energy conversion steps in photovoltaics, and the energetics of hydrogen storage."[14] The FY 2012 request for $58.6 million should be cut by $30 million.
  - The Theoretical Condensed Matter Physics research area emphasizes modeling and computer simulation to develop next-generation energy technologies, such as "inverse design of compound semiconductors for unprecedented solar photovoltaic conversion efficiency, solid-state approaches to improving capacity and kinetics of hydrogen storage, and ion transport mechanisms for fuel cell applications."[15] The FY 2012 request for $47.2 million should be cut by $20 million.
  - The Mechanical Behavior and Radiation Effects research area includes reliability and storage of "fossil, fusion, and nuclear energy conversion; radioactive waste storage; environmental cleanup; and defense."[16] The FY 2012 request of $32.4 million should be cut by $20 million.
  - The Physical Behavior of Materials research area includes energy improvement and storage research for "corrosion, photovoltaics, fast-ion conducting electrolytes for batteries and fuel cells, novel magnetic materials for low magnetic loss power generation, magnetocaloric materials for high-efficiency refrigeration, and new materials for high-temperature

13. U.S. Department of Energy, "Department of Energy FY 2012 Congressional Budget Request: Budget Highlights," p. 18.
14. U.S. Department of Energy, "Department of Energy FY 2012 Congressional Budget Request: Science," p. 104, at *http://www.cfo.doe.gov/budget/12budget/Content/Volume4.pdf*.
15. *Ibid.*, p. 105.
16. *Ibid.*, p. 106.

gasification."[17] The FY 2012 request of $46 million should be cut by $20 million.

- The Neutron and X-ray Scattering and the Electron and Scanning Probe Microscopies programs should return to FY 2008 levels. The FY 2012 request for $42.5 million and $30.3 million, respectively, should be cut by $11 million and $14 million.[18]
- The Experimental Program to Stimulate Competitive Research (EPSCoR) makes grants to research programs in areas that have not traditionally received funding for the basic energy sciences and the applied-research program, and should be eliminated. Eliminating the program would save $8.5 million.
- The Synthesis and Processing Science research area focuses on developing "new techniques to synthesize materials with desired structure, properties, or behavior; to understand the physical phenomena that underpin materials synthesis."[19] The application of this research is geared toward types of lighting, such as semiconductor light-emitting diodes (LEDs), organic light-emitting diodes (OLED), or polymer light-emitting diodes (PLED) (rather than electric filament such as the traditional incandescent bulb), solar energy conversion, hydrogen storage, and electricity storage. The FY 2012 request of $24.7 million should be cut by $10 million.
- The Materials Chemistry and Biomolecular Materials program produces research on chemical and bio-inspired synthesis. The budget profile of each subprogram mentions that the Materials Chemistry and Biomolecular Materials subprogram "underpins many energy-related technological areas such as batteries and fuel cells, catalysis, energy conversion and storage, friction and lubrication, high efficiency electronic devices, hydrogen generation and storage, light-emitting materials, light-weight high-strength materials, and membranes for advanced separations."[20] This subprogram also includes "expanded research to understand carbon capture phenomena… including investigation of novel chemical and biomimetic approaches for efficient carbon capture and release."[21] The FY 2012 request of $65 million should be cut by $30 million.
- In FY 2009, the Department of Energy established 46 Energy Frontier Research Centers (EFRCs) to accelerate R&D and provide a foundation for future energy technologies. The DOE's funding profile states that "In general terms, these EFRCs are focused on the design, discovery, synthesis, and characterization of novel, solid-state materials that improve the conversion of solar energy and heat into electricity; that improve the conversion of electricity to light; that can be used to improve electrical energy storage; that are resistant to corrosion, decay, or failure in extreme conditions of temperature, pressure, radiation, or chemical exposures; that take advantage of emergent phenomena, such as superconductivity, to improve energy transmission; that optimize energy flow to improve energy efficiency; and that are tailored at the atomic level for catalytic activity."[22] The profile also says that "For research for energy applications, areas of emphasis include: fundamental science of carbon capture, including the rational design of novel materials and separation processes for postcombustion CO_2 capture and fundamental science for advanced nuclear energy systems, e.g., radiation resistant materials in fission and fusion applications." EFRCs should be eliminated entirely, which would save $100 million.

17. *Ibid.*, p. 107.
18. *Ibid.*, pp. 107–109.
19. *Ibid.*, p. 111.
20. *Ibid.*, p. 112.
21. *Ibid.*
22. *Ibid.*, p. 129.

- The Atomic, Molecular and Optical Science research area emphasizes that "study of formation and evolution of energized states in atoms, molecules, and nanostructures provides a fundamental basis for understanding elementary processes in solar energy conversion and radiation-induced chemistry."[23] The FY 2012 request of $24 million should be cut by $10 million.
- The Chemical Physics Research program spends a significant amount of money on improved engine designs. The justification in the budget proposal is that "Truly predictive combustion models enable the design of new combustion devices (such as internal combustion engines, burners, and turbines) with maximum energy efficiency and minimal environmental consequences. In transportation, the changing composition of fuels, from those derived from light, sweet crude oil to biofuels and fuels from alternative fossil feedstocks, puts increasing emphasis on the need for science-based design of modern engines."[24] The FY 2012 request for $66.5 million should be cut by $30 million.
- The Solar Photochemistry research area focuses on "molecular-level research on solar energy capture and conversion." Solar photochemistry "energy conversion is an important option for generating electricity and chemical fuels and therefore plays a vital role in DOE's development of solar energy as a viable component of the nation's energy supply."[25] It is not the agency's role to develop solar energy as part of the nation's energy supply if it is not economically viable; therefore, Congress should eliminate this program. Eliminating the program would save the $52.7 million requested in the FY 2012 budget.
- The Photosynthetic Systems research area "supports fundamental research on the biological conversion of solar energy to chemically stored forms of energy."[26] The Physical Biosciences research area also focuses on next-generation energy storage systems as well as biomass conversion to chemical fuels. Both of these research activities can be left entirely to the private sector. Eliminating the two programs would save the $17.7 million and $17.1 million requested in the FY 2012 budget, respectively.
- The Catalysis Science research area focuses on catalyst design and chemical transformation control. The budget justification document stresses that "Catalytic transformations impact an enormous range of DOE mission areas. Particular emphasis is placed on catalysis relevant to the conversion and use of fossil and renewable energy resources and the creation of advanced chemicals. Catalysts are vital in the conversion of crude petroleum and biomass into clean burning fuels and materials. They control the electrocatalytic conversion of fuels into energy in fuel cells and batteries and play important roles in the photocatalytic conversion of energy into chemicals and materials."[27] The FY 2012 request of $53.8 million should be cut by $20 million.
- The Separations program and the Heavy Element Chemistry program should both return to FY 2008 levels. The FY 2012 requests of $18.8 million and $23.4 million, respectively, should be cut by $3 million and $14 million.
- The Geosciences research area, which focuses on geochemistry and geophysics, heavily ramps up funding to study gas hydrates. The FY 2012 request for $43 million should be cut by $20 million.

23. *Ibid.*, p. 121.
24. *Ibid.*, p. 122.
25. *Ibid.*, p. 124.
26. *Ibid.*
27. *Ibid.*, p. 126.

- **Biological and Environmental Research (Savings: $539 million).** The Biological and Environmental Research (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, BER also supports many activities, such 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."[28] 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_2 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 or do not align with DOE's mission. Another problem with BER programs is that they have become heavily earmarked and have thus become a slush pot for pet projects of Members of Congress. The following program descriptions support drastic cuts to FY 2008 levels: BER has two larger subprograms, Biological Systems Science and Climate and Environmental Sciences, and smaller programs within those subprograms. Most of the funding in the Biological Systems Sciences goes to the Genomics Science program.
  - The Foundational Genomics Research subprogram (part of the Genomic Science program) focuses on fundamental plant and microbe research. "In FY 2012, new research will be initiated to provide the scientific foundation for a bio-economy in which carbon-neutral and renewable processes can be safely designed and optimized."[29] The FY 2012 request for $102.9 million should be cut by $70 million.
  - The Genomics Analysis and Validation subprograms (part of the Genomic Science program) support "activity [that] develops the tools and resources needed to fully exploit the information contained in complete DNA sequences from microbes and plants for bioenergy, carbon sequestration, and bioremediation applications."[30] The FY 2012 request of $12 million should be cut by $2 million.
  - The Metabolic Synthesis and Conversion subprogram (part of the Genomic Science program) focuses on "genome-based knowledge of metabolic functions and regulatory networks in microbial systems, plants, and plant-microbe associations [that] can enable strategies to increase biomass formation for conversion into advanced biofuels or to increase the sequestration of carbon in terrestrial ecosystems." Other funds in the Metabolic Synthesis and Conversion subprogram will continue to support "research on carbon storage in plant biomass for conversion into advanced biofuels or for carbon sequestration."[31] The FY 2012 request of $37.2 million should be cut by $20 million.
  - The Computational Biosciences subprogram (part of the Genomic Science program) focuses on using models and algorithmic tools to advance Genomic Science activities. The FY 2012 request of $14.4 million should be cut by $10 million.
  - In 2007, the DOE established Bioenergy Research Centers (also part of the Genomic Science program) "to accelerate the transformational breakthroughs in basic science needed for the development of cost-effective

28. *Ibid.*, p. 10.
29. *Ibid.*, p. 181.
30. *Ibid.*
31. *Ibid.*, p. 182.

technologies to make production of cellulosic (plant-fiber based) biofuels commercially viable on a national scale."[32] It is the private sector's role to determine whether biofuels can be commercially viable on a national scale, and the company that commercializes biofuels capable of competing with oil will reap the benefits. These research centers should be eliminated, saving $75 million.

- The President's budget request reduces the Radiological Sciences program (which includes the Radiochemistry and Imaging Instrumentation subprogram as well as the Radiobiology subprogram) budget from $46.7 million in FY 2010 to $34.3 million in FY 2012. The new budget also zeroes out funding for the Ethical Legal and Societal Issues and Medical Applications Research and Radiobiology programs. These are appropriate cuts.
- Funding for the Biological Systems Facilities and Infrastructure program and the Joint Genome Institute should return to FY 2008 levels. The FY 2012 request for $90.2 million and $70.8 million, respectively, should be cut by $10 million each.
- The Climate and Environmental Science subprogram supports three research activities—Atmospheric System Research, Environmental System Science, and Climate and Earth System Modeling. Research on and modeling how and why earth's climate is changing can be valuable for future discussions, but it should be done objectively and not with the predisposition that greenhouse gas emissions are the main contributor to global warming and reducing them is a top priority. Either way, leading such a discussion is not the role of the DOE. It is unrelated to the DOE's mission. Environmental management, which is part of the DOE's mission, includes activities such as toxic-site cleanup, not climate change. Given the other extensive research on climate change in the government, privately and internationally, funding for climate change research should be cut entirely from the DOE budget. This would save the entire $341.6 million requested in the FY 2012 budget.

- **Advanced Scientific Computing Research (Savings: $123.9 million).** This program under the Office of Sciences conducts computer modeling, simulations, and testing to advance DOE'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. In order to live within today's fiscal constraints, the FY 2012 request for $465.6 million should be returned to the FY 2008 level of $341.7 million, a savings of $123.9 million.
- **Fusion Energy Sciences (Savings: $104.8 million).** Fusion technology has much potential to offer inexhaustible quantities of energy without the by-product 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. Currently, there are 63 public and private universities, 11 national laboratories (eight belong to DOE), nine private companies, and 29 international institutions that have fusion or plasma physics programs.[33] The basic science for fusion energy already exists, which is why several startups are raising capital for their own fusion reactors. 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 ITER[34] program, but more of the research should be driven

32. *Ibid.*, p. 183.
33. U.S. Department of Energy, "U.S. Fusion Program Participants," at *http://www.science.doe.gov/ofes/fusioninstitutions.shtml* (March 23, 2011).
34. U.S. Department of Energy, "ITER and the Promise of Fusion Energy," at *http://www.science.doe.gov/ofes/ITER.html* (March 23, 2011).

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." The FY 2012 request for $399.7 million should be returned to the FY 2008 level of $294.9 million, saving $104.8 million.

- **High Energy Physics (Savings: $94.4 million).** The High Energy Physics (HEP) program has the mission of uncovering "how our universe works at its most fundamental level."[35] In effect, the 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.[36] 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. The HEP is an area in which universities would strive to be the best and attract young talent and private funding. The FY 2012 request for $797.2 million should be returned to the FY 2008 amount of $702.8 million, saving $94.4 million.
- **Nuclear Physics (Savings: $181.6 million).** The Office of Nuclear Physics supports theoretical and experimental research in the field. The DOE 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 HEP, funding for Nuclear Physics has become excessive. The FY 2012 request for $605.3 million should be returned to the FY 2008 amount of $423.7 million, saving $181.6 million.
- **The Workforce Development for Teachers and Scientists Program (Savings: $35.6 million)**. The Workforce Development for Teachers and Scientists (WDTS) program trains teachers and scientists "to help ensure this Nation has the scientific workforce it will need in the twenty-first century." Funding goes to about 300 colleges and universities nationwide.

  Workforce development should fall squarely on the private sector. Federal funding simply crowds out private-sector investment. Universities and the private sector already conduct programs and training for future employees of the science sector. The Georgia Institute of Technology, for instance, recognizes the need to equip students with skills in science, technology, engineering, and mathematics (STEM). Through a program called Georgia Tech Enterprise Innovation Institute (EI^2), Georgia Tech is collaborating with economic developers, the academic community, and employers in southwestern Georgia to launch programs that will help meet future workforce needs in biotechnology and agribusiness. EI^2 represents a partnership between universities and members of the technology and agriculture industries. The initiative is connected to the statewide program Georgia Work Ready, started in 2006 by Governor Sonny Perdue's Office of Workforce Development. Industries, not taxpayers, should bear the costs of educating their workforces. Eliminating the WDTS would save $35.6 million.

Cutting the Advanced Research Projects Agency–Energy (Savings: $350 million)

The Advanced Research Projects Agency–Energy (ARPA-E) is another energy program designed to

35. U.S. Department of Energy, "High Energy Physics: Funding Profile by Subprogram," at *http://www.science.doe.gov/hep/files/pdfs/FY2009HEPBudget.pdf* (March 23, 2011).
36. U.S. Department of Energy, "Office of High Energy Physics: Research Areas," at *http://www.science.doe.gov/hep/research/index.shtml* (March 23, 2011).

fund high-risk, high-reward projects that the private sector would not embark upon on its own. ARPA-E also has the goal of reducing energy imports, increasing energy efficiency, and reducing energy-related emissions, including greenhouse gases.[37] Specifically, ARPA-E is "responsible for funding specific high-risk, high-payoff, game-changing research and development projects to meet the nation's long-term energy challenges. ARPA-E received initial funding in FY 2009 to fund transformational energy research that industry by itself cannot and will not support. There is an inherent risk associated with these programs, but the pay-off will be not only monetary but also socially rewarding."[38] Such a definition provides a very clear path under which ARPA-E should operate and how ARPA-E should allocate awards and could provide real value to the future of American energy. Of more than 3,600 applications, the government awarded ARPA-E funds to 37 companies.[39]

The problem is that ARPA-E does not always seem to follow this 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. FloDesign Wind Turbine, for instance, received an $8.3 million grant for a project to develop an advanced, shrouded wind turbine.[40] ARPA-E's project announcement addresses the issue of "Why ARPA-E Funding and Not Private Capital" by explaining that "ARPA-E permits an accelerated introduction of advanced materials and aerodynamics that would not be possible with private capital alone. In addition, ARPA-E's commitment, support and technical diligence greatly assisted FloDesign Wind to raise $34.5M in private capital to compliment the award. This partnership between public and private sectors significantly reduces risk and enhances the chance for successful commercial deployment of this critical renewable technology."[41]

But the reality is that FloDesign received private capital before receiving its ARPA-E grant. Venture Capital firm Kleiner Perkins Caufield & Byers invested $6 million in FloDesign through its purchase of FloDesign's Series A stock.[42] Venture capitalists could have undoubtedly funded FloDesign's new wind technology without the ARPA-E grant. Several other recipients of ARPA-E grants also received money from the government program after receiving funds from venture capitalists.[43]

A thorough review and more scrutiny of the projects that ARPA-E funds are in order for ARPA-E to be a successful program. There is no justification for venture-capitalist-funded projects to receive awards for "game-changing research and development projects." Although the mission of ARPA-E may be a laudable one, the $650 million budget request for FY 2012 should be cut to $300 million (the amount the President requested for FY 2011), especially since the American Recovery and Reinvestment Act of 2009 includes $400 million for ARPA-E. This cut would save $350 million.

Eliminating the Power Marketing Administrations (Savings: $85 million)

The DOE's Power Marketing Administrations (PMAs) consist of four power entities that sell electricity that stems primarily from hydroelec-

37. U.S. Department of Energy, "FY 2011 Congressional Budget Request: Budget Highlights," February 2010, at *http://www.cfo.doe.gov/budget/11budget/Content/FY2011Highlights.pdf* (March 23, 2011).
38. *Ibid.*
39. Press release, "Sun Catalytix Signs $4M ARPA-E Contract, Grows Team," SunCatalytix, January 25, 2010, at *http://www.suncatalytix.com/Sun_Catalytix_Signs_4M_ARPA-E_Contract.pdf* (March 23, 2011).
40. U.S. Department of Energy, "ARPA-E's 37 Projects Selected from Funding Opportunity Announcement #1," at *http://arpa-e.energy.gov/LinkClick.aspx?fileticket=aBlsCuR97m4%3D&tabid=221* (March 23, 2011).
41. *Ibid.*
42. Efrain Viscarolasaga, "FloDesign Finds $6M in First Funding," Mass High Tech, August 1, 2008, at *http://www.masshightech.com/stories/2008/07/28/weekly12-FloDesign-finds-6M-in-first-funding.html* (March 23, 2011).
43. ARPA-E recipients who also received money from the government after receiving funds from venture capitalists: Sun Catalytix, Agrivida Planar Energy Devices, Dodexis, General Compression, and 24M Technologies.

tric power. Formed in the early 1900s, PMAs were set up to provide cheap electricity to rural areas, mostly small communities and farms. PMAs originated as federal water projects currently operated by the Army Corps of Engineers and the Bureau of Reclamation.[44] PMAs use the revenue generated from electricity sales to reimburse taxpayers for construction and operation costs, but PMAs can sell the electricity at below-market rates because of favorable financing terms—they receive federal tax exemptions and receive loans at below-market interest rates.[45] The PMAs' construction, rehabilitation, operation, and maintenance costs are financed through the main DOE budget, offset collections, alternative financing, and a reimbursable agreement with the Bureau of Reclamation.

PMAs are an outmoded form of providing rural areas with electricity, yet they still enjoy tremendous special privileges that interfere with market competition. The DOE should restructure the PMAs to sell electricity at market rates by eliminating the subsidy for federal electricity rates. By doing so, Congress could remove the $85 million requested in the FY 2012 budget. Congress should then end PMA subsidies.[46]

DOE Budget Reform: Urgent and Necessary

It is not the role of the federal government to force certain technologies into the marketplace or to subsidize their commercialization. The $6 billion in cuts from the President's budget request for the Department of Energy would achieve significant and necessary savings without affecting legitimate energy research by the government. These cuts would remove the government—and the taxpayers—from the role of subsidizing research that should be the purview of the private sector, thereby automatically promoting private-sector innovation. Following through with these cuts would also be a signal to the American public that Washington is finally serious about putting an end to out-of-control spending.

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44. Congressional Budget Office, "Budget Options: Volume 2," August 2009, at *http://www.cbo.gov/ftpdocs/102xx/doc10294/08-06-BudgetOptions.pdf* (March 23, 2011).
45. *Ibid.*
46. Milton R. Copulos, "Cutting the Deficit by Selling Federal Power Marketing Administrations," Heritage Foundation *Backgrounder* No. 485, February 13, 1986, at *http://www.heritage.org/research/reports/1986/02/cutting-the-deficit-by-selling-federal-power-marketing-administrations*.