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DOD Needs to Take Actions to Address Challenges in Meeting Federal Renewable Energy Goals

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December 2009

DEFENSE INFRASTRUCTURE

DOD Needs to Take Actions to Address Challenges in Meeting Federal Renewable Energy Goals

GAO Accountability • Integrity • Reliability

Highlights

Highlights of GAO-10-104, a report to the Subcommittee on Readiness, Committee on Armed Services, House of Representatives

Why GAO Did This Study

The Department of Defense (DOD) consumes about 60 percent of all energy used at federal government facilities. To encourage an increased use of energy from renewable sources, such as solar and wind power, (1) the Energy Policy Act of 2005 (the 2005 Act) directs DOD to consume at least 3 percent of its total electricity from renewable resources starting in fiscal year 2007; (2) Executive Order 13423 (the 2007 Executive Order) directs that an amount equal to half of the statutorily required renewable energy be generated by sources placed into service in 1999 or later; and (3) the 2007 Defense Authorization Act directed that at least 25 percent of electricity consumed by DOD come from renewable sources in fiscal year 2025. GAO was asked to examine (1) DOD's progress toward these three key goals for consuming renewable energy in fiscal years 2007 and 2008, (2) challenges to DOD meeting those goals, and (3) DOD's plans to meet the goals. GAO reviewed relevant laws and DOD and Department of Energy (DOE) policy, plans, and data; interviewed agency officials; and visited DOD facilities.

What GAO Recommends

GAO makes 5 recommendations to DOD, including that DOD accurately report progress toward the goals and develop a long-term, DOD-wide plan to address challenges and meet goals. DOD concurred with 4 recommendations and partially concurred with 1, agreeing with its intent but stating that it is a service responsibility.

View GAO-10-104 or key components.
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What GAO Found

DOD has three key goals for its installations' consumption of renewable energy, contained in the 2005 Act, the 2007 Executive Order, and the fiscal year 2007 National Defense Authorization Act. DOD met the goals in the 2005 Act and 2007 Executive Order in fiscal year 2007. However, in fiscal year 2008, DOD fell just short of the 2005 Act goal. Moreover, in fiscal years 2007 and 2008, DOD overstated its progress toward the goal in the 2007 Defense Authorization Act, counting nonelectric renewable energy. In these 2 fiscal years, the 2007 Defense Authorization Act goal allowed only electric renewable energy to be counted. According to amendments in the fiscal year 2010 Defense Authorization Act—which became law in October 2009—DOD is now able to count nonelectric renewable energy toward this goal.

In fiscal years 2007 and 2008, when calculating progress toward the 2007 Defense Authorization Act goal, DOD included renewable electricity produced on DOD land, but not consumed by DOD. According to DOD, it has "facilitated production," but has not "directly consumed" this electricity. It is unclear whether such renewable energy should be included in the Office of the Secretary of Defense's (OSD) calculations of progress toward this goal. Moreover, OSD has not published guidance clarifying key terms in the language of the goal. With such guidance specifying how the services are to implement this goal, DOD will have greater assurance that it can accurately assess progress toward the goal and accurately report on this progress to Congress.

DOD faces three key challenges in meeting the renewable energy goals. First, renewable energy projects may sometimes be incompatible with installations' need to use land for primary mission objectives. For example, wind turbines may conflict with aircraft operations during training. Second, renewable energy is often more expensive than nonrenewable energy. Therefore, using renewable energy can be at odds with DOD and DOE guidance that calls for DOD to invest in energy projects when cost-effective. In response, DOD plans to obtain additional funds by joining with private industry, such as local electric utilities, to develop renewable energy projects. Third, however, the use of those private sector approaches can be constrained by several factors. For example, energy produced by the projects may not count toward the renewable energy goals. By addressing these challenges, DOD would strengthen its ability to fully realize the potential of its renewable energy resources, improving its chances of meeting the goals in the most cost-effective way.

OSD has not developed a long-term, DOD-wide plan to help ensure that DOD meets the renewable energy goals. Such a plan that identifies and addresses key challenges, has strategies for coordinating the services' renewable energy activities, sets realistic performance measures for achieving the goals, and aligns DOD resources will better enable DOD to meet the renewable energy goals.

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United States Government Accountability Office
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December 18, 2009

The Honorable Solomon P. Ortiz
Chairman
The Honorable J. Randy Forbes
Ranking Member
Subcommittee on Readiness
Committee on Armed Services
House of Representatives

The Department of Defense (DOD) is the largest single energy consumer in the United States—accounting for over 60 percent of all federal government facilities' energy consumption in fiscal year 2006. To put this in a national perspective, if DOD were a state, it would rank between the 35th and 36th largest states, based on total electricity consumption.[1] DOD reported that it spent almost $4 billion on facility energy in fiscal year 2008.[2] Over the course of many years, federal statutes and executive orders have set and revised a number of goals for changing the way federal agencies use or obtain energy.

Existing laws and an executive order direct federal agencies to increase their use of renewable sources of energy such as solar and wind power. First, the Energy Policy Act of 2005 (the 2005 Act) directs federal agencies—"to the extent economically feasible and technically practicable"—that 3 percent of the electrical energy consumed in fiscal years 2007 through 2009 come from renewable energy, with this percentage gradually increasing to 7.5 percent annually beginning in fiscal year 2013.[3] The amount of electricity needed to meet the 3 percent goal in

[1]In this example, we used DOD's total facility electricity use for fiscal year 2007.

[2]DOD divides its energy consumption into two main categories: mobility energy and facilities energy. We have previously reported that mobility energy is required for moving and sustaining DOD's forces and weapons platforms for military operations, while facilities energy is consumed at fixed installations. This report focuses on facilities energy. For previous work on mobility energy, see GAO, *Defense Management: Overarching Organizational Framework Needed to Guide and Oversee Energy Reduction Efforts for Military Operations*, GAO-08-426 (Washington, D.C.: Mar. 13, 2008).

[3]Section 203 of the 2005 Act directs the President, acting through the Secretary of Energy, to achieve these goals on behalf of the federal government as a whole. Furthermore, Department of Energy (DOE) guidance implementing this statutory goal directs each federal agency to meet this goal.

fiscal year 2007 would power about 79,209 homes for 1 year.[4] Second, Executive Order 13423 (the 2007 Executive Order) directs that in each fiscal year, an amount of renewable energy equal to at least half of the statutorily required renewable energy that is consumed by a federal agency must come from "new renewable sources placed into service after January 1, 1999."[5] Third, Section 2852 of the National Defense Authorization Act for Fiscal Year 2007 (the 2007 Defense Authorization Act) established a goal for DOD "to produce or procure" not less than 25 percent of its total electricity consumption during fiscal year 2025 and each fiscal year thereafter, from renewable energy sources.[6,7] The amount of power needed to meet the 25 percent goal in fiscal year 2025 would power approximately 660,080 homes for 1 year.[8] While one of the statutes and the executive order also contain goals for agencies to increase their energy efficiency, this report focuses on goals regarding the use of renewable energy at federal facilities.

[4]This example is based on DOE information concerning the 2007 average residential consumption in the United States and DOD information concerning its fiscal year 2007 facility electricity consumption. We use the example only to provide a sense of the amount of electricity required to meet the goal in the 2005 Act. Because the goal is calculated as a percentage of DOD's annual electricity use, the actual amount of electricity that it represents will likely change annually, along with DOD's electricity consumption.

[5]DOE guidance directs each federal agency to meet the goals in the 2005 Act and the 2007 Executive Order. DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423* (Jan. 28, 2008).

[6]Pub. L. No. 109-364, § 2852(a)(1) (2006) (codified at 10 U.S.C. § 2911). The law directed DOD "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 (as defined in section 203(b) of the Energy Policy Act of 2005)." As explained below, this goal was amended by the National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111-84, § 2842 (2009).

[7]Although not required to do so at the time, DOD reported its progress toward achieving this goal in both fiscal years 2007 and 2008. However, DOD is now required to report its progress toward achieving this goal by the National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111-84 § 332 (2009).

[8]This example is based on DOE information concerning the 2007 average residential consumption in the United States and DOD information concerning its fiscal year 2007 facility electricity consumption. We use the example only to provide a sense of the amount of energy required to meet the goal in the 2007 Defense Authorization Act. Because the goal is calculated as a percentage of DOD's annual electricity use, the actual amount of electricity that it represents will likely change annually, along with DOD's electricity consumption.

This report responds to your request that we review the status of DOD's progress in meeting the three key renewable energy goals. Specifically, for domestic installations,[9] we (1) assessed the progress DOD had made toward the three key goals for consuming renewable energy in fiscal years 2007 and 2008, (2) identified the challenges that may affect DOD's ability to meet the renewable energy goals, and (3) assessed DOD's plans to meet the renewable energy goals.

To determine whether DOD met the three key goals for consuming renewable energy in its domestic installations in fiscal years 2007 and 2008,[10] we reviewed DOD and service guidance and Department of Energy (DOE) guidance applicable to DOD and the services to identify the goals, and we compared the goals to DOD's renewable energy consumption data from DOD submissions to DOE for use in DOE's Annual Report to Congress on Federal Government Energy Management and Conservation Programs for fiscal years 2007 and 2008. To determine the reliability of these data, we interviewed officials at each level of data collection, aggregation, and review: those responsible for entering this information into data collection templates at the facilities level, for summarizing it and checking for accuracy at the headquarters level for each of the services, and for combining the services' data into a total for DOD and assessing the accuracy of this total. We determined that these data were sufficiently reliable for the purpose of determining the extent to which DOD met the renewable energy goals.

To identify the challenges that may affect DOD's ability to meet the renewable energy goals, we reviewed key documents—such as a DOD assessment of installations' potential for renewable energy development—and interviewed officials from the Office of the Secretary of Defense (OSD) and the services (U.S. Army, U.S. Navy, and U.S. Air Force) who are responsible for managing DOD's renewable energy efforts.[11] Because DOD

[9]While there are DOD overseas installations that use renewable energy, this report addresses renewable energy use in DOD installations located in the 50 states.

[10]In this report, we define "renewable energy" as energy generated from solar; wind; biomass; landfill gas; ocean (including tidal, wave, current, and thermal); geothermal (including ground source heat pumps and electric generation); municipal solid waste; or new hydroelectric generation capacity achieved since 1999 from increased efficiency or additions of new capacity at an existing hydroelectric project.

[11]In this report, we define "services" as the U.S. Army, U.S. Navy, and U.S. Air Force because the Department of the Navy manages both the Navy's and Marine Corps' renewable energy programs.

told us that aggregated data on DOD's renewable energy projects were unavailable, we asked OSD to collect data on the location, size, and type of renewable energy projects using a data collection instrument we provided. To determine the reliability of these data provided by OSD, we checked them against previously identified information about a selection of projects, and when we found inconsistencies, we discussed the inconsistencies with OSD and the services and made corrections. We also visited five installations to determine the practical effect of the challenges to meeting renewable energy goals. We selected these installations because they represent each of the services, have different types and sizes of renewable energy projects, and operate in three states.

To assess DOD's plans for meeting the renewable energy goals, we obtained and reviewed OSD and service plans to determine the extent to which they exhibited elements generally found in effective strategic planning documents. We also assessed the information systems the services use to track their renewable energy generation and consumption. Because two of the three services had not developed adequate information systems for monitoring or reporting their use of renewable energy, we did not use data from those systems to determine our findings, and we discuss the limitations of these systems further in our report. Our analysis of DOD's renewable energy production and consumption relied on the annual template reports submitted to OSD and a data collection instrument we developed, and not on the data logged into the services' information systems. In addition, we met with renewable energy experts at DOE's National Laboratories, selected nongovernmental organizations, and the public utility commissions of the states where we also visited DOD installations. We conducted this performance audit from October 2008 to November 2009, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The U.S. Renewable Energy Market

Three characteristics of the U.S. renewable energy market are key to understanding DOD's renewable energy activities: (1) the generally higher cost of renewable energy compared with nonrenewable energy in the

United States; (2) renewable energy certificates; and (3) state standards, mandates, and financial incentives.

Higher Cost of Renewable Energy

According to DOE, in the United States renewable energy is generally more expensive than energy derived from nonrenewable sources.[12] We have previously reported that renewable energy technologies have typically generated more expensive energy than nonrenewable sources because of renewable energy technologies' relatively high up-front capital costs and the fact that they operate intermittently, which results in less generation for every megawatt of installed generation capacity.[13] For example, solar energy can only be generated during daytime hours and wind energy can only be generated during periods of sustained wind activity.

Renewable Energy Certificates

Federal efforts to increasingly rely on renewable energy are taking place within the context of a renewable energy commodities market for buying and selling this energy through renewable energy certificates. In the United States, renewable energy production essentially creates two products: the energy itself and an associated commodity, called a renewable energy certificate. Each renewable energy certificate represents a certain amount of energy generated using a renewable resource.

According to the Environmental Protection Agency, these certificates represent the environmental attributes of renewable energy generation (e.g., 1 megawatt hour of wind power) that has been produced by private or public entities and can be sold to other parties,[14] including DOD and the services.[15] According to DOE's National Renewable Energy Laboratory, the

[12]DOE, Energy Information Administration, *Annual Energy Outlook 2009*, DOE/EIA-0383 (Washington, D.C., March 2009).

[13]GAO, *Advanced Energy Technologies: Budget Trends and Challenges for DOE's Energy R&D Program*, GAO-08-556T (Washington, D.C.: Mar. 5, 2008), and *Advanced Energy Technologies: Key Challenges to Their Development and Deployment*, GAO-07-550T (Washington, D.C.: Feb. 28, 2007).

[14]A watt is the basic unit used to measure electric power. A watt-hour is equal to a watt of power applied for 1 hour. A kilowatt-hour is 1,000 watt-hours, and a megawatt-hour is 1,000 kilowatt-hours.

[15]According to the Environmental Protection Agency, one example of an environmental attribute is the avoided carbon emissions from renewable energy generation, compared to nonrenewable generation. The renewable energy certificate associated with a specific source of renewable energy generation and the reporting rights to the avoided emissions associated with the certificate are also considered an environmental attribute.

certificates provide renewable energy producers with an extra stream of revenue that helps to offset the higher cost of renewable energy projects.[16] Bought and sold in a fashion similar to stocks and bonds, renewable energy certificates are a commodity with fluctuating prices. According to DOE's Pacific Northwest National Laboratory, the relative instability of the price for renewable energy certificates is a result of fluctuations in demand for these certificates.[17] In addition, these certificates facilitate the buying, selling, and trading of renewable energy without the need to actually transmit the electricity to each customer holding a certificate.

However, under DOE guidance for implementing the 2005 Act goal to obtain 3 percent of electricity from renewable sources and the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999, an agency can count renewable energy certificates toward these goals only if the certificate is retained by the agency, retired, or precluded from transfer to a third party.[18] This is because, according to the DOE guidance for implementing these two goals, if more than one party owns the same certificate, the credibility of the certificates in the general market could be jeopardized. Thus, if the federal agency does not retain, retire, or preclude the transfer of the certificate, it cannot claim the renewable energy that certificate represents toward the 2005 Act and 2007 Executive Order goals.

In order to follow this guidance, an installation or service buying renewable energy has two options: buy both the energy and the certificate or buy just the certificate. Purchasing the energy and certificate together is referred to as buying "bundled" renewable energy. When a purchaser buys only the certificate, the renewable energy associated with the certificate is sold to another consumer without the certificate, and is known as buying "unbundled" energy. For instance, at one Air Force installation we visited, Air Force officials explained that the owner of a photovoltaic array located

[16]DOE, National Renewable Energy Laboratory, *Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges*, NREL / TP-620-37388 (Golden, Colo., January 2005).

[17]DOE, Pacific Northwest National Laboratory, *Purchasing Renewable Power for the Federal Sector: Basics, Barriers, and Possible Options*, PNNL/16485. (Richland, Wash., April 2008).

[18]DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, §§ 3.2.1, 3.3.1.

on the installation sells the project's certificates to the local utility and sells the unbundled energy to the installation. DOD often buys only the certificate, to avoid the cost of developing its own projects.[19] Another reason a federal agency, such as DOD, would purchase certificates is that according to DOE guidance pertaining to the goals in the 2005 Act and 2007 Executive Order, purchasing and retaining these certificates is one way for an agency to get credit toward meeting these two renewable energy goals. This allows DOD installations that do not have renewable resources to contribute to achieving the renewable energy goals to which DOD is subject. However, it is important to note that if DOD buys only the certificate, the department is not purchasing actual energy that it can use to run its installations. This means that if DOD purchases just the certificate, the department still needs to buy actual energy at an additional cost.

For instance, a DOD installation without any renewable energy projects could purchase a certificate for 1 megawatt hour of renewable energy generated elsewhere—for example, from utility-owned wind turbines in a different state. According to the DOE guidance implementing the 2005 Act goal to obtain 3 percent of electricity from renewable sources and the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999, DOD's ownership of a renewable energy certificate is the key requirement if energy is to count toward either of these goals. For example, an agency can count energy toward the goals in the 2005 Act and 2007 Executive Order by purchasing a certificate for 1 megawatt hour of renewable energy plus the actual energy (that is, by purchasing bundled renewable energy), by using one megawatt of renewable energy from a project on federal land or owned by a federal agency and retaining or retiring a certificate, or by purchasing just a certificate for 1 megawatt hour of renewable energy generated elsewhere. In each case, the key qualification for counting the energy toward these two goals is that DOD retains or retires a renewable energy certificate. However, it is important to note that if DOD buys only the certificate, the department is not

[19]Although DOD purchased a substantial amount of unbundled renewable energy certificates in fiscal years 2007 and 2008, it is important to note that according to DOD data, there are 217 renewable projects located on or near DOD's installations in the 50 states; we discuss these projects throughout the report. In fiscal years 2007 and 2008, the renewable energy DOD claimed toward the goals came from each of the applicable categories: production of bundled renewable energy from such projects; purchases of bundled renewable energy; and purchases of unbundled renewable energy certificates.

purchasing actual energy that it can use to run its installations. This means that if DOD purchases just the certificate, the department still needs to buy actual energy at an additional cost.

Further, for the purposes of the 2005 Act goal, a bonus equivalent to doubling the amount of renewable energy used or purchased is available for qualified renewable energy sources generating electricity on federal or Indian lands, when that electricity is consumed at a federal facility, and the renewable energy certificates are not transferred to a party outside the federal government.[20] For example, at one Marine Corps installation we visited, Marine Corps officials explained that the installation consumes renewable electricity from a photovoltaic solar array located on-site, and because DOD owns the array, it also owns the certificates associated with the project's renewable electricity. In this case, because the project is located on federal land, DOD consumes the electricity, and DOD retains the certificates, the department can claim the bonus, counting the project's total amount of electricity twice toward the goal in the 2005 Act. However, if the agency is operating such a project that otherwise qualifies for the bonus and then transfers the renewable energy certificates to a party outside the federal government, the agency gives up its right to count that amount of renewable energy for its goal, as well as its right to claim the bonus.

If an agency wishes to transfer the renewable energy certificates to a party outside the federal government and still count the project's energy toward the goal in the 2005 Act, the agency must purchase renewable energy certificates from another source, effectively replacing the project's original certificates that the agency transferred. For the purposes of this report, we call these additional certificates replacement certificates. According to DOD data, the department has been able to utilize this approach. For

[20]According to the DOE guidance, this bonus equivalent is available if any of the following conditions are met: (1) the renewable energy is produced and used on-site at a federal facility; (2) the renewable energy is produced on federal lands and used at a federal facility; (3) the renewable energy is produced on Indian land and used at a federal facility; or (4) the electricity produced on-site at a federal facility is sold to a third party, but the power purchase contract explicitly states that the federal agency retains ownership of the related renewable energy certificates and nonenergy attributes, the energy buyer is precluded from representing that such purchased energy is "renewable" for any purpose, and all renewable energy and nonenergy attributes must be retained on-site. Further, nonelectric energy from renewable sources is not eligible for the bonus. DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, § 3.4.

instance, in fiscal year 2008, 190,964 megawatt hours of renewable energy certificates purchased by DOD were eligible to be used as replacement certificates by the department. Because DOD had renewable energy projects for which it had not retained the original certificates, it was able to use these replacement certificates to claim 190,964 megawatt hours of renewable energy toward the 2005 Act goal to obtain 3 percent of electricity from renewable sources.

State Standards, Mandates, and Financial Incentives

Many states have established policies that promote renewable energy. Specifically, according to the Database of State Incentives for Renewables and Efficiency,[21] as of September 2009,

- 34 states and the District of Columbia have established renewable portfolio standards requiring or encouraging that a fixed percentage of the electricity consumed in the state be generated from renewable sources;
- 40 states and the District of Columbia have established interconnection rules for electric utilities to connect renewable energy sources to the power transmission grid, which in some cases allows nonutility power producers to receive credit for excess generation; and
- 48 states and the District of Columbia offer tax credits, grants, or rebates to stimulate the development of renewable energy projects.

Federal law requires DOD to comply with state laws governing the provision of electric utility services when using appropriated dollars to purchase energy.[22] Certain types of state laws can affect DOD renewable energy projects. For example, the energy manager at a Navy installation we visited told us that because of a fee called a departing load charge, the installation had decided to reduce the size of a planned solar project from an estimated 15 to 20 megawatts to 5 megawatts. At the time this decision was made, utilities in the state where this installation is located could charge a customer this type of fee if the customer self-generated a portion of its electricity, reducing the amount of electricity the customer would purchase from the utility. According to Public Utilities Commission officials in this state, fees like the departing load charge exist so that utilities can recoup their investment in the energy infrastructure the

[21]This database is available at http://www.dsireusa.org and is maintained by staff at the North Carolina State University in partnership with the Interstate Renewable Energy Council, and is funded by the DOE.

[22]Section 591(a) of Title 40, U.S. Code. In addition, DOD must comply with state utility commission rulings and electric utility franchises or service territories established under state statute, state regulation, or state-approved territorial agreements.

utilities initially built to supply 100 percent of their customers' electricity demand. In the case of the Navy installation we visited, once the proposed solar project began operating, the installation would have purchased less electricity from the utility because a portion of its electricity needs would be satisfied by the solar project. According to Navy officials, concerns about the impact of the departing load charge influenced the decision to reduce the size of the solar project.

Sources of Funding for Renewable Energy Projects

DOD has funded renewable energy projects on its installations using both up-front appropriated dollars and various types of agreements with private sector entities.[23] DOD primarily uses funding from two kinds of appropriation accounts to develop renewable energy projects. First, DOD uses a military construction account to pay for the Energy Conservation Investment Program—funding that Congress provides directly to OSD and that OSD, in turn, allocates to each of the services. Program funds are specifically directed toward energy conservation and renewable energy projects. Second, the services' annual operation and maintenance appropriations provide funding that many installations have used to support small renewable energy projects.[24]

DOD has also joined with private sector entities, entering into various types of arrangements to develop renewable energy projects. Because these different arrangements with the private sector provide DOD with an alternative to using only up-front appropriations to fund renewable energy projects, we refer to these arrangements as alternative financing approaches. For the purposes of this report, we define an alternative financing approach as any funding arrangement other than projects in which total project costs are funded only through full up-front appropriations. DOD has entered into several different types of these approaches that have resulted in renewable energy projects.

[23]In this report, we define appropriated funding as "up-front" when DOD has sufficient funding to pay for the full cost of the renewable energy project before a commitment is made for the project, instead of the funding DOD uses to make payments on capital borrowed through certain types of alternative financing approaches. We have previously reported that full up-front appropriations are the best way to maintain governmentwide fiscal control. See GAO, *Budget Issues: Alternative Approaches to Finance Federal Capital*, GAO-03-1011 (Washington, D.C.: Aug. 21, 2003).

[24]For purposes of this report, we define "small" renewable energy projects as those under 1,000 million British thermal units of renewable energy production per year.

Roles of OSD and the Services in DOD's Renewable Energy Activities

According to DOE guidance implementing the 2005 Act goal to obtain 3 percent of electricity from renewable sources and the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999, as well as the 2007 Defense Authorization Act goal that 25 percent of electricity consumed by DOD come from renewable sources in 2025,[25] DOD as a department—rather than each of the services—is responsible for meeting the goals. However, within DOD, the activities required to meet these goals are carried out by both OSD and the services. DOD Instruction 4170.11 specifies that the Office of the Deputy Under Secretary of Defense (Installations and Environment) acting under the authority, direction, and control of the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) oversees the military services' renewable energy activities, is responsible for implementing policies and providing guidance to manage installation energy resources, and is responsible for providing annual programming guidance and overseeing the achievement of the energy goals and objectives.[26] The services are responsible for implementing OSD's guidance to meet the goals. The services do so by purchasing bundled renewable energy, unbundled renewable energy certificates, and developing renewable energy generation projects on their installations.

[25]DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, and Section 2911(e) of Title 10, U.S. Code.

[26]DOD Instruction 4170.11, Installation Energy Management, enc. 2 § 1 (Dec. 11, 2009).

DOD Met the 2007 Goals, Missed a 2008 Goal, and Overstated Reported Progress in Both Years toward the 2007 Defense Authorization Act Goal

DOD Met Both Goals in Fiscal Year 2007

According to DOD's fiscal year 2007 submission for DOE's Annual Energy Management Report, DOD met both of the goals regarding its installations' consumption of renewable energy in fiscal year 2007. In fiscal year 2007, 5.5 percent of DOD's total electricity consumption was from renewable sources, exceeding the 2005 Act goal of obtaining 3 percent of electricity from renewable sources. In the same year, 3.3 percent of the renewable energy consumed by DOD was "new," exceeding the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999.

DOD Narrowly Missed a Goal in Fiscal Year 2008

According to DOD's fiscal year 2008 submission for DOE's Annual Energy Management Report, DOD met only one of the two applicable goals regarding the consumption of facility renewable energy in fiscal year 2008. Specifically, in fiscal year 2008, 2.9 percent of DOD's total electricity use was derived from renewable sources, thus falling just short of the 2005 Act goal of obtaining 3 percent of electricity from renewable sources. In the same year, 1.8 percent of the renewable energy consumed by DOD was "new"—exceeding the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999.

DOD missed meeting the 2005 Act goal in fiscal year 2008 because the price of renewable energy certificates increased significantly from fiscal year 2007 to fiscal year 2008, and as a result, DOD purchased fewer of these certificates. In fiscal year 2007, DOD relied on unbundled renewable energy certificates for almost 90 percent of the renewable energy that it purchased. In that year, DOD purchased certificates that allowed it to claim credit for approximately 0.88 million megawatt hours of energy. However, in fiscal year 2008, the price of the certificates rose almost 185

percent. Responding to the increase, DOD bought substantially fewer renewable energy certificates that year—purchases that allowed DOD to claim credit for 0.32 million megawatt hours. According to an OSD official, that fiscal year 2008 decrease in the amount of renewable energy that DOD could claim caused the department to miss the 2005 Act goal of obtaining 3 percent of electricity from renewable sources. As a result, DOD's total consumption of renewable energy, including that claimed through renewable energy certificates, decreased, and DOD missed the 2005 Act goal for fiscal year 2008.

DOD Overstated Its Fiscal Years 2007 and 2008 Progress toward the Defense Authorization Act Goal for Fiscal Year 2025

DOD's fiscal years 2007 and 2008 progress toward the fiscal year 2025 goal—reported in DOD's submissions to DOE for the Annual Energy Management Report—was overstated because DOD counted nonelectric renewable energy that under the 2007 Defense Authorization Act, DOD should not have counted. It is important to note that the National Defense Authorization Act for Fiscal Year 2010 contains several amendments to the language defining the goal in the 2007 Defense Authorization Act that change the goal's requirements.[27] For example, DOD will be able to count nonelectric renewable energy toward the 2025 goal. However, regardless of changes in the goal's requirements, DOD overstated its progress toward the goal in fiscal years 2007 and 2008.

A key OSD official acknowledged that DOD incorrectly included nonelectric energy in its reported progress toward the 2007 Defense Authorization Act goal of having 25 percent of its total electricity consumption during fiscal year 2025 come from renewable energy sources. According to this official, beginning in fiscal year 2007, DOD adopted an internal policy goal to obtain at least 25 percent of its installations' total energy from renewable resources by fiscal year 2025. Under this internal DOD policy, all types of renewable energy counted toward the goal. However, Congress incorporated a similar statutory goal into the fiscal year 2007 Defense Authorization Act. At that time, Congress specified that only renewable electricity could be counted toward this statutory goal. But, according to OSD and service officials, in fiscal years 2007 and 2008 the Army, Navy, and OSD did not adapt their calculations to the act's new definition of what type of renewable energy counts toward the goal, incorrectly adding nonelectric renewable energy to electric renewable energy in their calculations of progress toward the goal.

[27]Pub L. No. 111-84, § 2842 (2009).

OSD Has Not Issued Guidance to Clarify What Should Be Included in Its Calculations of Progress toward the 2025 Goal Found in the 2007 Defense Authorization Act

According to the 2007 Defense Authorization Act, DOD's goal was 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."[28] Previous GAO work has shown that performance measures should be clearly stated and the definitions of key terms should be consistent with the methodology used for calculating the measure.[29] In calculating its progress toward the 2025 goal, DOD utilized an accounting method that includes renewable energy where DOD "facilitates the production, but does not directly consume the renewable energy." However, OSD has not issued guidance that provides a clear explanation of this methodology and its legal rationale for how its accounting method is consistent with the language of the statute. In particular, OSD has not defined several key terms in the act, including "produce" and "consumes." Without additional information on DOD's accounting method,[30] it is unclear whether renewable electricity where DOD has "facilitated production" on DOD land—but has not "directly consumed" such renewable energy—should properly be included in OSD's calculation of progress toward the goal. Further, without such clarification from OSD, it is unclear how the services are to properly implement the 2007 Defense Authorization Act goal.

DOD has utilized an accounting method in calculating its progress toward the 2007 Defense Authorization Act goal where "the Department facilitates the production, but does not directly consume the renewable energy."[31] Pursuant to this accounting method, in its fiscal years 2007 and 2008 submissions for DOE's Annual Energy Management Report, OSD reported DOD's progress toward the 2007 Defense Authorization Act goal by using a

[28]In the act, "renewable energy sources" are those resources defined as renewable in section 203(b) of the Energy Policy Act of 2005 (42 U.S.C. 15852(b)). As explained above, the 2025 goal in the 2007 Defense Authorization Act was amended by the National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111-84, § 2842 (2009).

[29]GAO, *Agencies' Strategic Plans Under GPRA: Key Questions to Facilitate Congressional Review*, GAO/GGD-10.1.16 (Washington, D.C.: May 1997).

[30]Because of this lack of clarity, in June 2009, we requested that DOD's Office of General Counsel provide us with DOD's legal rationale for counting renewable energy not consumed by DOD toward the 2007 Defense Authorization Act goal. We also asked several questions related to DOD's interpretation of the act, including DOD's definition of key terms and the extent to which DOD's current methodology is consistent with the plain language of the act. As of December 2009, DOD had not responded.

[31]DOD, *Report to Congress on Renewable Energy* (Washington D.C., April 2008), 4.

calculation that included renewable electricity from a power plant that uses a renewable resource on DOD land but does not supply renewable electricity to DOD. Specifically, OSD included the renewable electricity produced at one geothermal power plant located on a Navy installation toward the 2007 Defense Authorization Act goal, although the Navy did not use or purchase the renewable electricity produced at this location. Given that the statute stated that it shall be DOD's goal 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" (emphasis added), DOD's legal rationale for how this accounting method is consistent with the language of the statute is unclear.

When DOE issued guidance on the implementation of the 2005 Act and the 2007 Executive Order, it provided extensive information to federal agencies on the implementation of the goals and the definition of terms. Specifically, the DOE guidance provides several paragraphs as to how projects and purchases qualify as "consumed" electricity in order to be counted toward the 2005 Act requirement, and addresses the requirements for use of renewable energy certificates in that context.[32] However, OSD has not issued guidance that provides a clear explanation of its methodology for calculating progress toward the goal contained in the 2007 Defense Authorization Act, including an explanation of how its accounting method is consistent with the language of the statute. For example, DOD's April 2008 report stated that DOD "produce[s]" energy that meets the terms of the statute when it "facilitates the production" of renewable energy, but the circumstances under which DOD has "facilitate[ed] the production" of renewable energy to such an extent as it may be considered "produced" by DOD, as the statute specifies, are unclear.[33] As another example, DOD's April 2008 report stated that DOD counts energy toward the 2007 Defense Authorization Act goal when it does not "directly consume" such energy. However, the circumstances under which DOD has indirectly consumed such energy are unclear, as is the extent to which this indirect consumption is consistent with the statute's requirement to consume such energy. Because OSD has not

[32]DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, § 3.

[33]It is unclear, for example, whether DOD would consider energy that is generated by a private developer on DOD land where DOD is not directly involved in the production and distribution of that renewable energy as "produced" by DOD.

provided such guidance on its method of accounting for renewable energy use, it is unclear whether OSD's inclusion of renewable geothermal electricity that DOD neither directly produced nor "directly consumed" in its calculation of progress toward the goal is consistent with the act. Further, without such clarification from OSD, it is unclear how the services are to properly calculate progress toward the 2007 Defense Authorization Act goal.

This lack of clarity is significant because whether electricity from this geothermal power plant is properly included may have a serious effect on how much progress OSD reports to Congress in meeting the 2007 Defense Authorization Act goal. Because this plant generates nearly three-fourths of the total domestic renewable energy produced on DOD land, by including the plant's electricity as part of the total amount of electricity that qualifies for the 2007 Defense Authorization Act goal, OSD calculated that DOD achieved substantial progress toward the goal in fiscal years 2007 and 2008. In contrast, if OSD does not include the plant's electricity in its future reporting, it could likely report significantly less progress toward the 2007 Defense Authorization Act goal.

Without providing a clear definition of either the key terms in the act or a methodology for calculating progress toward the goal, OSD cannot ensure that the information on its progress toward meeting the goal is consistent or can be compared to past years' information. Further, in the absence of such clarification from OSD, it is unclear how the services are to properly implement the 2007 Defense Authorization Act goal. Thus, until OSD addresses this lack of clarity, DOD will not be able to accurately measure its own progress toward the goal or accurately report on its progress to Congress.

DOD Faces Three Key Ongoing Challenges to Its Ability to Meet the Renewable Energy Goals

Development of Renewable Energy Projects Is Not Always Compatible with the Primary Mission of a DOD Installation

According to a 2005 DOD study,[34] renewable energy projects may sometimes be incompatible with installations' needs for land use to meet primary mission objectives. Officials from DOD and most of the state public utility commissions with which we met told us that when renewable projects and an installation's primary mission are in potential competition, it is possible to develop these projects while maintaining mission effectiveness. This balance has been achieved when installation officials have found accommodations that enable a project to be developed without compromising primary mission objectives. However, OSD officials have acknowledged that OSD has not provided guidance indicating when it is appropriate for installation officials to develop such accommodations. Thus, DOD may not be availing itself of potential opportunities for renewable projects on its land.

The 2005 DOD study determined that the potential impact of a project on an installation's mission reduces DOD's ability to fully utilize all of the renewable resources on its installations. According to data included in the study's implementation plan, while DOD had the potential to annually obtain enough renewable energy to equal 20 percent of DOD's total facility electricity use,[35] the incompatibility between renewable energy projects and the primary mission of some installations would likely prevent DOD from fully realizing this potential. Officials at four of the five installations we visited explained that they had decided not to encroach on the land used for core mission activities in order to meet the renewable energy goals. For example, a Marine Corps installation we visited conducted an

[34]DOD, *Report to Congress: DOD Renewable Energy Assessment Final Report* (Washington, D.C., Mar. 14, 2005).

[35]This calculation was performed using the amount of electricity consumed by DOD installations in fiscal year 2006. The scope of the DOD study included generation of renewable energy on installations, generation of renewable energy on land near installations, and purchases of renewable energy.

assessment of wind resources that determined there were sufficient prevailing winds to install wind turbines to generate electricity. However, the location of this resource was designated for training activities involving rotary-wing aircraft and live-fire exercises—activities that installation officials determined to be incompatible with the siting and operation of wind turbines. DOD may also identify renewable energy projects outside its installations as incompatible with the installations' primary mission objectives. For example, an Air Force installation commander requested that the Department of the Interior's Bureau of Land Management withdraw permits for a planned solar thermal plant 20 miles from the installation. The request noted that the tower required for the solar thermal plant would hamper installation operations, including the operation of military radar.

In addition, the transmission and distribution infrastructure required to convey power from renewable energy projects to an installation's buildings or to the utility grid can sometimes be affected by an installation's mission. For example, officials at a Navy installation we visited told us that they were planning to install a solar photovoltaic system adjacent to the installation's existing geothermal plant, to allow the geothermal plant to run more efficiently by providing power to cool the plant's turbines. However, if the installation was to use the power generated by the solar and geothermal plants, the power lines required to distribute the power to the installation would have to be routed around areas designated for testing of live ordnance. The installation energy manager told us that the additional cost to route the power lines around the testing areas would make the project too costly to implement.

However, it is sometimes possible to develop renewable projects while maintaining mission effectiveness even when there is potential incompatibility between the two. For example, at one Air Force installation we visited, the installation officials were restricted in their ability to install a photovoltaic array due to concerns from the air operations staff that reflections from the array could disrupt training. A resolution to the incompatibility of installation needs was found by placing the array in a location that did not conflict with training, yet had an adequate solar resource. In another example, representatives from federal land management agencies, the services, and county officials worked with DOD installations to develop a map that indicates the height of wind turbines that require DOD review. In a certain part of the map colored red, all turbines over 200 feet need to be reviewed by DOD to ensure compatibility with the installations' mission. In other areas, colored green, no DOD review is required.

According to the officials responsible for drafting DOD's energy security strategy, decisions about specific renewable energy projects should be made at the installation level because of the differing specifics of each project. But, according to these officials, DOD's draft energy security strategy does not provide guidance to enable installation officials to develop the accommodations that may be possible and required to develop renewable energy projects that do not affect an installation's primary mission. While many states have established goals requiring or encouraging that a fixed percentage of the electricity consumed in the state be generated from renewable sources, state government officials we interviewed said that they have removed DOD installations from consideration as possible sources for the renewable energy required to meet these state goals because of a lack of guidance specifying where renewable energy projects can be located on DOD lands. A senior OSD energy official has acknowledged that base commanders need to do a better job "compromising" between the two goals of primary mission execution and renewable energy project development and that OSD needs to do a better job of providing guidance to these commanders on their consideration of such projects. At the time of our report, the services were conducting assessments to determine which installations can most cost effectively develop locally available resources. However, the lack of OSD guidance indicating when it is appropriate for installation officials to develop such accommodations to establish a balance between renewable energy projects and an installation's mission may delay or impede the development of renewable energy projects on and around DOD installations.

Purchasing or Generating Renewable Energy May Conflict with DOD Policy and DOE Guidance to Invest in Renewable Energy Cost Effectively

Both DOD policy and DOE's guidance implementing the 2005 Act goal to obtain 3 percent of electricity from renewable sources and the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999, encourage agency investment in renewable energy projects when it is cost-effective.[36] DOD requires its facilities to use life-cycle cost analysis to determine whether a planned energy project is cost-effective relative to the status quo, and the DOE guidance notes that agencies

[36]Further, the language of the 2005 Act goal itself directs fulfillment of the goal to obtain a certain percentage of energy from renewable sources "to the extent economically feasible and technically practicable."

should develop certain on-site renewable energy systems when "life-cycle cost-effective" to do so.

However, as we have previously reported, energy from renewable sources generally costs more than energy from nonrenewable sources, such as fossil fuels.[37] According to our analysis of DOD data, most DOD installations would need to spend more money to generate or purchase renewable electricity than they would to purchase conventional electricity offered by their local utilities. That is because the cost of renewable electricity is often greater than the cost of conventional electricity, the latter of which makes up the majority of the electricity sold by utilities.[38] Furthermore, in most states, DOD's installations pay below-average rates for nonrenewable electricity.[39] That means that most domestic DOD installations are even more likely to pay a higher price for renewable electricity than for the nonrenewable electricity provided by their local utilities. Thus, it may be challenging for DOD to develop on-site renewable energy systems that qualify for the goals while also attempting to follow DOD policy and DOE guidance that encourage investment in renewable energy projects when cost-effective.

One way for DOD to partially mitigate the challenges posed by higher-cost renewable electricity may be to purchase or generate nonelectric renewable energy, which DOD officials explained is more cost-effective than electric sources. Our analysis of DOD data indicates that a sizable proportion—26 percent—of DOD's total on-site domestic renewable energy production comes from nonelectric renewable energy sources. Ground source heat pumps are an example of nonelectric renewable technology; they provide nonelectric heating and cooling by using the constant temperature of the earth.[40] These heat pumps are used in 5 of the

[37]GAO, *Department of Energy: Key Challenges Remain for Developing and Deploying Advanced Energy Technologies to Meet Future Needs*, GAO-07-106 (Washington, D.C.: Dec. 20, 2006), and GAO-07-550T.

[38]According to GAO analysis of DOE data, almost all of the electricity generated in the United States comes from nonrenewable sources. For instance, in 2008, 91 percent of U.S. electricity generation came from power plants using nonrenewable sources of fuel, such as coal, natural gas, and nuclear material.

[39]We compared prices paid by DOD installations to the average price for utility-delivered electricity in the states in which the installations were located.

[40]According to the Environmental Protection Agency, these heat pumps are underground coils used to transfer heat from the ground to the inside of a building. See http://www.epa.gov/OCEPATERMS/gterms.html.

10 largest renewable energy projects on domestic DOD installations. According to DOE documentation, after 5 to 10 years, installations that install these pumps would save enough money through the pumps' operation to repay the financing used to purchase and install them.[41] In contrast, according to Navy officials, an installation that installs a renewable electric technology, such as a photovoltaic solar array, could have a substantially longer payback period—up to 35 years. However, according to the guidance and law that implement and establish the renewable energy goals, nonelectric renewable energy sources only qualified toward one of the three goals—the goal found in the 2007 Executive Order stating that an agency is to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999. As discussed earlier in this report, the National Defense Authorization Act for Fiscal Year 2010 amends the language defining the goal in the 2007 Defense Authorization Act. For example, DOD will now be able to count nonelectric renewable energy toward the 2007 Defense Authorization Act goal. However, as discussed earlier in the report, OSD has provided neither a clear definition of key terms in the act nor a methodology for calculating progress toward the goal. As a result it is unclear what effect these changes will have on the amount of progress DOD will be able to claim toward meeting this goal.

Another example of the challenge faced by DOD to implement cost-effective renewable energy projects involves the use of renewable energy generation as a source of backup power on DOD installations. According to DOD officials, it is particularly difficult to develop on-site renewable energy for backup power that is cost-effective because this use of renewable energy presents two technical challenges that make it expensive relative to conventional sources of backup power.

- First, because certain renewable energy technologies,[42] such as solar and wind, provide intermittent power, they require batteries to store the energy they produce or supplementary, conventional generation to ensure uninterrupted power. For example, because solar energy can only be

[41]The payback data were obtained from the DOE Energy Efficiency and Renewable Energy: Energy Savers Web site at http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12640.

[42]Certain types of renewable electricity generation technologies—such as geothermal and biomass—can provide uninterrupted power, but because of certain limitations, relatively few DOD installations can use these types of renewable energy. For example, the distribution of these types of resources is limited to certain parts of the country.

generated during daylight hours, the average solar project operates approximately 20 percent of the hours in a year, according to industry standards. According to DOD officials, the battery technology needed to store a solar project's electricity is currently too expensive for most installations to install. At one installation we visited, batteries and supplementary conventional power—to be used during the night and on cloudy days—would be necessary if the installation used its solar array as source of backup power. However, according to installation officials, this additional equipment would cost an estimated $50 million, increasing the original cost of the project by about 50 percent.

- Second, technical and safety challenges require special controls to integrate the on-site renewable energy generation with an installation's existing electrical infrastructure and operate the renewable technology safely during a power supply disruption. The technology required for coordinating an on-site generation project—renewable or nonrenewable—with power delivered by the utility grid is costly. For example, at one installation we visited, DOD officials explained that using either of the two on-site renewable energy projects as a source of backup power would require upgrades to the installation's energy distribution network that would allow the installation to switch from grid-delivered power to on-site power. These officials told us that such upgrades would be prohibitively expensive. Further, because of safety concerns, an installation's interconnection agreement with its utility company requires that any on-site generation be switched off during utility grid outages external to the installation, to ensure that external utility wires are not electrified during repairs. Only one of the five installations we visited had installed a renewable energy system that allowed part of the installation to operate during an off-installation utility outage. That installation designed its distribution system to enable a solar photovoltaic system to power certain buildings during power outages, but this system relies on natural gas backup, increasing the total project cost.

DOD officials explained that because renewable energy has a relatively higher cost than conventional alternatives, it is less feasible as a source of backup power for domestic installations. As a result of the high costs associated with using renewable energy as a source of backup power, installations generally rely on diesel generators for backup power. Because DOD policy requires energy projects to be cost-effective over their life cycles, and renewable energy projects are generally more expensive than nonrenewable energy projects, renewable energy projects are rarely selected to provide backup generation on military installations.

Alternative Financing Approaches Are Potentially Beneficial, but DOD Faces Three Key Obstacles in Implementing Them

According to DOD officials, entering into alternative financing approaches to develop renewable energy projects offers three main advantages to DOD. First, certain alternative financing approaches may be more cost-effective than DOD-funded and DOD-owned development of larger renewable energy projects. According to DOD officials, entering into alternative financing approaches to develop renewable energy projects may increase the likelihood of developing these projects on DOD land. This is because private developers have more options than DOD when it comes to obtaining project financing. For instance, developers can sell either the project's energy or renewable energy certificates to a third party, such as the local utility. However, DOD officials stated that DOD cannot make these types of sales. In addition, according to DOD officials, in some cases, private developers are able to accept renewable energy incentives, such as tax credits, that DOD cannot claim.

The second advantage, according to DOD officials, is that the government can realize significant benefits when renewable energy projects are owned by private developers because the contractor may provide operation and maintenance of the equipment. For example, officials at an Air Force installation we visited explained that their maintenance staff does not have anyone with the expertise to operate and maintain the installation's renewable projects, and because contractors perform these functions, the installation does not need to hire additional staff to perform these tasks.

Finally, although the services use up-front appropriated funding to develop smaller renewable energy projects, DOD officials explained that up-front appropriated funding may be a poor fit for developing the larger, higher-cost renewable projects that a key official says are necessary to achieve the renewable energy goals. According to GAO analysis of DOD project data, the services primarily use two types of up-front appropriated funding for smaller renewable projects: the Energy Conservation Investment Program, funded with a military construction account, and the operations and maintenance accounts. Because the total amount of annual Energy Conservation Investment Program funding is divided among the services, officials explained that they are limited in the amount of resources they can commit to a high-cost project from that account. According to DOD, OSD generally grants Energy Conservation Investment Program funding for potential renewable projects based on analysis of the project's life-cycle costs; the less an installation's energy costs, the less likely it may be to receive funding from that account. Because many DOD installations pay low rates for utility-delivered electricity, their proposals for Energy Conservation Investment Program funds to develop renewable projects

are often not selected, increasing the challenge DOD faces in funding projects that meet the criteria for funding.

According to DOD officials, operations and maintenance funding may also be difficult to use for the development of the large, higher-cost renewable projects that the services plan to develop to meet DOD's renewable energy goals. For instance, according to an Army official, the service considered building a 35-megawatt concentrated solar thermal plant. If completed, this project would be one of the largest on DOD land. According to this official, the Army estimated that the project would require an estimated $1.8 billion in appropriated funding. Because annual allocations of operations and maintenance funding are typically limited to $750,000 per project,[43] these funds may not be sufficient to fund such large, costly projects.

Although DOD has developed many small renewable energy projects with up-front appropriated funding, it has relied on alternative financing approaches for its relatively few large renewable energy projects. For example, GAO analysis of DOD data indicates that while the majority—74 percent—of renewable energy projects are funded using up-front appropriations, these projects only generate 13 percent of renewable energy produced on DOD land. In contrast, while only 18 percent of projects are funded using alternative financing, these projects generate the majority—86 percent—of renewable energy produced on DOD land.

Because alternative financing can supplement up-front appropriated funding, the services have encouraged the use of such approaches, in which a private developer provides much or all of the funding required to develop an energy project that uses a renewable source on, or close to, DOD land. We determined that although these approaches can make more funding available for DOD renewable energy projects, DOD needs to overcome the following three key obstacles to implementing these approaches.

- First, specific, local circumstances at installations can limit financing options for renewable energy projects and limit DOD's ability to develop a departmentwide strategy for financing projects.
- Second, DOD has a relatively small community of officials with the necessary expertise to develop and manage these approaches.

[43] 10 U.S.C. § 2805(c).

- Third, under DOE guidance, unless agencies meet two criteria, the agencies cannot count renewable energy from projects built at federal facilities or owned by a federal agency but located on private property toward the goal in the 2005 act goal of obtaining 3 percent of their electricity from renewable sources and the 2007 Executive Order goal to obtain an amount equal to half of the statutorily required renewable energy from sources placed into service after January 1, 1999.[44] The first criterion is that the renewable energy be produced and used on-site by a federal agency, or the renewable energy be produced by a project owned by a federal agency but installed on private property. The second criterion is that the agency retain or replace the renewable energy certificates associated with the energy produced. Thus, because alternative financing arrangements often require agencies such as DOD to permit the private developer to take possession of the renewable energy certificates, DOD would not be able to count the energy produced by alternatively financed projects toward the 2005 Act and 2007 Executive Order goals.

Limitations Caused by Local Conditions at Installations

If installation officials wish to use an alternative financing approach, they could use one of several types, including Energy Savings Performance Contracts and Utility Energy Service Contracts.[45] However, in practice, the type of approach chosen by an installation can depend on the specific financing options locally available to that particular installation. For example, an official at an Air Force installation we visited told us that the installation has only been able to use Energy Savings Performance Contracts. This is because the local electric utility has not offered a Utility Energy Service Contract, as in this type of contract the utility usually earns a profit only after demonstrating that it has saved its customer money by decreasing the amount of money the customer spends on energy. Because the installation's electricity prices are already low, it would be difficult for the utility to further lower the installation's energy costs. While an installation official stated that the installation is interested in developing additional renewable energy projects, he explained that the installation

[44]DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, § 3.2.1, 3.2.2.

[45]Energy Savings Performance Contracts allow federal agencies to hire a contractor to develop energy conservation or renewable energy projects with the expectation that the annual savings from the project will fund the project's annual costs. We have previously reported the Energy Savings Performance Contracts are likely to be more expensive over the long run than using full upfront appropriations to purchase assets; see GAO, *Capital Financing: Partnerships and Energy Savings Performance Contracts Raise Budgeting and Monitoring Concerns*, GAO-05-55 (Washington, D.C.: Dec. 16, 2004). Utility Energy Service Contracts are contracts between a federal agency and the local utility to provide comprehensive energy improvements, such as an energy efficiency or renewable energy.

has already developed the projects that are most cost-effective when using an Energy Savings Performance Contract. The official explained that if the installation decides to develop additional renewable energy projects, it may need to find a new contract and financing vehicle.

The specific, local circumstances surrounding the financing of renewable energy projects have made the creation of a DOD-wide strategy for funding these projects challenging. According to DOD officials, the market conditions that may make a potential renewable energy project attractive to private developers are often location and time specific. For example, another Air Force installation we visited partnered with a developer that financed and built one of the nation's largest solar photovoltaic arrays on the installation's land. The installation was able to negotiate a contract for low electricity prices with the developer because the Air Force provided the developer with the project's renewable energy certificates. At the time of negotiation, this was possible because of the renewable energy certificates' high price in the state's electricity market. However, according to Navy officials, when the Navy subsequently attempted to replicate this project development model at an installation in the same state, the price of renewable energy certificates had decreased significantly, and the Navy's potential private sector partners declined the project because they did not want to retain the now-less-valuable renewable energy certificates. A key OSD official explained that because alternative financing approaches depend on these types of specific, local conditions, a departmentwide strategy for financing these projects is not likely to be feasible. Rather, according to the OSD official, the more feasible approach would be to have an installation's energy management staff—experts on these local circumstances—develop the approaches.

Shortage of Staff with Expertise for Developing Alternative Financing Approaches

According to DOD officials with whom we spoke, the department has a shortage of officials with the necessary expertise to develop and manage alternative financing approaches. GAO has previously reported that if an agency is to effectively and efficiently implement these types of approaches, agency officials with adequate contracting expertise are critical to the success of the agency's efforts and to protecting the

government's interest in regard to government financial resources committed to these approaches.[46]

During our review, we found that DOD installations have varying human capital resources and expertise for developing alternative financing approaches. For example, according to Army officials, trained and qualified energy managers are in "short supply" at Army installations, most of the Army's contracting officers are generalists and have not been trained in contracting for renewable energy projects, and the Army also lacks personnel sufficiently trained in the legal requirements for authorizing the development of renewable energy projects. Officials from the Navy had similar concerns, explaining that when it comes Energy Savings Performance Contracts, the Navy does not have the expertise to define its own contract requirements or compare the renewable energy project proposals to determine which of the potential contractors to hire. Air Force officials stated that because of the shortage of trained energy managers in the Air Force, most of the personnel serving in this capacity have an installation management workload that is two or three times larger than it should be. The officials explained that when personnel have workloads this large, they will usually not have enough time to fully execute their multiple responsibilities.

Despite DOD guidance requiring that all installations have trained energy management personnel, we have previously reported that energy managers at some DOD installations lacked the expertise required to negotiate contracts for complex alternative financing approaches, and DOD has not adequately trained these managers in negotiating these contracts.[47] In the course of our review, a shortage of trained energy managers was evident at some of the installations we visited. For example, some energy managers were not aware of certain strategies and contracting methods for renewable energy project development because they had not received relevant training. At one installation we visited, the energy management staff were largely unfamiliar with alternative financing because they had not received training on the subject. According

[46]In our previous work, we have found that these contracts offer some benefits and challenges similar to those we discuss in this report. See GAO, *Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests*, GAO-05-340 (Washington, D.C.: June 22, 2005).

[47]GAO, *Federal Energy Management: Addressing Challenges through Better Plans and Clarifying the Greenhouse Gas Emission Measure Will Help Meet Long-term Goals for Buildings*, GAO-08-977 (Washington, D.C.: Sept. 30, 2008).

to service officials, energy managers are sometimes "dual hatted," serving as both the energy manager and the utility manager, giving an energy manager two complex jobs to do at the same time. At another installation we visited, the utility manager told us that because he was dual hatted, he did not have time to develop additional alternative financing approaches. Army officials told us that it was increasingly difficult to recruit and retain qualified energy managers because of increasing competition with other government entities and private sector employers. To address this challenge, service officials said that they plan to hire additional staff to support efforts to meet the renewable energy goals. However, this hiring is not expected to be completed until fiscal year 2013, at the earliest.

As we explained earlier in this report, DOD expects to rely increasingly on alternative financing approaches to meet the renewable energy goals. For DOD to effectively implement these approaches, the department will require energy management staff who have the relevant expertise for implementing the approaches. However, because we found that the services and their installations' staff often lack expertise in developing alternative financing approaches, DOD may by limited in its ability both to use these approaches to develop renewable energy projects and to do so in a manner that adequately protects the government's financial resources committed to these approaches.

Much of the Energy Generated May Not Qualify for Meeting the Renewable Energy Goals

According to DOD officials, in most cases, private developers are generally interested in partnering with DOD in order to sell the projects' unbundled energy or associated renewable energy certificates to a third party. These officials explained that the generally accepted business model for these types of approaches includes a renewable energy resource on or near DOD land that is harnessed by a project financed, built, and operated by third-party developer that then sells the unbundled energy to DOD or other customers and typically retains ownership of the project's renewable energy certificates.[48]

However, under such approaches, DOD often would neither consume the renewable energy nor retain the renewable energy certificates. When DOD does not consume the renewable energy, a developer would provide some other form of compensation for the use of the renewable resource on DOD

[48]Although DOD has relatively few projects that follow this model, according to DOD officials, the department plans to enter into more alternative financing approaches that follow this model.

land. For example, in the largest renewable energy project on DOD land, DOD does not consume the energy but instead receives financial compensation based on the sale of the project's energy. If DOD neither consumes the renewable energy nor retains the renewable energy certificates, a serious challenge may be posed to DOD's ability to meet the renewable energy goals. That occurs because, according to DOE's guidance on implementation of the 2005 Act and the 2007 Executive Order—guidance designed to preserve the integrity of the renewable energy certificate market—for an agency to count a project's renewable energy toward these goals, the project must meet two requirements. First, the renewable energy must be produced and used on-site at a federal agency or the renewable energy must be produced by a project owned by a federal agency but installed on private property. Second, the agency must retain or replace the renewable energy certificates associated with the energy produced. In addition, as we discussed earlier, unlike DOE, DOD has not issued guidance that provides a clear explanation of its methodology for calculating progress toward the fiscal year 2025 goal under the 2007 Defense Authorization Act, including DOD's definition of "consumption" and the treatment of renewable energy certificates in that context.

When DOD consumes the unbundled energy from a project built at a federal facility and does not retain the certificate—as is the case with one of the largest renewable energy projects on DOD land—DOD has two options: to not count the energy toward the renewable energy goals or to obtain new renewable energy certificates to replace those retained by the private developer.[49] If DOD plans to count the energy toward the goals, it would need to choose the second option, since under DOE guidance, DOD would need to consume the energy and own renewable energy certificates in order to count the energy toward the renewable energy goals. If DOD chose to purchase replacement renewable energy certificates, then it would generally pay a higher price for the energy consumed because DOD would need to purchase two products—the renewable energy and the replacement certificates. In short, while alternative financing approaches supplement DOD's appropriated funding and cost DOD less up front, if DOD intends to count projects' energy toward the renewable energy

[49]According to the DOE guidance, a federal agency can obtain replacement certificates in two different ways. It can trade with another federal agency or purchase the certificates from another source. DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, § 3.2.2.

goals,[50] DOD generally faces additional costs to purchase replacement certificates.

OSD Lacks a Long-Term, Departmentwide Plan to Meet the Renewable Energy Goals

OSD Has Not Developed a Departmentwide, Long-Term Plan to Meet the Renewable Energy Goals

Previous GAO work has shown that long-term plans can help agencies ensure that they meet their goals by identifying potential challenges agencies face in meeting their goals, coordinating the actions of agencies' components in pursuit of the goals, laying out performance measures for achieving those goals, aligning agency activities and resources to attain the goals, and providing the data agencies need to accurately assess progress against these performance measures.

Although DOD guidance states that offices within OSD are responsible for providing guidance and oversight for meeting DOD's energy goals, OSD has not developed a plan for meeting the renewable energy goals. DOD's draft energy security strategy that OSD was developing at the time of our review does address some issues relevant to DOD installations' use of renewable energy, according to an official representing OSD. For instance, the official explained that the draft strategy recognizes that renewable energy technologies tend to be more costly than nonrenewable energy generation. However, the draft strategy focuses on energy security without specifically addressing the renewable energy goals or presenting a plan to achieve them. For example, the draft strategy does not specify how DOD is to coordinate the services' renewable energy activities, according to officials from OSD.

[50]In such cases, it is unclear whether DOD must purchase replacement certificates to count the renewable energy toward the fiscal year 2025 goal under the 2007 Defense Authorization Act. As discussed earlier in the report, DOD has not developed guidance that could clarify this issue.

Because OSD has not developed a long-term, departmentwide plan to meet DOD's renewable energy goals, DOD instead relies on OSD's current approach to managing the services' renewable energy efforts as the means for achieving the goals. A senior OSD official who plays a key role in OSD's renewable energy activities explained that under OSD's current approach, each of the services plans, budgets, and implements an individual renewable energy effort. He explained that by following this approach, DOD intends to achieve—or nearly achieve—the renewable energy goals in most years. However, we found four reasons that that this approach may not be effective in helping DOD meet the renewable energy goals. Specifically, the approach (1) does not identify key challenges to meeting the goals or contain solutions for mitigating those challenges; (2) relies on the services to develop individual approaches to meeting the goals, which may not be effective; (3) lacks accurate performance measures with which DOD could assess progress toward the goals; and (4) may not be effectively aligning DOD's resources toward achieving the goals.

First, OSD did not identify the key challenges we discussed earlier in this report. Specifically, OSD did not identify as a key challenge its dependence on renewable energy certificates—a commodity with fluctuating prices—to meet the renewable goals. When the price of renewable energy certificates increased significantly from fiscal year 2007 to fiscal year 2008, DOD purchased fewer of these certificates, and DOD missed meeting the 2005 Act goal of obtaining 3 percent of electricity from renewable sources in fiscal year 2008. When this occurred, OSD had neither a plan identifying this key challenge nor a solution for mitigating the challenge, such as relying more on sources of renewable energy with more stable pricing. For instance, according to an analysis by DOE's Pacific Northwest National Laboratory, purchasing renewable energy from a wind turbine project is generally less risky than purchasing renewable energy certificates in a volatile market.[51] Because OSD lacked such a plan or solution, DOD was unprepared to compensate for the decrease in the amount of renewable energy that it claimed toward the goals when it purchased fewer certificates.

Second, we found that if the services separately pursue their own courses with regard to renewable energy efforts, their individual approaches may

[51]DOE, Pacific Northwest National Laboratory, *Purchasing Renewable Power for the Federal Sector: Basics, Barriers, and Possible Options.*

not be effective in helping DOD meet its renewable energy goals. While the three services are developing renewable energy plans, their plans lack key elements. For example, the Air Force's plan lacks accurate cost estimates and complete data on how much funding has been allocated to renewable energy projects. In addition, the Army's plan is preliminary in nature and cannot yet be considered complete. For instance, according to its plan and Army officials, the Army still needs to develop implementation strategies, establish and coordinate performance measures, and begin the "significant job" of executing the plan. Finally, the Navy's plan is also preliminary; does not explain how the Navy will align its organizations' renewable activities to attain the goals; does not discuss what type, or amount, of resources the Navy will commit to these activities; and does not address the Navy's need for better management of its energy data.

Third, OSD's current approach lacks accurate performance measures with which to assess DOD's progress toward meeting the 2007 Defense Authorization Act goal. GAO has previously reported that by specifying performance measures, agencies are better able to monitor progress made and hence better able to achieve the goals. While OSD has established performance measures to assess DOD's progress toward meeting the 2007 Defense Authorization Act goal, those performance measures are based on inaccurate calculations. Specifically, according to a key official, OSD assumed that DOD's renewable energy consumption would increase by roughly 1 percent annually. In its fiscal year 2010 Budget Request Summary Justification (published in May 2009), DOD included renewable energy consumption targets for fiscal years 2009 and 2010, based on this assumption. However, as we discussed earlier in the report, DOD overstated its fiscal years 2007 and 2008 renewable electricity consumption by incorrectly including nonelectric renewable energy toward this goal. Because DOD's renewable energy consumption targets for fiscal years 2009 and 2010 were based on these previous, inaccurate calculations, the fiscal years 2009 and 2010 targets were also overstated and hence similarly unlikely to be achieved.

As discussed earlier in this report, the National Defense Authorization Act for Fiscal Year 2010 amends the language defining the goal in the 2007 Defense Authorization Act. However, at the time DOD published the targets, the original requirements of the 2007 Defense Authorization Act goal were still in effect. This means that—regardless of the subsequent changes to the 2007 Defense Authorization Act goal—DOD's renewable energy consumption targets for fiscal years 2009 and 2010 were based on calculations that were inaccurate at the time DOD published the targets.

Finally, the services may not be effectively aligning DOD resources in pursuit of the renewable energy goals. According to DOD Instruction 4170.11, offices within OSD are responsible for providing oversight for the achievement of the renewable energy goals. However, OSD is not coordinating the services' allocation of resources in pursuit of the DOD-wide renewable energy goals, as evidenced by the fact that the services' cost estimates include projects that generate renewable energy that would not count toward at least two of the renewable energy goals. Specifically, officials from each of the services explained that their estimates on the total cost of meeting the renewable energy goals are based on the assumption that at least a portion of the renewable energy will be generated through alternative financing approaches on DOD land. However, if the private developers sell the associated renewable energy certificates to third parties, and DOD does not replace the certificates, DOD cannot count the energy toward the goals in the 2005 Act or 2007 Executive Order. Further, as discussed above, in the absence of additional guidance from OSD, it is unclear how the services are to properly count production of unbundled energy toward the 2007 Defense Authorization Act goal. If OSD's lack of oversight continues, the services' cost estimates may continue to include projects whose energy would not count toward these two goals.

Lacking a coordinated, DOD-wide plan for achieving the renewable energy goals, OSD has instead relied on an approach that has not identified key challenges or potential solutions, established accurate performance measures, or aligned DOD's resources in pursuit of the goals. This means that OSD has relied on the services to develop individual approaches. As a result, OSD has relied on the services' incomplete plans for achieving these goals, and lacks a coordinated DOD-wide plan to meet the challenging goal contained in the 2007 Defense Authorization Act.

OSD Lacks Visibility on Renewable Energy Projects, and Services Lack Adequate Information Systems for Tracking Renewable Energy Use

GAO has previously reported that strategic information management provides agencies with the data they need to improve program effectiveness and ensure consistent results. However, OSD does not have a system in place to track individual renewable energy projects or key information about these projects. Thus, while OSD is responsible for coordinating the services' renewable energy activities in pursuit of the goals, it does not have adequate visibility over the services' renewable energy efforts. For example, at the time of our review, OSD had neither a list of the renewable energy generation projects operating in DOD installations nor key information on the projects, such as their location, the type or amount of energy they produce, or the amount of funding

required to develop the projects. In order to complete our review, we gathered various data on these types of projects from DOD to develop our own data set. According to a key OSD official responsible for DOD's energy management, the data set we created was the first of its kind.

Although DOD policy requires all of the services to collect and manage data on the procurement and use of energy on their installations, at the time of our review, two of the three had not developed adequate information systems for monitoring or reporting their use of renewable energy. Specifically, the software that these two services use to manage their energy data does not reflect the sources of renewable energy that are eligible to be counted toward the renewable energy goals. For example, at two installations we visited, installation officials explained that the software they use to report their renewable energy production and consumption can only record the use of one category of energy: wind. However, both installations used forms of renewable energy other than wind. As a result, one installation had to use complex calculations in a lengthy process of conversion, transforming its data from these other technologies into units that it could report as wind energy. According to service officials, the Air Force and Navy were in the process of addressing several of the issues that we have identified in this report. For instance, an Air Force official told us that the Air Force is working on updating its system for managing energy information. However, the Air Force official was unable to provide us with a date by which the service was planning to complete the update of its energy management software.

As a result of the lack of adequate data management in the services and OSD, DOD lacks accurate, complete, and consistent data for effectively managing its renewable energy resources in pursuit of the renewable energy goals. Lacking such data, OSD cannot effectively coordinate service efforts in pursuit of the renewable energy goals, and DOD may not be able to accurately assess its performance against the goals.

Conclusions

DOD met both the 2005 Act and 2007 Executive Order goals in fiscal year 2007 and met the 2007 Executive Order goal in fiscal year 2008. However, in that same fiscal year, it missed the 2005 Act goal, and in both fiscal years overstated its progress toward the 2007 Defense Authorization Act goal. Furthermore, DOD does not have all the elements in place to enable it to maximize its progress toward meeting these goals. First, because the services lack OSD guidance that provides a methodology for calculating progress toward the 2007 Defense Authorization Act goal and OSD's legal rationale for how its accounting method is consistent with the language of

the statute, when the services calculate their progress toward the 2007 Defense Authorization Act, they cannot be sure whether including electricity generated on DOD lands but not consumed by DOD is consistent with the act. Such guidance would better enable OSD to both accurately measure DOD's progress toward the goal and accurately report on this progress to Congress. Second, OSD lacks guidance that could assist installation officials in developing accommodations to resolve potential incompatibilities between renewable energy projects and an installation's primary mission. Guidance would assist DOD in its development of renewable energy projects on and around DOD installations. Third, DOD lacks a sufficient cadre of qualified officials trained to effectively implement alternative financing approaches. With a sufficient number of officials qualified to effectively implement these approaches, DOD would improve its opportunities for developing renewable energy projects while protecting the government's financial resources committed to these projects. Fourth, OSD lacks a long-term, DOD-wide plan containing strategies for coordinating the services' renewable energy activities, establishing accurate performance measures for achieving the renewable energy goals, and effectively aligning DOD resources in pursuit of these goals. Such a plan would strengthen DOD's ability to meet future annual goals for renewable energy consumption. It is important to note that the fiscal year 2010 Defense Authorization Act amended the 2007 Authorization Act. However, because OSD lacks a clear methodology for calculating progress towards the 2007 Act's goal, determining the effect of the amendments on the amount of renewable energy the department can claim toward that goal is uncertain. Moreover, there are other key challenges we have identified in this report. Thus, a long-term, DOD-wide plan would still strengthen DOD's ability to meet these goals. Fifth, OSD lacks a system for tracking individual renewable energy projects DOD-wide, and two of the three services do not have adequate data systems for monitoring or reporting their use of renewable energy. With an OSD system that tracks projects across DOD and service systems that adequately monitor and report data on their renewable energy use, DOD would be better able to effectively coordinate service efforts in pursuit of the renewable energy goals, monitor and report service use of renewable energy, and accurately assess DOD's performance against the goals.

Recommendations for Executive Action

To enhance DOD's ability to achieve the renewable energy goals consistent with the need to maximize cost-effectiveness, follow existing federal guidance, and increase oversight of DOD's renewable energy activities, we recommend that the Secretary of Defense direct the Under

Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the secretaries of the services to take the following five actions:

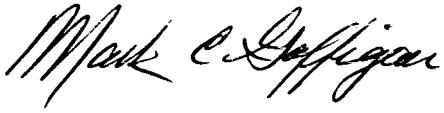
- Develop and issue guidance specifying how to accurately report DOD's annual progress toward the 2007 Defense Authorization Act goal, as amended by fiscal year 2010 Defense Authorization Act. Among other things, this guidance should clearly define how the services are to apply the terms "produce" and "consume" to their implementation of the goal and how OSD is to apply the terms to its reporting of DOD's progress toward the goal.
- Develop and issue guidance to assist the services in determining how to balance the use of land for renewable projects with their installations' primary missions, thereby assisting installation commanders and potential investors in knowing which land on the installations may be available for renewable energy projects, consistent with the installations' mission capabilities.
- Facilitate the successful implementation of alternative financing approaches and help ensure that DOD can maximize its opportunities for completing cost-effective renewable energy projects by (1) determining the adequate number of energy managers, contracting officials, and other officials with the necessary expertise to administer these complex transactions and (2) determining and providing the appropriate level of training to these employees.
- Develop a long-term, DOD-wide plan to assist DOD in effectively and efficiently meeting the renewable energy goals over the long term. At a minimum, this plan should identify key challenges—such as the higher price of renewable energy compared with conventional energy and volatility in renewable energy certificate markets—that DOD faces in meeting the goals and ways to mitigate those challenges. The plan should also coordinate the services' renewable energy activities, contain realistic performance measures for DOD and the services so that OSD can accurately assess annual progress, and align DOD's resources in pursuit of the renewable energy goals.
- Develop information systems or processes that will enable OSD to have visibility over DOD renewable energy projects, allow the services to monitor and coordinate the services' consumption of renewable energy, and guide DOD toward achievement of the renewable energy goals.

Agency Comments and Our Evaluation

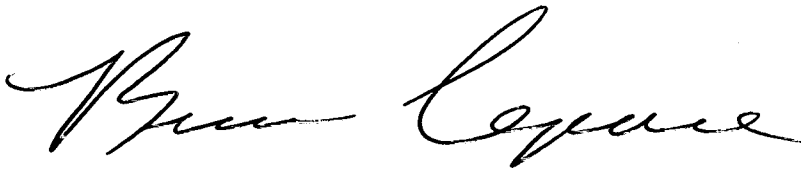
In written comments on a draft of this report, DOD concurred with our recommendations to develop (1) guidance on reporting progress toward the goal to obtain 25 percent of its facilities' energy from renewable sources by 2025, (2) guidance on balancing installations' renewable energy goals with the installations' missions, (3) a plan to meet renewable energy goals, and (4) information systems improving visibility over service progress toward the renewable energy goals. DOD partially concurred with our recommendation that OSD work with the secretaries of the services to facilitate the successful implementation of alternative financing approaches and help ensure that DOD maximizes opportunities for completing cost-effective renewable energy projects by (1) determining the adequate number of energy managers, contracting officials, and other officials with the necessary expertise to administer these complex transactions and (2) determining and providing the appropriate level of training to these officials. In its comments, DOD acknowledged that sufficient personnel with appropriate skills are necessary to execute third-party finance actions. However, DOD also stated that implementing the recommendation is the services' responsibility because DOD Instruction 4170.11 requires the services to designate and assign adequate staff to satisfy statutory energy management mandates, and manage the number and skills of these officials. While we recognize that the instruction specifies that the military services are to designate and assign energy management staff to their facilities, our report clearly stated that the Army, Navy, and Air Force had not fully implemented the instruction since each of these services continue to experience shortages of qualified energy officials. Moreover, the instruction assigns to an office within OSD the responsibility of conducting oversight of the services' implementation of the instruction, and OSD's activities to date have similarly not led to sufficient numbers of trained energy officials at the installations. As a result, we continue to believe that our recommendation has merit, and consequently we reiterate the recommendation. DOD's comments are reprinted in appendix II of this report.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees; the Secretaries of Defense, Energy, the Army, the Navy, and the Air Force; the Commandant of the Marine Corps; and the Director, Office of Management and Budget. The report also will be available at no charge on GAO's Web site at http://www.gao.gov.

If you or your staff have any questions concerning this report, please contact Mark Gaffigan at (202) 512-3168 or gaffiganm@gao.gov or Brian J. Lepore at (202) 512-4523 or leporeb@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix III.



Mark Gaffigan, Director
Natural Resources and Environment



Brian J. Lepore, Director
Defense Capabilities and Management

Appendix I: Scope and Methodology

Our objectives were to (1) determine whether the Department of Defense (DOD) met three key goals for consuming renewable energy in fiscal years 2007 and 2008; (2) identify the challenges that may affect DOD's ability to meet the renewable energy goals; and (3) assess DOD's plans to meet the renewable energy goals.

To determine whether DOD met the Energy Policy Act of 2005 (the 2005 Act) and Executive Order 13423 (the 2007 Executive Order) goals for consumption of renewable energy in its facilities in fiscal years 2007 and 2008, we analyzed data on DOD's performance toward these goals from the department's annual energy management reports for fiscal years 2007 and 2008. These reports were submitted by DOD to the Department of Energy (DOE) for use in DOE's Annual Report to Congress on Federal Government Energy Management and Conservation Programs. For fiscal years 2007 and 2008, we considered DOD to have met the 2005 Act goal if it obtained at least 3 percent of the electricity it consumed from renewable sources as defined in section 203 of the act, and considered DOD to have met the 2007 Executive Order goal if it obtained equal to half (or 1.5 percent) of this energy from new renewable sources as defined in section 2(b) of the executive order. In addition, we met with officials from DOE's Federal Energy Management Program—which prepared guidance for agencies to follow when meeting the goals—to gain their perspective on how progress toward the goals is calculated. We also met with officials from the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics), the Facility Energy office of the Office of the Deputy Under Secretary of Defense (Installations and Environment), and each of the military services to discuss how DOD and the services calculated their progress toward the goals. To determine DOD's progress toward the National Defense Authorization Act for Fiscal Year 2007 goal for consumption of renewable energy, we reviewed DOD's reported progress toward the goal included in the fiscal years 2007 and 2008 annual energy management reports and data provided by the services to the Facility Energy office of the Deputy Under Secretary of Defense (Installations and Environment) for preparation of the report. We also reviewed the legal language that established the goal and discussed our interpretation of this language with officials in the Office of the Secretary of Defense (OSD) General Counsel's office.

The data used by DOD to determine its progress toward the three goals are assembled using a data collection instrument that is separate from the information systems used by the military services to manage energy data. This data collection instrument is an electronic template created by DOE's Federal Energy Management Program and disseminated to the federal

agencies to use to assemble data for their annual energy management reports. To determine the reliability of the data used by DOD to report its progress toward the three goals, we interviewed officials at each level of data collection, aggregation, and review: those responsible for preparing the data collection tool sent to energy managers at the military facilities; for entering this information into data collection tools at the facility level; for summarizing it and checking it for accuracy at the headquarters level for each of the services; and for combining the services' data into a departmentwide total and assessing the accuracy of this total. We also obtained the data submitted by the services to OSD, and compared the two data sets for completeness and accuracy. We did not find discrepancies between the data submitted by the services to OSD and the department's annual energy management report data. We determined that these data were sufficiently reliable for our purpose, which was to convey the progress DOD made toward the three key goals for consumption of renewable energy in its facilities.

To identify the challenges that affect DOD's ability to meet these goals in the future, we met with officials at the Facility Energy office of the Deputy Under Secretary of Defense (Installations and Environment), each of the military services' headquarters, and offices within each military service with responsibility for renewable energy projects, and obtained and analyzed relevant documentation from these officials. Using a data collection instrument, we also collected data on the location, size, type, and financing of renewable energy projects at DOD. We used this data collection instrument because DOD does not have a central, comprehensive list of renewable energy projects. We sent the instrument to OSD with instructions in December 2008, and OSD sent the instrument to each of the services for each facility with relevant projects to complete the instrument. The initial data collection instrument, which we received from OSD in February 2009, accounted for all renewable energy projects from relevant DOD facilities, but was incomplete in that information on funding mechanisms was not provided for all projects. We made a follow-up request to OSD to clarify the missing elements of the data. These elements were incorporated into the original response from OSD. To determine the reliability of these data, we checked them against previously identified information about the projects and, when inconsistencies were found, discussed them with OSD and the services and made corrections when relevant. We determined these data were sufficiently reliable for our purpose, which was to establish how much renewable energy DOD produced from electric and nonelectric renewable energy and from projects financed through each type of financing approach. We also visited five military facilities to determine the practical effect of the challenges to

meeting renewable energy goals on the facilities. We selected these installations because they represent each of the military services, have different types and sizes of renewable energy projects, and operate in three different states. At these locations, we interviewed the facility energy managers and other relevant officials; confirmed data we had received about the facilities' renewable energy projects; viewed renewable energy projects at the facilities; and obtained relevant documents, including contracts for renewable energy projects, energy reports generated from on-site data management systems, and utility invoices. We systematically reviewed these interviews with OSD, military service, and facility officials to determine what primary challenges DOD faces and the tools the department uses to meet the renewable energy goals.

For our review of DOD's plans to meet these goals in the future, we reviewed planning documents obtained from OSD and military service officials as well as planning documents from DOD officials that summarized DOD's limited plans to achieve the renewable energy goals from fiscal year 2010 through fiscal year 2025. We also met with DOD officials to discuss efforts to develop a departmentwide, long-term plan to meet the renewable energy goals. We systematically reviewed these documents and interviews to determine whether DOD's plans contained key elements as identified by our past work.[1] To assess the information systems used by the military services to manage their energy data, we met with officials at each of the military service headquarters with responsibility for managing these systems, and obtained and analyzed relevant documentation about these systems. We also asked energy managers at the military facilities we visited about their use of these systems. We determined that there are problems associated with the systems used by two of the services. Specifically, the Navy's central Web-based data system to manage energy data has been unavailable since December 2007, and the Air Force's data system is unable to manage renewable energy data, requiring the use of spreadsheets directly e-mailed from installations to Air Force headquarters. We discuss these problems in more detail in our findings.

In addition to audit work described above, we also met with renewable energy experts at DOE's National Laboratories, selected nongovernmental organizations—including the National Association of Regulatory Utility Commissioners and the Interstate Renewable Energy Council—and the

[1]GAO/GGD-10.1.16.

public utility commissions of the states where we conducted site visits. We also participated in DOE webcast training on alternative financing mechanisms for renewable energy projects and attended GovEnergy, an energy training workshop and exposition for federal agencies.

We conducted this performance audit from October 2008 to November 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION
TECHNOLOGY
AND LOGISTICS

DEC 0 8 2009

Mr. Brian J. Lepore
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Mr. Lepore:

This is the Department of Defense (DoD) response to the GAO draft report GAO-10-104, DEFENSE INFRASTRUCTURE: DoD Needs To Take Actions To Address Challenges In Meeting Federal Renewable Energy Goals," dated November 5, 2009 (GAO Code 351274). Detailed comments on the report recommendations are enclosed.

The Department appreciates the opportunity to respond to your draft report and looks forward to working with you.

Sincerely,

Brian J Lally
Director
Facility Energy and Utilities Privatization

Enclosure:
As stated

GAO DRAFT REPORT – DATED NOVEMBER 5, 2009
GAO CODE 351274 / GAO-10-104

"DEFENSE INFRASTRUCTURE: DoD Needs To Take Actions To Address Challenges In Meeting Federal Renewable Energy Goals"

DEPARTMENT OF DEFENSE COMMENTS TO THE RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the Secretaries of the Services to develop and issue guidance specifying how to accurately report DoD's annual progress toward the 2007 Defense Authorization Act goal of obtaining not less than 25 percent of DoD's total electricity consumption during FY 2025, and each fiscal year thereafter, from renewable energy sources.

Among other things, this guidance should clearly define how the Services are to apply the terms "produce" and "consume" to their implementation of the goal and how OSD is to apply the terms to its reporting of DoD's progress toward the goal.

DOD RESPONSE: Concur. The Department recognizes the need the clarify the accounting differences between renewable projects that meet the 2005 Energy Policy Act goals as adjusted Executive Order 13423 and the renewable energy goals contained in the 2007 National Defense Authorization Act as modified by the 2010 National Defense Authorization Act. This will be addressed in the FY 2010 Annual Energy Management Report.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the Secretaries of the Services to develop and issue guidance to assist the Services in determining how to balance the use of land for renewable projects with their installations primary missions, thereby assisting installation commanders and potential investors in knowing which land on the installations may be available for renewable energy projects, consistent with the installations' mission requirements.

DOD RESPONSE: Concur. The Department agrees that it is necessary to implement the renewable energy goals contained in the 2005 Energy Policy Act and 2007 National Defense Authorization Act in a manner that integrates renewable energy projects with installation missions. This guidance will be overarching, yet sufficiently flexible to allow

each installation to manage its own specific renewable energy opportunities and mission requirements.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the Secretaries of the Services to facilitate the successful implementation of alternative financing approaches and help ensure that DoD can maximize its opportunities for completing cost-effective renewable energy projects by: (1) determining the adequate number of energy managers, contracting officials, and other officials with the necessary expertise to administer these complex transactions and (2) determining and providing the appropriate level of training to these employees.

DOD RESPONSE: Partially concur. The Department agrees that sufficient personnel with appropriate skill sets are necessary to execute third-party finance actions. In DoD Instruction 4170.11 (9 Sep 2009), the Department requires its components to designate and assign adequate staff to satisfy statutory energy management mandates. Determining the specific quantity and skill set of the staff is a component responsibility.

RECOMMENDATION 4: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the Secretaries of the Services to develop a long-term, DoD-wide plan to assist the Department in effectively and efficiently meeting the renewable energy goals over the long term. At a minimum, this plan should identify key challenges – such as the higher price of renewable energy compared with non-renewable energy and volatility in renewable energy certificate markets – that DoD faces in meeting the goals and ways to mitigate those challenges. The plan should also coordinate the Services' renewable energy activities; contain realistic performance measures for DoD and the Services do that OSD can accurately assess annual progress; and align DoD's resources in pursuit of the renewable energy goals.

DOD RESPONSE: Concur. The Department believes that a single energy security plan (which would integrate renewable energy) can satisfy recommendations 2 and 4.

RECOMMENDATION 5: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) in conjunction with the Secretaries of the Services to develop information systems or processes that will enable OSD to have visibility over DoD renewable energy projects, allow the Services to effectively monitor their production of renewable energy, coordinate the Services' consumption of renewable energy, and guide DoD toward achievement of the renewable energy goals.

DOD RESPONSE: Concur. The Department will identify the required personnel and funding resources to accomplish this goal over the long term.

Appendix III: GAO Contacts and Staff Acknowledgments

GAO Contacts

Mark Gaffigan, (202) 512-3168 or gaffiganm@gao.gov
Brian J. Lepore, (202) 512-4523 or leporeb@gao.gov

Acknowledgments

In addition to the contacts named above, Terrel Dorn, Director; Susan Irving, Director; Carol Henn, Assistant Director; Ernie Hazera, Assistant Director; Harold Reich, Assistant Director; John Van Schaik, Assistant General Counsel; Leslie Bharadwaja; Kenneth Cooper; Pamela Davidson; Cynthia Grant; Sarah Jones; Foster Kerrison; Ron La Due Lake; Katherine Lenane; Brian Mullins; Carol Shulman; Vasiliki Theodoropoulos; Jason Trentacoste; Christopher Turner; Cheryl Weissman; Sherie Walker; Michael Willems; Ignacio Yanes; and Kimberly Young made key contributions to this report.

Related GAO Products

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