Department of Defense Energy Initiatives: Background and Issues for Congress

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Summary

The Department of Defense (DOD) spends billions of dollars per year on fuel, and is pursuing numerous initiatives for reducing its fuel needs and changing the mix of energy sources that it uses. DOD's energy initiatives pose several potential oversight issues for Congress, and have been topics of discussion and debate at hearings on DOD's proposed FY2013 budget.

By some accounts, DOD is the largest organizational user of petroleum in the world. Even so, DOD's share of total U.S. energy consumption is fairly small. DOD is by far the largest U.S. government user of energy. The amount of money that DOD spends on petroleum-based fuels is large in absolute terms, but relatively small as a percentage of DOD's overall budget. DOD's fuel costs have increased substantially over the last decade, to about $17 billion in FY2011. Petroleum-based liquid fuels are by far DOD's largest source of energy, accounting for approximately two-thirds of DOD energy consumption. When DOD's fuel use is divided by service, the Air Force is the largest user; when divided by platform type, aircraft are the largest user.

According to DOD, currently about 75% of DOD's energy use is operational energy and about 25% is installation energy. Operational energy is defined in law as "the energy required for training, moving, and sustaining military forces and weapons platforms for military operations." Installation energy is not defined in law, but in practice refers to energy used at installations, including non-tactical vehicles, that does not fall under the definition of operational energy.

DOD's reliance on fuel can lead to financial, operational, and strategic challenges and risks. Financial challenges and risks relate to the possibility of a longer-term trend of increasing costs for fuel, and to shorter-term volatility in fuel prices. Operational challenges and risks relate to (1) the diversion of resources to the task of moving fuel to the battlefield; (2) the negative impact of fuel requirements on the mobility of U.S. forces and the combat effectiveness of U.S. equipment, and (3) the vulnerability of fuel supply lines to disruption. Strategic challenges and risks relate to getting fuel to the overseas operating area, and ensuring the global free flow of oil.

As part of its FY2013 budget submission, DOD has requested more than $1.4 billion for operational energy initiatives in FY2013. DOD's office of Operational Energy Plans and Programs, headed by the Assistant Secretary of Defense, Operational Energy Plans and Programs (ASD (OEPP)), is responsible for developing DOD policy for operational energy and alternative fuels, and for coordinating operational energy efforts across the services.

Congress has been concerned with energy policy since the 1970s, and has passed legislation relating to federal government energy use, including DOD installation energy use. Congress has set specific energy-reduction targets for DOD installation energy, but not for operational energy.

Potential oversight issues for Congress regarding DOD's energy initiatives include:

- DOD's coordination of operational energy initiatives being pursued by the military services.
- DOD's efforts to gather reliable data and develop metrics for evaluating DOD's energy initiatives.
- DOD's estimates of future fuel costs.

- DOD's role in federal energy initiatives.
- The Navy's initiative to help jumpstart a domestic advanced biofuels industry.
- The potential implications for DOD energy initiatives of shifts in U.S. military strategy.

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Introduction

This report provides background information and identifies issues for Congress on Department of Defense (DOD) energy initiatives. DOD spends billions of dollars per year on fuel, and is pursuing numerous initiatives for reducing its fuel needs and changing the mix of energy sources that it uses. DOD's energy initiatives pose several potential policy and oversight issues for Congress, and have been topics of discussion and debate at hearings on DOD's proposed FY2013 budget. Congress's decisions on DOD energy initiatives could substantially affect DOD capabilities, funding requirements, and U.S. energy industries.

This report supplements earlier CRS reports on DOD fuel use and conservation.[1] Another CRS report discusses DOD's facilities energy conservation policies.[2]

This report focuses primarily on DOD's use of liquid fuels. It does not discuss in detail DOD's use of other energy, such as natural gas or electrical power, or the use of nuclear power by some Navy ships.[3]

Background

DOD's Use of Fuels

In General

From fueling jets, ships, and tactical vehicles to powering domestic installations and forward operating bases, DOD consumes large amounts of energy to conduct its various operations. Points that help describe DOD's use of energy include the following:

- **DOD is by some accounts the largest organizational user of petroleum in the world.**[4] DOD consumed about 117 million barrels of oil in FY2011.[5]
- **Even so, DOD's share of total U.S. energy consumption is fairly small.** DOD's use of energy in FY2010 accounted for almost 1% of all U.S. energy consumption,[6] DOD's use of petroleum in FY2010 accounted for about 1.9% of U.S. petroleum use.[7]

[1] See, CRS Report R40459, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, by (name re dacted); and CRS Report RL34062, *The Department of Defense: Reducing Its Reliance on Fossil-Based Aviation Fuel—Issues for Congress*, by (name redacted).

[2] CRS Report R40111, *Department of Defense Facilities Energy Conservation Policies and Spending*, by (name re dacted).

[3] For a report discussing the use of nuclear power by certain Navy ships, see CRS Report RL33946, *Navy Nuclear-Powered Surface Ships: Background, Issues, and Options for Congress*, by (name redacted).

[4] See Jerry Warner and Peter Singer, *Fueling the "Balance": A Defense Energy Strategy Primer*, 2008; Bryan Walsh, "Blue Water, Green Fleet," *Time*, July 19, 2011.

[5] Data provided by the Defense Logistics Agency–Energy (DLA-E).

[6] CRS analysis of data from the U.S. Energy Information Administration, *Annual Energy Review*, October 19, 2011. In (continued...)

- **DOD is by far the largest U.S. government user of energy.** DOD's use of energy in FY2010 accounted for about 80% of the federal government's use of energy.[8]
- **The amount of money that DOD spends on petroleum-based fuels is large in absolute terms, but relatively small as a percentage of DOD's overall budget.** In FY2011, DOD spent about $17.3 billion on petroleum-based fuels, accounting for about 2.5% of DOD's total outlays in FY2011 and about 6% of total operations and maintenance outlays in FY2011.[9]
- **DOD's petroleum costs have increased substantially over the last seven years even as DOD petroleum use has declined slightly over the same period.** Between FY2005 and FY2011, DOD's petroleum use decreased 4%. Over the same period, DOD spending on petroleum rose 381% in real (i.e., inflation-adjusted) terms, from $4.5 billion in FY2005 (in FY2011 dollars) to about $17.3 billion in FY2011.[10]
- **Petroleum-based liquid fuels are by far DOD's largest source of energy.** Petroleum use accounted for 71% of DOD energy use in FY2010. By comparison, electricity accounted for 11%; natural gas 8%; nuclear power in Navy ships 7%; coal 2%; and all other sources 1%.[11]
- **When divided by platform type, aircraft are DOD's largest users of petroleum.** According to a 2006 Navy report, in 2003 aircraft accounted for 73% of DOD's petroleum use, ground vehicles accounted for 15%, while ships accounted for 8%. DOD installations accounted for 4%.[12]

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FY2010, DOD used about 890 trillion Btu of energy, while the United States as a whole used about 98,000 trillion Btu of energy.

[7] CRS analysis of data from the U.S. Energy Information Administration, *Annual Energy Review*, October 19, 2011. In FY2010, DOD used about 689 trillion Btu of petroleum, while the United States as a whole used about 36,000 trillion Btu of petroleum.

[8] Based on analysis by CRS. Total U.S. federal government energy use in FY2010 estimated at 1,100 trillion BTU, of which DOD accounted for 890 trillion Btu. U.S. Energy Information Administration, *Annual Energy Review*, October 19, 2011. The next-largest federal energy user—the Postal Service—accounted for 4%.

[9] Data provided by DLA-E, March 1, 2012, CRS calculations using budget figures from the Department of Defense, *National Defense Budget Estimates for FY2013*, Table 1-5, "National Defense Outlays," p. 10. Data on DOD fuel use based on fuel purchased by DOD components from DLA-E. Because DLA-E purchases fuel in advance and sells fuel to non-DOD customers, DLA-E fuel purchases may differ from actual fuel used by DOD in the same fiscal year.

[10] Data provided by DLA-E, March 1, 2012. CRS calculations adjusting for using DOD fuel deflation factors in the Department of Defense, *National Defense Budget Estimates for FY2012*, Table 5-9, "Department of Defense Deflators – Outlays," p. 62.

[11] CRS analysis of data from the U.S. Energy Information Administration, *Annual Energy Review*, October 19, 2011, and nuclear ship energy data provided by the Navy, March 1, 2012.

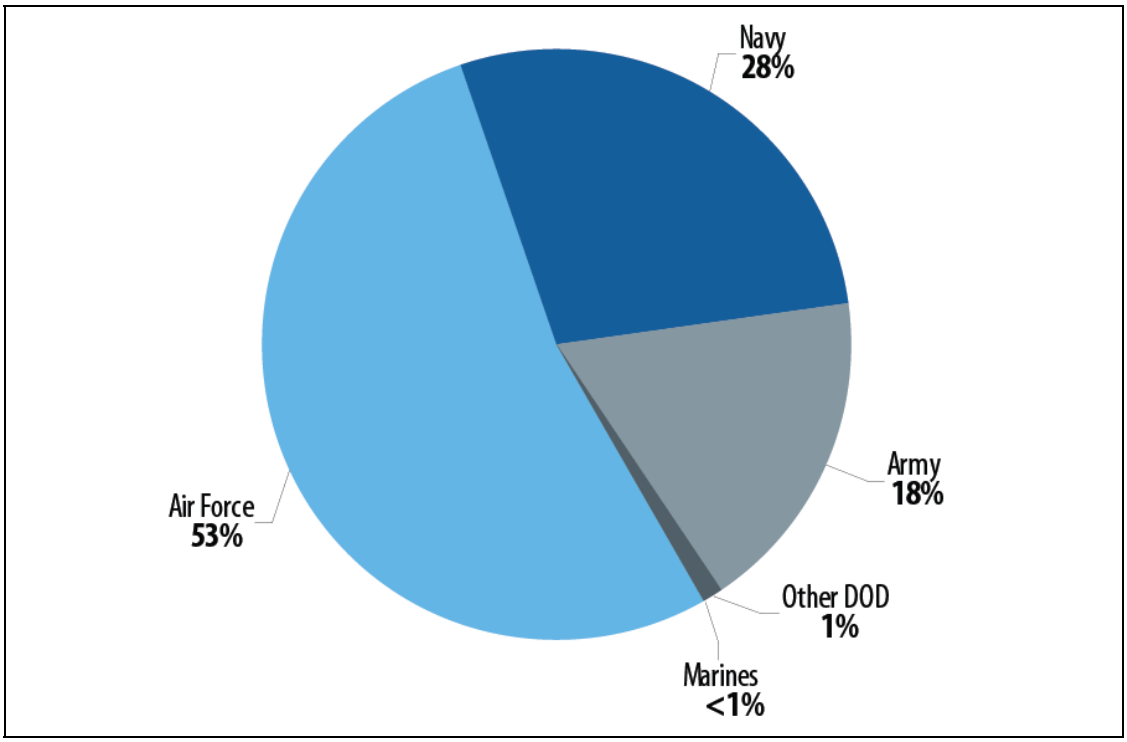
[12] A.M. Andrews, W. Bryzik, and R. Carlin, et al., *Future Fuels*, Naval Research Advisory Committee, April 2006, p. 19.

The Services

When DOD's fuel use is divided by service, the Air Force is the largest user, accounting for 53% of total DOD's fuel use, compared to 28% for the Department of the Navy (which includes the Navy and Marine Corps), and 18% for the Army (see **Figure 1**).[13]

Figure 1. DOD Petroleum Use by Service

FY2011



Source: CRS analysis of data provided by DLA-E, March 16, 2012.

Air Force

Between 85% and 95% of the fuel used by the Air Force is aviation fuel.[14] In FY2011, the Air Force used nearly 62 million barrels of petroleum fuel, including about 58 million barrels of aviation fuel. In FY2011, 64% of Air Force aviation fuel was used for mobility and logistics air operations, 31% for combat air operations, and 3% for training operations.[15] In FY2009, the Air Force's Air Mobility Command, which provides airlift and refueling services to joint forces, consumed more than half of Air Force fuel use and a quarter of DOD total fuel use.[16]

[13] Data provided by DLA-E, March 1, 2012.

[14] Office of the Deputy Assistant Secretary of the Air Force for Energy. *U.S. Air Force Energy Program*. June 2011; CRS analysis of Air Force data, March 6, 2012, and DLA-E data on overall Air Force Fuel purchases, March 1, 2012.

[15] Air Force aviation fuel data, provided March 6, 2012. The remainder is used by other missions, such as special forces and combat search and rescue.

[16] Oliver Fritz *Operational Energy Considerations*, Directorate of Strategic Planning, Headquarters U.S. Air Force, June 14, 2010, p. 15. http://e2s2.ndia.org/pastmeetings/2010/tracks/Documents/OperationalEnergySession/
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Navy and Marine Corps

The Department of the Navy is less dependent on petroleum than the Air Force and Army for meeting its energy needs, in part because all of the Navy's aircraft carriers and submarines are nuclear-powered. In FY2010, the Department of the Navy met 59% of its overall energy needs from petroleum, 22% from nuclear-powered ships, and 19% from electricity.[17] Aircraft operations account for 54% of the Navy's use of petroleum fuels, ships account for 43%, and non-tactical uses account for 3%.[18] The Marine Corps accounted for about 4.7 million barrels of the 30 million barrels of petroleum used by the Department of the Navy in FY2010. About 90% of the Marine Corps' fuel use is operational fuel, with aircraft accounting for about 85% and ground forces accounting for about 15% of operational fuel use.[19]

Army

The Army, despite being the service with the greatest number of personnel, consumes less fuel than the Air Force or Navy. In FY2011, the Army used about 21 million barrels of petroleum fuel.[20] The Army does not operate large numbers of airplanes, which are fuel-intensive platforms, and relies on the Air Force and the Military Sealift Command for transporting and sustaining troops.

Operational Energy vs. Installation Energy

DOD's energy use can be divided into two broad categories—operational energy and installation energy. Section 2821(a) of the FY2012 National Defense Authorization Act (H.R. 1540/P.L. 112-81 of December 31, 2011) defines operational energy as "the energy required for training, moving, and sustaining military forces and weapons platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms." The definition is codified at 10 U.S.C. 2924. DOD's use of operational energy can vary over time, depending on the number, location, scale, and tempo of DOD's military operations around the world.

Installation energy is not defined in law, but in practice refers to energy used at installations, including by non-tactical vehicles, that does not fall under the definition of operational energy.[21] Installation energy is sometimes referred to as facilities energy.[22]

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Operational%20Energy%20Considerations_Fritz_20100604_v4_for%20NDIA.pdf

[17] Data provided by the Navy, March 6, 2012. Analysis by CRS. The "N" in the hull classification for U.S. aircraft carriers and attack submarines denotes "nuclear."

[18] Data provided by the Navy, March 6, 2012. Analysis by CRS.

[19] Data provided by the Navy and the Marine Corps, March 6, 2012. Analysis by CRS.

[20] Data provided by the Army, March 1, 2012.

[21] Office of the Deputy Undersecretary of Defense (Installations and Environment), *Department of Defense Annual Energy Management Report*, Fiscal Year 2010, July 2011, p. 9.

[22] For example, the *Department of Defense Annual Energy Management Report*, Fiscal Year 2010 uses the term facilities energy to refer to installation energy.

Under the definition of operational energy in P.L. 112-81, energy used at an installation to train military personnel is considered operational energy.

The distinction between what is operational or installation energy is not always clear. For example, at a domestic base that serves as the home of remote drone operations, energy used at the base for drone operations could be viewed as operational energy. DOD is working to develop rules for allocating various activities to operational or installation energy.[23]

According to DOD, currently about 75% of DOD's energy use is operational energy and about 25% is installation energy.[24] Officials state current DOD energy use reflects recent operations in Afghanistan and Iraq: the split between operational and installation energy would likely be much different during peacetime.[25] About 80% of installation energy used in FY2010 was electricity and natural gas, about 15% was fuel oil and coal, and the remainder was renewable energy and other sources.[26]

Energy used to directly support ongoing expeditionary operations, including logistics support throughout the supply chain, and in-theatre energy consumption, can be considered a subset of operational energy. According to DOD officials, the military is more reliant on fuel during expeditionary operations.

How DOD Buys Fuels

Defense Logistics Agency-Energy (DLA-E)

The Defense Logistics Agency (DLA) is DOD's logistics support agency. DLA-Energy (DLA-E) is the part of DLA that is responsible for acquiring, storing, distributing and selling energy, including petroleum, natural gas, and coal.[27] DLA-E buys petroleum from suppliers around the world and resells it to customers within DOD, acting as a clearinghouse for filling DOD's petroleum needs.[28] DLA-E stores and sells fuel at more than 600 fuel depots worldwide, and also sells fuel to foreign governments and other federal agencies.

To reduce costs for transporting fuel, DLA-E generally purchases fuel from sources close to where it is to be used.[29] Fuel to support operations in Afghanistan, for example, is generally purchased from sources within the Central Command (CENTCOM) area of responsibility, while fuel to support operations in the Pacific is generally purchased from sources within the Pacific Command.[30]

[23] Source: Discussions with ASD(OEPP) and Army, Navy and Air Force officials, March 2012.

[24] Assistant Secretary of Defense for Operational Energy Plans and Programs, *Operational Energy Strategy*, p. 3.

[25] Email from Army officials to CRS, June 3, 2012.

[26] Department of Defense, *Annual Energy Management Report, FY2010*, pp. 15-16.

[27] For more information on DLA-E see http://www.desc.dla.mil/.

[28] DLA-E fulfills more than 99% of DOD's global petroleum needs.

[29] Sharon Burke, Assistant Secretary of Defense for Operational Energy Plans and Programs, testified that, "we fuel where we fight." U.S. Congress, House Committee on Armed Services, Subcommittee on Readiness, *What is the Price of Battlefield Security: From Battlefields to Bases*, 112th Cong., 2nd sess., March 29, 2012.

[30] Defense Logistics Agency-Energy, *Fact Book Fiscal Year 2010*, p. 18.

DLA-E incurs varying costs for obtaining fuels at different locations around the world, depending on regional fuel prices and logistic costs. Despite these differing costs, DLA-E establishes a "global leveled set price" for each fuel type—a single price for a gallon of that fuel type, regardless of where it is purchased. For example, DLA-E charges DOD customers the same price for a gallon of JP-8 (military jet fuel) purchased in Northern Afghanistan, Japan, or Fort Benning, Georgia. To calculate the global leveled set price, DLA-E averages the worldwide cost of fuel purchased, and then adds an operating surcharge to cover its worldwide operating expenses (such as expenses for storing and distributing fuel).[31]

Fully Burdened Cost of Fuel

Section 332(g) of the FY2009 Duncan Hunter National Defense Authorization Act (S. 3001/P.L. 110-417 of October 14, 2008) defines the fully burdened cost of fuel as "the commodity price for fuel plus the total cost of all personnel and assets required to move and, when necessary, protect the fuel from the point at which the fuel is received from the commercial supplier to the point of use."[32]

The price for fuel that DLA-E charges to DOD customers is less than the fully burdened cost of fuel—it covers the commodity cost of fuel and DLA-E's fuel handling and overhead costs, but it does not cover costs associated with transporting, storing, or protecting fuel beyond the DLA-E point of delivery.[33] Calculating the fully burdened cost of fuel requires adding these other costs to DLA-E's set fuel price.

The fully burdened cost of fuel varies widely, depending on where and under what circumstances fuel is used. The fully burdened cost of fuel that is used near a DLA-E delivery point in the United States is generally close to the DLA-E set price. In contrast, in rare cases, the fully burdened cost of fuel delivered by helicopter to a remote and isolated location can run into the hundreds of dollars per gallon.[34] Costs for supplying fuel during overseas contingency operations, particularly costs for logistics and force protection, generally increase the fully burdened cost of fuel. A DOD analysis concluded that the "hidden costs" associated with the fully burdened cost of fuel have led DOD to "systematically undervalue the true cost of supplying fuel to its battlespace forces."[35]

A number of studies have attempted to calculate the fully burdened cost of fuel in Iraq and Afghanistan. In 2010, the Marine Corps estimated the fully burdened cost of fuel in Afghanistan at between $9 to $16 per gallon if delivered by land, and between $29 to $31 per gallon if delivered by air. An Army study estimated the fully burdened cost of fuel in Iraq at $9 to $45 per

[31] DLA-E, Face Sheet "*Fuel Standard Pricing"*, May 2011.

[32] The provision is codified at 10 U.S.C. 2911.

[33] Army Environmental Policy Institute, *Sustain the Mission Project: Energy and Water Costing Methodology and Decision Support Tool*, Final Technical Report, July 2008, p. 3.

[34] Defense Science Board, *More Capable Warfighting Through Reduced Fuel Burden*, May 2001, pp. 14-20. The widely repeated $400 per gallon figure represents a very specific scenario: a multi-stage helicopter resupply of forces 600km beyond secure supply lines. Costs for more common fuel delivery methods are significantly lower – the report estimates that ground delivery over short distances would cost approximately $10 per gallon, while ground delivery over longer distances would cost between $40-50 per gallon.

[35] Defense Science Board, *More Fight - Less Fuel*, Report of the Defense Science Board on DoD Energy Strategy, February 2008, p. 16.

gallon, depending on the type of force protection used to and the delivery distance, while an Air Force study estimated the fully burdened cost of fuel delivered by land at $3 to $5 per gallon and $35 to $40 per gallon for aerial refueling.[36] A 2008 report by the Army Environmental Policy Institute estimated that the fully burdened cost of fuel for a Stryker brigade in Iraq ranged from $14.13 to $17.44 per gallon.[37]

While the fully burdened cost of fuel illustrates the "hidden costs" of supplying fuel to forces in the field, it is not a record of actual costs and is not used for budgeting purposes. Rather, it is intended to be used in the acquisitions process as a factor in selecting new equipment, and to illustrate potential systems' logistical footprints. Section 332(c) of P.L. 110-417 states that "The Secretary of Defense shall require that the life-cycle cost analysis for new capabilities include the fully burdened cost of fuel during analysis of alternatives and evaluation of alternatives and acquisition program design trades." The provision is codified at 10 U.S.C. 2911 note.

Contractor Fuel Costs

The military relies on thousands of contractors to support military operations both domestically and abroad.[38] These contractors depend on fuel to perform many of their activities. The cost of fuel used by contractors is often embedded in contracts and consequently not included in DOD's data on fuel. As a result, total DOD expenditures for fuel are higher than what is reflected in DOD data.

Challenges and Risks Associated with DOD's Use of Fuels

DOD's reliance on fuel can lead to certain financial, operational, and strategic challenges and risks. In recent years, rising fuel costs and operations in Iraq and Afghanistan have highlighted some of these challenges and risks.[39] DOD discusses these challenges and risks in some of its strategic guidance documents,[40] and takes them into account in its operational plans and in developing its future force structure. This section focuses on challenges and risks associated with DOD's use of operational energy.[41]

[36] DLA-E summarized the data from these three reports for CRS, June 2011.

[37] Army Environmental Policy Institute, *Sustain the Mission Project: Energy and Water Costing Methodology and Decision Support Tool*, Final Technical Report, July 2008.

[38] For example, in March 2011 there were over 174,000 DOD contractor personnel in the CENTCOM area of responsibility, compared to approximately 214,000 uniformed personnel. (CRS Report R40764, *Department of Defense Contractors in Afghanistan and Iraq: Background and Analysis*, by (name redacted) and (name redacted).)

[39] For some figures regarding fuel use in Afghanistan, see **Appendix C**.

[40] See, for example, the *2012 Defense Strategic Guidance*; *2012 Joint Operational Access Concept*; *2012 Army-Marine Corps Access Concept*; and *2012 National Military Strategy*.

[41] Since installation energy is largely electricity and natural gas, the risks of reliance on these sources, and possible strategies to mitigate these risks, are very different. For a more detailed consideration of the risks of installations energy, see Defense Science Board, *More Fight - Less Fuel*, Report of the Defense Science Board on DoD Energy Strategy, "Chapter V: Managing Risks to Installations," February 2008; *Department of Defense Strategic Sustainability Performance Plan, FY2010*, August 26, 2011.

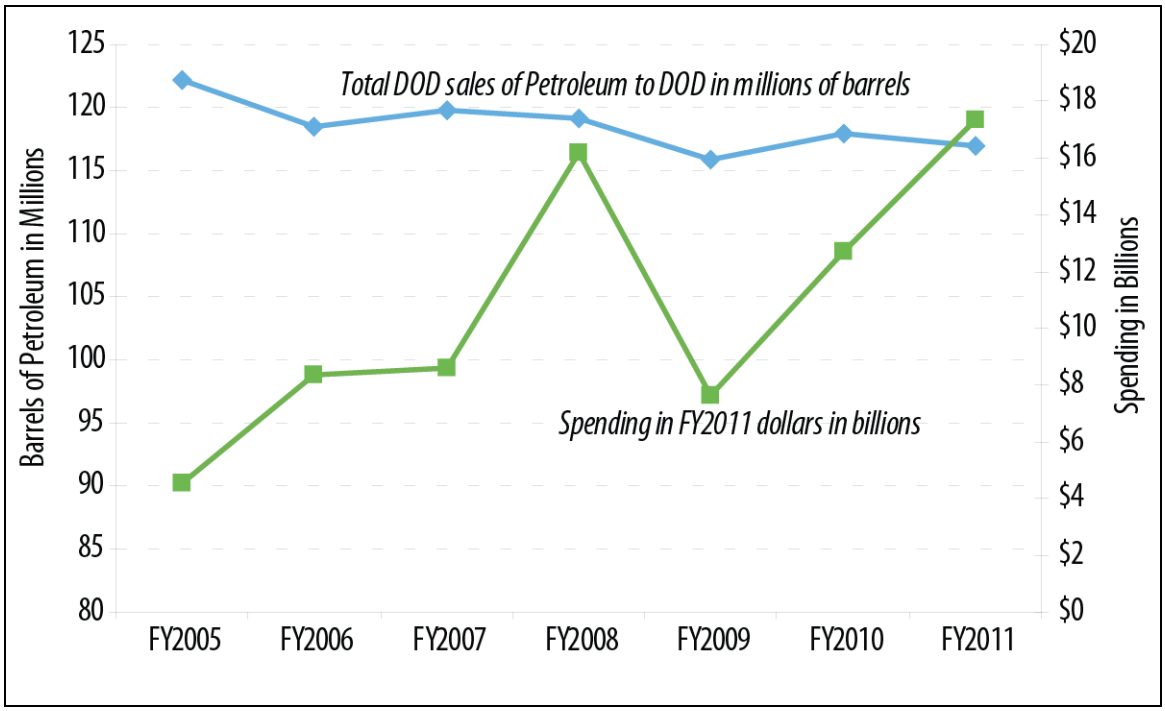
Financial

Financial challenges and risks associated with DOD's reliance on fuel relate to the possibility of a longer-term trend of increasing costs for fuel, and to shorter-term volatility in fuel prices. Each of these is discussed below.

Possible Longer-Term Trend of Increasing Fuel Costs

DOD's petroleum costs have increased substantially over the last seven years even as DOD petroleum use has declined slightly over the same period. Between FY2005 and FY2011, DOD's petroleum use decreased 4%, from 122 million barrels to 117 million barrels (see **Figure 2**). Over the same period, DOD spending on petroleum rose 381% in real (i.e., inflation-adjusted) terms, from $4.5 billion in FY2005 (in FY2011 dollars) to about $17.3 billion in FY2011.[42]

Figure 2. DOD Petroleum Spending and Consumption



Source: Data provided by DLA-E, March 1, 2012. Fuel deflation factor from National Defense Budget Estimates for FY2010, Office of the Undersecretary of Defense (Comptroller), June 2009, Table 5-9, "Department of Defense Deflators – Outlays for Pay and Purchases", p. 47. Analysis by CRS.

A longer-term trend of increasing fuel costs could require DOD to devote an increasing share of its budget to fuel, which in turn could make it more difficult for DOD to fund other priorities, such as personnel pay and benefits or equipment acquisition programs. Since the early 1990s, the cost of buying fuel has increased faster than any other major DOD budget category, including

[42] Data provided by DLA-E, March 1, 2012. CRS calculations adjusting for using DOD fuel deflation factors in the Department of Defense, *National Defense Budget Estimates for FY2012*, Table 5-9, "Department of Defense Deflators – Outlays," p. 62.

health care and military personnel.[43] Since FY2005, the share of DOD's spending dedicated to fuel increased from about 1.6% to about 2.5% of total spending.[44] Although that change appears small, in a DOD budget of roughly $700 billion per year, the increase of about 0.9% equates to about $6 billion per year that otherwise might be available for funding other DOD priorities.

Some DLA-E officials and other analysts expect the price of oil to continue to rise as a result of increasing demands for oil from developing countries.[45] DOD projects that fuel costs will decline 13% from FY2013 to FY2014 and then remain roughly at that lower price through FY2017, primarily because DOD projects the price of refined oil products to decline, even as it expects the price of crude oil to remain relatively flat.[46] Fuel appears to be the only category for which DOD projects costs to decrease over the next four years (see **Appendix A**).[47]

Shorter-Term Volatility of Fuel Costs

Shorter-term volatility in fuel costs complicates DOD budgeting and can cause funding shortfalls in the current-year budget. Because DOD fuel is funded primarily through DOD's Operations and Maintenance (O&M) account, unexpected increases in fuel prices can lead to significant O&M funding shortfalls. In DOD's FY2012 budget, for example, the cost of oil was forecast to be $130 per barrel, but oil prices in FY2012 rose to $156 per barrel, reportedly leading to an unfunded obligation of more than $3 billion across DOD.[48] Secretary of the Navy Ray Mabus stated in April 2012 that the Navy is facing nearly a billion dollars in unfunded fuel costs,[49] while U.S. Pacific Command, to cite another example, is facing a $200 million shortfall in FY2012 O&M funding due to higher-than-expected fuel costs.[50]

Even slight unexpected increases in costs for fuel can have a substantial effect on DOD's current-year budget. Navy officials state that a one-dollar increase in the price of a barrel of petroleum costs the Navy alone about $30 million annually.[51] (By extension, since DOD in FY2011 used about 117 million barrels of oil, a one-dollar increase in the price of a barrel of petroleum would cost DOD as a whole about $117 million.) A 10% increase from the FY2011 price of fuel would cost DOD as a whole an additional $1.7 billion per year—the price of about 14 F-35s.[52]

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[43] *National Defense Budget Estimates for FY2013*, Office of the Undersecretary of Defense (Comptroller), March 2012, Table 5-9, "Department of Defense Deflators – Outlays", pp. 67-68. Calculation by CRS.

[44] CRS analysis based on DOD budget authority figures in Department of Defense, *National Defense Budget Estimates for FY2013*. Data on DOD fuel spending provided by DLA-E, March 1, 2012.

[45] U.S. Energy Information Administration, *Annual Energy Outlook 2012 Early Release Report*, p. 1., Discussion with DLA-E, March 1, 2012. See also CRS Report R42024, *Oil Price Fluctuations*, by (name redacted) and (name redacted).

[46] Data from DOD Comptroller, May 1, 2012.

[47] *National Defense Budget Estimates for FY2013*, Office of the Undersecretary of Defense (Comptroller), March 2012, Table 5-9, "Department of Defense Deflators – Outlays", pp. 67-68. Calculation by CRS.

[48] Discussion with Navy officials, March 6, 2012; Speech given by Secretary of Defense Leon Panetta, May 2, 2012, http://www.defense.gov/speeches/speech.aspx?speechid=1667.

[49] Secretary of the Navy Ray Mabus, Remarks at the Sea Air Space Exposition, April 16, 2012.

[50] Discussion with Navy officials, March 6, 2012.

[51] Jo Decker, Assistant Deputy Chief of Naval Operations. "Energy and Total Ownership Cost." October 13, 2011; Al Shaffer, *Defense Energy Security Briefing*, Defense Energy Security Task Force, May 22, 2007, p. 9.

[52] Analysis by CRS, using F-35 cost data provided by the Air Force, March 6, 2012.

Responding to O&M funding shortfalls caused by unexpected increases in fuel costs can require either submitting supplemental funding requests (such as the $5 billion supplemental funding request to cover unexpectedly high fuel costs in FY2008), or reducing funding for other O&M-funded activities.[53] Then-Secretary of Defense Robert Gates testified in 2011 that unbudgeted fuel costs could force cuts in Air Force flying hours, Navy steaming days, and training for home-stationed Army troops.[54]

By some measures, petroleum prices have become increasingly volatile in recent years. DOD's petroleum costs, for example, increased by nearly 90% between FY2004 and FY2005, and then declined by about 50% between FY2008 and FY2009.[55] Volatility in prices prompted DLA-E in FY2005 to shift from a practice of setting fuel prices once a year to adjusting prices as needed within a given fiscal year (see **Appendix B**). Many analysts expect future oil prices to continue to be volatile in coming years.[56]

Operational

Operational challenges and risks associated with DOD's reliance on fuel relate to

- the diversion of resources to the task of moving fuel to the battlefield;
- the negative impact of fuel requirements on the mobility of U.S. forces and the combat effectiveness of U.S. equipment; and
- the vulnerability of fuel supply lines to disruption.

Diversion of Resources

Maintaining a logistics capability for an overseas military operation requires substantial personnel and materiel resources. The logistic network for an overseas military operation can be so extensive that reportedly as much as 1.4 gallons of petroleum fuel can be consumed to deliver 1 gallon to forces on the battlefield.[57] The use of personnel and material for getting fuel to the battlefield diverts resources that could otherwise be used for meeting other military requirements. A 2008 DOD analysis found that moving and protecting fuel "add[s] to sustainment costs and divert[s] and endanger[s] in-theatre force capability."[58] In addition, maintaining an extensive

[53] DoD Energy Security Task Force, OUSD(AT&L), *Department of Defense Report to Congress on Energy Security Initiatives*, October 2008, p. 1.

[54] U.S. Congress, Senate Committee on Armed Services, *To receive testimony on the Defense Authorization Request for Fiscal Year 2012 and the Future*, 112th Cong., 1st sess., February 17, 2011; in meetings with DOD energy officials, Navy officials said that fuel price volatility "crushes us," while Air Force officials said that the Air Force's budget is "heavily impacted by fluctuating fuel prices," March 6, 2012. GAO noted that out-of-[budget]-cycle price increases are hard for the services to absorb. U.S. Government Accountability Office, *DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, GAO-09-300, February 2009, p. 9.

[55] Data from Defense Energy Support Center, *FY2002-FY2010 Fact Books*, analysis by CRS. Fuel deflation factor from *National Defense Budget Estimates for FY2010*, Office of the Undersecretary of Defense (Comptroller), June 2009, Table 5-5, "Department of Defense Deflators – TOA", p. 43. Analysis by CRS.

[56] Robert McNally and Michael Levi, "A Crude Predicament: The Era of Volatile Oil Prices," *Foreign Affairs*, July/August 2011, p. 105; CRS Report R42024, *Oil Price Fluctuations*, by (name redacted) and (name redacted).

[57] Amory B. Lovins, "DOD's Energy Challenge as Strategic Opportunity," *Joint Forces Quarterly*, Issue 57, 2nd Quarter 2010, p. 37.

[58] Defense Science Board, *More Fight - Less Fuel*, Report of the Defense Science Board on DoD Energy Strategy, (continued...)

logistic network can result in increased numbers of contractors on the battlefield. In Iraq and Afghanistan, the extensive use of contractors has in some cases caused problems and undermined U.S. efforts.[59]

Restraint on Mobility and System Effectiveness

Fuel requirements can slow down the rate at which U.S. forces can be deployed and assembled in an overseas theater, can limit the rate of advance or the battlefield maneuverability of U.S. forces engaged in combat operations, and can affect the weight, speed, range, and lethality of U.S. weapon systems. A 2001 DOD study estimated that if the Abrams tanks used by the Army and Marine Corps were 50% more fuel efficient, and consequently if a smaller amount of fuel for those tanks needed to be moved to the battlefield, the build-up for Operation Desert Shield/Desert Storm (i.e., the 1990-1991 U.S.-led military operation against Iraq) could have been completed in about five months instead of six (i.e., about 15% more quickly).[60] During the 2003 U.S. advance on Baghdad, then-Major General James Mattis, commander of the 1st Marine Division, noted that U.S. forces were outpacing their logistics support.[61] General James Amos, Marine Corps Commandant, stated in 2001 that fuel dependency "constrains our tactical options for executing missions in complex battlespaces, across long distances, and against hybrid threats."[62]

The 2011 National Military Strategy states that U.S. forces in the future must become more "expeditionary in nature" and "require a smaller logistical footprint in part by reducing large fuel and energy demands."[63]

Vulnerability of Fuel Supply Lines

Fuel supply lines are vulnerable to disruption from enemy attack or from natural events—such as poor weather, floods, or earthquakes—that can damage, destroy, or limit the use of roads, ports, and airfields. Protecting fuel-supply lines against enemy attack can lead to the assignment of additional personnel and other resources to the task of moving fuel through the battlefield, increasing the above-discussed diversion of resources away from other military requirements.

DOD stated in 2011 that "attacks on fuel convoys and fixed energy supplies in Afghanistan, Iraq, and surrounding countries already demonstrate the vulnerability of our current supply networks."[64] Secretary of the Navy Ray Mabus testified in 2011 that "Future adversaries [can] target our operational dependence on petroleum, as we see in attacks on fuel convoys in Afghanistan."[65]

(...continued)

February 2008, p. 17.

[59] See CRS Report R40835, *The Department of Defense's Use of Private Security Contractors in Afghanistan and Iraq: Background, Analysis, and Options for Congress*, by (name redacted).

[60] Defense Science Board, *More Capable Warfighting Through Reduced Fuel Burden*, May 2001, p. 13.

[61] The full quote runs, "Unleash us from the tether of fuel." General Mattis is currently CENTCOM commander.

[62] USMC, United States Marine Corps Expeditionary Energy Strategy and Implementation Strategy: Bases to Battlefield, "Commandant's Message", General James F. Amos, Commandant, U.S. Marine Corps, April 4, 2011, p. 3.

[63] The Joint Chiefs of Staff, *The National Military Strategy of the United States*, February 2011, p. 18.

[64] Department of Defense, *Strategic Sustainability Performance Plan*, FY2011, July 12, 2011, pp. 1-2.

[65] U.S. Congress, Senate Committee on Appropriations, Subcommittee on Department of Defense, *Hearing on FY 2012* (continued...)

U.S. Transportation Command estimated that ground convoys in Afghanistan suffered more than 1,100 attacks in 2010, including attacks from improvised explosive devices.[66] The Marine Corps estimated in 2010 that there was one Marine casualty for each 50 Marine Corps fuel or water convoys in Afghanistan,[67] and an Army analysis of the period 2003-2007 that included both Army and contractor personnel estimated one casualty per 24 fuel convoys in Afghanistan.[68] The Marine Corps estimates that about 10% of battlefield casualties in Iraq and Afghanistan are related to convoy operations,[69] while the Army estimated that 18% of casualties in Iraq and Afghanistan are related to ground resupply operations.[70] A 2009 study by the Army Environmental Policy Institute reported that between 2003 and 2007, more than 3,000 U.S. troop and contractor deaths or injuries were attributable to fuel supply convoys in Iraq and Afghanistan.[71]

Strategic

Strategic challenges and risks associated with DOD's reliance on fuel relate to getting fuel to the overseas operating area, and ensuring the global free flow of oil.

Getting Fuel to the Area of Operations

Supply lines supporting overseas missions may cross international borders, giving other countries the ability to disrupt or otherwise influence the flow of supplies. Operations in Afghanistan highlight challenges associated with operating a logistic network that is dependent on the assent of other countries. Since Afghanistan is a landlocked country, fuel and supplies must run through the territory or airspace of one or more neighboring countries. Vice Admiral Mark Harnitchek, deputy commander of U.S. Transportation Command, reflecting on the task of keeping open U.S. supply lines to Afghanistan, described the U.S. military operation in Afghanistan as "the logistics challenge of our generation."[72]

(...continued)

Budget for the Dept. of the Navy, 112th Cong., 1st sess., March 16, 2011.

[66] Remarks by General Duncan McNabb, Commander, U.S. Transportation Command, CSIS, February 7, 2011. http://csis.org/event/military-strategy-forum-general-duncan-mcnabb-commander-us-transportation-command

[67] "Analysis of Logistics Related Casualties for Marine Forces in Afghanistan," by the Current Operational Analysis Support Team, Operations Analysis Division (OAD), Marine Corps Combat Development Command, Quantico VA, September 2010, is referred to by the Marine Corps Expeditionary Energy Strategy and Implementation Strategy: Bases to Battlefield", April 4, 2011, p. 7.

[68] Army Environmental Policy Institute, *Sustain the Mission Project: Casualty Factors for Fuel and Water Re-supply*, Final Technical Report, September 2009, p. 2-6.

[69] Presentation by Mike Boyd, HQMC Engineer Advocate Branch Head, "USMC Operational Energy Efforts and Challenges," p. 16.

[70] MG Raymond Mason, Office of the Deputy Chief of Staff (Army), "Power and Energy: Enhancing Mission Effectiveness while Preserving Future Choices," October 11, 2011, p. 3, http://usarmy.vo.llnwd.net/e2/c/downloads/223041.pdf.

[71] Army Environmental Policy Institute, *Sustain the Mission Project: Casualty Factors for Fuel and Water Resupply Convoys*, Final Technical Report, September 2009, p. 3. Supply convoys transport water and other goods in addition to fuel. This study calculated the casualties attributable to the fuel portion of supply convoys by multiplying the total number of casualties associated with supply convoys by the percentage of the convoy load allocated to fuel: 50% in Iraq and Afghanistan. While reducing fuel needs would reduce the overall number of convoys needed, the number of associated casualties may not to scale linearly.

[72] Tom Gjelten, "U.S. Now Relies On Alternate Afghan Supply Routes," *NPR*, September 26, 2011.

Until November 2011, routes running through Pakistan were the primary ones for bringing fuel into Afghanistan, accounting for approximately 70% of fuel (and also 29% of supplies) delivered to U.S. forces in Afghanistan.[73] DLA-E officials attribute hijackings and theft of supplies being transported along routes in Pakistan in part to Pakistan's prohibition on using U.S. military or private security contractors to protect convoys.[74] Following a U.S. airstrike on November 26, 2011, that killed 24 Pakistani soldiers, Pakistan closed its supply routes to Afghanistan. This closure forced DOD to shift to using the Northern Distribution Network, a longer, more costly, and more complex logistics route stretching from Latvia or Azerbaijan across Russia, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. DLA-E is currently moving all fuel through these northern routes.[75] There have been allegations of corruption tied to DLA-E fuel contracts in Kyrgyzstan, jeopardizing continued U.S. use of the Manas Transit Center, a key logistics hub.[76]

Using northern routes reportedly has increased DOD's costs for transporting fuel and supplies to Afghanistan to a reported $104 million per month—$87 million per month more than when routes through Pakistan were used.[77] Shipping a 20-foot cargo container to Afghanistan costs $10,000 more if transported on northern routes, according to the U.S. Transportation Command.[78] In addition to being more expensive, the northern route cannot be used to transport lethal cargo, can only be used one way, and, according to DLA-E officials was operating at fully capacity in March 2012.[79] Air Force General William M. Fraser III of the Air Force, Commander of U.S. Transportation Command testified that both the northern and Pakistani routes are necessary to support the U.S. drawdown in Afghanistan.[80]

Ensuring the Global Free Flow of Oil

Oil is critical to the U.S. economy. It is the United States' largest source of energy, providing 37% of the total energy the nation consumes and 94% of the energy used for transportation. Every U.S. recession in the last 40 years has been preceded by an increase in oil prices.[81] Any disruption in the global free flow of oil could result in an increase in oil prices and pose a serious risk to the U.S. and international economies.[82] DOD officials state that protecting shipping lanes and the free

[73] U.S. Congress, Senate Committee on Foreign Relations, *Central Asia and the Transition in Afghanistan*, A Majority Staff Report, 112th Cong., 1st sess., December 19, 2011, pp. 5-6.

[74] Interview with DLA-E officials, March 1, 2012.

[75] Discussion with DLA-E officials, March 1, 2012.

[76] Subcommittee on National Security and Foreign Affairs of the House Committee on Oversight and Government Reform, "Mystery at Manas: Strategic Blind Spots in the Department of Defense's Fuel Contracts in Kyrgyzstan," December 2010.

[77] Lolita C. Baldor and Robert Burns, "Costs Soar for New War Supply Routes," *Associated Press*, January 19, 2012.

[78] U.S. Congress, Senate Committee on Foreign Relations, *Central Asia and the Transition in Afghanistan*, A Majority Staff Report, 112th Cong., 1st sess., December 19, 2011, pp. 5-6.

[79] Tom Gjelten, "U.S. Now Relies On Alternate Afghan Supply Routes," *NPR*, September 26, 2011; Discussion with DLA-E officials, March 1, 2012. According to information provided by DLA-E officials in May 2012, capacity along the northern network is increasing.

[80] U.S. Congress, Senate Committee on Armed Services, *U.S. Pacific Command and U.S. Transportation Command Budget Request for FY2013*, 112th Cong., 2nd sess., February 28, 2012.

[81] See CRS Report R42024, *Oil Price Fluctuations*, by (name redacted) and (name redacted), p. 3.

[82] While a disruption in the flow of oil would not necessarily pose a risk a direct risk to DOD's ability to operate, DOD may be called upon to respond to such disruption.

flow of oil is a fundamental mission of the U.S. Navy, and is vital to U.S. national and economic interests.[83]

Global petroleum distribution networks pass through a number of "chokepoints" that are vulnerable to disruption, including in particular the Strait of Hormuz leading into and out of the Persian Gulf. Securing Persian Gulf shipping lanes, particularly through Straight of Hormuz, is one of the primary missions of the Navy's Fifth Fleet, headquartered in Bahrain. Although exact figures are difficult to calculate (because many U.S. forces have multiple mission responsibilities), observers believe that DOD spends billions or tens of billions of dollars annually protecting global oil transit routes and chokepoints. A 2009 RAND report estimated the cost to DOD of protecting the supply and transit of oil from the Persian Gulf at between $86 billion and $104 billion per year—figures that equate to a substantial fraction of DOD's total budget.[84]

DOD's role in protecting the global free flow of oil can lead to U.S. combat operations, such as those in the Persian Gulf against Iranian forces that occurred during Operation Earnest Will, the 1987-1988 U.S. military operation to protect oil tankers and other commercial ships operating in the Persian Gulf from Iranian attack during the so-called Tanker War (i.e., the at-sea component of the Iran-Iraq War of the 1980s). In December 2011, in response to threats by Iran to close the Strait of Hormuz, Secretary of Defense Leon Panetta stated that a closure of the strait would be considered a "redline" by the United States; a spokeswoman from the 5th Fleet similarly stated that "any disruption will not be tolerated."[85]

DOD's Energy Initiatives

DOD is pursuing numerous initiatives for reducing its fuel needs and changing the mix of fuels that it uses. Some of DOD's energy initiatives respond to statutory requirements (see "Past Legislation on DOD Energy Use" below). More generally, DOD justifies its energy initiative in connection with reducing the challenges and risks associated with DOD's reliance on fuel that are discussed in the previous section of this report. Several DOD strategy documents discuss the need to decrease logistic footprints and reduce energy demands.[86] A 2008 DOD report states "the payoff to DOD from reduced fuel demand in terms of mission effectiveness and human lives is probably greater than for any other energy user in the world."[87]

[83] Meeting with Navy officials, March 6, 2012. The Navy mission statement includes "maintaining freedom of the seas." http://www.navy.mil/navydata/organization/org-top.asp.

[84] Keith Crane, Andreas Goldthau, and Michael Toman, et al., *Imported Oil and U.S. National Security*, RAND, 2009. Other estimates have ranged from $27 billion to $143 billion annually. See Adam J. Liska and Richard K. Perrin, "Securing Foreign Oil: A Case for Including Military Operations in the Climate Change Impact of Fuels," *Environment Magazine*, July/August 2010.

[85] Thom Shanker, "Defense Chief Says Israel Must Mend Arab Ties," *The New York Times*, December 2, 2011; Diane Cardwell and Rick Gladstone, "Oil Prices Predicted to Stay Above $100 a Barrel Through Next Year," *The New York Times*, December 28, 2011; Robert Johnson, "US Sends Aircraft Carrier Into The Strait Of Hormuz, As Iran Beats Its Chest," *Business Insider*, December 29, 2011. For further discussion, see CRS Report R42335, *Iran's Threat to the Strait of Hormuz*, coordinated by (name redacted).

[86] See 2012 Defense Strategic Guidance; 2012 Joint Operational Access Concept; 2012 Army-Marine Corps Access Concept; and 2012 National Military Strategy.

[87] Defense Science Board, *More Fight - Less Fuel*, Report of the Defense Science Board on DoD Energy Strategy, February 2008, p. 18.

As part of its FY2013 budget submission, DOD is requesting more than $1.4 billion for operational energy initiatives in FY2013. Most of these initiatives are aimed at reducing the amount of energy DOD needs to conduct operations. DOD's five year (FY2013-FY2017) Future Years Defense Plan (FYDP) includes a total of about $8.6 billion for operational energy initiatives.[88]

DOD as a whole faces certain challenges in decreasing its reliance on fuel. One of these relates to equipment service lives: aircraft and ships, which together account for more than half of DOD fuel use, have long service lives, so the composition of the inventory of aircraft and ships tends to change slowly over time. Another challenge relates to gathering reliable data on energy use for developing clear metrics to evaluate the effectiveness of the initiatives, and making informed decisions.[89]

The following sections summarize energy initiatives being pursued by DOD's Office of Operational Energy Plans and Programs (OEPP), and by each of the military services.

DOD Office of Operational Energy Plans and Programs

DOD's office of Operational Energy Plans and Programs was established by statute as set forth in the FY2009 Duncan Hunter National Defense Authorization Act (P.L. 110-417, as amended).[90] The office is headed by the Assistant Secretary of Defense, Operational Energy Plans and Programs (ASD(OEPP)), and is responsible for developing DOD policy for operational energy and alternative fuels, and for coordinating operational energy efforts across the services. OEPP states that its efforts focus on promoting institutional change, supporting current operations, and building energy awareness into the requirements of future systems.[91] **Table 1** lists what OEPP describes as its major operational energy initiatives.

Table 1. Major ASD(OEPP) Operational Energy Initiatives

Initiative	Description
Establish a baseline of DOD operational energy consumption	Gather reliable DOD-wide data on operational energy consumption, to serve as a foundation for analyzing DOD operational energy use and developing operational energy metrics.
Defense Operational Energy Board	This board oversees the execution of the Operational Energy Implementation Plan, including setting operational energy metrics.
Operational energy budget certification	Evaluate DOD budget allocations for operational energy to ensure that they are sufficient to support the operational energy strategy.
Operational energy partnerships with CENTCOM and U.S. Forces–Afghanistan (USFOR-A)	USFOR-A and CENTCOM have stood up operational energy groups, and USFOR-A has issued operational energy policy guidance.

[88] Testimony of Sharon Burke, Assistant Secretary of Defense, Operational Energy Plans and Programs, U.S. Congress, House Committee on Armed Services, Subcommittee on Readiness, *What is the Price of Energy Security: from Battlefields to Bases*, 112th Cong., 2nd sess., March 29, 2012; Data from OEPP, April 2012.

[89] Discussion with ASD(OEPP) officials, March 1, 2012.

[90] See "DOD Office of Operational Energy Plans and Programs" for a discussion on the legislation establishing the office.

[91] Information provided by ASD(OEPP), April 2012.

Initiative	Description
Establish a baseline of DOD operational energy consumption	Gather reliable DOD-wide data on operational energy consumption, to serve as a foundation for analyzing DOD operational energy use and developing operational energy metrics.
Defense Operational Energy Board	This board oversees the execution of the Operational Energy Implementation Plan, including setting operational energy metrics.
Rapid fielding of equipment in theatre	Efforts to streamline the deployment of equipment (such as more-efficient generators) that reduces in-theatre fuel consumption,
Operational Energy Capability Improvement Fund	$19.5 million fund to spur technology innovations that reduce energy load at contingency bases, measure energy consumption in forward areas, and transform waste into energy.
Energy Key Performance Parameter	Establish a methodology for an Energy Key Performance Parameter (KPP) to be used in requirements gap analysis, requirements development, and acquisition programs.
Fully burdened Cost of Fuel	Provide the services with non-binding guidance on the methodology and application of Fully Burdened Cost of Energy (FBCE) estimates as part of the life-cycle cost analysis for new capabilities during the acquisitions process.
Energy in Procurement Contracts	Work with DOD's office of Defense Procurement and Acquisition Policy to develop template language on energy performance for DOD contracts.

Source: Information provided by ASD(OEPP), April 2012.

Air Force

Air Force officials state that the Air Force's energy initiatives are aimed at reducing the service's energy costs (which accounted for 8.4% of the Air Force's budget in FY2011) and at reducing the budgetary impact of volatility in fuel prices.[92] More specifically, the Air Force states that its operational energy goals are the following:

- Reduce consumption of aviation fuel 10% by 2015.
- Be prepared to acquire 50% of the Air Force's domestic aviation fuel requirement via an alternative fuel blend by 2016.
- Test and certify all aircraft and systems on a 50:50 alternative fuel blend[93] by 2012.[94]

The Air Force's FY2013 budget submission requests $655 million for operational energy initiatives in FY2013, and programs a total of about $2.6 billion for energy initiatives across the FYDP. **Table 2** lists what the Air Force describes as its major operational energy initiatives.

[92] Data provided by the Air Force, March 2012.

[93] A 50:50 alternative fuel blend is fuel that consists of 50% conventional (i.e., petroleum-based) fuel and 50% alternative (i.e., non-petroleum-based) fuel.

[94] U.S. Air Force Briefing, "Air Force Energy Consumption," March 6, 2012. The original target date for completing testing and certifying had been 2011. U.S. Air Force, "Air Force Energy Plan 2010," December 9, 2009, p. 8.

Table 2. Major Air Force Operational Energy Initiatives

Initiative	Description	Goals	Funding (millions)		
			FY2012	FY2013 (requested)	FYDP (FY13-FY17)
Adaptive Versatile Engine Technology (ADVENT)	Next-generation turbine engine, optimizing combat aircraft engine fuel efficiency and performance at all flight conditions.	25% greater fuel efficiency, increased strike radius, fewer tanker sorties.	$58	$48	$48[a]
Adaptive Engine Technology Development (AETD)	Follow-on to ADVENT engine development of next-generation turbine engine	25% greater fuel efficiency, increased strike radius, fewer tanker sorties.	$0[b] [$68]	$213.6	$346.4
Highly Efficient Embedded Turbine Engine (HEETE)	Develop advanced engine technologies for tanker, ISR, and strike aircraft.	35% greater fuel efficiency, increased payload, range.	$15.8	$8.8	$237.3
Alternative Aviation Fuels Certification	Certify Air Force Fleet on Fischer-Tropsch, biojet, and alcohol-to-jet blends.	Diversify potential fuel supplies.	$0 [$24.1 in FY2011]	$0	$0
KC-135 Propulsion Upgrade	4th generation engine upgrades to high pressure components	Reduce fuel consumption by 1.5%, improved reliability and durability; achieve lifetime fuel and maintenance savings of more than $1.3 billion.	$0	$29	$159
KC-10 Drag Reduction	Corrects aircraft drag problems	Reduce fuel consumption by 1.4%, saving $5.4 million per year.	$0	$2.1	$28.1
Policy Changes	Improved aircraft routing, more precise fuel and cargo loading, etc.	Reduce FY2013 aviation needs by 55 million gallons, saving $208.1million.	$0	$0	$0

Source: Data provided by the Air Force March 2012, drawing on the FY2013 Air Force Energy Program Overview and FY2013 Budget material. ISR is intelligence, surveillance, and reconnaissance.

Notes:

a. AETD is the follow-on program to ADVENT, which is terminating in FY2012.

b. The Air Force's FY2012 budget justification material does not provide funding for AETD in FY2012. The FY2013 budget justification material states that in FY2012 AETD required $68 million over the baseline FY2012 funding.

Navy

The Department of the Navy has identified six major objectives for FY2013, of which the third is to

> ***Lead the Nation in Sustainable Energy.*** The Navy and Marine Corps are pioneering DoD's efforts to reduce energy consumption. Our investments in alternative fuels/biofuels have led to success in both aircraft and ships supporting our path to a green fleet. Our hybrid-drive system has already produced fuel savings on the [amphibious assault ship] USS Makin Island (LHD 8). Energy saving efforts have also drastically cut energy usage on bases, with new solar and geothermal technologies providing electricity. As the use of alternative energy increases across the Department, DON will be protecting the environment with clean energy and lessening our dependence on foreign oil.[95]

Secretary of the Navy Ray Mabus testified on February 16, 2012, that "we would be irresponsible if we did not reduce our dependence on foreign oil."[96] Secretary Mabus stated in April 2012 that the Navy's biofuel efforts will increase the security of the Navy's energy supply and reduce the service's vulnerability to price shocks.[97]

Accordingly, the Navy's operational energy initiatives focus on reducing the service's energy consumption and its reliance on fossil fuels. The Navy's operational energy goals are to

- Require consideration of life-cycle energy costs as a factor in developing and awarding contracts for systems and buildings.
- Demonstrate a "Green Strike Group" of ships and aircraft powered by biofuels by 2012, and deploy it overseas by 2016.
- Ensure that at least 50% of the Navy's total energy consumption is from alternative sources by 2020.
- Increase energy efficiency and/or reduce fuel consumption afloat by 15% by 2020.[98]

The Navy's FY2013 budget submission requests $338 million for operational energy initiatives in FY2013, and programs a total of about $1.9 billion for operational energy initiatives across the FYDP. Of the $338 million requested for FY2013, $186.3 million is for maritime energy (i.e., ships), $121.3 million is for aviation energy, $13.4 million is for expeditionary energy, and $17.1 million is for alternative fuels procurement and testing.

One of the most controversial of DOD's energy initiatives is the Navy's proposal to invest $170 million over the next several years to jumpstart a domestic advanced biofuels industry, using authority provided by the Defense Production Act. An August 2011 MOU between the Navy, and the Departments of Agriculture and Energy formalizes this intention. Each agency has pledged up to $170 million with substantial cost-sharing from industry, to construct or retrofit commercial scale (at least 10 million gallons) advanced drop-in biofuel plants and refineries.[99] The Navy's

[95] Department of the Navy, *Highlights of the Department of the Navy FY 2013 Budget*, February 2012, p. 1-8. The other five objectives listed are "take care of our people," "maintain warfighter readiness," "promote acquisition excellence and integrity," "dominate in unmanned systems," "drive innovative enterprise transformation." The Department of the Navy states, in presenting the list, that "Our objectives are aligned with new strategic guidance for DoD and will provide real benefit to the nation in the fulfillment of our responsibilities to maintain a capable Navy and Marine Corps.... Each of these objectives will allow us to meet our mission of being a highly effective and efficient force." (Department of the Navy, *Highlights of the Department of the Navy FY 2013 Budget*, February 2012, pp. 1-7 to 1-9.)

[96] U.S. Congress, House Committee on Armed Services, *FY2013 Budget Request for the Navy*, 112th Cong., 2nd sess., February 16, 2012.

[97] Secretary of the Navy Ray Mabus, Remarks at the Sea Air Space Exposition, April 16, 2012.

[98] "The Department of the Navy's Energy Goals." http://www.navy.mil/features/Navy_EnergySecurity.pdf

[99] "US Government to invest $510M in advanced, drop-in biofuels," *Biofuels Digest*, August 16, 2011.
(continued...)

alternative fuel purchases for testing and certification purposes and $170 million commitment to support construction of biofuel production facilities add up to slightly more than $200 million (a more in-depth discussion on the Navy's role in developing biofuels is discussed later in this report: see "Navy Role in Developing Advanced Biofuels").

Table 3 lists what the Navy describes as its major operational energy initiatives. The last item in the table—alternative fuels testing and certification—includes Navy testing of equipment performance and reliability on non-petroleum fuel, but does not include Navy efforts to promote the development of advanced biofuels.

Table 3. Major Navy Operational Energy Initiatives

Initiative	Description	Goals	Funding (millions)		
			FY2012	FY2013 (requested)	FYDP (FY13-FY17)
Aviation Simulator Upgrades	Expands simulator capacity and improves fidelity to real-world flight conditions.	Significant reduction in fuel consumption, improvements in tactical training.	$64	$68.1	$351.5
DDG-51 hybrid electric drive retrofit	Adds electric motor to the propulsion plant to allow for more efficient low-speed operation.	Efficiency gains of up to 10%, or about 5,500 barrels per ship per year.	$14.6	$13.1	$235.3
Variable Cycle Advanced Technology Engine	Allows for optimizing engine performance on the fly, more efficient low-speed operation.	Reduced fuel consumption, higher performance, increased range and loiter	$19.5	$20.7	$152.6
Aviation Energy Conservation RDT&E	Extends the Navy's standardized ship energy best practices to aviation.	reduced energy conservation	$23.9	$19.2	$152.6
Maritime "Quick Wins"	Stern flaps, propeller coatings, solid state lighting, etc.	Achieve payback periods of less than 2 years, and returns on investment (ROIs) ranging from 3:1 to 45:1.	$13.4	$17.4	$76.8
Alternative Fuels Testing and Certification	Testing alternative fuel blends in ships and aircraft.	Greater choice in tactical fuels, lower greenhouse gas emissions.	$16	$11.1	$65.3

Source: Data provided by the Navy March 2012, drawing on the FY2013 Department of the Navy Energy Program Overview; More detailed information on the Maritime "Quick Wins" drawn from Rear Admiral Tom Eccles. Chief Engineer, NAVSEA. "Building a Foundation for the Green Fleet." Briefing. October 12, 2010. p. 2.

(...continued)

http://www.biofuelsdigest.com/bdigest/2011/08/16/usda-doe-usn-to-invest-510m-in-advanced-drop-in-biofuels/, "Defense Production Act Title III Advanced Drop-In Biofuels Production Act," Special Notice, Solicitation Number SN-12-15-PKM. https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=9ec4273b98ce62c3178916a432967581&_cview=0

Marine Corps

The Marine Corps' operational energy efforts focus primarily on increasing combat effectiveness through reducing energy challenges and risks (such as the vulnerability of fuel supply lines) for Marine Corps forces operating in the field.[100] In support of this goal, the Marine Corps' energy goals are to increase the service's overall efficiency by 50% by 2025, and to be able by 2025 to deploy a Marine Corps expeditionary force from the sea that can operate self-sufficiently in terms of energy, except for vehicle fuel.

The Marine Corps' FY2013 submission requests $64.5 million for operational energy efforts in FY2013 and programs a total of $352 million for operational energy initiatives over the FYDP. About 58% of the funding requested for FY2013 is for procurement of new equipment with improved energy characteristics. The Marine Corps' proposed FY2013 programs are intended to reduce the fuel used by a Marine Expeditionary Brigade by 9%, allowing them to operate for 15 days from an initial assault without a fuel resupply, up from the current 14 days. **Table 4** lists what the Marine Corps describes as its major operational energy initiatives.

Table 4. Major Marine Corps Operational Energy Initiatives

Initiative	Description	Goals	Funding (millions)		
			FY2012	FY2013 (requested)	FYDP (FY13-FY17)
Solar Powered Adaptors for Communication Equipment Systems (SPACES) / Ground Renewable Expeditionary Energy Networks (GREENS)	Solar power for soldier equipment and expeditionary bases.	Enables extended patrol lengths and reduces or eliminates battery resupply missions by infantry on foot; allows austere patrol bases to operate entirely on renewable power and others to reduce fuel consumption.	$3.1	$16.7	$86.3
Experimental Forward Operating Base (ExFOB), Expeditionary Energy Office (E2O)	ExFOB permits rapid testing and deployment of commercial energy-saving technologies for Marines in the field. Effort also involves evaluation and Marine education in expeditionary energy equipment.	Streamlines adoption of energy efficiency technologies for expeditionary use.	$6.7	$7	$36.6
Shelter Liners, LED lights	Tent insulation and energy-efficient lights.	Reduces power demand for field shelters.	$0	$8.0	$37

[100] Discussion with USMC officials, March 6, 2012.

Initiative	Description	Goals	Funding (millions)		
			FY2012	FY2013 (requested)	FYDP (FY13-FY17)
Advanced Medium Mobile Power Sources (AMMPS)	Improved field generators.	17% greater efficiency, permitting reduced fuel consumption and reduced logistics burden for remote locations.	$6.3	$13.9	$40.2
Medium Tactical Vehicle Replacement (MTVR)	Vehicle efficiency improvements.	15% improvement in fuel efficiency.	$1.4	$1.5	$11.6

Source: Data provided by the Marine Corps March 2012, drawing on the FY2013 Department of the Navy Energy Program Overview.

Army

The Army's operational energy efforts focus on reducing energy demand, increasing fuel efficiency, and increasing the use of alternative and renewable energy. The Army's FY2013 budget submission requests $560 million for operational energy initiatives, and programs a total of about $4.1 billion across the FYDP, of which $3.3 billion is for procurement of new equipment and $832 million is for science and technology research. In April 2012 the Army opened the Ground Systems Power and Energy Laboratory to conduct research and development on mobility power and energy. The Base Camp Integration Laboratory is where the Army tests and evaluates new technologies/systems for basing during contingency operations, including smart micro-grid prototypes, more efficient environmental control units, rigid-wall shelters, and re-locatable buildings.[101]

Many of the Army's energy initiatives are intended to increase the Army's ability to operate remotely and in a broader variety of terrain. **Table 5** lists what the Army describes as its major operational energy initiatives.

[101] Data provided by the Army to CRS, June 1, 2012.

Table 5. Major Army Operational Energy Initiatives

Initiative	Description	Goals	Funding (millions)		
			FY2012	FY2013 (requested)	FYDP (FY13-FY17)
Bradley armored vehicle upgrades	Improves transmission and power management.	Reduced fuel consumption.	$12.2	$81.7	$955
Advanced Mobile Medium Power Sources (AMMPS)	Next-generation battlefield generator.	Reduce fuel consumption by 21%; decrease maintenance requirements.	$35.8	$50.7	$721
Abrams tank upgrades	Provides an improved auxiliary power unit.	Generate increased levels of electrical power to support more capabilities.	$9.6	$110.7	$543
Improved Turbine Engine Program (ITEP)	Program to improve engine efficiency and extend operational capability.	Increase fuel efficiency by 25%; extend operational parameters from 4000 feet/95˚F to 6000 feet/95˚F.	$0	$8.4	$518
Aviation Simulators	Use flight simulators to reduce flying time for helicopters.	Reduce fuel and maintenance costs.	$116	$105.4	$369
Logistics Civil Augmentation Program (LOGCAP) IV	Requires contractors to identify energy savings initiatives in current operations.	Greater energy efficiency at contingency bases, saving more than 1 million gallons of fuel per year in Afghanistan.	$0	$0	$0

Source: Data provided by the Army, April 25, 2012, based on Army Energy & Sustainability Program Overview Briefing to House Armed Services Committee Staff, February 17, 2012.

Past Legislation on DOD Energy Use

Congress has been concerned with energy policy since the 1970s, and has passed legislation relating to federal government energy use, including DOD installation energy use. Congress has set specific energy-reduction targets for DOD installation energy, but not for operational energy.

Installation Energy

Congress has set targets for reducing federal (including DOD) government energy use and for increasing renewable power. Section 203 of the Energy Policy Act of 2005 (H.R. 6/P.L. 109-58 of August 8, 2005) states that "The President, acting through the Secretary, shall seek to ensure that, to the extent economically feasible and technically practicable, of the total amount of electric energy the Federal Government consumes during any fiscal year," not less than 7.5% in FY2013 and each fiscal year thereafter shall be renewable energy. Section 431 of the Energy Independence and Security Act of 2007 (H.R. 6/P.L. 110-140 of December 19, 2007) requires federal building energy use to be reduced 30% by FY2015. Section 142 of the law mandates a 20% reduction in annual non-tactical vehicle petroleum use, and a 10% increase in annual non-tactical alternative fuel use, by the start of FY2015, as measured from an FY2005 baseline.

Section 433 of the law requires certain new and significantly renovated federal buildings to reduce energy usage.

Congress has also enacted DOD-specific installation energy requirements. Section 2852 of the FY2007 John Warner National Defense Authorization Act (H.R. 5122/P.L. 109-364 of October 17, 2006) "to produce or procure not less than 25 percent of the total quantity of electric energy it consumes within its facilities and in its activities during fiscal year 2025 and each fiscal year thereafter from renewable energy sources." Section 2823 of the FY2012 National Defense Authorization Act (H.R. 1540/P.L. 112-81 of December 31, 2011) directed DOD to set an interim goal for 2018. These provisions are codified at 10 U.S.C. 2911(e).

Operational Energy

Position of Assistant Secretary of Defense for Operational Energy Plans and Programs

Section 902 of the FY2009 Duncan Hunter National Defense Authorization Act established the DOD position of Director of Operational Energy Plans and Programs (OEPP).[102] The FY2011 Ike Skelton National Defense Authorization Act redesignated the position as an Assistant Secretary of Defense.[103] The position is now codified at 10 U.S.C. 138c, which states in subsection (b) that the Assistant Secretary of Defense for Operational Energy Plans and Programs shall:

> (1) provide leadership and facilitate communication regarding, and conduct oversight to manage and be accountable for, operational energy plans and programs within the Department of Defense and the Army, Navy, Air Force, and Marine Corps;
>
> (2) establish the operational energy strategy;
>
> (3) coordinate and oversee planning and program activities of the Department of Defense and the Army, Navy, Air Force, and the Marine Corps related to -
>
> (A) implementation of the operational energy strategy;
>
> (B) the consideration of operational energy demands in defense planning, requirements, and acquisition processes; and
>
> (C) research and development investments related to operational energy demand and supply technologies; and
>
> (4) monitor and review all operational energy initiatives in the Department of Defense.

Federal Policy Limiting Contracts for Procuring Alternative Synthetic Fuels

Section 526 of the Energy Independence and Security Act of 2007 (H.R. 6/P.L. 110-140 of December 19, 2007) prohibits federal agencies from entering into a contract for procurement of an alternative or synthetic fuel, including a fuel produced from nonconventional petroleum

[102] S. 3001/P.L. 110-417 of October 14, 2008.

[103] §§901(a)(1)(B), 901(b)(4), and 901(b)(7), H.R. 6523/P.L. 111-383 of January 7, 2011.

sources, for any mobility-related use, other than for research or testing, unless the contract specifies that the lifecycle greenhouse gas emissions associated with the production and combustion of the fuel supplied under the contract must, on an ongoing basis, be less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.

DOD Policy on Fuel Efficiency of Weapon Platforms

Section 360(a) of the FY2007 John Warner National Defense Authorization Act (H.R. 5122/P.L. 109-364 of October 17, 2006) states that it "shall be the policy of the Department of Defense to improve the fuel efficiency of weapons platforms, consistent with mission requirements, in order to—(1) enhance platform performance; (2) reduce the size of the fuel logistics systems; (3) reduce the burden high fuel consumption places on agility; (4) reduce operating costs; and (5) dampen the financial impact of volatile oil prices."

Fully Burdened Cost of Fuel As An Acquisition Consideration

As mentioned earlier, Section 332(c) of P.L. 110-417 states that "The Secretary of Defense shall require that the life-cycle cost analysis for new capabilities include the fully burdened cost of fuel during analysis of alternatives and evaluation of alternatives and acquisition program design trades." The provision is codified at 10 U.S.C. 2911 note.

Annual DOD Reports Relating to DOD Energy Use

Congress has required DOD to provide a number of reports related to operational energy. Among these are the annual Energy Performance Master Plan and Report Related to Operational Energy.

Annual Energy Performance Master Plan

The requirement for an annual Energy Performance Master Plan was created by Section 2851 of the FY2007 John Warner National Defense Authorization Act[104] and amended in subsequent legislation, including Section 2832 of the FY2011 Ike Skelton National Defense Authorization Act.[105] The provision is codified at 10 U.S.C. 2911(b), which states that the document is to be "a comprehensive master plan for the achievement of the energy performance goals of the Department of Defense, as set forth in laws, executive orders, and Department of Defense policies."

Annual Report Related to Operational Energy

The requirement for an annual Report Related to Operational Energy was created by Section 331(a) of the FY2009 Duncan Hunter National Defense Authorization Act.[106] The provision is codified at 10 U.S.C. 10 U.S.C. 2925(b), which states that the document is to be a "report on operational energy management and the implementation of the operational energy strategy.... "

[104] H.R. 5122/P.L. 109-364 of October 17, 2006.

[105] H.R. 6523/P.L. 111-383 of January 7, 2011.

[106] S. 3001/P.L. 110-417 of October 14, 2008.

Other Annual Reports

Under 10 U.S.C. 138c(e)(3), the Assistant Secretary of Defense for Operational Energy Plans and Programs is required to annually review the budgets for operational energy activities of the military departments and defense agencies and certify that the budgets are adequate to implement the operational energy strategy. Other required annual reports relating to DOD energy include the following:

- a list of DOD energy performance goals regarding transportation systems, support systems, utilities, and infrastructure and facilities (10 U.S.C. 2911(a));
- a report on installations energy management detailing the fulfillment during the previous fiscal year of DOD's energy performance goals for that fiscal year as set forth under the above provision (10 U.S.C. 2925(a)); and
- a report on mitigation of power outage risks for DOD facilities and activities (10 U.S.C. 2911 note).

For a list of one-time reports that Congress has required on various DOD energy-related issues, see **Appendix D**. For an expanded review of legislative activity relating to DOD energy, see **Appendix E**.

Issues for Congress

DOD's energy initiatives pose several potential policy and oversight issues for Congress. The sections below briefly review several of these issues.

DOD Coordination of Service Operational Energy Initiatives

As discussed above, the various services have different energy goals and are pursuing different energy initiatives. One potential oversight issue for Congress concerns DOD coordination of the operational energy initiatives being pursued by the individual military services. As mentioned in the previous section, one of the responsibilities of the Assistant Secretary of Defense for Operational Energy Plans and Programs (ASD(OEPP)), which is codified by statute, is to coordinate and oversee planning and program activities relating to operational energy. Potential oversight questions for Congress include the following:

- How well is ASD(OEPP) coordinating the operational energy initiatives of the various services?
- Have ASD(OEPP)'s coordination activities resulted in any changes to the services' proposed operational energy initiatives, and if so, what have been these changes?
- How much latitude should the services have in developing their service-specific operational energy strategies?
- Does ASD(OEPP) believe it makes sense, in terms of having a coordinated DOD approach to operational energy, for DOD's second-largest user of fuel—the Department of the Navy—to attempt to spur a domestic advanced biofuels industry, while DOD's largest user of fuel—the Air Force—is not attempting to

do this, and has instead adopted an approach of not purchasing biofuels until they are cost competitive with petroleum-based fuels? What formal evaluation did ASD(OEPP) conduct to inform or validate its belief?

- Are the operational energy initiatives of the services sufficiently coordinated? What actions has ASD(OEPP) taken to ensure that there is no unnecessary duplication or overlap in the operational energy initiatives of the services? What process do the services have for consulting with one another on their operational energy initiatives, and what changes in the two services' initiatives have occurred as a result of such consultations?

Data and Metrics for Evaluating DOD's Initiatives

Another potential oversight issue for Congress concerns the status of DOD's efforts to gather data and develop metrics for evaluating DOD energy initiatives. Absent reliable data, DOD lacks the information upon which to make sound policy decisions. Without clear metrics, it is difficult to measure the effectiveness of the various energy initiatives currently underway. As mentioned earlier, DOD has acknowledged that it faces a challenge in gathering reliable data on DOD energy use for developing clear metrics to evaluate the effectiveness of DOD energy initiatives.[107] Potential oversight questions for Congress include the following:

- What specific challenges does DOD currently face in gathering reliable data on DOD energy use? What actions has DOD taken, or what actions does DOD plan to take, to address these challenges? When does DOD anticipate having reasonably comprehensive data on DOD energy use?
- If DOD currently faces challenges in gathering reliable data on DOD energy use, how confident can it be in decisions it has already made regarding current DOD energy initiatives? How do current challenges in gathering reliable data on DOD energy use affect ASD(OEPP)'s ability to coordinate DOD operational energy initiatives across the services?
- What are DOD's current metrics for evaluating DOD energy initiatives, and how were they developed? What assumptions underpin these metrics? If addressing challenges in gathering reliable data on DOD energy use leads to a revision of these metrics, when and how does DOD anticipate reporting these revised metrics to Congress?
- In developing metrics for evaluating DOD energy initiatives, how much weight does DOD give to the various financial, operational, and strategic challenges and risks discussed earlier (see "Challenges and Risks Associated with DOD's Use of Fuels")? To what extent are factors such as potential climate effects (e.g., greenhouse gas emissions) or environmental degradation (e.g., pollution) used by DOD as metrics for evaluating DOD energy initiatives?

[107] Discussion with ASD(OEPP) officials, March 1, 2012.

DOD Estimate of Future Fuel Costs

As mentioned earlier, DOD in its FY2013 budget submission projects that fuel costs will decline 13% from FY2013 to FY2014 and then remain at that lower price through FY2017, primarily because DOD is projecting lower costs for refined products.[108] Fuel appears to be the only category for which DOD projects costs to decrease over the next four years.[109] While some analysts expect crude oil prices to decline, at least some of those analysts have said that DOD's projected declines may be overly optimistic.[110] Underestimating future fuel costs can complicate DOD budget planning and execution, and can lead to inaccurate evaluations of the potential cost-effectiveness of DOD energy initiatives.

The Office of Management and Budget (OMB) provides the cost of crude oil to be used by federal government departments in preparing their departmental budgets. DOD takes the OMB-provided cost of crude oil and then adds a percentage markup to account for the difference between crude oil costs and the costs of refined petroleum products. DOD calculates this refining markup using actual figures from past years. DOD states that the actual markup in FY2011 varied between 45% and 60%, and that the assumed markup in FY2012 is about 55%. In estimating future fuel costs, DOD is assuming a 50% markup for FY2013 and 30% for FY2014-FY2017, "consistent with standard practice between FY2007-FY2011."[111] A potential oversight question for Congress is whether these markup rates are too high, too low, or about right.

DOD Role in Federal Energy Initiatives

Another oversight issue for Congress concerns what role DOD should play in federal government energy initiatives. DOD is requesting substantial funding for an array of energy initiatives. In some cases, DOD is partnering with other federal government agencies in energy initiatives. In July 2010, for example, DOD and the Department of Energy (DOE) signed a Memorandum of Understanding (MOU) to coordinate efforts to enhance national energy security and "demonstrate federal government leadership in transitioning America to a low carbon economy." The MOU covers the development and testing of a wide range of energy efficiency and renewable energy technologies to meet DOD energy needs or address national security, and "speed innovative energy and conservation technologies from laboratories to military end users."[112] As a second example, the Navy in August 2011 announced an MOU with Department of Agriculture (USDA) and DOE agreeing to invest in developing a domestic advanced biofuels industry, with each agency contributing $170 million.[113]

[108] Data provided by DOD Comptroller, May 1, 2012.

[109] *National Defense Budget Estimates for FY2013*, Office of the Undersecretary of Defense (Comptroller), March 2012, Table 5-5, "Department of Defense Deflators – TOA", pp. 59-60.

[110] Based CRS discussions with industry and government experts, March – May 2012.

[111] Data provided by DOD Comptroller, May 1, 2012.

[112] "Memorandum of Understanding between U.S. Department of Energy and U.S. Department of Defense," July 22, 2010. http://energy.gov/sites/prod/files/edg/media/Enhance-Energy-Security-MOU.pdf

[113] Memorandum of Understanding between The Department of the Navy and the Department of Energy and the Department of Agriculture, http://www.rurdev.usda.gov/SupportDocuments/DPASignedMOUEnergyNavyUSDA.pdf.

Potential oversight questions for Congress regarding DOD's role in federal energy initiatives include the following:

- Are DOD's energy initiatives adequately coordinated with those of other federal agencies? How much overlap or duplication, if any, is there between DOD's energy initiatives and those being pursued by other federal agencies? What process does the executive branch use to coordinate energy initiatives across all federal agencies? What criteria are used in this process to determine whether an initiative should be pursued by DOD or some other federal agency? What changes, if any, in DOD energy initiatives have been made as a result of the executive branch's process for coordinating federal energy initiatives?
- Under the July 2010 MOU between DOD and DOE, what role does DOD anticipate having in "demonstrating federal government leadership in transitioning America to a low carbon economy?" Given the wide range of technologies included in the MOU, what technologies does DOD see as priority areas? How will these "innovative energy and conservation technologies" move from development to military end users, and what is DOD's role in this process?
- Is the division in costs between the Navy, USDA, and DOE in the August 2011 MOU for developing a domestic advanced biofuels agency appropriate? How was this division determined?

Navy Role in Developing Advanced Biofuels

Within the broader issue of DOD's role in federal energy initiatives, a more specific oversight issue for Congress concerns the Navy's role in attempting to jumpstart a domestic advanced biofuels industry. This issue has been the topic of substantial discussion and debate during Congress's review of DOD's proposed FY2013 budget.[114]

The Navy and other supporters of the initiative argue or might argue the following, among other things:

- Developing a domestic advanced biofuels industry will improve the Navy's (and the nation's) energy security by diversifying the Navy's (and the nation's) sources of energy.
- Developing a domestic advanced biofuels industry will reduce the Navy's (and the nation's) exposure to financial shocks caused by short-term volatility in petroleum fuel costs.
- The $200 million or so that the Navy plans to spend on advanced biofuels—including $170 million in costs to develop the fuels and about $20 million between FY2009-FY2012 for early purchases of advanced biofuels—is a small fraction of the Navy's annual cost for petroleum based fuel (which was about $4.5 billion in FY2011), and an even smaller fraction of the Department of the

[114] See, for example, Frank Oliveri, "Senate's Defense Policy Bill Is Next Battleground for Biofuels Supporters," *CQToday*, May 23, 2012; "House Armed Services Committee Votes to Ban Alternative Fuel Buys," *InsideDefense*, May 9, 2012; Noah Schachtman, "Republicans Order Navy to Quit Buying Biofuels," *Wired*, "Danger Room," May 14, 2012.

Navy's total budget (which was about $173.0 billion in FY2012, including about $15.7 billion for overseas contingency operations). In addition, the Navy's planned $170-million investment in developing a domestic advanced biofuels industry will leverage equal investments being made by USDA and DOE.

- Early purchases by the Navy of advanced biofuels will help create production economies of scale in the domestic advanced biofuels industry, causing the cost of advanced biofuels to come down over time. The Navy over the longer run anticipates that the cost of advanced biofuels will come down to a price competitive with that of petroleum-based fuels.

Skeptics of the initiative argue or might argue the following, among other things:

- Given that about 90% of the fuel used by a Navy carrier strike group during a typical overseas deployment lasting several months is obtained overseas, from sources close to where the strike group is operating,[115] it is not clear whether developing a domestic advanced biofuels industry would do much in practical terms to diversify the Navy's fuel sources. There are alternatives that the Navy could pursue to reduce its dependence on petroleum-based fuels, such as nuclear-propulsion for surface combatants other than aircraft carriers[116] or kite-assisted propulsion for Navy auxiliary ships.[117]
- It is not clear whether developing advanced biofuels would provide the Navy (and the nation) with much protection against volatility in petroleum-based fuel prices. Since advanced biofuels are intended to be drop-in substitutes for petroleum-based fuels, providers of cost-competitive advanced biofuels might simply adjust their prices up and down to match changes in prices for petroleum-based fuels. An alternative way to insulate the Navy (and DOD) from short-term volatility in petroleum-based fuel costs would be to purchase fuel through multiyear contracts that lock in prices over the term of the contract—an approach that has long been used by commercial airlines and other firms to insulate themselves from volatility in energy prices.[118]
- The Navy's decision to expend funding in an attempt to jumpstart a domestic advanced biofuels industry, and to pay a cost premium for early biofuel purchases, is not consistent with the decision by the Air Force—a service that uses even more petroleum-based fuel than the Department of the Navy—to not do these things.[119]
- Given the current high cost of advanced biofuels, and technical challenges involved in developing cost-competitive advanced biofuels, it is not clear whether the Navy's initiative, even with the added efforts of USDA and DOE, will succeed in establishing a commercially viable domestic advanced biofuels

[115] Data provided by the Navy, February 2012.

[116] For a discussion of this option CRS Report RL33946, *Navy Nuclear-Powered Surface Ships: Background, Issues, and Options for Congress*, by (name redacted).

[117] For a discussion of this option, see CRS Report RL33360, *Navy Ship Propulsion Technologies: Options for Reducing Oil Use—Background for Congress*, by (name redacted).

[118] For a recent analysis of options for DOD to reduce exposure to fuel price volatility, see Defense Business Board, *Re-examining Best Practices for DOD Fuel Acquisition*, June 2011.

[119] Discussion with Air Force Energy Officials, March 6, 2012.

industry or in reducing the costs of advanced biofuels to levels competitive with those of petroleum-based fuels.

- Particularly in light of current and future constraints on the Navy's budget, funding that the Navy is proposing to spend on advanced biofuels could be better spent on other Navy program priorities, such as platform acquisition. The $200 million or so that the Navy has spent and plans to spend on this initiative is roughly equivalent, for example, to the cost of a Joint High Speed Vessel (JHSV).

Potential oversight questions for Congress include the following:

- Why is the DOD effort to jumpstart a domestic advanced biofuels industry being led by the Navy rather than the Air Force? If the Navy were not attempting to jumpstart a domestic advanced biofuels industry, would the Air Force decide to do it?
- To what degree does DOD currently use multiyear fuel-purchasing contracts as a means of insulating itself against short-term volatility in petroleum-based fuel costs? What impediments (legal or otherwise) are there to having DOD increase its use of such contracts, and could these impediments be mitigated through legislation?
- What is the Navy's specific projection for how quickly prices for advanced biofuels will drop to levels competitive with those for petroleum-based fuels? On what studies is the Navy relying for this projection, or for its confidence more generally that biofuels will at some point become cost-competitive with petroleum-based fuels? Do the Air Force, ASD(OEPP), and private industry agree with the Navy's interpretation of these studies?
- What studies did the Navy or DOD conduct to evaluate the cost-effectiveness of developing a domestic advanced biofuels industry against the cost-effectiveness of other options for diversifying the Navy's fuel sources or for insulating the Navy against volatility in prices of petroleum-based fuels?

Implications of Changes in Strategy

Another potential oversight issue for Congress concerns the potential implications for DOD energy initiatives of shifts in U.S. military strategy, such as the new strategic guidance issued by the Obama Administration in 2012, which, among other things, features an increased emphasis on operations in the Asia-Pacific region.[120] Shifts in strategy can have implications for how and where the U.S. military will use fuel, as well as for risks that DOD could face as a result of its reliance on liquid fuel. DOD officials, for example, project that, as a result of the new strategic guidance, Army operational energy use will decline, while its installation energy use will remain high.[121] Potential oversight questions for Congress include the following:

[120] See Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, January 2012, 8 pp. For additional discussion of this document, see CRS Report R42146, *In Brief: Assessing DOD's New Strategic Guidance*, by (name redacted) and (name redacted), CRS Report R42448, *to the Pacific? The Obama Administration's "Rebalancing" Toward Asia*, coordinated by (name redacted), and CRS Report R42493, *Army Drawdown and Restructuring: Background and Issues for Congress*, by (name redacted).

[121] Discussion with Army officials, April 2012.

- Are DOD energy initiatives aligned with DOD's projected operational patterns under the January 2012 strategic guidance? What changes in DOD's energy initiatives have been made as a result of this new strategic guidance?

Legislative Action for FY2013

FY2013 National Defense Authorization Act (H.R. 4310/P.L. 112-239)

House (As Reported)

Section 253 of the FY2013 National Defense Authorization Act (H.R. 4310 of the 112th Congress) as reported by the House Armed Services Committee (H.Rept. 112-479 of May 11, 2012) states:

> SEC. 253. BRIEFING ON POWER AND ENERGY RESEARCH CONDUCTED AT UNIVERSITY AFFILIATED RESEARCH CENTER.
>
> Not later than February 28, 2013, the Secretary of Defense shall brief the Committees on Armed Services of the Senate and House of Representatives on power and energy research conducted at the University Affiliated Research Centers. The briefing shall include—
>
> (1) a description of research conducted with other university based energy centers; and
>
> (2) a description of collaboration efforts with university-based research centers on energy research and development activities, particularly with centers that have an expertise in energy efficiency and renewable energy, including—
>
> (A) lighting;
>
> (B) heating;
>
> (C) ventilation and air-conditioning systems; and
>
> (D) renewable energy integration.

Section 313 states:

> SEC. 313. EXEMPTION OF DEPARTMENT OF DEFENSE FROM ALTERNATIVE FUEL PROCUREMENT REQUIREMENT.
>
> Section 526 of the Energy Independence and Security Act of 2007 (P.L. 110-140; 42 U.S.C. 17142) is amended by adding at the end the following: `This section shall not apply to the Department of Defense.'[122]

[122] §526 of the Energy Independence and Security Act of 2007 (H.R. 6/P.L. 110-140 of December 19, 2007) states:

> §526. PROCUREMENT AND ACQUISITION OF ALTERNATIVE FUELS.
>
> No Federal agency shall enter into a contract for procurement of an alternative or synthetic fuel, including a fuel produced from nonconventional petroleum sources, for any mobility-related use, other than for research or testing, unless the contract specifies that the lifecycle greenhouse gas

(continued...)

Section 314 states:

> SEC. 314. LIMITATION ON AVAILABILITY OF FUNDS FOR PROCUREMENT OF ALTERNATIVE FUEL.
>
> (a) Limitation- Except as provided in subsection (b), none of the funds authorized to be appropriated by this Act or otherwise made available during fiscal year 2013 for the Department of Defense may be obligated or expended for the production or purchase of any alternative fuel if the cost of producing or purchasing the alternative fuel exceeds the cost of producing or purchasing a traditional fossil fuel that would be used for the same purpose as the alternative fuel.
>
> (b) Exception- Notwithstanding subsection (a), the Secretary of Defense may purchase such limited quantities of alternative fuels as are necessary to complete fleet certification for 50/50 blends. In such instances, the Secretary shall purchase such alternative fuel using competitive procedures and ensure the best purchase price for the fuel.

Section 2402 of the bill authorizes energy conservation projects at various locations inside and outside the United States.

Section 2821 of the bill states:

> SEC. 2821. CONGRESSIONAL NOTIFICATION FOR CONTRACTS FOR THE PROVISION AND OPERATION OF ENERGY PRODUCTION FACILITIES AUTHORIZED TO BE LOCATED ON REAL PROPERTY UNDER THE JURISDICTION OF A MILITARY DEPARTMENT.
>
> Section 2662(a)(1) of title 10, Untied States Code, is amended by adding at the end the following new subparagraph:
>
> `(H) Any transaction or contract action for the provision and operation of energy production facilities on real property under the jurisdiction of the Secretary of a military department, as authorized by section 2922a(a)(2) of this title, if the term of the transaction or contract exceeds 20 years.'.

H.Rept. 112-479 states that Section 2821 "would require the Department of Defense to notify Congress when entering into contracts for the provision and operation of energy production facilities on real property owned by the United States if the contract is longer than 20 years." (Page 317)

Section 2822 states:

> SEC. 2822. CONTINUATION OF LIMITATION ON USE OF FUNDS FOR LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) GOLD OR PLATINUM CERTIFICATION AND EXPANSION TO INCLUDE IMPLEMENTATION OF ASHRAE BUILDING STANDARD 189.1.

(...continued)

> emissions associated with the production and combustion of the fuel supplied under the contract must, on an ongoing basis, be less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.

> Section 2830(b) of the Military Construction Authorization Act for Fiscal Year 2012 (division B of P.L. 112-81; 125 Stat. 1695) is amended—
>
> (1) in the subsection heading, by inserting after `and ASHRAE Implementation' after `Certification'; and
>
> (2) in paragraph (1)—
>
> (A) by striking `authorized to be';
>
> (B) by striking `by this Act';
>
> (C) by inserting `or 2013' after `fiscal year 2012'; and
>
> (D) by inserting before the period at the end the following: `and implementing ASHRAE building standard 189.1'.

Regarding Section 2822, H.Rept. 112-479 states:

> This section would continue the prohibition on the use of funds for Leadership in Energy and Environmental Design gold or platinum certifications for fiscal year 2013 set forth in the National Defense Authorization Act for Fiscal Year 2012 (P.L. 112-81). This section would also limit the use of funds for implementation of ASHRAE building standard 189.1. The committee remains concerned that the Department of Defense is investing significant funding for more aggressive certifications without demonstrating the appropriate return on investment. The committee looks forward to receiving the Department's report required in section 2830 of P.L. 112-81 by June 30, 2012. (Page 317)

Section 2823 of the bill states:

> SEC. 2823. AVAILABILITY AND USE OF DEPARTMENT OF DEFENSE ENERGY COST SAVINGS TO PROMOTE ENERGY SECURITY.
>
> Section 2912(b)(1) of title 10, United States Code, is amended by inserting after `additional energy conservation' the following: `and energy security'.

H.Rept. 112-479 states that Section 2823 "would amend section 2912(b)(1) of title 10, United States Code, to allow the Department of Defense to also use the energy cost savings resulting from shared energy savings contracts for energy security." (Pages 317-318)

Section 3104 authorizes funds for FY2013 energy security and assurance programs necessary for national security.

H.Rept. 112-479 also states:

> ENERGY ISSUES
>
> Energy and Fuel Budget Justification
>
> The committee commends the Department of Defense for its emphasis on energy reductions, investments in renewable projects that result in long-term savings, and more efficient processes that reduce demand for fuel consumption. The committee is, however, concerned by the lack of visibility into the annual investments in energy and expenditures on fuel. The committee notes that the Department of Defense spent $19.4 billion in fiscal year 2011 on

energy, an increase from the total expenditure of $15.2 billion in fiscal year 2010. The committee is concerned about fluctuating fuel prices, and the resulting shortfalls and impacts on the operation and maintenance accounts.

Therefore the committee directs the Secretary of Defense to submit to the congressional defense committees in conjunction with the annual President's Budget request, a separate budget justification material on energy and fuel budget justification. The material should include details of energy costs by account, energy investments by account, and details of fuel expenditures. The committee recognizes that there are a variety of funding accounts and mechanisms being leveraged for energy investments that result in reductions in long-term sustainment costs. Therefore, the energy and fuel justification should include the details regarding the total energy expenditures by account and investments being made for energy by account and type of funds across the Future Years Defense Program to ensure that the committee can exercise the necessary oversight for the investment in funds.

Regarding fuel expenditures, the committee seeks information regarding budgeted fuel prices, adjustments to the account, resulting shortfalls or excesses, and details regarding the accounts that funded any such shortfalls and the impact to those accounts. The committee notes that in the fiscal year 2013 budget request, the projected price for fuel is $157 per barrel, whereas the average price in fiscal year 2012 is $162 per barrel. The committee also notes that the price for fuel projected across the FYDP is $137 per barrel. Recognizing the volatility in the fuel market, the committee further directs the Secretary of Defense to more accurately project fuel prices and to seek opportunities to enter into longer-term bulk fuel contracts or identify other options that would stabilize the fuel accounts for the military services.

Marine Energy Technologies

The committee is aware of the Navy's efforts to develop and test wave marine and hydrokinetic energy technologies as one of many technology solutions helping the Navy meet its shore energy goals and mandates, as well as to potentially power maritime security systems, and support at-sea surveillance and communications systems. The committee directs the Secretary of Defense to provide a briefing to the congressional defense committees by October 31, 2012, on the current and future investments in test wave marine and hydrokinetic energy technologies, the payback associated with this investment, the future of the program, and a map of possible locations in proximity to military installations for employing this technology.

Navy Hybrid Electric Technology

The committee is aware of the Navy's efforts to incorporate hybrid electric engines into its fleet to reduce fuel consumption, and to help meet its energy goals. The committee directs the Secretary of the Navy to provide a briefing to the Senate Committee on Armed Services and the House Committee on Armed Services by October 31, 2012, on the current and long-term employment of hybrid electric engine technology. The briefing should include details on the potential long-term savings that may be achieved, the projected cost for incorporating such technology in the initial design of engines, the cost to retrofit a platform with the technology, and future plans to incorporate this technology into additional classes of ships in the fleet.

Procurement Procedures to Incorporate the Use of Fuel Cells

The Defense Logistics Agency sponsored report, "Beyond Demonstration: The Role of Fuel Cells in DOD's Energy Strategy," published on October 19, 2011, offers recommendations with respect to the Department of Defense's use of fuel cell technology for distributed

generation, backup power, unmanned vehicles, and non-tactical material handling equipment. The committee is very interested in the Department's use of fuel cells in defense energy applications.

The committee directs the Department to Defense to brief the congressional defense committees no later than June 1, 2013, on the implementation of the report's recommendations. This brief should address how the Department is addressing the following report recommendations:

(1) Develop and implement procurement models, which enable more efficient acquisition of fuel cell systems, including through third-party financing mechanisms, such as power purchase agreements;

(2) Require consideration of natural gas as well as renewable-fueled fuel cells for meeting electric power, heating, cooling and back-up power requirements for new and major renovations of DOD facilities and include evaluation of fuel cell options in all A/E design contracts;

(3) Require that solicitations for energy services/electric power include consideration of natural gas and renewable fueled stationary fuel cells and fuel cells for back-up power;

(4) Require that designers of unmanned vehicles evaluate fuel cells as an option for providing power; and

(5) Encourage the incorporation of fuel cell power in material handling applications. (Pages 121-123)

The report also states:

Army Energy Initiatives Task Force

The committee recognizes the work the Army Energy Initiative Task Force has undertaken to improve and expand opportunities with the private sector to execute large scale renewable energy projects on Army bases. The committee encourages the Energy Initiative Task Force to also consider alternative energy efficiency and other sustainability proposals that could also assist the Army in meeting its energy goals.

Briefing on Alternative Power Applications on Military Installations

The committee recognizes that there may be merit to the development of small modular reactors (SMR), that produce under 300 Megawatts, to support the electricity consumption on military installations. The Center for Naval Analysis (CNA) report, entitled Feasibility of Nuclear Power on US Military Installations, indicated that an SMR could be a viable option for a military installation provided the Department does not assume First Of a Kind (FOAK) expenses. If the Department was required or assumed FOAK expenses SMR was not determined to be a viable option for military installations. The committee is interested, however, in the Department's assessment of the CNA report, and whether the Department has assessed the practicality of partnering with interested parties that would undertake the FOAK expenses in order to assess the viability of SMR on a military installation. The committee, therefore, directs the Secretary of Defense to brief the House Committee on Armed Services by December 31, 2012, on any actions the Department has undertaken to date on this issue. If action has been taken to move forward on the deployment of SMR, the briefing should include the current and potential budget for such an undertaking, including any personnel costs associated with such projects, a timeline for the proposed projects, a plan

for storing the resulting nuclear waste, if necessary, the additional security requirement that may be required, and any other factors that are pertinent to the successful execution of establishing a SMR on a military installation.

Briefing on Direct Solar and other Energy Efficient Technologies Applications on Military Installations

The committee recognizes direct solar as one technology available to reduce Department of Defense energy consumption and enhance energy security on military installations. The committee also recognizes that direct solar devices such as daylighting systems and direct solar pipe technology can have broader application across military installations and may reduce demand load while providing light for facilities. In the committee report (H.Rept. 112-78) accompanying the National Defense Authorization Act for Fiscal Year 2012, direct solar was listed as one of several possible technologies for the Department of Defense to consider jointly with Department of Energy when generating its list of energy efficient technologies. The committee, therefore, directs the Secretary of Energy in consultation with the Secretary of Defense to brief the congressional defense committees no later than December 31, 2012 about existing projects where direct solar devices as well as other energy efficiency technologies listed in the Energy Performance Master Plan have been employed across military installations. The briefing shall include a description of the most promising technologies, the savings achieved, and details regarding the impact of such technologies on the Department of Defense efforts to meet its energy goals and mandates.

Building Conversions

The committee is aware that the Department of Defense is contemplating facility standards to support sustainable design features and has generally adopted Leadership in Energy and Environment Design (LEED) standards to meet these requirements. The committee supports sustainable design and building reuse standards that value existing and historic facilities as integral elements of the overall installation. The committee believes that the adoption of sustainable design and building reuse standards concurrently reduces the one time construction and renovation costs. For example, the Department of the Army has indicated their intent to reuse an existing building at Aberdeen Proving Ground, Maryland, and upgrade the facility for the purpose of conducting high performance computing. The committees urges the Secretary of Defense to adopt a comprehensive set of sustainable design and reuse standards that values building reuse and provides facility savings.

Decentralized Steam Generation

In fiscal year 2013, the committee recommends authorization of over $180.0 million in military construction projects to support rapid energy savings in decentralizing steam utilities at three locations. In addition to the quick payback period, these investments are expected to reduce steam lost in the transmission lines and provide a more reliable utility. While the Department of Defense has proposed additional energy projects in the budget request for fiscal year 2013, the Department has elected to not prioritize any further decentralized steam systems. The committee supports investments in projects that provide a rapid return on investment and believes the payback period associated with these facilities makes them ideal candidates for future military construction projects.

Therefore, the committee directs the Secretary of Defense to brief the congressional defense committees by March 1, 2013, on the current inventory of centralized steam systems. The briefing should include an assessment of the costs to decentralize these steam systems, the payback associated with decentralizing these assets, the current locations of decentralized steam systems, the potential location of additional decentralized steam systems, and funding options available to support these decentralized efforts.

Department of Defense Energy Demonstration and Validation

The committee recognizes the services' efforts to reduce energy consumption, increase use of renewable energy, conserve water and utilize sustainability building practices for new construction, and implement energy efficiency initiatives. In this resource constrained environment, the committee commends the services' for their efforts to ensure that energy demonstration and validation programs continue to demonstrate an acceptable return on investment. The committee urges the services to continue their efforts to transition demonstration and validation energy programs into operational and installation initiatives and ensure there continues to be a sufficient payback.

Departments of Defense and Energy Collaboration and Technology Transition

The committee notes that in July 2010, the Department of Defense and the Department of Energy signed a memorandum of understanding (MOU) to encourage innovative energy and conservation technologies, from research and development to end user applications within the Department of Defense. The committee commends both agencies for working together to maximize both of their technical expertise in emerging energy technology. The committee is aware that the Department of Energy has made significant investment in the development of alternative energy sources, and the committee urges the Department of Defense to leverage those investments in its alternative energy initiatives. The committee is also aware that the Department of Defense's Environmental Security and Technology Certification program funds an installation energy test bed to demonstrate energy efficiencies and renewable energy technologies to validate performance, cost, and environmental impacts, and to determine which technologies would be applicable for broader application across the Department of Defense's inventory of installations. The committee directs the Secretary of Defense to provide a briefing to the congressional defense committees by October 31, 2012, on the current status of activities under the MOU, details regarding the installation energy technology selection process, the list of companies and technologies that received awards in fiscal years 2011–12, a description of how the technologies were transitioned, and the installations where they were employed.

Department of Defense Energy Technologies

The committee is aware of efforts by the Department of Defense to reduce energy consumption and improve energy efficiency. The committee is aware of a variety of technologies, to include waste-to-energy systems and other new technologies, which can help the Department meet its energy goals and mandates. The committee encourages the Department to leverage these technologies where appropriate and continue its efforts to improve operational and installation energy programs....

Inclusion of Cost-Benefit Analysis for Energy Security

The committee recognizes the importance of energy security on military installations to ensure access to reliable supplies of energy sufficient to meet mission essential requirements. The National Defense Authorization Act for Fiscal Year 2012 (P.L. 112-81) required the Secretary of Defense to establish a policy for military installations to include favorable consideration for energy security in the design and development of energy projects on military installations using renewable energy sources, and to provide guidance to commanders in order to minimize the effects of a disruption of services by a utility. The committee believes that energy security projects are vital to the operational requirements that support national security. Therefore, the committee directs the Secretary of Defense to ensure that any installation energy project that excludes energy security in its design due to excessive costs provide details of the factors used to value energy security within the required cost-benefit analysis.

Increased Utilization of Third Party Financing for Energy Efficiency Projects

> The committee recognizes that the Department of Defense has very aggressive goals and mandates to reduce energy consumption on military installations and to enhance energy security. A critical component of this effort includes large-scale energy efficiency and conservation efforts at military installations, particularly through partnerships with the private sector. The committee urges the Department and the service secretaries to partner with third parties through energy savings performance contracts, enhanced use leases, and other third party authorities to achieve their goals, maximize savings, and achieve a demonstrated return on these investments. The committee also encourages the Department of Defense to consider the best complement of technologies that provide energy security to include consideration for those that provide continuous power at a cost-competitive price. (Pages 309-313)

The report also states:

Turbo Fuel Cell Advanced Technology Development

> The budget request contained $69.0 million in PE 62601A for combat vehicle and automotive technology. Of this amount, $24.4 million was requested for ground vehicle technology. The committee believes the integration of mature, advanced fuel cell technologies into an engine that could effectively meet military logistic requirements should be adequately resourced. The committee is encouraged by the work being done at the Army's Research, Development and Engineering Command-Tank Automotive Research, Development and Engineering Center (RDECOM–TARDEC), where engineers are developing a turbo fuel cell engine for the Heavy Expanded Mobility Tactical Truck, which is the primary logistics vehicle being used in support of Operation New Dawn and Operation Enduring Freedom. The committee notes that funding at RDECOM–TARDEC has been used to manufacture tubular air electrodes for stable, high-performance solid oxide fuel cells. The committee encourages RDECOM–TARDEC to continue its work in the development of the turbo fuel cell engine and supports its efforts to increase energy efficiency utilizing renewable and alternative sources of energy.
>
> The committee recommends $69.0 million, the full amount requested, in PE 62601A for combat vehicle and automotive technology. (Pages 63-64)

House (Floor Action)

On May 17, 2012, as part of its consideration of H.R. 4310 of the 112th Congress, the House passed **H.Amdt. 1111**, an en bloc amendment that contained several amendments printed in the report (H.Rept. 112-485 of May 17 [legislative day May 16], 2012) on H.Res. 661, providing for the consideration of H.R. 4310, including amendment number 98, which became **Section 834** of H.R. 4310. The text of Section 834 is as follows:

> SEC. 834. ENERGY SAVINGS PERFORMANCE CONTRACT REPORT.
>
> Not later than June 30, 2013, the Secretary of the Army, the Secretary of the Navy, and the Secretary of the Air Force shall each submit to the congressional defense committees a report on the use of energy savings performance contracts by the Department of the Army, the Department of the Navy, and the Department of the Air Force, respectively, including each of the following:

> (1) The amount of appropriated funds that have been obligated or expended and that are expected to be obligated or expended for energy savings performance contracts.
>
> (2) The amount of such funds that have been used for comprehensive retrofits.
>
> (3) The amount of such funds that have been used to leverage private sector capital, including the amount of such capital.

On May 18, 2012, as part of its consideration of H.R. 4310, the House passed **H.Amdt. 1133**, which was amendment Number 52 in the report (H.Rept. 112-485 of May 17 [legislative day May 16], 2012) on H.Res. 661, providing for the consideration of H.R. 4310. H.Amdt. 1133 became **Section 2824** of H.R. 4310. The text of Section 2824 is as follows:

> SEC. 2824. DEFINITION OF RENEWABLE ENERGY SOURCE FOR DEPARTMENT OF DEFENSE ENERGY SECURITY.
>
> Section 2924(7)(A) of title 10, United States Code, is amended by inserting before the period at the end the following: `and direct solar renewable energy'.

The purpose of the amendment is to clarify that direct use solar energy technology is considered a renewable energy source for the purposes of the requirement that DOD obtain 25% of its facility energy from renewable sources by 2025.

On May 18, 2012, as part of its consideration of H.R. 4310, the House passed **H.Amdt. 1137**, an en bloc amendment that contained several amendments printed in the report (H.Rept. 112-485 of May 17 [legislative day May 16], 2012) on H.Res. 661, providing for the consideration of H.R. 4310, including amendment number 68, which became **Section 349** of H.R. 4310. The text of Section 349 is as follows:

> SEC. 349. REPORT ON STATUS OF TARGETS IN OPERATIONAL ENERGY STRATEGY IMPLEMENTATION PLAN.
>
> (a) In General- The Secretary of Defense shall submit annually to the relevant congressional committees a report on the status of the targets listed in the document entitled `Operational Energy Strategy: Implementation Plan, Department of Defense, March 2012', including—
>
> (1) the status of each of the targets listed in the implementation plan;
>
> (2) the steps being taken to meet the targets;
>
> (3) the expected date of completion for each target if such date is different from the date indicated in the report; and
>
> (4) the reason for any delays in meeting the targets.
>
> (b) Relevant Congressional Committees Defined- In this section, the term `relevant congressional committees' means—
>
> (1) the Committee on Armed Services of the Senate and the House of Representatives;
>
> (2) the Committee on Oversight and Government Reform of the House of Representatives;
>
> (3) the Committee on Homeland Security and Governmental Affairs of the Senate;

(4) the Committee on Foreign Affairs of the House of Representatives; and

(5) the Committee on Foreign Relations of the Senate.

Senate (As Reported)

Section 313 of the FY2013 National Defense Authorization Act (S. 3254 of the 112th Congress) as reported by the Senate Armed Services Committee (S.Rept. 112-173 of June 4, 2012) states:

> SEC. 313. LIMITATION ON AVAILABILITY OF FUNDS FOR PROCUREMENT OF ALTERNATIVE FUEL.
>
> (a) Limitation- Except as provided in subsection (b), none of the funds authorized to be appropriated by this Act or otherwise made available during fiscal year 2013 for the Department of Defense may be obligated or expended for the production or sole purchase of an alternative fuel if the cost of producing or purchasing the alternative fuel exceeds the cost of producing or purchasing a traditional fossil fuel that would be used for the same purpose as the alternative fuel.
>
> (b) Exception- Notwithstanding subsection (a), the Secretary of Defense may purchase such limited quantities of alternative fuels as are necessary to complete engine or fleet certification for 50/50 blends. In such instances, the Secretary shall purchase such alternative fuel using amounts authorized for research, development, test, and evaluation using competitive procedures and shall ensure the best purchase price for the fuel.

Regarding Section 313, S.Rept. 112-173 states:

> **Limitation on availability of funds for procurement of alternative fuel (sec. 313)**
>
> The committee recommends a provision that would prohibit the use of funds authorized to be appropriated to the Department of Defense in fiscal year 2013 from being obligated or expended for the production or sole purchase of an alternative fuel if the cost exceeds the cost of traditional fossil fuels used for the same purpose, except for continued testing purposes.
>
> The committee notes that in December 2011, the Defense Logistics Agency, on behalf of the Department of the Navy, purchased 450,000 gallons of biofuels for $12.0 million, which equates to $26.66 a gallon. According to the Department of the Navy it was the single largest purchase of biofuel in government history and was carried out in order to "demonstrate the capability of a Carrier Strike Group and its air wing to burn alternative fuels." The Department of the Navy noted that, despite the use of operation and maintenance funds for the purchase, the demonstration is deemed a research, development, test, and evaluation (RDTE) initiative as justification for the higher cost per gallon.
>
> The committee also notes that the Vice Chief of Naval Operations testified before the Subcommittee on Readiness and Management Support on May 10, 2012, regarding pressure on readiness accounts from increased fuel prices that "every $1 increase in the price per barrel of fuel results in approximately $31M of additional cost annually above our budgeted level." Therefore, the high cost of fuel has direct and detrimental impact on other readiness accounts.
>
> The committee strongly supports initiatives undertaken by the Department of Defense to reduce the fuel demand of the operational forces through affordable new technologies that increase fuel efficiency and offer alternative sources of power. But given the pressure placed

on current and future defense budgets, the committee is concerned about the use of operation and maintenance funds to pay significantly higher costs for biofuels being used for RDTE efforts. Therefore, the committee directs the Secretary of Defense to develop and promulgate guidance to the military services and defense agencies on the difference between the operational use of alternative fuels versus continued RDTE initiatives. (Pages 80-81)

Section 2821 states:

SEC. 2821. GUIDANCE ON FINANCING FOR RENEWABLE ENERGY PROJECTS.

(a) Guidance on Use of Available Financing Approaches- Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Deputy Under Secretary of Defense for Installations and Environment, shall issue guidance about the use of available financing approaches for financing renewable energy projects and direct the Secretaries of the military departments to update their guidance accordingly. The guidance should describe the requirements and restrictions applicable to the underlying authorities and any Department of Defense-specific guidelines for using appropriated funds and alternative-financing approaches for renewable energy projects.

(b) Guidance on Use of Business Case Analyses- Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics, the Deputy Under Secretary of Defense for Installations and Environment, and the Secretaries of the military departments, shall issue guidance that establishes and clearly describes the processes used by the military departments to select financing approaches for renewable energy projects to ensure that business case analyses are completed to maximize benefits and mitigate drawbacks and risks associated with different financing approaches.

(c) Information Sharing- Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Deputy Under Secretary of Defense for Installations and Environment, shall develop a formalized communications process, such as a shared Internet website, that will enable officials at military installations to have timely access on an ongoing basis to information related to financing renewable energy projects on other installations, including best practices and lessons that officials at other installations have learned from their experiences in financing renewable energy projects.

Section 2822 states:

SEC. 2822. CONTINUATION OF LIMITATION ON USE OF FUNDS FOR LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) GOLD OR PLATINUM CERTIFICATION.

Section 2830(b)(1) of the Military Construction Authorization Act for Fiscal Year 2012 (division B of P.L. 112-81; 125 Stat. 1695) is amended—

(1) by striking `authorized to be appropriated by this Act' and inserting `authorized to be appropriated'; and

(2) by inserting before the period at the end the following: `until the date that is six months after the date of the submittal to the congressional defense committees of the report required by subsection (a)'.

Section 2823 states:

> SEC. 2823. PROHIBITION ON BIOFUEL REFINERY CONSTRUCTION.
>
> Notwithstanding any other provision of law, neither the Secretary of Defense nor any other official of the Department of Defense may enter into a contract to plan, design, refurbish, or construct a biofuels refinery or any other facility or infrastructure used to refine biofuels unless such planning, design, refurbishment, or construction is specifically authorized by law.

S.Rept. 112-173 states:

> **Energy efficiency research and development coordination and transition**
>
> The committee is encouraged by the Defense Department's efforts to coordinate with the Department of Energy in pursuing and evaluating energy efficient technologies. The wide variety of investments made by the Defense Department towards reducing energy usage has already illustrated savings; however, the numerous organizations pursuing these initiatives within the Defense Department and other federal agencies also presents increasing potential for duplicative research and development as well as successful technologies not identified and effectively transitioned. The continued cooperation and combination of technical expertise as coordinated in the July 2010, memorandum of understanding (MOU) between the Departments of Defense and Energy is important in maximizing the return on these investments. The committee encourages the Defense Department to continue both internal efforts and coordination with other agencies to manage ongoing and planned energy efficiency research and development as well as continuing to establish processes for effectively transitioning technologies for broader application across the Department of Defense. (Pages 70-71)

The report also states:

> **Consideration of fuel cell systems**
>
> The committee is encouraged by many of the findings and recommendations included in the Defense Logistics Agency (DLA) sponsored report, "Beyond Demonstration: The Role of Fuel Cells in DoD's Energy Strategy," published on October 19, 2011. Among other things, this report recommended that Department of Defense (DOD) headquarters organizations and the military services: (1) develop and implement procurement models that enable more efficient acquisition of fuel cell systems; (2) consider fuel cell systems for meeting electric power, heating, and cooling demands whenever new facilities and major renovations are planned and designed; (3) consider fuel cell systems when planning and designing backup power capability for DOD sites; and (4) consider fuel cell power for material handling equipment. The committee directs the DOD to report back to the congressional defense committees no later than June 1, 2013, on the steps being taken to implement the recommendations of the DLA report, or if the DOD does not intend to implement any of the recommendations, to explain the reasons behind those decisions. (Page 89)

The report also states:

> **Energy performance savings contracts**
>
> The committee understands that the Department of Defense (DOD) spends billions of dollars on energy costs each year and that financing large-scale energy projects can be cost-prohibitive for the DOD. Energy Performance Savings Contracts (ESPC) enable the DOD to

> finance energy efficiency upgrades on military installations by funding various Energy Conservation Measures, through private investments, and receive a guarantee that the energy savings will pay for the project.
>
> The committee directs the Secretary of Defense to review the potential applicability of ESPC authority to construct power generating plants, and to acquire mobile sources, including electric and natural gas-powered vehicles and their associated charging stations on military installations, and to make recommendations to the congressional defense committees if changes in law or regulation are needed for the Department to pursue efficient and effective initiatives using ESPC authorities. (Page 92)

The report also states:

> **Solar power units**
>
> The budget request included $98.2 million in Other Procurement, Army (OPA), Overseas Contingency Operations (OCO), for rapid equipping soldier support equipment (RESSE). The committee notes that the Army's Rapid Equipping Force has initiated the procurement of solar power units that significantly increase the operational energy effectiveness and sustainability of remotely located units in Afghanistan. These solar power units will be deployed to support Village Stability Operations, and will substantially reduce the requirement for fuel delivery by ground convoy or by air. These units provide sustainable power for U.S. forces and the Afghan people. The committee recommends an increase of $30.0 million in OPA OCO for RESSE solar power units. (Page 235)

Senate (Floor Action)

On November 28, 2012, as part of its consideration of S. 3254 of the 112th Congress, the Senate agreed, 62-37, to **S.Amdt. 2985**, striking Section 313 of S. 3254 as reported by the Senate Armed Services Committee, which limited the availability of funds for the procurement of alternative fuel (see previous section for the text of Section 313).

On November 29, 2012, as part of its consideration of S. 3254, the Senate agreed, 54-41, to **S.Amdt. 3095**, striking Section 2823 of S. 3254 as reported by the Senate Armed Services Committee, which prohibited the construction of a biofuel refinery (see previous section for the text of Section 2823).

Conference

Section 314 of the conference report (H.Rept. 112-705, filed December 18, 2012) on the FY2013 National Defense Authorization Act (H.R. 4310/P.L. 112-239 of January 2, 2013) states:

> SEC. 314. REPORT ON STATUS OF TARGETS IN IMPLEMENTATION PLAN FOR OPERATIONAL ENERGY STRATEGY.
>
> (a) REPORT REQUIRED.—If the annual report for fiscal year 2011 required by section 2925(b) of title 10, United States Code, is not submitted to the congressional defense committees by December 31, 2012, the Secretary of Defense shall submit, not later than June 30, 2013, to the congressional defense committees a report on the status of the targets established in the implementation plan for the operational energy strategy established pursuant to section 139b of such title, as contained in the document entitled ''Operational Energy Strategy: Implementation Plan, Department of Defense, March 2012''.

(b) ELEMENTS OF REPORT.—The report required by subsection (a) shall describe, at a minimum, the following:

(1) The status of each of the targets listed in the implementation plan.

(2) The steps being taken to meet the targets.

(3) The expected date of completion for each target, if the date is different from the date indicated in the implementation plan.

(4) The reason for any delays in meeting the targets.

Section 315 states:

SEC. 315. LIMITATION ON OBLIGATION OF DEPARTMENT OF DEFENSE FUNDS FROM DEFENSE PRODUCTION ACT OF 1950 FOR BIOFUEL REFINERY CONSTRUCTION.

Amounts made available to the Department of Defense pursuant to the Defense Production Act of 1950 (50 U.S.C. App. 2061 et seq.) for fiscal year 2013 for biofuels production may not be obligated or expended for the construction of a biofuel refinery until the Department of Defense receives matching contributions from the Department of Energy and equivalent contributions from the Department of Agriculture for the same purpose.

Section 2821 states:

SEC. 2821. CONGRESSIONAL NOTIFICATION FOR CONTRACTS FOR THE PROVISION AND OPERATION OF ENERGY PRODUCTION FACILITIES AUTHORIZED TO BE LOCATED ON REAL PROPERTY UNDER THE JURISDICTION OF A MILITARY DEPARTMENT.

Section 2662(a)(1) of title 10, United States Code, is amended by adding at the end the following new subparagraph:

''(H) Any transaction or contract action for the provision and operation of energy production facilities on real property under the jurisdiction of the Secretary of a military department, as authorized by section 2922a(a)(2) of this title, if the term of the transaction or contract exceeds 20 years.''.

This provision requires DOD to notify Congress when entering into contracts for the provision and operation of energy production facilities on real property owned by the United States if the contract is longer than 20 years.

Section 2822 states:

SEC. 2822. AVAILABILITY AND USE OF DEPARTMENT OF DEFENSE ENERGY COST SAVINGS TO PROMOTE ENERGY SECURITY.

Section 2912(b)(1) of title 10, United States Code, is amended by inserting after ''additional energy conservation'' the following: ''and energy security''.[123]

[123] The text of 10 U.S.C. 2912(a) and (b) is as follows:

(continued...)

Section 2823 states:

> SEC. 2823. CONTINUATION OF LIMITATION ON USE OF FUNDS FOR LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) GOLD OR PLATINUM CERTIFICATION.
>
> (a) ADDITIONAL REQUIREMENTS FOR REPORT ON ENERGY-EFFICIENCY STANDARDS.—Subsection (a) of section 2830 of the Military Construction Authorization Act for Fiscal Year 2012 (division B of Public Law 112–81; 125 Stat. 1695) is amended—
>
> (1) in paragraph (1), by striking ''Not later than June 30, 2012, the'' and inserting ''The''; and
>
> (2) by striking paragraph (3) and inserting the following new paragraph (3):
>
> ''(3) DEPARTMENT OF DEFENSE UNIFIED FA CILITIES CRITERIA AND RELATED POLICIES.—The report shall also include the Department of Defense Unified Facilities Criteria and related Department of Defense policies, which shall be updated—
>
> ''(A) to reflect comprehensive guidance for the pursuit of design and building standards throughout the Department of Defense that specifically address energy- and water-efficient standards and sustainable design attributes for military construction based on the cost-benefit analysis, return on investment, total ownership costs, and demonstrated payback of the design standards specified in subparagraphs (A), (B), (C), and (D) of paragraph (2); and
>
> ''(B) to ensure that the building design and certification standards are applied to each military construction project based on geographic location and local circumstances to ensure maximum savings.''.

(...continued)

> §2912. Availability and use of energy cost savings
>
> (a) Availability.-An amount of the funds appropriated to the Department of Defense for a fiscal year that is equal to the amount of energy cost savings realized by the Department, including financial benefits resulting from shared energy savings contracts entered into under section 2913 of this title, shall remain available for obligation under subsection (b) until expended, without additional authorization or appropriation.
>
> (b) Use.-The Secretary of Defense shall provide that the amount that remains available for obligation under subsection (a) and the funds made available under section 2916(b)(2) of this title shall be used as follows:
>
> (1) One-half of the amount shall be used for the implementation of additional energy conservation measures at buildings, facilities, or installations of the Department of Defense or related to vehicles and equipment of the Department, which are designated, in accordance with regulations prescribed by the Secretary of Defense, by the head of the department, agency, or instrumentality that realized the savings referred to in subsection (a).
>
> (2) One-half of the amount shall be used at the installation at which the savings were realized, as determined by the commanding officer of such installation consistent with applicable law and regulations, for-
>
> (A) improvements to existing military family housing units;
>
> (B) any unspecified minor construction project that will enhance the quality of life of personnel; or
>
> (C) any morale, welfare, or recreation facility or service.

(b) PROHIBITION ON USE OF FUNDS FOR LEED GOLD OR PLATINUM CERTIFICATION PENDING REPORT.—Subsection (b)(1) of such section is amended—

(1) by striking ''for fiscal year 2012'' and inserting ''for fiscal year 2012 or 2013''; and

(2) by inserting before the period at the end the following: ''until the report required by subsection (a) is submitted to the congressional defense committees''.

Regarding Section 2823, the Joint Explanatory Statement for H.Rept. 112-705 states:

The House bill contained a provision (sec. 2822) that would continue the prohibition on the use of funds for Leadership in Energy and Environmental Design gold or platinum certifications for fiscal year 2013 set forth in the National Defense Authorization Act for Fiscal Year 2012 (Public Law 112–81). This section would also limit the use of funds for implementation of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) building standard 189.1.

The Senate amendment contained a similar provision (sec. 2822).

The Senate recedes with a clarifying amendment. The amendment would limit the prohibition on the use of funds to Leadership in Energy and Environmental Design gold or platinum certifications for fiscal year 2013 until the submission of a required report and updated policy guidance from the Department of Defense (DOD).

The conferees note that while there is no prohibition limiting the use of funds for implementation of ASHRAE building standard 189.1, they expect DOD to not provide broad, sweeping policy guidance on the use of ASHRAE building standard 189.1 but rather utilize this standard on a project by project basis to maximize savings based on geographic locations and returns on investment through water and energy efficiencies, among other considerations. (Pages 351-352)

Section 2824 states:

SEC. 2824. GUIDANCE ON FINANCING FOR RENEWABLE ENERGY PROJECTS.

(a) GUIDANCE ON USE OF AVAILABLE FINANCING APPROACHES.—

(1) ISSUANCE.—Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense shall—

(A) issue guidance about the use of available financing approaches for financing renewable energy projects; and

(B) direct the Secretaries of the military departments to update their military department-wide guidance accordingly.

(2) ELEMENTS.—The guidance issued pursuant to paragraph (1) should describe the requirements and restrictions applicable to the underlying authorities and any Department of Defense-specific guidelines for using appropriated funds and alternative-financing approaches for renewable energy projects to maximize cost savings and energy efficiency for the Department of Defense.

(b) GUIDANCE ON USE OF BUSINESS CASE ANALYSES.—Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense shall issue guidance that

establishes and clearly describes the processes used by the military departments to select financing approaches for renewable energy projects to ensure that business case analyses are completed to maximize cost savings and energy efficiency and mitigate drawbacks and risks associated with different financing approaches.

(c) INFORMATION SHARING.—Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense shall develop a formalized communications process, such as a shared Internet website, that will enable officials at military installations to have timely access on an ongoing basis to information related to financing renewable energy projects on other installations, including best practices and lessons that officials at other installations have learned from their experiences in financing renewable energy projects.

(d) CONSULTATION.—The Secretary of Defense shall issue the guidance under subsections (a) and (b) and develop the communications process under subsection (c) in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Deputy Under Secretary of Defense for Installations and Environment. The Secretary of Defense shall also issue the guidance under subsection (b) in consultation with the Secretaries of the military departments.

Section 2825 states:

SEC. 2825. ENERGY SAVINGS PERFORMANCE CONTRACT REPORT.

(a) REPORT REQUIRED.—Not later than June 30, 2013, the Secretary of Defense shall submit to the congressional defense committees a report on the use of energy savings performance contracts awarded by the Department of Defense during calendar years 2010, 2011, and 2012.

(b) ELEMENTS OF REPORT.—The report shall include the following (identified for each military department separately):

(1) The amount of appropriated funds that were obligated or expended during calendar years 2010, 2011, and 2012 for energy savings performance contracts and any funds remaining to be obligated or expended for such energy savings performance contracts.

(2) The amount of such funds that have been used for comprehensive retrofits.

(3) The amount of such funds that have been used to leverage private sector capital, including the amount of such capital.

(4) The amount of savings that have been achieved, or that are expected to be achieved, as a result of such energy savings performance contracts.

Regarding Section 2825, the Joint Explanatory Statement for H.Rept. 112-705 states:

The House bill contained a provision (sec. 834) that would require the military departments to submit reports to the congressional defense committees on the use of energy savings performance contracts (ESPCs).

The Senate amendment contained no similar provision.

The Senate recedes with an amendment requiring a single report by the Department of Defense (DOD), and clarifying the content of the required report.

> The conferees note that DOD has encouraged the military services to increase the use of ESPCs to meet energy savings goals. Under section 8287 of title 42, United States Code, ESPC contracts provide for the contractor to incur the costs of implementing energy savings measures, including at least the costs (if any) incurred in making energy audits, acquiring and installing equipment, and training personnel, in exchange for a share of any energy savings directly resulting from the implementation of such measures.
>
> Section 8287 provides for the use of ESPCs "solely for the purpose of achieving energy savings and benefits ancillary to that purpose." While ESPCs are not available for the purpose of the construction of new buildings or facilities, the conferees note that in some cases, the installation of equipment meeting the standard of section 8287 requires the modification or repair of existing facilities, or the construction of ancillary facilities or infrastructure, to accommodate the equipment. In some such cases, ESPCs may be used for the construction, repair, maintenance, or modification of facilities or infrastructure ancillary to the qualifying equipment. The conferees expect a detailed description of any facility work required to carry out an ESPC to be included in the report required by this section. (Pages 352-353)

Department of Defense, Military Construction and Veterans Affairs, and Full-Year Continuing Appropriations Act, 2013 (H.R. 933/P.L. 113-6)

Version Passed by House on March 6, 2013

H.R. 933 of the 113th Congress as passed by the House on March 6, 2013, includes the FY2013 DOD appropriations act as Division A, and the FY2013 Military Construction, Veterans Affairs, and Related Agencies Appropriations Act as Division B.

In the explanatory statement for H.R. 933, the part for Division A does the following:

- reduces by $10 million DOD's FY2013 Defense Production Act Purchases funding request for advanced drop-in biofuel production, with the decrease being for "Ahead of need" (pdf page 195 of 394);
- increases by $20 million the Army's FY2013 funding request for research and development work on electronics and electronic devices, with the increase being for "Program increase—energy efficiency" (pdf page 208 of 394, line 18);
- increases by $37 million the Army's FY2013 funding request for research and development work on combat vehicle and automotive advanced technology, with the increase being for "Alternative energy research" (pdf page 208 of 394, line 33);
- increases by $40 million the Navy's FY2013 funding request for research and development work on force projection applied research, with the increase being for "Alternative energy research" (pdf page 22 of 394, line 5);
- increases by $40 million the Navy's Fy2013 funding request for research and development work on the Navy energy program, with the increase being for "Program increase-alternative energy initiatives" (pdf page 223 of 394, line 60); and

- increases by $57 million the Air Force's Fy2013 funding request for research and development work on support systems development, with the increase being for "Alternative energy research" ($37 million) and "Coal to liquid fuel only for lower emission research." ($20 million) (pdf page 240 of 394, line 238).

The part of the explanatory statement for Division A states:

> PROMOTING ENERGY SECURITY
>
> The conferees do not include a provision as proposed by the House regarding the Energy Independence and Security Act. However, the conferees provide $20,000,000 in Research, Development, Test and Evaluation, Air Force only for research that will improve emissions of coal to liquid fuel to enable this technology to be a competitive alternative energy resource to meet the goals established in the Department of Defense's Operational Energy Strategy and its Implementation Plan. The conferees direct the Secretary of the Air Force, in consultation with the Assistant Secretary of Defense for Operational Energy Plans and Programs, to inform the congressional defense committees 30 days prior to any obligation or expenditure of these funds. (pdf page 242 of 394)

The part of the explanatory statement for Division B increases by $10 million the FY2013 request for defense-wide military construction planning and design funding, with the increase being for "Energy conservation investment program" (pdf page 17 of 44, line for worldwide unspecified, defense-wide funding).

The part of the explanatory statement for Division B states:

> *Energy Conservation Investment Program (ECIP).*—The conference agreement provides $150,000,000 for ECIP. Additionally, the conference agreement provides $10,000,000 in dedicated funding for ECIP planning and design. The conferees strongly support the efforts of the Department of Defense to promote energy conservation, green building initiatives, energy security, and investment in renewable energy resources, and commend the leadership of the Department and the services for making energy efficiency a key component of construction on military installations. The conferees urge the Department to use the dedicated planning and design funds to invest in innovative renewable energy projects as well as projects that enhance energy security at military installations. The conferees also encourage the Department to request dedicated planning and design funding for ECIP in future budget submissions. (pdf page 339 of 394)

Version Passed by Senate and House on March 20 and 21, 2013 (P.L. 113-6)

H.R. 933 of the 113th Congress as passed by the Senate on March 20, 2013, and the House on March 21, 2013, includes the FY2013 DOD appropriations act as Division C and the FY2013 Military Construction, Veterans Affairs, and Related Agencies Appropriations Act as Division E. The bill was signed into law as P.L. 113-6 on March 26, 2013.

The explanatory statement for Division C of H.R. 933 as passed by the Senate on March 20, 2013, and the House on March 21, 2013, is the essentially the same as the explanatory statement for Division A of H.R. 933 as passed by the House on March 6, 2013 (see above).[124]

[124] The explanatory statement for Division C of H.R. 933 as passed by the Senate on March 20, 2013, consists of the pages from the Congressional Record of March 6, 2013, containing the explanatory statement of Division A H.R. 933 (continued...)

The explanatory report for Division E increases by $10 million the FY2013 request for defense-wide military construction planning and design funding, with the increase being for "Energy conservation investment program" (pdf page 357 of 394, line for defense-wide funding).

The explanatory report for Division E states:

> *Energy Conservation Investment Program (ECIP).*—The bill provides $150,000,000 for ECIP. Additionally, the bill provides $10,000,000 in dedicated funding for ECIP planning and design. The Committees strongly support the efforts of the Department of Defense to promote energy conservation, green building initiatives, energy security, and investment in renewable energy resources, and commend the leadership of the Department and the services for making energy efficiency a key component of construction on military installations. The Department is urged to use the dedicated planning and design funds to invest in innovative renewable energy projects as well as projects that enhance energy security at military installations. The Department is also encouraged to request dedicated planning and design funding for ECIP in future budget submissions. (pdf page 4 off 44)

FY2013 Department of Defense Appropriations Act (H.R. 5856 of 112th Congress)

House (As Reported)

The House Appropriations Committee, in its report (H.Rept. 112-493 of May 25, 2012) on H.R. 5856 of the 112th Congress, states:

> ADVANCED DROP-IN BIOFUEL PRODUCTION
>
> The request [for Defense Production Act purchases] includes $70,000,000 for the construction or retrofit of domestic commercial (or pre-commercial) scale advanced drop-in biofuel plants and refineries. The Committee understands that the Department has allocated $100,000,000 of the $150,000,000 program addition to the fiscal year 2012 Defense Production Act account for this effort and that $70,000,000 of this funding likely will not execute until well into fiscal year 2013 or even into fiscal year 2014. While the Committee is supportive of alternative energy development, in these times of decreasing budgets, it does not seem prudent to stockpile funds so far ahead of need. Accordingly the recommendation provides no funding for this effort in fiscal year 2013. The Committee urges the Secretary of Defense to request this funding in future years when it can execute in a timely manner. (Page 203)

House (Floor Action)

On July 19, 2012, as part of its consideration of H.R. 5856 of the 112th Congress, the House agreed to by voice vote H.Amdt. 1428, an amendment to prohibit the use of funds to enforce

(...continued)

as passed by the House on March 6, 2013 (Congressional Record, daily edition, March 6, 2013, pages H1029-H1256, plus 3 additional pages from the Congressional Record, numbered 1 through 3, presenting a table showing the new budget authority by account provided by the bill).

Section 526 of the Energy Independence and Security Act of 2007 (H.R. 6/P.L. 110-140 of December 19, 2007).[125]

Senate

The Senate Appropriations Committee, in its report (S.Rept. 112-196 of August 2, 2012) on H.R. 5856 of the 112th Congress, recommends:

- increasing the Army's FY2013 funding request for research and development work on combat vehicle and automotive advanced technology by $40 million, with the additional funding being for alternative energy research (page 174, line 33);
- increasing the Navy's FY2013 funding request for research and development work on force protection applied research by $40 million, with the additional funding being for alternative energy research (page 189, line 5); and
- increasing the Air Force's FY2013 funding request for research and development work on support systems development by $40 million, with the additional funding being for alternative energy research (page 203, line 238).

The report states (emphasis added):

> The Committee has included funding above the President's budget request for several programmatic initiatives which the Committee believes are of inherent value for national defense. In several cases, funds are restored for programs which were included in previous Department of Defense budget requests, and several are for programs that the Committee believes are necessary to improve defense even though they have not been included under the request formulated by the Department of Defense. For instance, the Committee provides additional research funding in the following areas: **alternative energy**, space situational awareness, unexploded ordnance and landmine detection, nanotechnology, advanced metals and materials, military burn treatment, and traumatic brain injury and psychological health. The Committee believes additional research funding is warranted in these and other areas to ensure that the Department of Defense continues to pursue technological advances that are critical to our national defense. (Page 9)

The report also states:

> *Solar Energy Development*.—The Committee directs the Secretary of Defense and the Secretary of the Interior to jointly prepare a plan to facilitate solar energy development on military installations. The plan should be consistent with the military mission and habitat conservation needs of disturbed lands on military bases that have been withdrawn from the public domain. The Committee directs the Secretaries to submit to the congressional defense and interior committees a joint report that includes the proposed plan within 120 days of enactment of this act. If legislation is necessary to implement the plan, the Committee directs the Secretaries to submit to Congress a legislative proposal to accompany the plan.
>
> Furthermore, the Committee directs the Deputy Under Secretary of Defense for Installations and Environment to provide a report to the congressional defense committees not later than

[125] For the text of §526 of P.L. 110-140, see footnote 122.

> 180 days after enactment of this act on the viability or incompatibility of solar energy for Nellis and Creech Air Force Bases. (Page 14)

The report also states:

> *Microtechnology Energy*.—The Committee understands that the Department of Defense continues its focus on developing sustainable energy technologies that provide strategic effectiveness and energy security in the areas of energy supply, demand and assured distribution. The Committee believes that continued research into these technologies is necessary to develop a wide range of micro- and nanotechnology-enabled mobile military energy technologies. Therefore, the Committee encourages the Department to continue research related to micro technology energy. (Page 180)

The report also states:

> *Ocean Renewable Energy*.—The Committee commends the Navy's efforts to support ocean renewable energy testing, research, development, and deployment for maritime security systems, support at-sea surveillance and communications systems, and further opportunities to reduce the cost of energy and increase energy security at coastal Department of Defense facilities. The Committee encourages the Navy to continue its investments in developing ocean renewable energy technologies and to coordinate with the Department of Energy and designated National Marine Renewable Energy Centers for ocean renewable energy demonstration activities at or near Department of Defense facilities. The Committee understands the Navy's goal is to produce 50 percent of its shore-based energy requirements from alternative sources by 2020 and notes that deepwater offshore wind and other renewable energy sources could offer advantages as an electricity source for Navy facilities. Not later than 90 days after enactment of this act, the Department shall provide a briefing to the congressional defense committees on current and future programs related to ocean renewable energy research and development activities and provide an analysis of the locations within the United States that such activities would be viable. (Pages 190-191)

Conference

For further action on the FY2013 DOD Appropriations Act, see H.R. 933/P.L. 113-6 above.

FY2013 Military Construction, Veterans Affairs, and Related Agencies Appropriations Act (H.R. 5854/S. 3215 of 112th Congress)

House (As Reported)

The House Appropriations Committee, in its report (H.Rept. 112-491 of May 23, 2012) on H.R. 5854 of the 112th Congress, states:

> *Rebates.*—The Department of Defense has been increasing the use of green technology to reduce energy consumption on military installations. The Committee commends this policy but is concerned that the Department of Defense is not fully utilizing the potential savings and rebates that may be available from the use of certain technologies or utilities. The Committee directs the Deputy Under Secretary of Defense for Installations and Environment to report to the congressional defense committees on the amount of rebates the Department has been able to capture. (Page 16)

H.Rept. 112-491 also states:

> *Increased Fuel and Training Efficiency.*—The Committee is aware of proposals by the Department of Defense to use military construction funding to construct specialized training runways near existing aircraft locations. By constructing these specialized runways, the Department of Defense will save taxpayer dollars by decreasing the amount of transient flight hours required for aircraft to reach their training locations. Therefore, the Committee urges the Deputy Under Secretary for Installations and Environment to conduct a cost-benefit analysis regarding the construction of specialized training runways near existing aircraft locations and report back to the Committee within 180 days of enactment of this Act. (Page 17)

The report also states:

> *LED lighting technologies.*—The Committee understands that the use of LED lighting technology at military facilities has demonstrated substantial energy efficiencies and cost savings. However, the Committee is aware that LED lighting products of inferior quality were used at some facilities and installations and has resulted in those locations failing to achieve expected efficiencies. In some instances, this has led to policies prohibiting the use of this technology. Accordingly, the Committee directs the Deputy Under Secretary of Defense for Installations and Environment to establish minimum quality standards for the use of LED lighting products at Department of Defense installations and facilities. The standards should take into consideration Energy Star ratings and/or the Design Light Consortium lighting product recommendations. (Page 17)

The report also states:

> *Sustainable Buildings Policy.*—The Committee supports the Department of Defense's commitment to green buildings, and its goal to promote cost-effective sustainability. However the Committee is concerned that the Department of Defense's current approach to sustainable construction appears to select one green building certification system over others, particularly for wood products. The Committee expects the Department to ensure equal acceptance of forestry certification systems, and that systems designated as American National Standards are allowed to compete equally for use in the Department of Defense's building construction and major renovations while continuing to follow existing Buy America requirements. The Committee also strongly urges the Department of Defense to incorporate in its Sustainable Buildings Policy energy efficiency standards that are cost-effective, incorporate Energy Star components, and the results of life cycle assessments. The Committee directs the Deputy Under Secretary of Defense for Installations and Environment to provide a report to the congressional defense committees on the Department's efforts not later than 90 days after enactment of this Act.
>
> *Energy security.*—The Committee strongly supports Department of Defense efforts to reduce costs and increase energy security through their investments in alternative energy sources. The reliance on oil for forward-deployed operations leaves the military vulnerable to supply shortages, attacks on fuel convoys, and volatile swings in the cost of petroleum. The Committee recognizes that investments in clean alternative energy sources will make our nation more secure and result in significant long term energy savings. Therefore, the Committee directs the Department of Defense, as a follow up to the Operational Energy Strategy Implementation Plan released on March 6, 2012, to report to the congressional defense committees on how energy efficient construction on military installations will lower operation and maintenance costs. This report shall be submitted within 90 days of enactment of this Act. (Page 18)

The report also states:

> *Energy Conservation Investment Program.*—The Committee believes that as new construction and retrofit projects are undertaken at facilities to improve building energy efficiency and achieve the objectives prescribed in statutes, executive orders, and initiatives, the Department of Defense is encouraged to utilize new and underutilized, low-cost energy efficient technologies that provide the best value to taxpayers through minimal lifecycle costs. The Deputy Under Secretary for Installations and Environment shall report to the congressional defense committees on the Department's plan to implement these technologies across the Department of Defense within 60 days of enactment of this Act. (Pages 20-21)

The report also states:

> The Committee recommends a total appropriation of $1,650,781,000 for family housing construction, family housing operation and maintenance, and the homeowners assistance program, a decrease of $32,165,000 below the fiscal year 2012 enacted level and the same as the budget request. The decrease below the 2012 enacted level is due partly to the Department of Defense's success in implementing the Military Housing Privatization Initiative on military installations and the reduced requirement for appropriated construction and operating costs. The Committee encourages the Department, where feasible, to utilize energy efficient, environmentally friendly, and easily deployable composite building materials in new family housing construction. (Page 23)

House (Floor Action)

On May 31, 2012, as part of its consideration of H.R. 5854 of the 112th Congress, the House passed **H.Amdt. 1166**, which added **Section 522** to the bill. Section 522 states:

> Sec. 522. None of the funds made available by this Act shall be available to enforce section 526 of the Energy Independence and Security Act of 2007 (P.L. 110-140; 42 U.S.C. 17142).[126]

Senate

The Senate Appropriations Committee, in its report (S.Rept. 112-168 of May 22, 2012) on S. 3215 of the 112th Congress, states:

> ENERGY POLICY
>
> The Department of Defense is the largest consumer of energy in the Federal Government, accounting for nearly 80 percent of the government's total energy consumption. DOD spends nearly $4,000,000,000 annually on facility energy alone, nearly a quarter of its total energy

[126] §526 of the Energy Independence and Security Act of 2007 (H.R. 6/P.L. 110-140 of December 19, 2007) states:

> §526. PROCUREMENT AND ACQUISITION OF ALTERNATIVE FUELS.
>
> No Federal agency shall enter into a contract for procurement of an alternative or synthetic fuel, including a fuel produced from nonconventional petroleum sources, for any mobility-related use, other than for research or testing, unless the contract specifies that the lifecycle greenhouse gas emissions associated with the production and combustion of the fuel supplied under the contract must, on an ongoing basis, be less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.

costs. However, installation energy consumption accounts for nearly 40 percent of the Department's greenhouse gas emissions. The Committee commends the Department for its aggressive efforts to improve the energy efficiency of its buildings and installations, reduce consumption, mitigate its carbon footprint, invest in renewable energy projects, and enhance energy security on its installations.

The Committee also supports the efforts of the Department to incorporate green building technologies into both new construction and renovations of buildings. As noted in the past, the Committee believes that the use of these technologies should be a fundamental consideration in the design or retrofit of all military construction projects.

In particular, the Committee believes that the Department should maximize the use of energy efficient, eco-friendly roofing technologies for new construction and renovations, including family housing construction and renovation. These technologies include, but are not limited to, photovoltaic panels, solar thermal roof coatings, rooftop direct use solar lighting technology, green roofs, and cool roofs. In an effort to capture the most innovative of these technologies, the Committee encourages the Department and the services to monitor new technologies emerging from government, industry, or university research and development programs.

Although federally mandated sustainable design policies and energy efficiency goals are standard elements of military construction design, the Committee encourages the Department and the services to incorporate additional leading-edge technologies into the construction program and to utilize new and underutilized, low-cost energy-efficient technologies that provide the best value to taxpayers through minimal life-cycle costs.

While strongly supportive of DOD's commitment to green buildings, and its goal to promote cost-effective sustainability, the Committee is concerned that the Department's current approach to sustainable construction could result in giving preference to one green building certification system to the exclusion of others, particularly wood products. The Committee expects DOD to ensure equal acceptance of forestry certification systems, and to allow systems designated as American National Standards to compete equally for use in the Department's building construction and major renovations, subject to Buy America requirements.

Cybersecure Microgrids at Military Installations.—The Committee is impressed with the progress the Department has made in deploying microgrids to mitigate risk to mission critical assets and promote energy independence at military installations through the Smart Power Infrastructure Demonstration for Energy Reliability and Security [SPIDERS] program. However, the Committee remains concerned that most installations across the country are dependent on commercial grids, which could potentially compromise the security and access to reliable supplies of energy necessary to meet mission essential requirements. The Committee believes the Department should study and evaluate using cybersecure microgrid technologies to promote energy security. Therefore, the Secretary of Defense shall submit a report to the congressional defense committees, no later than 180 days from the enactment of this act, regarding: (1) the status of microgrid demonstrations currently deployed domestically; (2) the Department's plan to secure energy supplied to military installations to meet mission essential requirements; and (3) the potential benefits of the wide-spread use of secure microgrid technology on domestic military installations. (Pages 8-9; material in brackets as in original)

S.Rept. 112-168 also states:

ENERGY CONSERVATION INVESTMENT PROGRAM

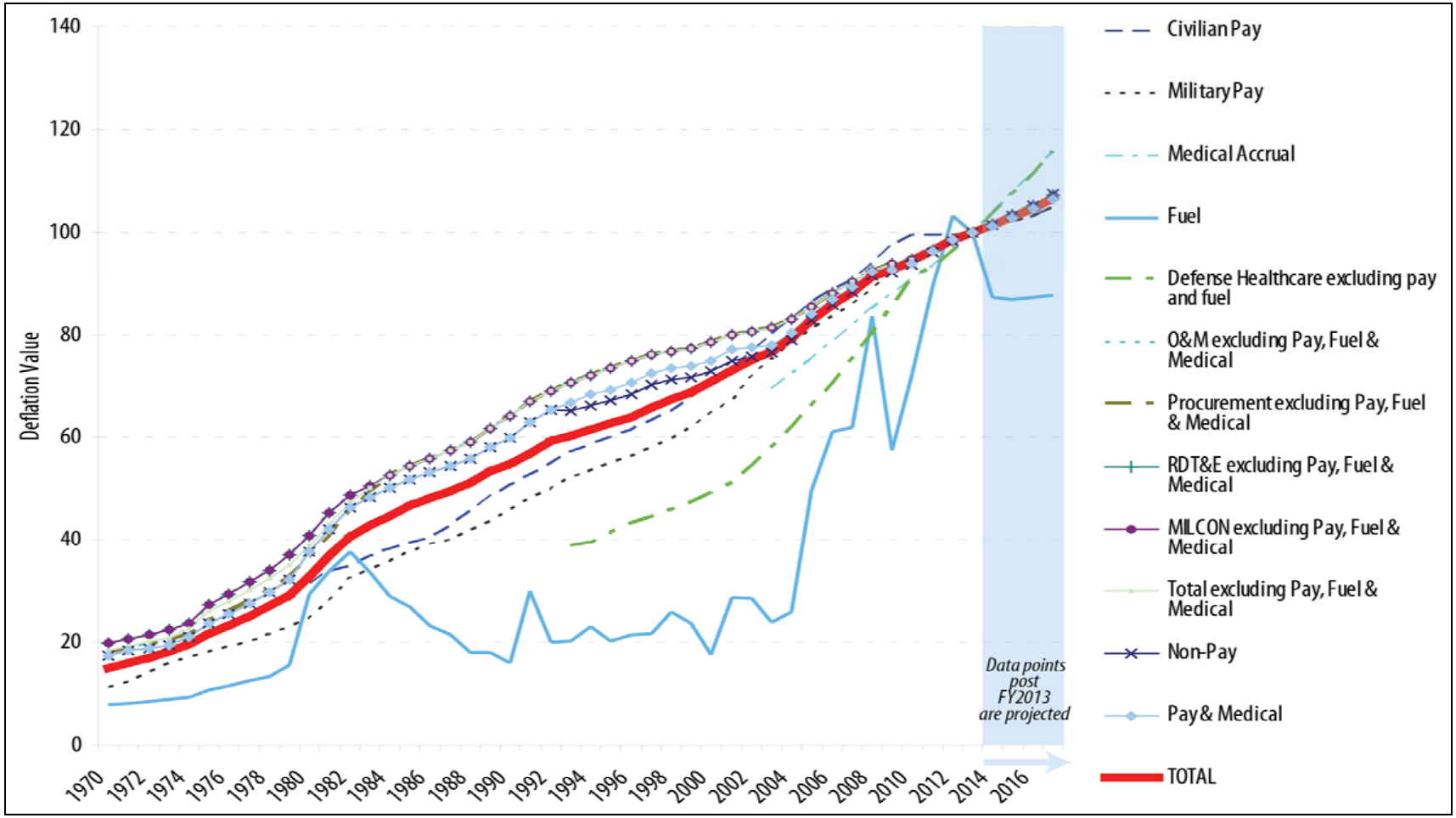
> The Committee recommends the requested level of $150,000,000 for the Energy Conservation Investment Program [ECIP]. The Committee also recommends a transfer of $10,000,000 from unspecified Defense-Wide planning and design into a separate line item for ECIP planning and design to ensure that adequate funds are available for future ECIP project planning.
>
> ECIP is the only dedicated stream of funding for energy projects within DOD. Historically, ECIP has funded small projects with rapid payback. As DOD moves more aggressively to develop renewable energy resources and improve energy security, ECIP is emerging as a major tool to leverage investment in larger projects, such as net-zero energy facilities or smart grid technologies, that are intended to produce significant improvements in energy consumption, costs, and security at single or multiple installations. The Committee encourages the Department to continue using ECIP funds to leverage investments in game-changing major energy projects, particularly renewable energy initiatives.
>
> The Committee notes that, in addition to ECIP funding, the fiscal year 2013 budget request includes two projects in the major construction program intended primarily to improve energy efficiency and security (an Army-funded ground source heat transfer system at Fort Benning, Georgia, and a Navy-funded remotely controlled electrical distribution system at Diego Garcia). The Committee believes that energy efficiency, energy security, and renewable energy investments are mission-critical requirements to reduce DOD's dependence on costly and potentially unreliable sources of commercial energy, and encourages the services and the defense agencies to aggressively pursue opportunities to include projects designed to improve installation energy efficiency and security in their major construction programs as well as through ECIP. (Page 20; material in brackets as in original; see also the table on page 88)

Conference

For further action on the FY2013 Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, see H.R. 933/P.L. 113-6 above.

Appendix A. DOD Budget Deflation Factors

Figure A-1. DOD Budget Outlay Deflation Factors, FY1970 - FY2017



Source: *National Defense Budget Estimates for FY2013*, Office of the Undersecretary of Defense (Comptroller), March 2012, Table 5-9, "Department of Defense Deflators – Outlays", pp. 67-68.

Appendix B. DLA-E Price Adjustments

Figure B-1 shows how DLA-E in recent years has adjusted the price for a barrel of fuel multiple times within individual years.

Figure B-1. DLA-E Fuel Price Per Barrel

Source: DLA-E Data, May 10, 2011.

Note: These prices are not inflation adjusted.

Appendix C. Fuel Use in Afghanistan

This appendix presents some additional information on DOD fuel use for conducting operations in Afghanistan.

In Afghanistan, fuel purchased by U.S. forces increased from 48 million gallons in FY2003 to 489 million gallons in FY2011, an increase of 920%.[127] Total fuel purchases in Afghanistan over this period exceeded 1.5 billion gallons (over $5.6 billion).[128] This increase in fuel use tracked the increase in troop strength: between FY2003-FY2011, the number of U.S. uniformed personnel in Afghanistan increased from 10,400 to 97,000, an increase of approximately 830%.[129] These figures do not include fuel purchased outside of Afghanistan to support Operation Enduring Freedom.

While aircraft account for the largest amount of fuel used to support operations in Afghanistan, many aircraft are fueled outside of the country, where the logistics challenges are less pressing. By contrast, generators are one of the largest consumers of energy on the ground in Afghanistan. In August 2009, the Marine Energy Assessment team found that electrical power generation accounted for 32% of the fuel used by the Marine Expeditionary Brigade – Afghanistan.[130] Other analyses estimate that climate control and air conditioning account for between 57% and 70% of generator power demand. Army officials have also commented on the growing use of personal electronic devices at bases in Afghanistan, which increase demand for electric power.[131]

Fuel and water, the most commonly transported supplies, make up approximately 70% of total supplies shipped into Afghanistan.[132] On a single day in Afghanistan, DLA-E and CENTCOM counted approximately 5,396 trucks moving supplies for U.S. forces in Afghanistan, in addition to an estimated 1,306 NATO and DLA-E fuel trucks.[133] DLA-E provides about 1 million gallons of JP-8, 7,000 gallons of diesel fuel, and 9,000 gallons of motor gasoline to U.S. forces in Afghanistan daily.

[127] A portion of the fuel purchased by DOD in Afghanistan was provided to Afghan security forces as part of the effort to train and equip the Afghan National Security Forces. CRS does not have data on the precise amount of fuel provided.

[128] This figure includes fuel purchased by U.S. forces from both DLA-E and NATO, which share responsibility for providing fuel in Afghanistan. This figure does not include fuel purchased by NATO forces. This data also does not include fuel purchased by DOD outside of Afghanistan to support Operation Enduring Freedom. For example, aircraft supporting Operation Enduring Freedom upload a substantial amount of fuel at air bases located on the Persian Gulf, and the Manas Transit Center in Kyrgyzstan is a major logistics hub. Data provided by DLA-E, March 1, 2012.

[129] CRS analysis of Joint Staff, Joint Chiefs of Staff, "Boots on the Ground," monthly reports, 2003 and 2011.

[130] USMC, United States Marine Corps Expeditionary Energy Strategy and Implementation Strategy: Bases to Battlefield, April 4, 2011, p 71. Data from the Report of the Marine Expeditionary Assessment Team, August 2009. Data provided by MEB-A Bulk Fuels Officer.

[131] Discussion with Army energy officials, March 2, 2012.

[132] USMC, *United States Marine Corps Expeditionary Energy Strategy and Implementation Strategy: Bases to Battlefield*, April 4, 2011, p. 8, inset box.

[133] Data provided by DLA-E, March 1, 2012. DLA-E is responsible for fueling U.S. and coalition forces in Regional Commands East and North, while NATO has responsibility for Regional Commands South, Southwest, West and Capitol (Kabul).

Appendix D. One-Time Reports on DOD Energy-Related Issues

Table D-1 shows a list of one-time reports that Congress in recent years has required DOD to submit on various energy-related issues.

Table D-1. One-Time Reports on DOD Energy-Related Issues

Legislation	Topic	Deadline
FY2006 NDAA §357	Biofuel and Ethanol	October 3, 2006
FY2007 NDAA §360	Implementing Improvements in the Fuel Efficiency of Weapons Platforms	October 17, 2007
FY2009 NDAA §332	Incorporating Fuel Logistics Support Requirements: Implementation Plan	April 12, 2009
	Progress Report	October 18, 2010
	Notification of Compliance	October 18, 2011
FY2009 NDAA §333	Solar and Wind Energy for Expeditionary Forces	February 18, 2009
FY2009 NDAA §334	Alternative and Synthetic Fuels	March 1, 2009
FY2010 NDAA §333	Implementation of Recommendations on Fuel Demand Management at Forward-Deployed Locations	February 1, 2010
FY2010 NDAA §334	Using Renewable Fuels to meet DOD Energy Requirements	February 1, 2010
FY2011 NDAA §842	DOD Policy on Acquisition and Performance of Sustainable Products and Services	July 6, 2011
FY2011 NDAA §901	Report on ASD reorganization must consider merging ASD(ASD(OEPP)) and DUSD(I&E) positions	September 15, 2013
FY2008 NDAA §2864	Report on Renewable Energy Use by DOD	May 27, 2008
FY2010 NDAA §335	Vulnerability of Critical Military Missions to Electricity Disruptions	April 26, 2010
FY2012 NDAA §2823	Interim Goal for Renewable Facility Energy by 2018	June 28, 2012
FY2012 NDAA §2830	Energy-Efficiency Standards for Military Construction	June 30, 2012

Note: NDAA is the National Defense Authorization act for the fiscal year in question.

Appendix E. Expanded Review of Past Legislation from 2005 Through FY2012

This appendix presents a more detailed review of past legislation on DOD energy-related issues from 2005 through FY2012.

Energy Policy Act of 2005 (P.L. 109-58)

Section 203 of this act required federal agencies to procure 7.5% of their power from renewable sources by FY2013. This section also defined renewable power sources.

FY2006 National Defense Authorization Act

Section 357 required a report on DOD use of biofuel and ethanol fuel, including potential DOD requirements for increased biofuel and ethanol use and an assessment of current and future availability of alternative fuels.

FY2007 John Warner National Defense Authorization Act (P.L. 109-364)

The FY2007 NDAA represented a major expansion of DOD interest in energy security issues, most notably Section 2851, which added Chapter 173 "Energy Security" to Title 10 of the U.S. code. Section 2851 required DOD to establish energy performance goals, as well as reports on the plan to meet these goals and on DOD's annual energy use and progress towards meeting the installation energy goals set by the Energy Policy Act of 2005.

Policy Changes

Fuel Efficiency in Weapons Platforms

Section 360 required DOD to improve the fuel efficiency of weapons platforms as DOD in order to "(1) enhance platform performance; (2) reduce the size of the fuel logistics systems; (3) reduce the burden high fuel consumption places on agility; (4) reduce operating costs; and (5) dampen the financial impact of volatile oil prices."[134] This section did not require a specific target for improvements in fuel efficiency. DOD was required to submit a report on the how improvements in the fuel efficiency of weapons platforms will be implemented.

Energy Performance Goals, Plan and Progress

Section 2851 required DOD to establish energy performance goals, including "transportation systems, support systems, utilities and infrastructure and facilities."[135] These goals must be

[134] P.L. 109-364, §360.

[135] P.L. 109-364, §2911.

submitted to the congressional defense committees annually by the date of the President's submittal of the defense budget to Congress. The Secretary was required to develop an energy performance plan to meet these energy goals. This section also required an annual energy report on the progress made on the Department's energy performance goals and the goals of the Energy Policy Act of 2005. This report must include a description of actions taken and energy savings realized. The report was also required to include a breakdown of energy used by military installations, including energy types, costs, and quantities consumed.[136]

Installation Energy

Section 2851 added several sections to the new Chapter 173, "Energy Security" dealing with energy costs, savings, and contracts. The inserted section 2913 required a simplified method of contracting for shared energy savings at military installations, while Section 2912 required DOD to spend half the funds saved on additional energy conservation measures, leaving half of the savings to be spent by the commanding officer of the installation on improvements to military family housing, small construction, or morale, welfare or recreation facilities or services. Section 2914 authorized military construction for energy conservation, using available funds, with congressional notification. Section 2854 further amended the new Chapter 173, "Energy Security," to require energy efficient products in military construction as inserted Section 2915.

Renewable Power

Section 2852 required DOD to procure 25% of its electricity from renewable energy by FY2025, and directed DOD to procure power from renewable sources whenever it is consistent with DOD's energy performance goals and plan established in Section 2851.

Fuel Cells as Back-Up Power

DOD was required by Section 358 to consider using fuel cells for current back-up power systems to increase the longevity of the systems.

Energy Independence and Security Act of 2007 (P.L. 110-140)

Policy Changes

Alternative Fuels

Section 526 prohibited any federal agency, including DOD, from contracting for alternative or synthetic fuels that have a lifecycle greenhouse gas emission greater than conventional petroleum fuel. This prohibition is for all mobility fuels, with the exception of fuel for testing and research.[137]

[136] P.L. 109-364, §2925.

[137] P.L. 110-140, §526.

Installation Energy

For all federal agencies, EISA 2007 required building energy use to be reduced by 3% annually through 2015 for a total reduction of 30% from a FY2003 baseline. It also mandated reductions in non-tactical vehicle petroleum use by 20% and increases in alternative fuel use by 10% annually by FY2015 from a FY2005 baseline. EISA 2007 also required new and majorly renovated federal buildings to reduce energy usage by set percentages.[138]

FY2008 National Defense Authorization Act (P.L. 110-181)

Energy Efficient Lighting

Section 2863 required DOD to use energy efficient lighting fixtures in DOD facilities.

Renewable Energy Report

DOD was required by Section 2864 to submit a report discussing the extent of renewable energy use, their financing via appropriated funds or alternative financing, and a graph of renewable power as a percentage of total facility electricity use from FY2000 through FY2025, including projected future trends. Following the initial report, this information was required to be included in the Annual Energy Management Report, created by Section 2851 of the FY2007 NDAA.

FY2009 Duncan Hunter National Defense Authorization Act (P.L. 110-417)

The 2009 NDAA established an operational energy office, defined operational energy, and required an operational energy implementation strategy The NDAA for FY2009 also required acquisitions planning and analyses to consider energy, including lifecycle costs and fuel logistics, as important factors. It also broadened the scope of the energy performance master plan required by Section 2851 of the FY2007 NDAA to require separate master plans for each department or agency and specific requirements and metrics to enable measurements of progress towards achieving energy performance goals. Section 2832 added the progress made towards achieving the goals of EISA 2007 to the annual energy management report.

The act required several reports on alternative energy topics, including the viability of onsite solar and wind energy to power expeditionary forces and the lifecycle emissions of alternative and synthetic fuels.[139]

[138] P.L. 110-140, §141, 142, 431, 433.

[139] P.L. 110-417, Title III: Operations and Maintenance, Subtitle D: Energy Security.

Policy Changes

Fuel in Acquisitions

Energy was highlighted as a required consideration in capacity analyses, force planning processes, and the acquisitions process. Section 332 required:

- Analyses and force planning to consider "requirements for, and vulnerability of, fuel logistics."
- Fuel efficiency to be included as a Key Performance Parameter (KPP) in the requirements process. This requirement puts energy on par with other KPPs, such as lethality, protection and reliability, during the requirements development phase.
- In acquisitions, the lifecycle cost analysis for new capabilities must include the fully burdened cost of fuel.

DOD must prepare an implementation plan for these requirements within 180 days of enactment, and submit a progress report within 2 years. DOD must be in compliance within 3 years or provide an explanation.[140]

Definitions

"Operational energy" and the "fully burdened cost of fuel" are both defined in the 2009 NDAA. Operational energy is defined in Section 331 as,

> "operational energy" means the energy required for training, moving, and sustaining military forces and weapons platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms.[141]

The fully burdened cost of fuel is defined in Section 322 as,

> the commodity price for fuel plus the total cost of all personnel and assets required to move and, when necessary, protect the fuel from the point at which the fuel is received from the commercial supplier to the point of use.[142]

Organizational Changes

Operational Energy Plans and Programs Office

The FY2009 NDAA established the Director of Operational Energy Plans and Programs office, charged with drafting an operational energy strategy with "near-term, mid-term, and long-term goals, and a plan for implementation of the strategy."[143] The two major responsibilities of the appointed Director of Operational Energy Plans and Programs are the creation of a department-

[140] P.L. 110-417, §332.

[141] P.L. 110-417, §331.

[142] P.L. 110-417, §332.

[143] P.L. 110-417, §902.

wide operational energy strategy and implementation plan and the Director's certification of the adequacy of the services' budgets for implementing the operational energy strategy. Each service must also designate a senior official to be responsible for operational for energy plans and programs for that armed force within 90 days after the appointment of the Director of Operational Energy Plans and Programs.

Operational Energy Strategy & Implementation Plan

The operational energy strategy will establish DOD goals for operational energy, performance metrics to measure progress, while the implementation plan will create a plan for implementing the strategy. This strategy was required within 180 days after the appointment of a Director.

Budget Certification Authority

Section 902 also required the Director of Operational Energy Plans and Programs to review the budgets of the military departments and defense agencies in regard to their efforts under the operational energy strategy. These proposed budgets must be submitted to the Director of Operational Energy Plans and Programs for review before being submitted to the Under Secretary for Defense (Comptroller). The Director must review the proposed budgets, and certify whether the proposed budget is adequate to implement the operational energy strategy. Not later than January 31 of the preceding fiscal year, the Director must submit a report containing commentary on the proposed budgets, together with the budget certification.

If the proposed budget is not found to be adequate to achieve the operational energy implementation plan, the Director may decline to certify it. In this case, DOD is required to submit a report to Congress proposing remedies for the inadequacy of the budget within 10 days of when the budget for the upcoming fiscal year is submitted to Congress.

Installation Energy

Section 2831 required DOD to certify to the defense committees that enhanced use leases (Section 2667(h) of Title 10) longer than 20 years are consistent with the DOD energy performance goals and plan of Section 2911 of Title 10.

The Annual Energy Report of Section 2925(a) of Title 10 was broadened to include DOD progress in meeting the EISA 2007 installation energy requirements, and an estimate of progress made by DOD to meet the certification requires regarding green building standards in construction and major renovation, as required by Section 433 of EISA 2007.

Reports Required

Operational Energy

Section 331 required an annual report addressing operational energy to be submitted by the Director of the Operational Energy Plans and Programs to the congressional committees concurrently with the annual DOD energy management reports. The annual operational energy report must include extensive data about operational energy demands, expenditures, and efforts to date and an evaluation of progress made in implementing the operational energy strategy.

Solar and Wind Energy for Use by Expeditionary Forces

This report, due from the Secretary of Defense 120 days after the enactment of the NDAA for FY2009, must consider "the potential for solar and wind energy to reduce the fuel supply needed to provide electricity for expeditionary forces and the extent to which such reductions will decrease the risk of casualties by reducing the number of convoys needed to supply fuel to forward operating locations."[144] The report must also address the cost, potential savings, environmental benefits, and sustainability and operating requirements of solar and wind electricity generation for expeditionary forces, as well as potential opportunities for experimentation and training.

Alternative and Synthetic Fuels

Section 334 required a report on ways to reduce the total lifecycle emissions of alternative and synthetic fuels, including coal-to-liquid fuels. For military operations and expeditionary forces, it must consider the usefulness of domestically produced alternative and synthetic fuels to the military utility and lifecycle emission of alternative fuels produced in-theatre.[145] This report must also evaluate DOD's progress in research, testing and certification of alternative and synthetic fuels for military vehicles and aircraft, and evaluate the ability of the alternative and synthetic fuel industries to meet DOD fuel requirements, considering broad trends, levels of investment, and development of refining capacity. This report was required by March 1, 2009.

Mitigation of Power Outage Risks

Section 335 required a technical and operational risk assessment of the risks posed to "mission critical installations, facilities and activities ... by extended power outages"[146] from a failure of the grid or commercial electricity supply. DOD was required to develop plans to eliminate, reduce or mitigate risks identified, prioritizing the mission critical installations, facilities and activities that are at the greatest risk, considering the cost effectiveness various options. These prioritized plans and progress made must be described in annual report as part of the budget justification materials submitted to Congress for FY2010 and thereafter.[147]

FY2010 National Defense Authorization Act (P.L. 111-84)

The Director of Operational Energy Plans and Programs office received authorization of $5 million by Section 331, to be made available on the confirmation of a Director for the office.

[144] P.L. 110-417, §333.

[145] P.L. 110-417, §334.

[146] P.L. 110-417, §335.

[147] P.L. 110-417, §335.

Reports Required

Annual Energy Management Report

Section 332 expanded the Annual Energy Management report, dealing principally with installation energy, to discuss the feasibility and financing of renewable energy projects, detailed funding information, and steps taken to ensure best practices for measuring energy consumption in DOD installations. The first revised report must also address the adequacy of current funding mechanisms to meet DOD installation energy goals, the cost and feasibility of requiring new power generation projects to go off the grid during a grid outage, the feasibility of net-zero installations, analysis of whether new DOD construction projects adhere to sustainable design standards, and assessments of costs, obstacles, and other considerations of renewable power generation on base.

On Implementation of Comptroller General Recommendations of Fuel Demand Management at Forward-Deployed Locations

Section 333 required a report by February 1, 2010, on specific actions that DOD has taken on three of the recommendations in a GAO report.[148]

Use of Renewable Fuels to Meet DOD Energy Requirements

Section 333 required a report considering the use of renewable fuels as alternative fuels for all DOD aviation, maritime and ground fleets, including both tactical and non-tactical vehicles and applications. Required by February 1, 2010, this assessment must consider domestically produced algae-based, biodiesel and biomass-derived alternative fuels and cover technical, logistical and policy considerations. The report must also assess potential benefits of establishing a renewable fuel commodity class distinct from petroleum-based products.

Energy Security on DOD Installations

Similar to Section 335 of the FY2009 NDAA, Section 335 of the FY2010 NDAA required the Secretary of Defense to develop a plan to identify and address vulnerabilities to critical military missions as a result of electricity disruptions.[149]

[148] P.L. 111-84, §333.

[149] P.L. 111-84, §333.

FY2011 Ike Skelton National Defense Authorization Act (P.L. 111-383)

Policy Changes

Energy Performance Master Plan

The energy performance plan of Section 2851 of the FY2007 NDAA was expanded by Section 2832 to a "master plan" to achieve the energy performance goals of "laws, executive orders and Department of Defense policies."[150] This revised master plan must include:

(a) separate master plans for each Department and Defense Agency
(b) the use of a baseline standard for energy consumption that is consistent across departments,
(c) a method for measuring energy conservation
(d) "Metrics to track annual progress in meeting energy performance goals," and
(e) a description of specific requirements and proposed investments.[151]
The current master plan must be submitted to Congress annually no later than 30 days after the President submits his budget to Congress. The revised master plan must also consider hybrid electric drives, high performance buildings and high efficiency vehicles.
Section 2832 also required adding hybrid-electric drive and alterative fuels and high-performance buildings as special consideration in the plan.

Use of Energy Efficient Products in Facilities

In addition to amending the required reports, Section 2832 created a minimum list of energy-efficient technologies, including roof-top solar, energy management systems, energy efficient HVAC systems, thermal windows and insulation systems, electric meters, lighting and equipment designed to use less electricity, hybrid vehicle charging stations, solar power vehicle shade structures, and insulation and weatherproofing.

Pilot Study of Smart Microgrids for Deployment

Section 242 allowed DOD (with coordination from the Department of Energy) to carry out a pilot program to evaluate and validate microgrids for deployment. This pilot program would be intended to inform key performance parameters and "validat[e] energy components and designs that could be implemented ... at forward operating bases."[152]

DOD Policy on Acquisition and Performance of Sustainable Products and Services

Executive Order No. 13514, dated October 5, 2009, directed DOD and the federal agencies to establish a strategy to procure sustainable products and services. DOD's Strategic Sustainability Performance Plan responds to this executive order. Section 842 requires DOD to submit a report

[150] P.L. 111-383, §2832.

[151] P.L. 111-383, §2832.

[152] P.L. 111-383, §242.

to the congressional defense committees on the status and achievements of DOD regarding these sustainable procurement goals.

Organizational Changes: Operational Energy Plans and Programs Office

Section 901 redesignated the Director of Operational Energy Plans and Programs as the Assistant Secretary of Defense for Operational Energy Plans and Programs.

This section also required the Secretary of Defense to consider merging the positions of Deputy Undersecretary of Defense (Installations and Environment) and Assistant Secretary of Defense for Operational Energy Plans and Programs into a single Assistant Secretary position by January 1, 2015, and report the feasibility of this merger to the Committees on Armed Services of the Senate and House by September 15, 2013.[153]

FY2012 National Defense Authorization Act (P.L. 112-81)

The FY2012 NDAA continued the focus on operational energy and the logistics burden of fuel evident in the FY2009 NDAA. Among other provisions, the FY2012 NDAA added alternative fuels to the portfolio of the Assistant Secretary of Defense for Operational Energy Plans and Programs and requires energy technologies and practices from contractors providing logistical support for contingency operations.

Policy Changes

Alternative Fuels

Section 314 added oversight of DOD's alternative fuel efforts to the responsibilities of the Assistant Secretary of Defense for Operational Energy Plans and Programs.[154] The Assistant Secretary shall lead the alternative fuel activities and oversee alternative fuel investments, make recommendations regarding the development of alternative fuels, encourage collaboration with other federal agencies, and issue guidelines and policy to streamline alternative fuels investments.

The budget certification authority of the Assistant Secretary of Defense for Operational Energy Plans and Programs will also include investment in alternative fuel activities.[155] The annual operational energy report initially required by Section 331 of the NDAA for FY2009 must now include alternative fuels initiatives, including descriptions, funding and expenditures.[156]

Energy Efficiency in Contingency Operations

Section 315 required the energy performance master plan (amended by Section 2832 of the FY2011 NDAA, discussed above) to address requiring energy efficiency or energy conservation

[153] P.L. 111-383, §901.

[154] P.L. 112-81, §314.

[155] P.L. 112-81, §314.

[156] P.L. 112-81, §314.

measures in logistics support contracts for contingency operations. The energy performance master plan must now include "goals metrics and incentives for achieving energy efficiency in such contracts."[157] Any energy efficiency or conservation measures would be required to

(1) "achieve long-term savings for the Government by reducing overall demand for fuel and other sources of energy in contingency operations,"
(2) ... "not disrupt the mission, the logistics, or the core requirements in the contingency operation concerned," and
(3) be "able to integrate seamlessly into the existing infrastructure in the contingency operation concerned."[158]

Any guidance or regulations must consider the lifecycle costs savings of a technology or process and require logistics support contractors to demonstrate savings over traditional technologies.

The energy performance master plan report must discuss the implementation of Section 315, including savings achieved by the department.

The operational energy report must also discuss progress on applying energy efficiency measures to logistics support contracts for contingency operations, per Section 315, while Section 342 requires the operational energy report to evaluate practices used in contingency operations to reduce vulnerabilities related to fuel convoys, including improvements in tent and structure efficiency, generator efficiency, and displacement of liquid fuels with on-site renewable generation.

Energy Efficiency in Tents

Section 368 required including the total life-cycle costs for tents, including heating and cooling, in calculating the best value of tents.

Definitions

Section 2821 provided a comprehensive set of definitions for energy terms used by DOD. Among other terms, "energy security" is defined as "assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements."[159]

"Defense logistics support contract," discussed above, is defined in Section 315 as, "a contract for services, or a task order under such a contract, awarded by the Department of Defense to provide logistics support during times of military mobilization, including contingency operations, in any amount greater than the simplified acquisitions threshold."[160]

[157] P.L. 112-81, §315.

[158] P.L. 112-81, §315.

[159] P.L. 112-81, §2821. This definition is very nearly the same as that used for "energy security" in the 2010 QDR. The 2010 QDR reads, "... the ability to protect and deliver sufficient energy to meet operational requirements."

[160] P.L. 112-81, §315.

Installation Energy: Renewable Energy and Energy Security

The FY2012 NDAA also contained a number of provisions related to installation energy. Section 2823 requires DOD to choose an interim goal for the amount of renewable power used in FY2018, prior to the FY2025 goal of 25%.

DOD was also required by Section 2822 to favorably consider energy security in the design and development of renewable energy projects on military installations. DOD must also issue guidance for commanders of installations on planning measures to minimize the effects of disruptions in natural gas, water or electric utility services. This section also adds energy security of renewable energy projects to the required considerations of the energy performance goals and plans, as well as geothermal energy.

The Annual Energy Management Report was also amended by Section 2822 to include details of energy security provisions and details of the total number, frequency, financial impact of and mitigation strategies for utility outages. Section 2826 sets the deadline for this report of no later than 120 days after the end of each fiscal year.

Energy Data from Meters

DOD was required to capture and track data on energy usage from installation energy meters in order to determine baseline consumption and help reduce energy consumption by Section 2827. Section 2828 requires the Navy to meter its piers to allow the energy consumption of navy vessels in port to be tracked. The progress of this effort must be included in the Annual Energy Management Report.

DOD Energy Manager Training

Following Section 2829, DOD must establish a training policy for military installation energy managers, focusing on improving their knowledge of current laws, mandates, regulations and alternative energy options, improve consistency, and create opportunities for knowledge exchange among departments and across DOD.

Organizational Changes

Section 311 added a senior official for operational energy plans and programs for the Joint Chiefs of Staff and the Joint Staff, in coordination with the Assistant Secretary of Defense for Operational Energy Plans and Programs.[161]

[161] P.L. 112-81, §311.

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