EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET

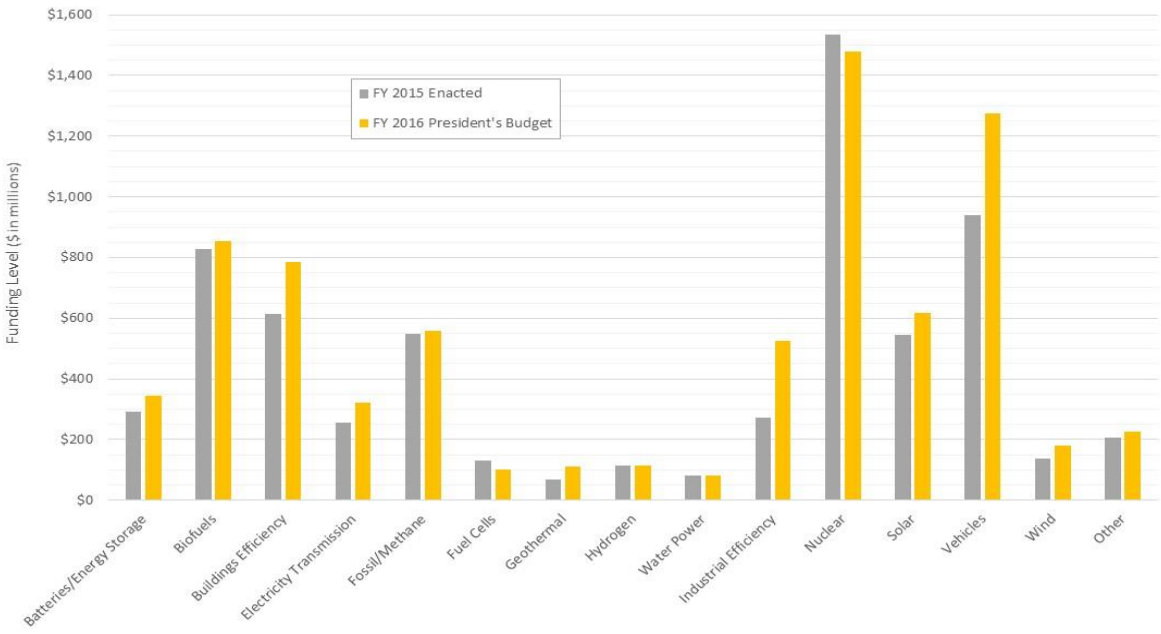
Government-Wide Funding For Clean Energy Technology

Introduction

The Nation needs to transition to a clean energy economy to cut carbon pollution and reduce the impacts of climate change. To achieve this goal the Administration is implementing an aggressive energy strategy that incorporates a wide array of programs and policies to promote advances in clean energy, reflecting the complexities and opportunities of the Nation's energy ecosystem. Federal support includes funding of approximately $7.6 billion for clean energy technology proposed in the FY 2016 President's Budget, which is discussed in more detail below as the subject of this brief report. In addition, the tax code incentivizes billions of private sector investments in clean energy; land management policies enable clean energy deployment on public land; credit programs across the government manage billions of dollars in loans and loan guarantees that support clean energy projects; and Federal leadership in energy, fleet, buildings, and acquisition management continue to drive national greenhouse gas reductions.

This report summarizes clean energy technology research, development, demonstration and deployment investments being made across the government. Given the scope and scale of Federal investment, and the ubiquitous nature of climate related emissions, no survey would capture every investment by the Government that has an incremental or ancillary environmental benefit. This survey presents activities whose purpose reflects the advancement of clean energy technology as a driver for investment. Funding for Federal activities can be grouped into general technology categories as shown in Figure 1.

Figure 1
Government-Wide Funding for Clean Energy Technology Research, Development, Demonstration and Deployment



"Clean energy technology" means energy-related hardware, software, systems, or practices that avoid, reduce, or sequester greenhouse gas emissions or other air pollutants. This includes technologies that convert, convey, or store energy resources, improve energy efficiency, or reduce energy consumption. The spectrum of Federal efforts in these areas is extremely diverse, from weatherizing low-income households to the development of green propulsion technology for spacecraft.

In fiscal year (FY) 2015, Federal funding for clean energy technology programs is about $6.6 billion government-wide. The FY 2016 President's Budget proposes a 15 percent increase – a total of $7.6 billion – for these important technologies.

Current Congressional funding allocations for FY 2016, which incorporate an assumption that sequestration will continue, will underfund clean energy technology investments, constraining our transition to a clean energy economy and our ability to cut carbon pollution.

The data presented here encompass activities across 11 agencies – the Departments of Agriculture (USDA), Commerce (DOC), Defense (DOD), Energy (DOE), Housing and Urban Development (HUD) and Transportation (DOT), the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the Nuclear Regulatory Commission (NRC), and the Tennessee Valley Authority (TVA). Generally, DOE funding accounts for 70-75 percent of the government-wide investment. DOE's clean energy technology funding for FY 2015 is about $4.8 billion and the FY 2016 President's Budget proposes to increase that by 17 percent to $5.6 billion. The next largest contributors in the FY 2016 Budget are DOD at about $630 million, NSF at about $380 million, and USDA at nearly $355 million. The Vehicles and Buildings categories have the highest number of agency contributors at eight each, in part because these categories touch on a particularly broad range of technologies and applications. While DOE makes up the lion's share of funding in nearly every category, each category has at least three contributing agencies, demonstrating the crosscutting nature of clean energy technology development and commercialization.

Activities contained in this tally of clean energy technology funding include basic and applied research, development, demonstration projects, commercialization efforts, and deployment support. Associated infrastructure and some types of overhead are generally captured as well. Funding for regulatory and permitting programs and Federal procurement of clean energy technologies is not included. Also, while credit subsidy amounts are included in the funding totals, loan and loan guarantee volumes are not. Additionally, tax expenditures that support clean energy technologies are not captured in these totals. For context, according to the Treasury's Fiscal Year 2016 Tax Expenditures report, the Production Tax Credit and Investment Tax Credit together are projected to be about $3.8 billion in FY 2016.

Understanding how the Federal investment in clean energy is allocated affords important insights. It provides information on the breadth of Federal activity in given sectors and on the costs of programs that help move toward the Nation's climate and clean energy goals. It also helps inform decisions about future activities, policies, and investments. When considering and comparing these categories, it is important to keep in mind that there are variances in the data within and across categories and agencies.

Perhaps as important, the potential and actual effectiveness of any particular investment is not illustrated by this simple compilation of expenditures. While the full cost of conducting R&D provides a broad picture of what it takes to achieve our goals, it does not address other considerations. In particular, it may cost much more to obtain equivalent progress in one category than another. Newer and more nascent technology may benefit more from Federal R&D, whereas other technologies may have significant market penetration already, which provide incentives to market participants to continue development. In the end, these federal investments are most effective when they serve as a catalyst for state, local, and private sector investment.

The following sections highlight a few of the categories in more detail to help illustrate the scope of Federal efforts.

Solar Energy

Solar, especially photovoltaics, is a clean energy technology that has large potential for growth, and can make an impact in driving down greenhouse gas emissions in the near term. According to one report by the National Renewable Energy Laboratory, the estimated technical resource potential for solar in the U.S. is over 200,000 gigawatts (GW). Government-wide funding for solar energy in the FY 2016 President's Budget is about $600 million across seven agencies. DOE accounts for over $400 million and the Department has made tremendous strides with prior funding in advancing basic research and reducing the cost of the technology. Today, one high priority in DOE's solar portfolio is the development of innovative and scalable solutions to soft cost challenges (e.g., customer acquisition, installation logistics, and financing models). Examples of other solar efforts include basic research on nanotechnology for solar energy collection and conversion at NSF; DOD R&D on artificial photosynthesis to extract hydrogen and electricity directly from water and sunlight; and USDA financial support for the installation of solar energy systems in rural areas.

The DOE SunShot Initiative *is a collaborative national effort to make the U.S. a leader in the global clean energy race by accelerating solar energy technology development. The goal of the Initiative is to develop solar energy technologies to be cost-competitive without incentives with conventional energy sources by 2020. Reducing the total installed cost for utility-scale solar electricity to roughly $.06/kWh will enable rapid, large-scale adoption of solar electricity. The program has already made it 68% of the way toward achieving the 2020 objectives. Through SunShot, DOE aims to re-establish American technological and market leadership in solar energy, improve the Nation's energy security, reduce environmental impacts of electricity generation, and strengthen U.S. economic competitiveness.*

Vehicles

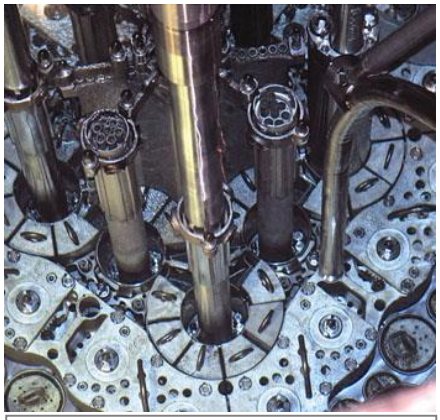
The development and deployment of technologies that displace fossil-based transportation fuels or reduce fuel consumption are critical to achieving the Nation's greenhouse gas emission and pollution reduction goals. The transportation sector is 93 percent dependent on petroleum, represents 70 percent of all U.S. petroleum use, and produces about 27 percent of U.S. CO_2-equivalent greenhouse gas emissions.

Transitioning to a mix of plug-in electric vehicles has the potential to notably reduce the Nation's petroleum use and greenhouse gas emissions. These vehicles are expected to play a key role in the country's transportation future.

The Vehicles category covers the widest range of activities, with efforts across eight agencies spanning the research-to-commercialization spectrum. Areas of work include: light-weight materials; next generation aircraft configurations; alternative fuels and lubricants; hybrid propulsion systems; batteries and energy storage; electrical power management between vehicles and the grid; afloat power systems; locomotive engine efficiency and exhaust emissions reduction; vehicle automation; and baseline safety performance of electric vehicle areas.

This category is funded at nearly $1.3 billion in the FY 2016 President's Budget, making it the second largest area of clean energy technology funding and 17 percent of the government-wide total. Unlike other technology areas where DOE provides the largest amount of funding, there are three agencies that maintain strong investment in vehicle technologies – NASA, DOE, and DOD. Roughly, these agencies contribute 20, 35, and 40 percent respectively to the Vehicles category total.

Nuclear



The Advanced Test Reactor at Idaho National Lab, with its unique serpentine core, is used for nuclear energy R&D at the Department of Energy.

Nuclear energy is an important component of the Nation's current energy mix. Today it accounts for nearly 20 percent of the electricity generated nationally and over 60 percent of our non-CO2 emitting generation. Funded at $1.5 billion[1] in the FY 2016 President's Budget, nuclear energy receives the largest share of Federal clean energy technology funding government-wide. Relative to other energy technologies, nuclear energy R&D requires larger infrastructure and safeguard investments because of the need for specialized equipment and the sensitive nature of certain nuclear materials.

Of the total Federal clean energy technology investment in nuclear, DOE accounts for about 90 percent, with about $900 million in the Office of Nuclear Energy (NE) and $460 million in the Office of Science (SC). NE R&D supports the continued viability of the current U.S. nuclear reactor fleet, development of new fission reactor technologies, and research into the nuclear fuel cycle. About one-third of NE's budget is for infrastructure and security. SC supports the development of fusion as a future energy source, both through an array of fundamental research as well as supporting the construction of ITER, the international, large scale experimental fusion reactor in France.

Beyond DOE, NASA, NRC, and DOC all fund clean energy technology activities related to nuclear. NASA develops nuclear power systems used in solar system exploration, NRC conducts research to develop technical advice, tools, methods, data, and information that support their regulatory mission, and DOC looks at radiation measurements and standards in support of the nuclear power industry.

Water Power

Water Power includes hydropower, marine, and hydrokinetic technologies. Hydropower is a well-established technology with a current installed capacity of 78 GW, which accounts for about 7 percent of the annual total U.S. electricity production. Significant opportunities remain to expand hydropower generation in the United States. DOE estimates a 60 GW technical resource potential for hydropower, but expanded use of the technology faces a number of deployment limitations. Marine and hydrokinetic (MHK) technologies generate energy from highly forecastable waves and currents (tidal, ocean, river). These technologies are early in the development process and more R&D is needed to advance their viability. The total Federal investment for Water Power in the FY 2016 President's Budget is $83 million, of which DOE accounts for about 90 percent.

[1] Does not include investments in Naval Reactors by the Department of Energy's National Nuclear Security Administration.