United States Government Accountability Office

Report to Congressional Committees

September 2016

DOD RENEWABLE ENERGY PROJECTS

Improved Guidance Needed for Analyzing and Documenting Costs and Benefits

Accessible Version

GAO-16-487

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GAO Highlights

Highlights of GAO-16-487, a report to congressional committees

Why GAO Did This Study

By law and executive order, DOD is to pursue goals for the production and consumption of renewable energy. Also, DOD policy calls for investing in cost-effective renewable energy and improving energy security—addressing risks such as disruption of electricity grids serving military installations.

The Joint Explanatory Statement for the National Defense Authorization Act for Fiscal Year 2015 included a provision for GAO to examine how DOD determines the costs and benefits of a sample of renewable energy projects. This report examines (1) DOD's approach for developing renewable energy projects with a generating capacity greater than 1 megawatt, (2) DOD's approach for analyzing the financial costs and benefits of selected projects, and (3) the extent to which these projects addressed DOD's renewable energy goals and energy security objective. GAO examined a nongeneralizable sample of 17 projects that reflect a mix of military departments and services, funding mechanisms, and technologies. GAO also examined legal authorities, project documentation, and DOD guidance, and interviewed DOD officials.

What GAO Recommends

GAO is making eight recommendations, including that DOD should clarify guidance to call for project documentation to include (1) a comparison of the value of the land used and the compensation DOD is to receive for it and (2) information on projects' contributions toward DOD's energy security objective. DOD fully concurred with GAO's recommendations.

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What GAO Found

The Department of Defense (DOD) has emphasized working with private developers using a variety of alternative financing mechanisms—that is, agreements with private developers to pay back the costs of the projects over time—to develop renewable energy projects greater than 1 megawatt. According to DOD officials, DOD works with private developers because doing so gives DOD several advantages. For example, private developers have access to tax incentives that can significantly lower the overall costs of developing projects compared to what those costs would be if DOD developed the projects on its own.

DOD used various approaches to analyze the financial costs and benefits of the 17 renewable energy projects GAO examined, but project documentation was not always clear or complete. In particular, project documentation did not always clearly identify the value of land used and compare that to any compensation DOD received. Specifically, for 8 projects, DOD received little or no financial compensation for the use of its land, but the documentation did not clearly compare the value for granting use of DOD land to the value of what DOD received for it. As a result, DOD contributed potentially valuable land—in some cases, over 100 acres—for the development of a project without including this as a cost in project documentation. GAO's 2009 cost-estimating guide states that one basic characteristic of a credible cost estimate is the recognition of excluded costs, so any excluded costs should be disclosed and a rationale provided. However, DOD guidance does not specify that project documentation should include a comparison of the value of land and any compensation received. By clarifying its guidance to call for project documentation to include a comparison of land values and any compensation it would receive, DOD would have greater assurance that its officials have credible information about projects' financial costs and benefits before approving them.

Some of the 17 projects GAO reviewed advanced DOD's renewable energy goals and energy security objective (e.g., for access to reliable supplies of energy during an outage of the commercial grid), but project documentation was not always clear about how projects did so. For example, officials told GAO they believe that all the projects contributed to DOD's energy security objective, but this view was not reflected in the documentation for the 17 projects. GAO found that only 2 projects would immediately be able to provide electricity to an installation in the event of a grid outage. Five other projects would require additional investment, such as the installation of batteries or other energy storage, before they would be able to deliver electricity during an outage, and project documentation did not always reflect this information. Under federal standards for internal control, agencies are to record and communicate information to management and others who need it and in a form and within a time frame that enables them to carry out their internal control and other responsibilities. Without clarifying its guidance to call for project documentation to include information about projects' contributions to DOD's energy security objective and any additional investment needed to do so, DOD officials may not have a full understanding of all relevant information when approving renewable energy projects.

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Abbreviations

DOD	Department of Defense
ESPC	energy savings performance contract
GSA	General Service Administration
PPA	power purchase agreement
PV solar	photovoltaic solar
UESC	utility energy service contract

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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September 8, 2016

Congressional Committees

The Department of Defense (DOD) is the largest energy consumer in the federal government, spending about $4.2 billion on facilities' energy at more than 500 permanent military installations throughout the world in fiscal year 2014.[1] These installations largely depend on the commercial power grid (i.e., the infrastructure of power plants, transmission lines, and distribution lines) to provide electricity to power their facilities.

For over a decade, the federal government has encouraged the development of renewable energy by providing financial support for the research, development, and deployment of renewable energy projects, among other things. As part of these efforts, it has established a variety of goals for federal departments and agencies. In particular, the Energy Policy Act of 2005,[2] as well as other federal laws and executive orders, set goals that apply to DOD's production and consumption of renewable energy, including from sources on DOD installations.[3]

DOD has also identified renewable energy as one way to help ensure access to electricity for its installations. In particular, DOD has recognized that depending on the commercial power grid, which is vulnerable to disruption resulting from aging infrastructure, weather-related events, and direct attack, is a risk to maintaining continuous supplies of electricity for its installations. To address this vulnerability, DOD has developed an objective to improve energy security, that is, assured access to reliable

[1]DOD distinguishes facility energy from operational energy. Facility energy consists largely of traditional energy sources (i.e., from fossil fuels) used to heat, cool, and provide electrical power to diverse DOD facilities, such as barracks, commissaries, data centers, office buildings, laboratories, and aircraft maintenance depots. Operational energy is the energy required for training, moving, and sustaining military forces and weapons platforms in military operations. This report addresses only facility energy.

[2]Pub. L. No. 109-58, § 203 (codified at 42 U.S.C. § 15852).

[3]For example, section 2911(e) of Title 10 of the United States Code sets a goal for DOD related to the production or procurement of renewable energy. This report examines only the production of renewable energy on its installations. DOD can also procure renewable energy to meet this goal by purchasing electricity produced using renewable sources.

supplies of energy during an outage of the commercial grid. DOD has established policies to pursue this objective. These policies state, among other things, that DOD can pursue its energy security objective by diversifying and expanding its supply of energy to include sources such as renewable energy.[4]

As part of its efforts to address these policies, DOD has pursued the development of renewable energy projects on its installations. Renewable energy projects on DOD installations have included electricity-generating technologies such as solar photovoltaic arrays, wind turbines, and burning of landfill gas and biomass.[5] DOD is a large organization that includes three military departments—the Air Force, Army, and Navy—and four military services—the Air Force, Army, Navy, and Marine Corps.[6] In some cases, DOD and the military services have pursued small-scale renewable energy projects, such as installing photovoltaic arrays ranging from a few kilowatts to a few hundred kilowatts of generating capacity sometimes located on a single building (e.g., a residential dwelling unit).[7] In other cases, DOD and the military services have installed larger projects, such as stand-alone photovoltaic arrays of more than 1 megawatt, installed over several acres of land.

[4]Energy security is defined by 10 U.S.C. § 2924 as having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission-essential requirements. In a January 2016 report, we observed that DOD has reported that it is critical to understand the vulnerabilities and risks associated with power disruptions that can affect mission assurance, and such disruptions become even more critical at DOD installations that are located in areas without access to the commercial power grid. In that report, we noted that there are multiple ways to help ensure sufficient and reliable energy (i.e., energy security) at installations, including the diversification of energy sources and the use of renewable energy. See GAO, *Defense Infrastructure: Improvement Needed in Energy Reporting and Security Funding at Installations with Limited Connectivity*, GAO-16-164 (Washington, D.C.: Jan. 27, 2016).

[5]Biomass is generally defined as plant-derived organic matter, such as wood waste or agricultural crop waste, that may be used for fuels or power production.

[6]The Department of the Navy consists of all elements of the Navy as well as the Marine Corps. DOD also includes the Office of the Secretary of Defense and various defense agencies.

[7]A watt is a measure of electrical power. A kilowatt is 1,000 watts. A megawatt is 1,000,000 watts. One gigawatt is 1 billion watts.

DOD encourages investment in cost-effective renewable energy sources,[8] and the department has issued guidance for evaluating the cost-effectiveness of renewable energy projects in certain contexts.[9] In addition, the Department of Energy's Federal Energy Management Program has issued regulations and guidance for federal agencies' analysis of cost-effectiveness for certain types of projects involving federal buildings, such as guidance that specifies how to prepare these analyses and identifies the assumptions to be used to develop estimates of the financial costs and benefits for these analyses.[10] The Department of Commerce's National Institute of Standards and Technology has issued additional guidance for such analyses and periodically quantifies the assumptions to use in preparing them.[11]

The Joint Explanatory Statement accompanying the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 included a provision for GAO to examine, among other things,

[8]See Department of Defense, DOD Instruction 4170.11, *Installation Energy Management* (Dec. 11, 2009) and DOD Directive 4180.01, *DOD Energy Policy* (Apr. 16, 2014). Similarly, DOD policy is to mitigate costs in its use and management of energy, and the Deputy Under Secretary of Defense for Installations and Environment (now the Assistant Secretary of Defense for Energy, Installations, and Environment) is responsible for ensuring that cost-effective investments are made in facility infrastructure to increase on-site distribution of energy (including renewables), among other things.

[9]Department of Defense, DOD Unified Facilities Criteria 1-200-02, *High Performance and Sustainable Building* (November 2014) states that for construction or renovation projects, including renewable energy projects that result in DOD real property assets, all life cycle cost analyses must be prepared in accordance with the regulations at 10 C.F.R. pt. 436 and a supporting handbook. In addition, for certain renewable energy projects where DOD uses private financing to cover initial capital costs, a DOD memorandum specifies that military departments must submit certain project information and analyses for DOD review. Department of Defense, Under Secretary of Defense for Acquisition, Technology and Logistics, "Financing of Renewable Energy Projects Policy" Memorandum (Nov. 29, 2012).

[10]See 10 C.F.R. pt. 436, subpt. A—Methodology and Procedures for Life Cycle Cost Analyses. The Federal Energy Management Program issues rules related to federal energy management, and provides federal agencies with information, tools, and assistance to help them meet and track their energy-related requirements and goals.

[11]National Institute of Standards and Technology, *Life-Cycle Costing Manual for the Federal Energy Management Program* (1995). The National Institute of Standards and Technology is a non-regulatory federal agency that seeks to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology.

how DOD determines the financial costs and benefits of a sample of five renewable energy projects per service with a generating capacity of greater than 1 megawatt of electricity.[12] This report examines (1) DOD's approach for developing renewable energy projects with a generating capacity greater than 1 megawatt (2) DOD's approach for analyzing the financial costs and benefits of the selected renewable energy projects contracted for or funded from 2010 through 2015 and (3) the extent to which selected projects addressed DOD's renewable energy goals and energy security objective.

To address these objectives, we examined recent DOD renewable energy projects, selected a sample of projects for a more detailed analysis, and interviewed key DOD officials.[13] For more details on our objectives, scope, and methodology, see appendix I. To inform all three objectives, we examined lists of approved but not necessarily operational projects as well as operational projects with a generating capacity greater than 1 megawatt and with funding or contracts awarded from 2010 through 2015 on DOD installations in the United States.[14] We selected a nonprobability sample of 17 projects that reflected a range of military departments and services, funding mechanisms, and renewable energy technologies. Appendix II provides information about the locations and other characteristics of these projects. Because this was a nonprobability sample, our findings are not generalizable to all DOD renewable energy projects but provide illustrative examples of DOD's renewable energy efforts.

To examine DOD's approach for developing renewable energy projects, we reviewed applicable laws and DOD guidance for developing renewable energy projects, and interviewed officials with DOD and the

[12]The Joint Explanatory Statement also included provisions that we review DOD's Energy Report and energy security at energy-remote military installations in the United States. We reported on these provisions separately. See GAO-16-164.

[13]This report attributes information to DOD officials if it came from officials in more than one military department or at least one military department and the Office of the Secretary of Defense.

[14]While the mandate required us to review 5 projects in each of the four services for a total of 20 projects, we found that at least one service did not have 5 recent projects with 1 megawatt of generating capacity. As a result, we agreed to review at least 5 projects per department and ultimately selected 17 projects.

military departments and services who were knowledgeable about DOD's development of such projects, including our sample of 17 projects.

To examine DOD's approach for analyzing the financial costs and benefits of selected renewable energy projects, we reviewed the analyses DOD included in the project documentation it used to examine and approve the 17 projects in our sample. We reviewed DOD's guidance on, among other things, preparing project documentation for consideration by officials responsible for reviewing and potentially approving projects for development. In addition, we reviewed the guidance developed by the Federal Energy Management Program and National Institute of Standards and Technology for assessing the cost-effectiveness of projects. We also reviewed our 2009 cost-estimating guide,[15] a compilation of cost-estimating best practices drawn from across industry and government, to inform our review of the analyses DOD included in its documentation for these projects. We evaluated whether DOD's analyses of these 17 projects followed this guidance—particularly the source of assumptions—and the extent to which DOD assessed and documented any uncertainties with the estimates. We interviewed DOD officials knowledgeable about each of the projects for additional information on these analyses, as well as officials with the Department of Energy, which provides information and support to federal agencies when they analyze renewable energy projects and related matters.

To examine the extent to which selected projects addressed DOD's renewable energy goals and energy security objective, we reviewed DOD guidance on renewable energy and energy security and, for the 17 projects we examined, the contributions to the goals or objective cited in the analyses DOD included in documentation for these projects. To ensure that we fully identified and understood the contributions DOD expected, we interviewed DOD officials knowledgeable about each project.

We conducted this performance audit from March 2015 to September 2016 in accordance with generally accepted government auditing

[15]GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP (Washington, D.C.: March 2009). This guide focuses on developing cost estimates for government capital acquisition programs, but it outlines best practices that are applicable to cost estimation in general.

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

Under federal statutes, executive orders, and department-level guidance, DOD is to meet various renewable energy goals. Statutory goals include the following:

- **Production**. DOD is to adopt the goal to produce or procure not less than 25 percent of the total quantity of facility energy it consumes within its facilities from renewable sources beginning in fiscal year 2025.[16] DOD can meet this goal by producing electricity using renewable sources on its installations or by procuring electricity produced using renewable sources that is produced in other locations.
- **Consumption**. To the extent economically feasible and technically practicable, not less than 7.5 percent of electrical energy consumed by federal agencies is to come from renewable sources beginning in fiscal year 2013.[17] According to federal guidance implementing the Energy Policy Act of 2005, to count toward the consumption goal, DOD must possess renewable energy credits for electricity it consumes.[18]

Executive Order 13693 established additional goals, including directing agency heads to ensure that increasing percentages of electrical energy consumed in buildings be renewable electric energy where cost-effective, beginning with 10 percent in 2016 and climbing to at least 30 percent by fiscal year 2025.

[16]10 U.S.C. § 2911(e).

[17]Pub. L. No. 109-58, § 203 (codified at 42 U.S.C. § 15852).

[18]According to Department of Energy guidance, renewable energy credits represent the technological and environmental attributes of energy generated from renewable resources. Developers can use these credits to meet state requirements or they can sell the credits to others. According to the Department of Energy, renewable energy credits separate the sale of electricity from these environmental attributes. See Department of Energy, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423*, § 3 (Jan. 28, 2008).

In addition, the military departments have also taken steps to encourage renewable energy, and each has issued department-level guidance to develop 1 gigawatt of renewable energy—Air Force by 2016, Navy by 2020, and Army by 2025. The military departments have also established some unique energy goals. For example, the Secretary of the Navy established a goal to derive at least 50 percent of shore-based energy requirements from alternative sources, including renewable energy, by 2020.[19] In addition, in its energy strategy, the Army established a goal to increase its use of renewable or alternative resources for power and fuel use.[20]

To meet these goals, over a number of years, DOD has taken steps to develop renewable energy projects on its installations. Additionally, Congress requires that DOD report information on its progress toward these and other energy goals in its annual energy management report.[21] DOD's most recent report identifies more than 1,130 operational projects of varying generating technologies and capacities.[22]

In addition to its renewable energy goals, DOD has also identified renewable energy projects as a possible way to contribute to its energy security objective. In particular, DOD has noted that its installations and missions can be vulnerable to disruptions of the commercial electricity grid and that renewable energy, combined with energy storage and other

[19]Department of Navy, *Energy Program for Security and Independence* (October. 2010).

[20]U.S. Army, *Army Energy Security Implementation Strategy* (Washington, D.C.: Jan. 13, 2009) and *Energy Security and Sustainability (ES2) Strategy* (Washington, D.C.: May 1, 2015).

[21]Section 2925 of Title 10 U.S. Code requires DOD to submit to Congress an annual energy management report.

[22]Department of Defense, *Annual Energy Management Report Fiscal Year 2014* (May 2015).

tools, can allow installations to maintain critical operations without electricity from outside the installations.[23]

To develop renewable energy projects, DOD can either directly fund the construction or development of projects or work with private developers to help initially finance them. To directly develop renewable energy projects, DOD typically uses funds provided through its annual appropriations process—referred to in this report as up-front appropriated funding. Otherwise, DOD can finance projects through agreements with private developers and pay back the costs of the projects over time—referred to as alternative financing mechanisms.

In addition, when developing projects with private developers, DOD may use one of three types of land use agreements to provide developers with use of DOD land. Through such agreements, DOD allows developers the use of its land in exchange sometimes for revenues or in-kind consideration.[24] Each type of land use agreement has different requirements for compensation for the use of DOD land, as follows:

- **Leases**. Under 10 U.S.C. § 2667, the secretary of a military department (or the Secretary of Defense in certain contexts) may lease land in exchange for the payment of cash or in-kind

[23]See Dr. Dorothy Robyn, Deputy Under Secretary of Defense (Installations and Environment), testimony before the House Committee on Armed Services Committee, Subcommittee on Readiness, March 29, 2012. Also, see Department of Defense, DOD Instruction 4170.11, *Installation Energy Management* (Dec. 11, 2009). In a March 2016 revision of this instruction, DOD generally replaced the objective of energy security with one of energy resilience. It defines energy resilience as the ability to prepare for and recover from energy disruptions that impact mission assurance on military installations. However, the revised instruction still calls for energy generation on installations using renewable and other technologies, when determined to be life cycle cost-effective, to provide security—and now *resilience*—to mitigate unacceptable risk from energy disruptions.

[24]In-kind consideration refers to goods or services that a lessee provides to an agency in lieu of cash rent payments. In the case of DOD's renewable energy projects, for example, in-kind considerations might include the installation of a new substation or electrical switching and other features that support the provision of project electricity to the installation in the event of a grid outage.

consideration in an amount that is not less than the fair market value of the lease interest, as determined by the secretary.[25]

- **Easements**. Under 10 U.S.C. § 2668, the secretary of a military department may provide an easement for rights-of-way, upon terms that the secretary considers advisable, but is not required to include a cash or in-kind consideration.
- **Access licenses or permits**. Depending on the structure of the agreement, DOD may provide contractors a license or permit, which allows access to and use of a site for the purposes of the contract, without compensation.[26]

DOD Emphasized Working with Private Developers to Develop Larger Renewable Energy Projects but Builds Some Projects Using Up-Front Appropriated Funds

According to DOD officials and documents, in recent years, DOD's approach emphasized developing larger projects and working with private developers to develop renewable energy projects with a generating capacity of greater than 1 megawatt on DOD installations in the United States. DOD used alternative financing mechanisms—that is, financing the initial capital investments in projects with private funding—to facilitate working with private developers. Nonetheless, DOD also directly developed some of these projects using up-front appropriated funds.[27]

[25]This provision applies to DOD land that is not needed for public use, but that is not excess land.

[26]For a standard clause providing such permit or license, see 48 C.F.R. 52.241-5 (1995).

[27]We define appropriated funding as "up-front" when DOD has been appropriated sufficient funds to pay for the full cost of the renewable energy project before a commitment is made for the project, as opposed to appropriated funds DOD uses to make payments on capital borrowed through certain types of alternative financing approaches. We define "alternative financing" as ways of financing capital assets other than through full, up-front appropriations.

DOD Has Emphasized Larger Projects and Working with Private Developers

According to DOD officials and documents, the department has emphasized generally larger renewable energy projects—such as those greater than 1 megawatt—and working with private developers. In 2012, DOD testified before Congress that it planned to emphasize the development of large-scale renewable energy projects with private developers. In 2011, the Army began an initiative focusing on large-scale renewable energy, and in 2014, it established the Office of Energy Initiatives and issued supporting guidance for developing large-scale projects with private developers. According to the guidance, the Army forms relationships with project developers, utilities, and the renewable energy industry and leverages these relationships to identify, develop, and finance projects across its installations. Likewise, in 2014, the Navy established the Renewable Energy Program Office to provide a centralized Navy and Marine Corps approach to developing large-scale renewable energy with private developers. According to a Marine Corps official, there has been a shift toward larger projects in recent years, and the Marine Corps' strategy for renewable energy will be to finance large-scale projects through private developers. Similarly, according to Air Force officials, the Air Force has been shifting its emphasis toward developing large-scale renewable energy projects with private developers, in part to avoid committing DOD resources to the ownership or operation of renewable energy projects. In March 2016, the Air Force announced the establishment of its Office of Energy Assurance to focus on developing large-scale renewable and other energy projects with private developers.

DOD officials told us that the recent focus on pursuing larger projects offers some key advantages. For example, officials said that the increasing emphasis on larger projects offers better opportunities to more efficiently reach DOD's renewable energy goals and that projects that generate more electricity allow the installations to obtain larger amounts of renewable electricity to apply toward energy goals. According to DOD officials, because of recognition that larger projects can sometimes be more cost-effective, among other reasons, DOD has pursued projects that are larger than 1 megawatt, such as those 10 megawatts and greater. Ten of the 17 projects in our sample were 10 megawatts or larger.

According to DOD officials and our prior work, working with private developers when developing renewable energy projects offers several advantages for DOD, including the following:

- **Access to incentives**. According to DOD officials, private developers can obtain federal, state, and local tax incentives, which can significantly lower their overall costs of developing renewable energy. These incentives are not generally available to DOD if it develops projects on its own. In particular, the federal government offers certain incentives, such as tax credits to encourage the development of renewable energy, but while private developers may claim these by filing tax returns, DOD cannot claim them because it does not pay federal income taxes.[28]
- **Access to capital**. Private developers can arrange their own funding for developing and constructing projects, which allows DOD to avoid seeking up-front appropriated funds. DOD officials told us that obtaining up-front appropriated funds for developing large-scale renewable energy projects can be difficult. Large renewable energy projects such as these can cost several million dollars. As we found in our April 2012 report, obtaining appropriations to finance projects can take longer than developing projects with alternative financing mechanisms.[29] In that report, DOD officials told us that it can take 3 to 5 years to navigate the programming and budgeting process and to obtain military construction appropriations for the project. Up-front appropriation funding through the Energy Conservation Investment Program can also be difficult to obtain.[30] Air Force officials told us that renewable energy projects over 1 megawatt would generally have a

[28]Renewable energy projects may be eligible for several types of incentives, including the Investment Tax Credit—which provides a tax credit currently of up to 30 percent of the eligible costs for certain renewable energy projects—and the Production Tax Credit—which provides a tax credit currently equal to 2.3 cents per kilowatt-hour for energy produced from wind and certain other renewable energy sources. For more information on types of federal supports see GAO, *Electricity Generation Projects: Additional Data Could Improve Understanding of the Effectiveness of Tax Expenditures*, GAO-15-302 (Washington, DC: Apr. 28, 2015).

[29]GAO, *Renewable Energy Project Financing: Improved Guidance and Information Sharing Needed for DOD Project-Level Officials*, GAO-12-401 (Washington, D.C.: Apr. 4, 2012).

[30]To help conserve energy at its installations, DOD, in fiscal year 1976, established the Energy Conservation Investment Program, which funds projects every year through the defense-wide military construction appropriation. For more information on the Energy Conservation Investment Program, see *Defense Infrastructure: Energy Conservation Investment Program Needs Improved Reporting, Measurement, and Guidance*, GAO-16-162 (Washington, D.C.: Jan. 29, 2016).

difficult time competing for Energy Conservation Investment Program funding against other types of energy conservation measures.

- **Better asset management**. According to DOD officials and our previous work, working with private developers allows DOD to leverage private companies' expertise in developing and managing of projects and limits the number of personnel DOD has to commit to projects.
- **Better risk management**. According to prior work and military department officials, private developers can be held responsible for development and operational risks, depending on the contract terms.

Previous reports and DOD officials we interviewed also identified drawbacks to entering into agreements with private developers, including the following:

- The federal government incurs the cost of some incentives used to develop projects on DOD installations. Many of the financial incentives private developers use, such as federal tax credits, are paid for by other parts of the federal government, such as the Department of the Treasury.[31] As we found in an April 2015 report,[32] incentives for renewable energy projects like those in our sample have collectively cost taxpayers $13.7 billion in tax expenditures, such as tax credits, and an additional $16.8 billion in grants provided in lieu of tax expenditures from fiscal year 2004 through 2013.[33] Because DOD's analysis of cost-effectiveness solely focuses on the costs DOD incurs, these costs to the government are not included in DOD's decision-making process. As a result, projects using such incentives may be more expensive to the government than the cost that DOD estimates it will incur on its own. In its comments on our draft report,

[31]For this report, the analyses we reviewed examined only the costs DOD would likely incur and were not necessarily designed to capture certain costs of projects that were external to DOD. Therefore, they do not account for costs others may incur, such as subsidies provided by the federal government through federal tax expenditures.

[32]GAO-15-302.

[33]These estimates reflected all projects that used these tax expenditures, not just projects undertaken in coordination with DOD. In that report, we suggested that Congress consider directing the Internal Revenue Service to collect and report project-level data from taxpayers who claim certain types of credits. Solar projects like several of those we examined during the course of our review would have been eligible for these tax credits.

DOD stated that in federal procurement, it is the norm for a business case to address the cost to the agency, not to the entire government.

- Private financing of projects can increase overall cost. As we reported in a December 2004 report,[34] and more recently in an April 2012 report,[35] financing projects through private developers may be more expensive over time than using up-front appropriations because the federal government's cost of capital is lower than that of the private sector.
- Working with private developers can require significant DOD expertise. Army officials told us that working with private developers can require staff to help the developers understand specific requirements for development on installations. In particular, developing projects inside installations involves a complex combination of financing, regulatory requirements, ensuring that the projects are compatible with the installations' military missions, and other needs that require DOD expertise.
- DOD can face challenges in completing work to meet external deadlines. Air Force officials said that renewable energy projects incorporate a number of processes, including environmental reviews, procurement, renewable energy analysis, and real estate valuations. In some cases, these processes must be pursued concurrently to work within a time frame that is reasonable to successfully reach agreements with the private sector. Also, according to information provided by the Army, completing these processes in a timely manner can be important because projects with private developers may face a variety of external deadlines to remain viable, such as those imposed by lenders for private parties, when they obtain their own financing, or those to obtain organizational approval or timely access to incentives.

[34]GAO, *Capital Financing: Partnerships and Energy Savings Performance Contracts Raise Budgeting and Monitoring Concerns*, GAO-05-55 (Washington, D.C.: Dec. 16, 2004).

[35]GAO-12-401.

DOD Has Used Alternative Financing Mechanisms to Facilitate Working with Private Developers

DOD officials and documentation identified a range of alternative financing mechanisms DOD has used to work with private developers, singly or in combination, in developing renewable energy projects,[36] including the following:

- **Power purchase agreement (PPA)**. An agreement negotiated between DOD and an energy supplier to purchase specified quantities of electricity at specified prices for a specific period of time. PPAs may be short term, 10 years or less, or long term, typically up to 30 years.[37] Revenues developers receive under PPAs can be used to repay the costs of constructing and operating a renewable energy project on a DOD installation. According to DOD documentation, PPAs are becoming increasingly common. In some cases, these agreements can be used to purchase electricity from projects built on DOD land, but some can involve projects built elsewhere. DOD officials told us long-term PPAs can provide a cost-effective opportunity to repay private developers for the initial costs of building and the ongoing costs of operating these facilities.
- **Enhanced use lease**. A long-term lease of property to a private developer for uses including the installation of renewable energy systems in exchange for cash or in-kind services. These leases are usually for 25 years or more, up to 50 years. In many cases, enhanced use leases do not include a specific provision to purchase electricity produced from the project. According to DOD documentation, DOD is increasingly using enhanced use leases, enabling installations to obtain revenue for the value of DOD land by leasing property to private developers for long periods, such as 50-

[36]Some of these financing mechanisms could be used for purposes other than developing renewable energy projects.

[37]DOD has several authorities for entering into PPAs. For example, under 10 U.S.C. § 2410q, DOD can enter into contracts for up to 5 years generally, or up to 10 years in certain circumstances. Under 10 U.S.C. § 2922a, DOD may enter into agreements of up to 30 years. Under 10 U.S.C. § 2809, subject to certain conditions, DOD may enter into contracts of up to 32 years, excluding the period for construction. DOD officials told us that they have not used the authority under 10 U.S.C. § 2809 to enter into PPAs. We have previously reported that in the event of base closure under the Base Realignment and Closure process, alternative financing arrangements that require future payments such as PPAs are likely to create a financial liability to the federal government. See GAO, *Defense Infrastructure: Improved Guidance Needed for Estimating Alternatively Financed Project Liabilities*, GAO-13-337 (Washington, D.C.: Apr. 18, 2013).

years terms. In contrast to PPAs, which provide DOD with potential financial benefits through the purchase of electricity and leasing of the land for the project, the financial benefit derived from enhanced use leases is derived through payments received from private developers leasing DOD land for the project.[38]

- **General Services Administration (GSA) areawide contract**. A preexisting agreement negotiated between GSA and a local electricity supplier allowing government agencies in specified areas to purchase electricity and other utility services at established terms and conditions. These agreements are limited to no more than 10 years.[39] Similar to PPAs, revenues received under these contracts can be used to repay the local electricity supplier to construct and operate a renewable energy project on a DOD installation. Army officials told us they have used GSA areawide contracts when PPAs are not economically viable or not allowed under state regulations. Army officials said that under some conditions, these types of agreements can be the easiest and fastest mechanisms for contracting for

[38]DOD is authorized to enter into enhanced use leases only for nonexcess property that is not for the time needed for public use. "Excess property" is defined as property under the control of a federal agency that the head of the agency determines is not required to meet the agency's needs or responsibilities. 40 U.S.C. § 102. Therefore, a parcel of DOD real property could not be needed for public use for some period of time, but still be nonexcess because it is required to meet certain future DOD needs or responsibilities, such as maintaining additional space to accommodate an increase in DOD's force in the event of a war. For more information on the enhanced use lease program see GAO, *Defense Infrastructure: The Enhanced Use Lease Program Requires Management Attention*, GAO-11-574 (Washington, D.C.: June 30, 2011).

[39]The 10-year term of the GSA areawide contract may not match the duration of other long-term agreements for the same renewable energy project. We identified such an instance in our work. Specifically, the Army provided the project developer a 30-year land use agreement for the Fort Huachuca, Arizona project. For the same project, Army officials also signed three 10-year authorizations for services under a GSA areawide contract, ostensibly creating a 30-year authorization for services, something not clearly within the scope of the underlying contract. Upon further inquiry, Army officials told us that it appeared that the authorizations for Fort Huachuca, Arizona, had been signed by an unauthorized person. Army officials told us that the Army had conducted an internal inquiry and, in December 2015, Army officials executed a replacement agreement. That agreement states that because DOD does not have the authority to issue a 30-year GSA areawide contract, it is the government's intent to renew the agreement upon the expiration of the initial 10-year period and to continue such issuances every 10 years through the 30-year period specified in the land use agreement. In addition, Army officials told us that their investigation determined that no unauthorized commitment of funds had taken place because previous agreements with the utility were still in effect.

renewable energy projects because they extend existing GSA areawide contracts for the purchase of electricity from the existing supplier and merge this contract extension with an agreement with the local utility for the construction of a renewable energy project. According to Army officials, these contract extensions sometimes provide no cost savings because the purchase price of the electricity is unchanged, but the renewable energy projects may provide military installations other benefits such as providing a step toward obtaining energy security by building the renewable energy project on the installation.

- **Energy savings performance contract (ESPC)**. A contract with private companies to pursue installation of energy savings measures, such as more efficient equipment and renewable energy, where the savings are used to pay for the measures. In many cases, a single contract can combine multiple energy savings measures and can last for up to 25 years.[40]
- **Utility energy service contract (UESC)**. A contract with a local utility to provide energy management services focused on energy efficiency or demand reduction, such as designing and installing renewable energy projects. These agreements have typically not exceeded 10 years.

DOD officials told us that DOD has not emphasized some alternative financing mechanisms because they pose difficulties; see the following examples:

- **Short terms**. Short-term PPAs and UESCs are difficult to contract at prices competitive with existing electricity sources because of their short terms—no more than 10 years. For example, Navy officials told us that a 10-year—rather than a 25-year—PPA for the Hawaiian project would have resulted in the developer setting an unacceptably high electricity rate compared to electricity from the existing supplier. Army officials told us that short-term UESCs are mostly used for small projects because, except in some special cases, it may not be possible to develop larger projects—those greater than 1 megawatt—that can be cost-effective within the required 10-year payback period.

[40]For additional information on ESPCs, see GAO, *Energy Savings Performance Contracts: Additional Actions Needed to Improve Federal Oversight*, GAO-15-432 (Washington, D.C.: June 17, 2015).

According to Army officials, the 1.9-megawatt solar photovoltaic project at Fort Campbell, Kentucky—a larger UESC project—was possible only because a $3 million grant from the state made the project cost-effective.[41]

- **Access to incentives**. Some ESPCs and UESCs may not allow private developers to capture federal tax incentives because Internal Revenue Service rules stipulate that only owners of the projects or those meeting certain standards are eligible to claim key tax expenditures.[42] According to Army officials, the Army has structured ESPCs to allow private developers to capture federal incentives by owning the embedded renewable energy projects, but it stopped doing so after a 2012 Office of Management and Budget memorandum required government ownership of such renewable energy projects to avoid obligating the full cost of the project when the contract is signed.[43]

DOD officials told us that they believed that developing renewable energy projects with private developers requires appropriate agreements that balance the interests of the federal government with the developers' interests. To do this, DOD typically negotiates land use and other agreements with private developers. These agreements can be complex. Some agreements may address ownership of the assets of the project. For example, one agreement we reviewed immediately assigned ownership of the project to the Army, whereas some other agreements assigned initial ownership of the project to the private developer with

[41]To address the difficulty of the short-term duration of UESCs, DOD issued a final rule to amend the Defense Federal Acquisition Regulation Supplement to clarify that contracting officers may enter into an energy savings contract for a period not to exceed 25 years. See 81 Fed. Reg. 90, 28733 (May 10, 2016).

[42]Incentives for renewable technologies vary widely from state to state, utility to utility, and even by local area. However, as with tax benefits, the types of owner entities eligible for these benefits are often limited to commercial, industrial, and residential owners. Federal agencies do not qualify as they do not pay taxes. DOD can benefit from tax expenditures that can be captured by having the energy service company own the renewable energy asset, although the tax expenditure does represent a cost to the government through tax revenue not collected.

[43]Office of Management and Budget, *Addendum to OMB Memorandum M-98-13 on Federal Use of Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs)*, Memorandum M-12-2I (Sept. 28, 2012).

provisions to potentially convert ownership over to the Army after a specific period of time.

DOD Used Up-Front Appropriated Funds to Develop Some Projects

In addition to using alternative financing mechanisms, DOD used traditional financing methods, such as up-front appropriated funds, to develop some projects. According to DOD guidance, appropriations can be an important source of funding for energy projects. In fiscal year 2014, DOD obligated about $99 million for 130 renewable energy projects. According to a DOD report, DOD generally uses appropriated funds for small-scale projects but in some cases has used them to develop projects over 1 megawatt. Unlike projects developed using alternative financing mechanisms, projects developed using appropriated funding are generally owned by DOD and built on DOD land and, as such, do not require the negotiation of financing and land use agreements.

DOD officials identified several sources of up-front appropriated funds for funding renewable energy projects over 1 megawatt. For example, officials identified potential sources to include funds made available through annual military construction appropriations. Another key source of funding officials identified within the military construction account is the Energy Conservation Investment Program.[44] This program has historically received annual appropriations to fund energy conservation and renewable energy, among other things. According to DOD guidance, the amount of annual awards made depends on funding and DOD priorities, among other things. In fiscal year 2015, $160 million was provided to the program—$150 million for projects and $10 million for planning and design. Proposals for Energy Conservation Investment Program projects undergo a multistep selection process, beginning with DOD guidance outlining its priorities. DOD components, including the military departments then develop military construction proposals and cost analyses based on this guidance. Similarly, DOD officials noted that the department can also fund renewable energy projects with funds provided through annual operation and maintenance appropriations, (subject to certain limitations).[45] DOD officials also cited other funding that Congress

[44]For more information on the Energy Conservation Investment Program, see GAO, *Defense Infrastructure: Energy Conservation Investment Program Needs Improved Reporting, Measurement, and Guidance*, GAO-16-162 (Washington, D.C.: Jan. 29, 2016)

[45]For example, 10 U.S.C. § 2805 allows DOD to use operation and maintenance funds to carry out minor military construction projects costing not more than $1 million.

may periodically provide, such as funding appropriated through the American Recovery and Reinvestment Act of 2009, which could be used.[46]

DOD Used Various Approaches to Analyze the Financial Costs and Benefits of Selected Renewable Energy Projects, but Its Analyses and Documentation Were Not Always Clear

DOD used various approaches to analyze the financial costs and benefits of the 17 renewable energy projects we reviewed and determined that they were generally cost-effective. However, the project documentation DOD developed for the officials responsible for approving these projects did not always clearly identify the value of land used for the projects and in turn the compensation the department received for the land. In addition, key differences in DOD's analyses and documentation for projects incorporating long-term PPAs raise questions about the information available to approving officials about projects' estimated costs and benefits.

DOD Used Various Approaches to Determine If Selected Renewable Energy Projects Were Cost-Effective

DOD used various approaches to determine that of the 17 projects we reviewed, 12 were cost-effective in producing electricity. DOD conducts business case analyses of potential renewable energy projects to determine whether they met DOD's policy of encouraging investment in cost-effective renewable energy sources.[47] In general, to do these analyses, DOD officials told us that DOD compares the estimated cost of the electricity from these projects over each project's life or its contract terms with the estimated cost of continuing to purchase electricity from existing suppliers.[48] If the estimated cost of purchasing electricity from a project is equal to or lower than the cost of continuing to purchase electricity from existing suppliers, DOD determines that the project is

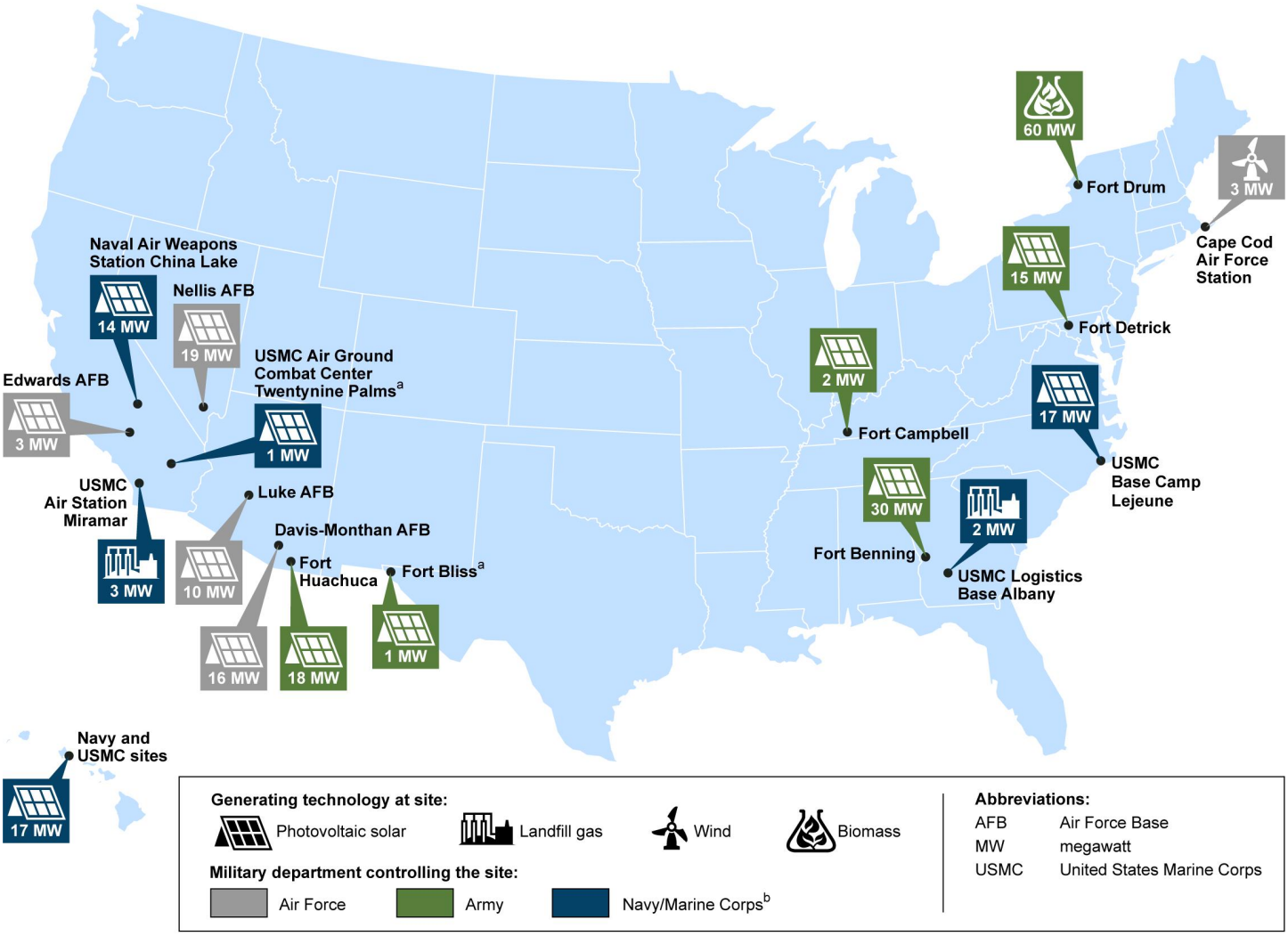
[46]As we found in April 2012, DOD reported spending nearly $200 million of appropriated funds from the American Recovery and Reinvestment Act of 2009 on renewable energy projects. See GAO-12-401.

[47]DOD refers to project analyses variously as economic analyses, business case analyses, or life cycle cost analyses. In this report, we refer to them as business case analyses.

[48]All estimates are to be discounted to current-year dollars to reflect the time value of money.

cost-effective, according to these officials. Figure 1 shows the locations, technologies and other information about the 17 projects in our sample.

Figure 1: Location, Generating Technology, and Capacity and Controlling Military Department for 17 Selected Department of Defense Renewable Energy Projects with a Generating Capacity Greater Than 1 Megawatt from 2010 through 2015



Sources: Department of Defense; Map Resources (map). | GAO-16-487

[a]This project slightly exceeds but is rounded down to 1 megawatt.

[b]The Department of the Navy includes the Navy and Marine Corps military services.

Because of the differences in the ways these 17 selected projects were financed, DOD officials told us that they used various approaches to estimate electricity costs in their analyses. Specifically:

- For 9 of the projects, including 7 projects developed using long-term PPAs and 1 using a short-term PPA[49]—where DOD agreed to purchase specified quantities of electricity from a supplier at specified prices—as well as 1 project developed using an ESPC,[50] DOD estimated the total cost of purchasing electricity from each project by using the developer's proposed prices for and amount of electricity specified in the contract. DOD then compared this estimate to the cost of purchasing the same amount of electricity from its existing supplier at the prices it estimated the supplier would charge over each year of the term of the contract.
- For each of the 2 projects developed using GSA areawide contracts—where DOD is granting only the use of its land for the project and will continue to purchase electricity under its existing arrangement with its supplier—DOD officials told us that because there would be no change in its electricity costs, DOD did not undertake a detailed analysis to compare the cost of the project with the cost of continuing to purchase electricity from its existing supplier.
- For the project developed using an UESC—where DOD would immediately own the project and obtain the electricity generated from the project—DOD compared the amount it would pay for electricity from the project over each year of the 10-year contract term to its estimate of the cost of purchasing the same amount of electricity from its existing supplier at the prices it estimated the supplier would charge during each year of the same 10-year period.
- For the 2 projects funded through up-front appropriations, DOD developed life cycle cost estimates—that is, estimates of the overall costs of developing, constructing, operating, maintaining, and ultimately disposing of these projects, as well as estimates of the amount of the electricity that would be produced over each year of the projects' lifetimes. DOD then compared these estimates to the cost of

[49]For one project at Edwards Air Force Base, California, developed using a short-term PPA, Air Force officials provided the analysis of financial costs and benefits when our report was in the final stages of processing. As a result, we did not conduct a detailed examination of how the Air Force completed this analysis.

[50]According to DOD officials, the project at Fort Bliss, Texas, was uniquely structured, with Fort Bliss entering into a PPA for power produced from a solar array developed as a part of a broader ESPC. For this project, DOD analyzed its cost-effectiveness as a purchase of electricity rather than of the generating system. Army officials told us that the Army no longer structures projects combining ESPCs and PPAs.

purchasing the same amount of electricity from its existing suppliers at the prices it estimated the supplier would charge over the lifetimes of the projects.

- For the 3 projects financed using enhanced use leases, DOD did not take steps to evaluate the cost-effectiveness of the electricity purchases since these projects were not designed to provide cost savings from purchasing electricity. Instead, DOD examined whether the leases for these projects provided compensation at least equal to the estimate of fair market value for the land used.

For the 14 projects for which DOD evaluated cost-effectiveness,

- 12 projects were determined to be cost-effective based on electricity costs and
- 2 projects were determined to be not cost-effective solely based on electricity prices, but DOD pursued them for other reasons. Specifically,
  - DOD pursued a project at Fort Campbell, Kentucky, because, according to Army officials, while the project would not be cost-effective over the 10-year term of the contract, it would be cost-effective over the estimated 25-year lifetime of the project.
  - DOD pursued a project at Marine Corps Air Station Miramar, California, because according to a Marine Corps project document, it contributed to DOD's renewable energy goals and energy security objective, which are discussed later in this report.

DOD's business case analyses for the 12 projects it determined to be cost-effective showed a range of estimated cost savings.[51] In some cases, DOD identified instances of relatively high expected cost savings. For example, DOD estimated the project serving Navy and Marine sites in Hawaii—Joint Base Pearl Harbor Hickam and Marine Corp Base Hawaii at Kaneohe Bay and Hawaii Camp Smith—would provide about $75

[51]For the project at Edwards Air Force Base, California, Air Force officials provided the business case analysis completed to make that determination when our report was in the final stages of processing. As a result, we did not conduct a detailed examination of how the Air Force determined the cost-effectiveness of this project.

million in cost savings over 25 years.[52] Other projects were expected to provide modest energy cost savings. For example, DOD estimated less than $100,000 in cost savings over 20 years for a project at Fort Drum, New York. Some projects were deemed cost-effective even if they provided no cost savings because DOD established the threshold for cost-effectiveness for energy cost savings at zero—that is, it considered projects to be cost-effective as long as electricity from the projects would not cost more than electricity from the existing supplier. For example, the Army designed the GSA areawide contracts at Fort Benning, Georgia, and Fort Huachuca, Arizona, to cost the same as continuing to purchase electricity from existing suppliers, thereby meeting the minimum cost-effectiveness threshold.

Project Documentation Available to Approving Officials Was Not Always Clear about the Value of Land Used and the Compensation DOD Received

The project documentation DOD developed for the officials responsible for approving the 14 of the 17 projects in our review that involved private developers and land use agreements was not always clear about the value of the land used and the compensation DOD received for granting such use.[53] For these projects DOD used the following three types of land agreements, and compensation received varied widely. Specifically:

- For the 6 projects that used leases—which require the government to obtain at least fair market value for the leased land—the agreements

[52]These cost savings over the economic life of the project or duration of the contract were presented as present values. Present value dollars have had their annual cash flow occurring over time converted to equivalent amounts at a common point in time to account for the time value of money.

[53]The three other projects in our sample did not require land use agreements since two of them were funded through appropriations and owned by DOD and the other project involved a utility energy service contract to fund a project that was also DOD owned.

were structured to obtain cash or in-kind payments that DOD believed met this requirement.[54]

- For the 3 projects that used easements to grant the use of DOD land—which have less specific requirements regarding compensation—the levels of financial compensation varied, including $1 for the easement provided for the project at Edwards Air Force Base, California, and 2 projects that their documentation indicated they would be obtaining other benefits without specifying the financial value of those benefits.
- For the other 5 projects that used access licenses or permits to grant the use of DOD land—which do not require compensation—DOD obtained no financial compensation.[55]

The project documentation DOD prepared for approving officials for these 14 projects differed in how it presented information about the value of the land used and the compensation DOD received. Specifically:

- For 6 projects in our sample involving leases, DOD's project documentation presented information about the value of the land and the compensation the department received in return for granting the lease, but the documentation for 2 out of the 6 projects did not provide a clear comparison of these land values and compensation. For example, the documentation for a project at Nellis Air Force Base, Nevada, included information about the estimated market value of the land but did not clearly explain how the in-kind compensation it received for the land compared with that value. Approving officials

[54]This report generally discusses the land use agreement applied to the electricity-generating areas of the project; however, DOD provided more than one type of land use agreement for some projects. For example, at Luke Air Force Base, Arizona, the Air Force awarded a lease for the solar array site and an easement for using other land for a transmission line. In addition, for the projects at Air Station Miramar and Fort Drum, DOD had leased the generation site in prior agreements and thus those leases were not part of the projects we examined. For example, the Army had previously leased the land to the developer for the biomass plant at Fort Drum, and the PPA did not require any new land use agreement for the generating facility, but was paired with a lease for substation areas and an easement for a transmission line for the project.

[55]According to Navy officials, the Hawaii project at Navy and Marine Corps installations included both an access license or permit and a site occupancy agreement, which the Navy specifically created for this project. The officials told us that the site occupancy agreement has features of a lease but did not require the developer to provide cash or in-kind considerations equal to the fair market value of the land.

agreed to receive in-kind compensation, including an electric substation and two lines to distribute electricity on the base. However, the project documentation did not explain how DOD estimated the value of the substation and additional distribution lines and how that value compared with the market value of the land.[56]

- For 8 projects in our sample involving other types of agreements, such as easements and access licenses or permits, project documentation did not always include information about the value of the land and the compensation DOD received. In particular, none of the project documentation for the 8 projects where land was granted using land use agreements other than leases included a discussion of how the value of the land compared with the compensation DOD received. For example, the documentation for the project that provided about 120 acres of land at Naval Air Weapons Station China Lake, California, using an access license and a long-term PPA did not discuss the value of the land or compare it with the value of any compensation. Similarly, the documentation for the project that provided over 150 acres of land at Fort Huachuca, Arizona, using an easement and a GSA areawide contract did not provide a comparison of the fair market value of the land with an estimate of the compensation DOD received in return.

DOD has guidance for presenting land values in project documentation; however, the guidance does not discuss all types of alternative funding mechanisms currently in use. Because the 2012 Office of the Secretary of Defense policy memorandum on alternative financing mechanisms does not apply to all types of alternative financing mechanisms, it is not certain that those projects to which it does not apply are obtaining the required fair market value for land, either in kind or in cash, required by 10 U.S.C. § 2667. For example, the guidance does not apply to 7 of the 14 selected projects involving alternatively financed mechanisms and land use agreements that we examined.

Under Standards for Internal Control in the Federal Government, agencies are to clearly document internal controls and the documentation

[56]For the project at Nellis Air Force Base, Nevada, Air Force officials told us that the value of the in-kind consideration had been verified and exceeded the fair market rental value of the leased land, but could not provide project documentation confirming that Air Force approving officials received that information in project documentation before approving the project.

is to appear in management directives, administrative policies, or operating manuals.[57] While DOD has guidance for some alternative financing mechanisms used to work with private developers, the guidance does not clearly apply to all alternative financing mechanisms. Without modifying its guidance for presenting land values in project documentation to apply to the range of alternative financing mechanisms it has used, DOD does not have reasonable assurance that project documentation for approving officials will be consistent or complete for projects using these kinds of financing mechanisms.

In addition, the guidance does not direct project documentation to include a comparison of the value of the land used and the compensation DOD receives for it. Our 2009 cost-estimating guide states that one basic characteristic of a credible cost estimate is the recognition of excluded costs, so that any excluded costs should be disclosed and given a rationale.[58] By clarifying the guidance to direct all project documentation for alternatively financed projects involving land use agreements to include the value of the land, the compensation DOD would receive for it, and how the value of the land compared with the value of the compensation, DOD approving officials would have more information for understanding the financial costs and benefits of a project. This information can be particularly important for approving officials for projects like Fort Huachuca and other GSA areawide contracts, where DOD provides the use of its land but obtains no energy cost savings because the cost of purchasing electricity remains the same.

[57]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999). GAO has revised and reissued *Standards for Internal Control in the Federal Government*, with the new revision effective as of October 1, 2015. See GAO-14-704G (Washington, D.C.: September 2014).

[58]GAO-09-3SP.

Key Differences in Analyses and Documentation for Projects Incorporating Long-Term PPAs Raise Questions about Information Available to Approving Officials

Key differences in how DOD conducts business case analyses for renewable energy projects incorporating long-term PPAs—those with terms of up to 30 years—and how it documents these analyses raise questions about the information available to approving officials about projects' estimated costs and benefits. First, differences in the assumptions DOD used to estimate electricity prices from existing suppliers could affect DOD's conclusions about projects' estimated cost savings. Second, DOD examined but did not consistently document the sensitivity of its estimates for some projects to changes in these assumptions. Third, DOD's project documentation was not always clear or consistent about how compensation for the use of its land was reflected in its analyses of whether electricity produced by the projects was cost-effective.

Differences in Sources for Assumptions Used to Estimate Energy Prices Raise Questions about Estimated Cost Savings of Projects

For the seven projects in our sample involving long-term PPAs, DOD used different sources for the assumptions when it developed its estimates of the cost of continuing to purchase electricity from existing suppliers, and these differences raise questions about the estimated costs and benefits of these projects. Specifically, in developing its estimates of the costs of continuing to purchase energy from existing suppliers, DOD used different sources for assumptions, such as how existing suppliers' electricity prices may change in the future—known as escalation rates.[59] Escalation rates are a key assumption in these estimates because if the actual escalation rate turns out to be lower than the rate DOD assumed in its analysis, its estimates of electricity prices in future years from existing suppliers would be overstated and make renewable electricity appear more cost-effective than it actually would be. Accordingly, any cost savings associated with purchasing electricity from the project instead of from existing suppliers would have been also overstated. Conversely, if the actual escalation rate turns out to be higher than the rate DOD assumed in its analysis, the estimated electricity prices in future years from existing sources would be understated and make renewable electricity appear less cost-effective than it actually would be.

[59]Other key assumptions DOD used to estimate cost savings included the estimated baseline price of electricity from existing suppliers at the time of project operations start and a "discount" rate to adjust cost savings to account for the time value of money over the life of the contract.

Eleven of the 17 projects we reviewed required DOD to use escalation rates for electricity prices to estimate cost savings. DOD used assumptions in National Institute of Standards and Technology's guidance for the 4 projects that involved financial mechanisms other than long-term PPAs. However, for 6 of the 7 remaining projects that required the use of escalation rates and involved long-term PPAs, DOD relied on assumptions from sources other than National Institute of Standards and Technology's guidance.

GAO's 2009 cost-estimating guide highlights the importance of obtaining valid data when preparing credible cost estimates and the need for consistency in how cost estimates are structured.[60] DOD has not issued guidance for preparing cost estimates for projects involving all the financing mechanisms the department uses. For projects relying on up-front appropriated funds, DOD has issued guidance that calls for the use of assumptions stipulated in guidance from the Federal Energy Management Program and National Institute of Standards and Technology—including assumptions about the price of electricity from existing suppliers and escalation rates.[61] However, according to DOD and Federal Energy Management Program officials, neither DOD nor the Federal Energy Management Program has issued guidance for such assumptions for projects that involve long-term PPAs. In the absence of guidance specific to projects involving long-term PPAs, DOD generally undertook special studies to develop assumptions for the analyses we examined, which means that the sources for the assumptions used for long-term PPAs may not be the same. According to DOD officials, they undertook these studies because DOD guidance did not specify the source for escalation rates to use for projects involving long-term PPAs, and DOD wanted to obtain input on developing reasonable estimates to use in its analyses.

Differences in the sources for the assumptions it used for escalation rates to estimate the costs of renewable energy projects involving the 7 long-term PPAs in our sample raise questions about the credibility of the estimated costs of these projects. For example, in reviewing the analyses of the projects involving long-term PPAs at Naval Air Weapons Station

[60]GAO-09-3SP.

[61]Department of Defense, Unified Facilities Criteria 1-200-02.

China Lake, California, and Marine Corps Air Station Miramar, California, we found that DOD used a higher escalation rate than the rate in National Institute of Standards and Technology's guidance. DOD officials told us that they used the higher rate because industry representatives said the rate in the National Institute of Standards and Technology's guidance was too low. Using the higher escalation rate made the price of electricity purchased from the renewable energy project appear more competitive compared to the estimated price of electricity from existing suppliers than if they used the rate in guidance from the National Institute of Standards and Technology. Using higher assumptions has, in turn, made the estimated cost savings appear higher. Questions about these projects' estimated benefits, in turn, raise questions about the information DOD officials relied on when approving these projects. In contrast, 5 other projects in our sample that used an escalation rate followed DOD guidance to use assumptions developed by the National Institute of Standards and Technology. Without guidance for long-term PPAs that identifies the preferred source for assumptions for escalation rates, there is a risk that DOD's estimates of cost savings could incorporate an escalation rate that is too high or low and DOD does not have a consistent basis for estimating the cost savings of projects developed using different financing mechanisms. If DOD developed guidance for renewable energy projects involving long-term PPAs that calls for consistent sources for assumptions for escalation rates, DOD officials charged with approving projects would have greater assurance that they had credible cost estimates on which to base these decisions and more consistency across projects developed using varied financing mechanisms.

Project Documentation Did Not Always Include Discussion of Sensitivity of Estimated Cost-Effectiveness to Changes in Assumptions

Project documentation for the seven projects in our sample that used long-term PPAs did not always include a discussion of how sensitive DOD's estimates of cost and cost-effectiveness were to changes in key assumptions. Recognizing that changes in key assumptions could affect these estimates, DOD examined a range of potential values for key assumptions used to develop cost estimates for some projects to determine how sensitive they were to changes in these assumptions. These sensitivity analyses generally identified the escalation rate for electricity from existing suppliers as a key uncertainty affecting an

estimated project's cost savings, given the difficulties inherent in predicting electricity prices sometimes decades into the future.[62]

However, DOD did not consistently describe the sensitivity analyses it conducted in the project documentation provided to approving officials for three of the seven projects that we examined involving long-term PPAs. For two projects—Davis-Monthan Air Force Base, Arizona, and Marine Corps Air Station Miramar, California—DOD did not include descriptions of the sensitivity analyses that had been conducted. For a third project—the project at Fort Drum, New York—DOD included a description of the sensitivity analysis in the project documentation but did not explain that relatively small changes in its estimates of future electricity prices from the existing source could reverse the estimated cost savings from purchasing project electricity to a loss.

DOD's guidance for business case analyses states that a well-documented sensitivity analysis allows approving officials to understand how much confidence they should have in an analysis's conclusions—in this case, whether the project will be cost-effective in the future, that is, the credibility of the cost savings estimate.[63] In that regard, DOD guidance is consistent with Office of Management and Budget guidance[64] and our 2009 cost-estimating guide,[65] which identifies the characteristics of a high-quality—that is, reliable—cost estimate. Such an estimate would be credible, well-documented, accurate, and comprehensive, and documenting the estimate, which includes describing the sensitivity analysis, is among the 12 steps in our cost-estimating guide that, if followed correctly, should result in reliable and valid cost estimates that agency management can use for making informed decisions. However, DOD did not always include a description of the sensitivity analyses it conducted in the project documentation provided to approving officials.

[62]Other assumptions that DOD examined in some, but not all, sensitivity analyses included the baseline price for electricity from existing suppliers, the growth of electricity consumption on the base, and the amount of electricity purchased.

[63]See Department of Defense, *DOD Product Support Business Case Analysis Guidebook* (April 2011) and U.S. Army, *U.S. Army Cost Benefit Analysis Guide* (Apr. 24, 2013).

[64]Office of Management and Budget, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Circular No. A-94 (Oct. 29, 1992), and GAO-09-3SP.

[65]GAO-09-3SP.

One reason for this appears to be that DOD's guidance for projects involving long-term PPAs does not specify how to describe sensitivity analyses in project documentation. Without clarifying in guidance how to describe sensitivity analyses in project documentation, DOD does not have reasonable assurance that DOD staff will consistently document such analyses for projects involving long-term PPAs to show whether changes in key assumptions would affect the conclusion that a project was cost-effective, and that approving officials know how much confidence to have in the cost savings estimate.

Project Documentation Did Not Always Reflect All DOD Costs in Analysis of Cost-Effectiveness

Project documentation for the seven projects in our sample involving long-term PPAs did not fully reflect all costs to DOD, often excluding the value of DOD land used by the project. DOD guidance on business case analyses calls for cost estimates to be complete, that is, to reflect the full cost of the resources used.[66] However, for six of the seven projects incorporating long-term PPAs, project documentation did not reflect all costs, either because the project did not obtain compensation for the land used or DOD effectively returned compensation received for the land back to the developer, thereby excluding this compensation from the cost of electricity from the project when estimating the cost-effectiveness of the project. Specifically, for the four projects that involved long-term PPAs and used an instrument other than a lease, such as an access license or permit, in project documentation DOD did not include the valuation of the land in its cost estimate or obtain financial compensation for the use of its land. Because DOD was not obtaining financial compensation for the land, the estimated electricity costs for these projects did not reflect the value of DOD land used, helping to make the cost of electricity from the projects more advantageous than from existing suppliers. For these four projects, the discussion about the land used differed in the project documentation. For example, the documentation for a project at Navy and Marine Corps sites in Hawaii clearly stated that the value of the land was not considered when estimating cost savings, whereas the project documentation for the project at Naval Air Weapons Station China Lake, California did not discuss the value of the land in the cost savings estimate.

[66]For example, see Department of Defense, *DOD Product Support Business Case Analysis Guidebook*, and U.S. Army, *U.S. Army Cost Benefit Analysis Guide.*

Even for the three projects where DOD received compensation for the use of its land, information in project documentation did not reflect a consistent approach for treating the compensation—which in the case of leases is required to be at least equal to the estimated fair market value of the land—in the cost savings estimate. For two of the projects—the projects at Davis-Monthan Air Force Base, Arizona, and Fort Detrick, Maryland—DOD used the compensation it was to receive for the use of land as a credit to payments it would have made for electricity. This approach had the effect of giving back to the developer the full compensation that had been owed to DOD for the land to reduce the amount DOD owed the developer for electricity. DOD then used the reduced amounts as the costs of electricity from the projects to compare with the costs of purchasing electricity from the existing supplier to determine whether the projects were cost-effective. This approach significantly affects the estimated financial costs of projects, helping to make projects' electricity appear more financially cost-effective. For example, the Army is committing 67 acres valued at an annual rent of more than $400,000 over a 26-year lease to the Fort Detrick project. Including the fair market rental value of the land would raise the electricity prices of the project and, as a result, significantly reduce the estimated cost savings for project—by about 70 percent—compared to the analysis presented in project documentation where the value of the land was effectively excluded, according to information provided by Army officials. In contrast, for the project at Fort Drum, New York—where DOD obtained compensation equal to fair market value—DOD simply relied on the total cost of purchasing electricity as stipulated in the contract—without reducing this amount by the compensation owed to DOD for use of its land—to compare with the costs of purchasing electricity from the existing supplier, resulting in more accurate estimated cost savings.

DOD does not have guidance for long-term PPAs that specifies that DOD cost estimates are to reflect all costs, including the value of land to ensure that DOD analyses consistently treat and document the value of land in the estimated cost of electricity. The 2012 policy memorandum calls for these projects to generally utilize leases and for project documentation to include a statement of the fair market value of land in land use agreements as well as a business case analysis of the electricity purchased. However, this policy memorandum does not specify how to present information on how the value of the land or how any compensation that may have been owed to DOD should be considered when developing analyses of the cost-effectiveness of projects. In particular, this document does not specify how to reflect the value of lands used for projects for which DOD was not compensated. The

document also does not specify whether the determination of cost-effectiveness of projects should reflect the total costs for purchasing electricity or whether it is allowable to reduce this amount by treating compensation provided to DOD for granting the use of its land as a credit toward future electricity purchases.

Some DOD officials we interviewed did not think obtaining compensation for land involving PPAs benefits the government because such payments would simply increase the price of electricity from a project and make the project look less cost-effective. For projects involving long-term PPAs—where DOD is both buying electricity from the project and providing the use of DOD land on which a developer will install, operate, maintain, and own the project—these officials believed all costs associated with the project would be recovered through payments made by DOD for the electricity produced by the project. As such, DOD officials told us that any compensation provided by the developer for use of DOD land provides no net financial benefit for DOD since it would result in higher DOD payments to the developer. According to these officials, the primary financial benefit of these projects is obtained through energy cost savings. However, not providing information about the full costs of DOD contributions, both in terms of electricity purchases and the value of the land and any compensation, can make electricity from the projects appear more cost-effective than purchasing electricity from existing suppliers. Our 2009 cost-estimating guide states that one basic characteristic of a credible cost estimate is the recognition of all associated costs, so that any excluded costs should be disclosed and given a rationale.[67]

Without clarifying guidance on how documentation should present information on all costs of a project, including the value of the land and compensation received for it and in turn how that value and compensation affect the estimated costs and benefits of purchasing electricity from projects involving PPAs, DOD officials approving such projects may lack credible information about costs for those projects. As DOD pursues larger renewable projects on its land, the amount of land used may be larger, more valuable, and committed for longer periods of time and unavailable for other purposes—making this land an increasingly significant project resource.

[67] GAO-09-3SP.

Some Selected Projects Advanced DOD's Energy Goals and Security Objective, but Documentation of Project Contributions Was Not Always Clear and Consistent

Some of the 17 projects we reviewed advanced DOD's energy goals and energy security objective, but project documentation was not always clear about how each project was expected to (1) contribute to the department's production and consumption goals or (2) advance the department's energy security objective or estimate the value of energy security provided.

Some of the Selected Projects Advanced DOD's Energy Goals, but Project Documentation about Contributions toward the Goals Was Not Always Clear

According to DOD project documentation and the DOD officials we interviewed, all 17 of the renewable energy projects we reviewed contributed to DOD's renewable energy production goal,[68] and 9 of these projects contributed to DOD's consumption goal (see table 1).[69] According to information provided by DOD, all of the projects claimed that the energy they produced counted toward DOD's renewable energy production goal because DOD reporting guidance calls for crediting all renewable energy projects on DOD land as contributing to this goal. However, according to DOD project documentation and officials, 8 of the 17 projects did not contribute to DOD's consumption goal because the military services did not retain or replace the renewable energy credits associated with the project. Under the Energy Policy Act of 2005, DOD has to retain ownership of these credits to claim the energy produced by these projects toward its energy consumption goal or purchase credits to replace them,[70] but the ownership of these credits is often negotiated as

[68]Section 2911(e) of Title 10 U.S. Code. As previously noted, DOD has a statutory goal to produce or procure not less than 25 percent of the total quantity of facility energy it consumes within its facilities from renewable sources by 2025.

[69]Energy Policy Act of 2005, Pub. L. No. 109-58 (2005) (codified in relevant part at 42 U.S.C. § 15852). The federal government is required to consume, to the extent economically feasible and technically practicable, not less than 7.5 percent of electrical energy from renewable sources each year.

[70]In the United States, renewable energy production essentially creates two products: the energy itself and an associated commodity, called a renewable energy credit, which represents a certain amount of energy generated using a renewable resource. Renewable energy credits are bought and sold in a fashion similar to stocks and bonds.

part of the contract to develop the project, according to military department officials. These officials told us that in some locations renewable energy credits can be valuable. In some cases, developers directly use them to meet state requirements.[71] In other cases, developers may be able to sell them to others. In either case, developers retaining these credits can typically offer lower prices for electricity, according to the officials. The military department officials noted that, because the price of renewable energy credits can vary widely across different parts of the country, it is sometimes possible to purchase replacement credits elsewhere in the country at a lower price and allow private developers to retain the credits where a project is developed.

Table 1: DOD Assessment of Selected Renewable Energy Projects' (Awarded from 2010 through 2015) Contributions to Energy Production and Consumption Goals

	Project	Contributes to energy production goal[a]	Contributes to energy consumption goal[b]
Department of the Army	1. Fort Benning, Georgia	Yes	No
	2. Fort Bliss, Texas	Yes	Yes
	3. Fort Campbell, Kentucky	Yes	Yes
	4. Fort Detrick, Maryland	Yes	Yes
	5. Fort Drum, New York	Yes	No
	6. Fort Huachuca, Arizona	Yes	No
Department of the Navy	7. Navy and Marine Corps sites, Hawaii	Yes	No
	8. Marine Corps Logistics Base Albany, Georgia	Yes	Yes
	9. Naval Air Weapons Stations China Lake, California	Yes	No
	10. Marine Corps Air Station Miramar, California	Yes	Yes
	11. Camp Lejeune, North Carolina	Yes	No
	12. Air Ground Combat Center Twentynine Palms, California	Yes	No

[71]According to military department officials, some project developers, which are also state-regulated utilities, may need to retain the renewable energy credits from the projects to meet state-mandated requirements such as Renewable Portfolio Standards.

	Project	Contributes to energy production goal[a]	Contributes to energy consumption goal[b]
Department of the Air Force	13. Nellis Air Force Base, Nevada	Yes	Yes
	14. Edwards Air Force Base, California	Yes	Yes
	15. Davis-Monthan Air Force Base, Arizona	Yes	Yes
	16. Cape Cod Air Force Station, Massachusetts	Yes	Yes
	17. Luke Air Force Base, Arizona	Yes	No
Total	**Not applicable**	**17**	**9**

Source: GAO from information provided by the Department of Defense (DOD). | GAO-16-487

Notes: Three projects in this table—Camp Lejeune, Nellis Air Force Base, and Luke Air Force Base—were financed through enhanced use leases, which are not designed to provide cost savings from purchasing electricity but rather provide DOD with compensation for leasing land and may provide other benefits. The Navy and the Air Force are not purchasing electricity from the projects at Camp Lejeune and Luke Air Force Base, respectively, so there would be no opportunity to retain the renewable energy credits. However, the Air Force is purchasing electricity from the project at Nellis Air Force Base, and while the developer will retain the renewable energy credits, the Air Force is purchasing replacement credits and thus, is able to count the project as contributing to DOD's energy consumption goal.

[a]Section 2911(e) of Title 10 U.S. Code establishes a goal for DOD to produce or procure not less than 25 percent of the total quantity of facility energy it consumes within its facilities from renewable sources by 2025. DOD guidance on renewable energy accounting rules calls for crediting all renewable energy projects on DOD land as contributing to the production goal, regardless of whether DOD consumes the electricity or owns the generating asset or the renewable energy credits. Renewable energy credits are market-based instruments that represent the property rights to the environmental, social, and other nonpower qualities of renewable electricity generation.

[b]Under the Energy Policy Act of 2005, the federal government, including DOD, is required to consume, to the extent economically feasible and technically practicable, not less than 7.5 percent of electrical energy from renewable sources each year. Under the guidance for this act, DOD has to retain or replace renewable energy credits—tradable certificates representing the environmental attributes of renewable energy generation—to claim a contribution toward the consumption goal.

Project documentation was not always clear or did not provide information about which of DOD's energy goals a project was contributing to or important aspects of how that contribution toward goals was supported. For example, the documentation for the project at Camp Lejeune, North Carolina submitted to officials did not reflect that it would not contribute to the consumption goal. In interviews about this project, Navy officials told us that the project did not contribute to the consumption goal because the developer would retain renewable energy credits associated with the project. However, this information was not reflected in project documentation submitted to approving officials. In other cases, project documentation did reflect to which goals a project would contribute but did not reflect important aspects of how that contribution toward goals was supported. For example, project documentation for the renewable

energy project at Davis-Monthan Air Force Base, Arizona, reflects that the project is expected to contribute to DOD's consumption goal. Project documentation did indicate that the developer retained the renewable energy credits associated with this project. However, it did not explain that the Air Force would have to purchase renewable energy credits to claim the energy the project produces toward its consumption goal. Thus approving officials did not have access to all relevant information about the project and its contributions toward the energy goals.

Standards for Internal Control in the Federal Government states that information should be recorded and communicated to management and others within the entity who need it and in a form and within a time frame that enables them to carry out their internal control and other responsibilities.[72] Without information in project documentation about the extent to which an individual project contributes toward DOD's production and consumption goals, it is not clear that approving officials had access to all relevant information about the project before approving it.

Further, federal standards for internal control state that internal control and all transactions and other significant events need to be clearly documented; such documentation should be complete and available for inspection; and that documentation is to appear in management directives, administrative policies, or operating manuals. However, DOD's guidance does not direct that all project documentation should identify the extent to which an individual project will contribute toward the department's energy goals. Without DOD clarifying in guidance that projects should specify if they are contributing to DOD's energy goals (i.e., production and consumption), approving officials may approve the development of renewable energy projects without fully understanding the projects' potential costs and benefits. In particular, DOD officials may unknowingly approve projects that contribute only to DOD's production goal, thereby rendering its land unavailable for other projects that could have contributed to both its production and consumption goals.

[72]GAO/AIMD-00-21.3.1.

Documentation Was Not Always Clear about How Projects Advanced DOD's Energy Security Objective or the Value of Energy Security Benefits Provided

The views of DOD officials and documentation for projects in our sample reflected a wide range of perspectives on energy security, but we found that only 2 of the projects were specifically designed to provide power to the installations in the event of a disruption of the commercial grid without additional investments. DOD officials told us that they believed all 17 of the projects in our sample provided an energy security benefit because the officials defined energy security broadly to encompass the diversification of fuel sources, among other things. However, this view was not consistently reflected in the documentation for the 17 projects in our sample. Specifically, of the 17 projects, the documentation for 5 projects either did not identify energy security as a project benefit or stated that the project would not provide an energy security benefit. For example, for a project at Navy and Marine Corps sites in Hawaii, documentation stated that the project would not incorporate energy security features because to do so would be cost prohibitive.

In contrast, the documentation for the other 12 projects identified a wide range of potential energy security benefits but did not use consistent definitions of energy security or consistently identify the need for additional investment. For 5 of the 12 projects, the documentation either did not clarify the specific energy security benefit or identified energy security benefits more broadly, such as promoting the use of nonfossil fuels. For example, documentation for the project at Naval Air Weapons Station China Lake, California, identified that the project would reduce reliance on electricity produced by natural gas, a fossil fuel; replace energy purchased from other suppliers; and be located on the installation as the energy security and independence benefits. For the remaining 7 projects, the documentation noted that the projects had the potential of providing power in the event of a commercial grid outage—a narrower definition of energy security benefits. However, we found that only 2 of these projects had the capability to provide electricity to the installation in the event of an outage of the commercial grid without additional steps. Specifically, documentation for a project at Fort Drum, New York, stated that the project would provide access to on-site electricity generation for all of the installation's energy needs in the event of a grid outage. In addition, Marine Corps officials told us that the project at Marine Corps Logistics Base Albany, Georgia, would provide electricity to the

maintenance center—the critical facility on the installation—during a grid outage.[73]

The other 5 projects would require additional steps and investments, such as the installation of batteries or other energy storage equipment and the integration of improvements to the electricity delivery and control systems on the installation before they would be able to deliver electricity during a grid outage. For example, documentation for the project at Fort Benning, Georgia, noted that additional infrastructure would be needed to enable use of the energy produced by the project during a grid outage and estimated that this infrastructure would cost an additional $30 million to $40 million. Similarly, documentation for the project at Camp Lejeune, North Carolina, stated that the Department of the Navy would be investing up to $48 million more to achieve the project's energy security benefits. One project did not provide any information about the additional investment required to provide electricity during a grid outage. Documentation for a project at Marine Corps Air Station Miramar, California, identified an energy security benefit of providing power during an outage of the commercial grid but did not clearly specify what additional investments were required or provide estimates of the costs of those investments. Navy officials told us that since the approval of the project, the Navy has developed a proposal for about $18 million in upgrades that will integrate this project as well as other emergency energy sources to enable it to provide this capability, but these improvements were not included in the project documentation that we examined.

Under federal standards for internal control, information should be recorded and communicated to management and others within the entity who need it and in a form and within a time frame that enables them to carry out their internal control and other responsibilities. However, the military departments and services did not consistently record in project documentation the type of energy security benefit projects would provide and whether any such benefit would be immediately available or would require additional investments and, if additional investment was required,

[73]The Maintenance Center consists of approximately 90 buildings, including a central repair shop, according to officials. Officials also told us that the landfill at Marine Corps Logistics Base Albany, Georgia, does not produce enough methane gas to power the critical facility on the installation during normal circumstances, so in the event of grid outage, the installation would also have to use natural gas to power this facility.

provide a detailed estimate of those investments. Without specifying this information, project documentation did not convey a full understanding of the projects' potential costs and benefits specific to energy security to approving officials. Table 2 describes the extent to which project documentation identified energy security as a benefit and whether additional investment would be needed to achieve this benefit for the 17 projects we reviewed.

Table 2: Contributions of Selected DOD Renewable Energy Projects (Awarded from 2010 through 2015) to Energy Security Objective as Identified in Project Documentation

	Military department and project	Energy security[a] benefit claimed (definition inclusive of energy diversity and ability to provide power during an outage)	Availability of power during an outage of the commercial grid		
			Without additional investment	With additional investment	Total (both with and without additional investment)
Army	18. Fort Benning, Georgia	yes	not applicable	yes	yes
	19. Fort Bliss, Texas	yes	not applicable[b]	not applicable[b]	not applicable
	20. Fort Campbell, Kentucky	not applicable	not applicable	not applicable	not applicable
	21. Fort Detrick, Maryland	yes	not applicable	yes	yes
	22. Fort Drum, New York	yes	yes	not applicable[c]	yes
	23. Fort Huachuca, Arizona	yes	not applicable	yes	yes
Navy	24. Navy and Marine Corps sites, Hawaii	not applicable	not applicable	not applicable	not applicable
	25. Marine Corps Logistics Base Albany, Georgia	yes	yes	not applicable[c]	yes
	26. Naval Air Weapons Stations China Lake, California	yes	not applicable[b]	not applicable[b]	not applicable
	27. Marine Corps Air Station Miramar, California	yes	not applicable	yes	yes
	28. Camp Lejeune, North Carolina	yes	not applicable	yes	yes
	29. Air Ground Combat Center Twentynine Palms, California	yes	not applicable[b]	not applicable[b]	not applicable
Air Force	30. Nellis Air Force Base, Nevada	yes	not applicable[b]	not applicable[b]	not applicable
	31. Edwards Air Force Base, California	not applicable	not applicable	not applicable	not applicable
	32. Davis-Monthan Air Force Base, Arizona	yes	not applicable[b]	not applicable[b]	not applicable
	33. Cape Cod Air Force Station, Massachusetts	not applicable	not applicable	not applicable	not applicable
	34. Luke Air Force Base, Arizona	not applicable	not applicable	not applicable	not applicable
Total	not applicable	**12**	**2**	**5**	**7**

Source: GAO from information provided by the Department of Defense (DOD). | GAO-16-487

Note: DOD has identified renewable energy projects as a possible way to contribute to its energy security objective. See Department of Defense, DOD Directive 4180.01, DOD Energy Policy, and DOD Instruction 4170.11, Installation Energy Management.

[a]Energy security is defined by 10 U.S.C. § 2924 as having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission-essential requirements. There are multiple ways to help ensure energy security at installations, including diversification of energy sources, use of renewable energy, energy redundancy, and energy conservation. One particular way to ensure energy security is using renewable energy to assure installations' access to power during commercial grid outages.

[b]For this project DOD claimed an energy security benefit, but not a benefit specifically associated with providing electricity during a disruption of the commercial grid.

[c]DOD officials told us that these projects provided the energy security benefit without additional investments.

Moreover, DOD did not consistently estimate or document the value of the energy security benefits associated with the 17 projects we reviewed. For example, the project at Fort Huachuca, Arizona, granted an easement to a private developer to use DOD land in exchange for energy security benefits but did not provide an estimated value for this benefit in documentation for the project. DOD officials we interviewed told us that they estimated the value of the energy security benefit as the developers' full cost of the project—$46 million. However, it was not clear from the project documentation why the Army valued the energy security benefits as equal to the entire cost of the project. In contrast, for the Navy project at Camp Lejeune, North Carolina, documentation contained the Navy's estimate of the value of the energy security benefit as the government's projected cost of alternatively obtaining the same amount of electricity capacity with diesel generators plus the developer's cost of providing project studies, site preparation, and connection infrastructure, which totaled about $23 million.

As we mentioned earlier, under federal standards for internal control, information should be recorded and communicated to management and others within the entity who need it and in a form and within a time frame that enables them to carry out their internal control and other responsibilities.[74] However, DOD used different approaches to estimate the value of the energy security benefit of providing assured access to power during a grid outage and did not consistently record the approach used in project documentation. Without a consistent approach to estimating the value of the energy security benefits and a description of

[74]GAO/AIMD-00-21.3.1.

the approach used to estimate that value in project documentation, approving officials may not have reasonable assurance about the value of projects' energy security benefits.

The primary reason for the lack of consistency and completeness in project documentation concerning projects' contributions to DOD's energy security objective and the value of the energy security benefits provided is that DOD has not issued guidance on how to document projects' contributions to its energy security objective. Available guidance does not directly apply to estimating and documenting projects' energy security benefits. While 10 U.S.C. § 2924 points toward a narrower definition of energy security, specifically the ability to provide power during a disruption of the commercial grid, DOD's directive that calls for improving energy security, among other things, does not specify how to identify the type of energy security provided by projects or how to otherwise document these contributions. [75] In addition, we were not able to identify any other guidance that directs the military departments and services on how information about the need for additional investment to obtain an energy security benefit should be presented in project documentation. DOD officials we interviewed were also not aware of any guidance on how to value the energy security provided by renewable energy projects.

Finally, DOD officials were not able to identify specific documented guidance on valuing energy security that applies to projects relying on energy sources that are intermittent—such as solar sources that vary throughout the day and are unavailable at night. As mentioned earlier, under federal standards for internal control, agencies are to clearly document internal controls and the documentation is to appear in management directives, administrative policies, or operating manuals.[76] In the absence such specific guidance, DOD officials took different approaches to estimating the value. Specifically, with regard to the project at Fort Huachuca, Arizona, Army officials estimated that the energy security value was equal to the cost of the renewable energy project. In contrast, for the project at Camp Lejeune, North Carolina, Navy officials estimated that the value was equal to the cost of obtaining the comparable amount of capacity from a standard technology for providing

[75]Department of Defense, DOD Directive 4180.01 (Apr. 16, 2014).

[76]GAO/AIMD-00-21.3.1.

backup power supplies, in this case backup diesel generators—a technology that can produce specified amounts of energy whenever called upon. It is inherently difficult to estimate the value of energy security.[77] However, it is not clear that either of the two approaches they used—namely, equal to the total cost of the project or equal to the cost of obtaining diesel generators of an equal capacity to produce electricity—is valid for estimating the value of energy security provided by the renewable energy projects in our sample.[78] Officials we interviewed from all three military departments stated that it was difficult to develop such estimates without guidance. For example, Marine Corps and Navy officials discussing the project at Air Ground Combat Center Twentynine Palms, California, told us that they were wary of estimating the value of energy security without specific guidance from DOD on how to estimate such value for renewable energy projects because they were concerned that their valuation would be critiqued. Further, approving Army officials told us that they had an option in the request for proposals for the project at Fort Detrick, Maryland, to consider energy security benefits but did not know how to evaluate them, and thus they did not consider them in the proposals they reviewed. Without guidance for estimating and documenting the contributions of renewable energy projects to DOD's energy security objective, approving officials may continue to see inconsistent and incomplete project documentation and may approve the development of renewable energy projects without fully understanding the projects' potential costs and benefits specific to energy security.

Conclusions

By emphasizing larger projects and working with private developers, DOD is making strides toward various federal renewable energy goals and its

[77]According to a study by Ernest Orlando Lawrence Berkeley National Laboratory at a fundamental level, for businesses and residential customers the value of energy security is equal to the expected economic losses during an outage or consumers' willingness to pay for energy during an outage and the values different types of customers placed on energy security varied widely by customer type and duration of outage. Ernest Orlando Lawrence Berkeley National Laboratory, *Estimated Value of Service Reliability for Electric Utility Customers in the United States*, LBNL-2132E (2009).

[78]Under standard economic principles, benefits should be measured in terms of what individuals are willing to pay to obtain a given benefit, and the cost of obtaining alternative reliable sources of energy may be a reasonable proxy for this value. For example, see Office of Management and Budget, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, OMB Circular No. A-94 (Washington D.C.: Oct. 29, 1992).

own energy security objective. As DOD has worked more frequently with private developers using alternative financing mechanisms to further its renewable energy goals and energy security objective, its guidance for analyzing the financial costs and benefits of these projects appears to have lagged, particularly for projects involving long-term PPAs for which DOD grants the use of its land.

DOD has guidance for presenting land values in project documentation, but the guidance does not discuss all types of alternative funding mechanisms currently in use. As a result, the project documentation DOD prepared for approving officials differed in how it presented information about the value of the land used and the compensation DOD received for the use of its land. Without modifying its guidance for presenting land values in project documentation to apply to the range of alternative financing mechanisms it has used, particularly long-term PPAs, DOD may not have reasonable assurance that project documentation for approving officials is consistent or complete. If DOD clarifies the guidance to direct all project documentation for alternatively financed projects involving land use agreements to include the value of the land, the compensation DOD would receive for it, and how the value of the land compared with the value of the compensation, DOD approving officials would have more information for understanding the financial costs and benefits of a project.

Further, for projects involving long-term PPAs, DOD's guidance provides few specific details for conducting its business case analyses of these projects' costs and benefits, in particular, the key assumptions that DOD departments, services, and installations use for escalation rates. Differences in the sources DOD used as the basis for assumptions about escalation rates raise questions about the credibility of the estimated costs of projects provided to approving officials. Developing guidance that calls for drawing upon consistent sources for assumptions for escalation rates would provide DOD officials charged with approving renewable energy projects involving long-term PPAs more assurance that they had credible cost estimates on which to base these decisions. In addition, although DOD's guidance for business case analyses states that a well-documented sensitivity analysis allows approving officials to understand how much confidence they should have in an analysis's conclusions, DOD's guidance for renewable energy projects does not specify how to describe sensitivity analyses in project documentation. Without clarifying its guidance on how to describe sensitivity analyses in project documentation, DOD may not have reasonable assurance that it will consistently document such analyses for projects involving long-term

PPAs to show whether changes in key assumptions would affect the conclusions that projects were cost-effective.

Moreover, DOD does not have guidance for long-term PPAs that specifies that cost estimates reflect all costs, including the value of land that DOD forgoes the use of for renewable energy projects, to ensure that DOD analyses consistently treat and document the value of land in the estimated cost of electricity. Without DOD clarifying its guidance on how documentation should present information on all costs of a project, including the value of the land and compensation received for it and in turn how that value and compensation affect the estimated costs and benefits of purchasing electricity from projects involving PPAs, DOD officials approving such projects may lack credible information about costs for those projects.

Finally, limited guidance regarding how to prepare documentation for renewable energy projects has resulted in project documentation that is not always clear as to which projects are contributing toward DOD energy goals and its energy security objective. Without information in project documentation about the extent to which an individual project contributes toward DOD's production and consumption goals, approving officials may not have access to all relevant information about the project when making decisions before approving it. Regarding energy security, DOD's project documentation did not always clearly define the energy security benefits associated with projects and whether additional investment would be required to obtain these benefits. If project documentation does not specify the type of energy security benefit projects would provide and whether any such benefit would be immediately available or would require additional investments and, if additional investment was required, provide a detailed estimate of those investments, approving officials may not fully understand the projects' potential costs and benefits specific to energy security. In addition, lack of guidance on how to value energy security provided by renewable energy projects such as those we reviewed has resulted in inconsistent approaches to estimating the value of the energy security benefits associated with each project. Without a consistent approach to estimating the value of the energy security benefits and a description of the approach used in project documentation, approving officials cannot have reasonable assurance about the value of projects' energy security benefits.

Recommendations for Executive Action

We are recommending that the Secretary of Defense direct the Assistant Secretary of Defense for Energy, Installations and Environment and the Secretaries of the Army, Navy, and Air Force to take the following eight actions:

To improve DOD's analyses of the financial costs and benefits of renewable energy projects,

- modify guidance for presenting land values in project documentation to apply to the range of alternative financing mechanisms DOD has used and
- clarify the guidance to direct all project documentation for alternatively financed projects involving land use agreements to include the value of the land, the compensation DOD would receive for it, and how the value of the land compared with the value of the compensation.

To improve DOD's analyses of the financial costs and benefits of renewable energy projects involving long-term PPAs on its land, revise guidance to

- develop consistent sources for assumptions for escalation;
- clarify how to describe sensitivity analyses in project documentation; and
- clarify how project documentation should present information on all costs of a project, including the value of the land and compensation received for it and in turn how that value and compensation would affect the estimated costs and benefits of purchasing electricity from the project (e.g., whether compensation could be used to reduce electricity costs for the project when estimating cost-effectiveness).

To improve the information available to approving officials on projects' contributions to DOD's renewable energy goals and energy security objective and to help ensure the consistency and completeness of project documentation, develop guidance to

- clarify that projects should specify their contribution to DOD's energy production and consumption goals;
- clarify the type of energy security benefit that projects will provide and state whether any such benefit is immediately available or would require additional investments and, for projects that would require additional investment, provide a detailed estimate of those investments; and

- clarify that a consistent approach is to be taken to estimate the value of the energy security benefit of providing assured access to power during a grid outage and that a description of this approach is provided in project documentation.

Agency Comments

We provided a draft of this report to DOD for review and comment. In written comments, reprinted in appendix III, DOD concurred with all of our recommendations. In addition, DOD provided technical comments, which we incorporated as appropriate.

We are providing copies of this report to appropriate congressional committees; the Secretary of Defense; the Secretaries of the Army, the Navy, and the Air Force; the Commandant of the Marine Corps; and the Secretary of Energy. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact Brian J. Lepore at (202) 512-4523 or leporeb@gao.gov or Frank Rusco at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff members who made key contributions to this report are listed in appendix IV.

Brian J. Lepore
Director, Defense Capabilities and Management

Frank Rusco
Director, Natural Resources and Environment

List of Committees

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Thad Cochran
Chairman
The Honorable Richard J. Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Mark Kirk
Chairman
The Honorable Jon Tester
Ranking Member
Subcommittee on Military Construction, Veterans Affairs, and Related Agencies
Committee on Appropriations
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Rodney Frelinghuysen
Chairman
The Honorable Pete Visclosky
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

The Honorable Charles Dent
Chairman
The Honorable Sanford Bishop, Jr
Ranking Member
Subcommittee on Military Construction, Veterans Affairs, and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope and Methodology

The objectives of our review were to examine (1) the Department of Defense's (DOD) approach for developing renewable energy projects with a generating capacity greater than 1 megawatt (2) DOD's approach for analyzing the financial costs and benefits of selected renewable energy projects contracted for or funded from 2010 through 2015 and (3) the extent to which selected projects addressed DOD's renewable energy goals and energy security objective.

To address these questions, we examined 17 renewable energy projects built with a generating capacity greater than 1 megawatt on military installations in the United States with funding or contracts awarded from 2010 through 2015.[1] We identified possible projects for examination from lists of approved but not necessarily operational projects and lists of operational projects the military departments provided. Including approved projects that were not necessarily operational enabled us to review more recent projects that are more revealing of DOD's current efforts and emphasis on larger, alternatively financed projects. We selected projects that reflected a range of military departments and services, funding mechanisms, and renewable energy technologies. Because this was a nonprobability sample, our findings are not generalizable to other DOD renewable energy projects but provide illustrative examples of how DOD develops projects, analyzes costs and benefits, and addresses its goals and objective with such projects. For a complete listing of the projects in our sample, see appendix II.

To examine DOD's approach for developing renewable energy projects with a generating capacity of 1 megawatt and greater, we reviewed applicable laws, DOD guidance for developing renewable energy projects, and DOD's annual reporting on energy management, and interviewed officials with the Office of the Secretary of Defense and the

[1]While the provision in the Joint Explanatory Statement accompanying the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 was for us to review 5 projects in each of the four services for a total of 20 projects, we found that at least one service does not have 5 recent projects with 1 megawatt of generating capacity. In consultation with congressional committees, we selected a preliminary sample of at least 5 projects per department. After getting additional information on the preliminary sample of projects, we found that 3 projects did not meet our sample criteria—for example, did not have generating capacity greater than 1 megawatt—and ultimately selected 17 projects to examine.

military departments and services who were knowledgeable about DOD's development of such projects, including our sample of 17 projects.

To examine how DOD analyzed the financial costs and benefits of selected renewable energy projects, we reviewed DOD's guidance as well as Federal Energy Management Program and National Institute of Standards and Technology guidance for assessing cost-effectiveness of projects and examined whether DOD followed this guidance. We focused on the approaches DOD used to calculate the costs of various sources of energy and estimate cost savings derived from the project electricity, the source of assumptions for the analyses, any compensation from developers for the land used for the project, assessments of uncertainties with its long-term estimates, and the information conveyed in project documentation to approving officials about any government payments or compensation stipulated in project agreements. We reviewed the relevant project documentation for the selected projects, including business case analyses of cost savings and, for alternatively financed projects, the project contracts with developers and any associated agreements to allow developers temporary use of land for the project. We also interviewed key officials with the Office of the Secretary of Defense; military departments and services; specific installations with specific knowledge of projects; and Department of Energy, which provides federal agencies information and support when examining energy projects and related matters. Project documentation DOD provided us was not always clear about all aspects of the estimation process or the source of assumptions; moreover, DOD could not provide documentation for the business case analysis done for 1 of the 17 projects we examined, and we do not report on the estimation process for that project. Based on our interviews to confirm DOD's estimation process described in project documentation, we determined that the DOD information was reliable for the purposes of examining how DOD determined the costs and benefits of these projects.

To examine the extent to which DOD addressed its renewable energy goals and energy security objective through the projects in our sample, we reviewed DOD guidance on renewable energy and energy security. We also reviewed project documentation prepared for project approval, as well as contracts and land use agreements to determine the extent to which renewable energy goal contributions and energy security benefits were identified in project documentation. In addition, to ensure that we reliably identified and understood the contributions to the renewable energy goals and the energy security objective for the projects, we interviewed DOD officials about each project. Based on our comparison of project documentation and interview responses, we determined that

the DOD information was reliable for the purposes of examining the extent to which DOD addressed its renewable energy goals and energy security objective through selected renewable energy projects.

We conducted this performance audit from March 2015 to September 2016 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: DOD Renewable Energy Projects in GAO Sample

Table 3: Selected Characteristics of GAO Sample of DOD Renewable Energy Projects

	Installation	Financing mechanism/approach[a]	Land use agreement(s)[b]	Generating capacity[c] (megawatts)	Generating technology
Department of the Army	Fort Benning, Georgia	General Services Administration (GSA) area-wide contract/alternative	Easement	30	Photovoltaic solar (PV solar)
	Fort Bliss, Texas	Energy savings performance contract/alternative	Access license or permit	1	PV solar
	Fort Campbell, Kentucky	Utility energy service contract/alternative	Not applicable	2	PV solar
	Fort Detrick, Maryland	Long-term power purchase agreement (PPA)/alternative	Lease	15	PV solar
	Fort Drum, New York	Long-term PPA/alternative	Lease[d]	60	Biomass
	Fort Huachuca, Arizona	GSA area-wide contract/alternative	Easement	18	PV solar
Department of the Navy	Naval Air Weapons Station China Lake, California	Long-term PPA/alternative	Access license or permit	14	PV solar
	Navy and Marine Corps sites, Hawaii	Long-term PPA/alternative	Access license or permit, site occupancy agreement[e]	17	PV solar
	Marine Corps Air Ground Combat Center Twentynine Palms, California	Long-term PPA/alternative	Access license or permit	1	PV solar
	Marine Corps Air Station Miramar, California	Long-term PPA/alternative	Access license or permit	3	Landfill gas
	Marine Corps Base Camp Lejeune, North Carolina	Enhanced use lease/alternative	Lease	17	PV solar
	Marine Corps Logistics Base Albany, Georgia	Energy Conservation Investment Program/up-front appropriations	Not applicable	2	Landfill gas
Department of the Air Force	Cape Cod Air Force Station, Massachusetts	Energy Conservation Investment Program/up-front appropriations	Not applicable	3	Wind
	Davis-Monthan Air Force Base, Arizona	Long-term PPA/alternative	Lease	16	PV solar
	Edwards Air Force Base, California	Short-term PPA/alternative	Easement	3	PV solar
	Luke Air Force Base, Arizona	Enhanced use lease/alternative	Lease	10	PV solar
	Nellis Air Force Base, Nevada	Enhanced use lease/alternative	Lease	19	PV solar

Source: GAO with data obtained from the Department of Defense (DOD). | GAO-16-487

[a]Two major financing approaches are to fund projects either through alternative financing—that is, using private sector financing—or up-front appropriations. Financing mechanisms include energy

savings performance contracts, which can last up to 25 years, with private companies to pursue installation of energy conservation measures, such as more efficient equipment and renewable energy where the savings are used to pay for the measures; utility energy service contracts, which typically last for about 10 years, with a local utility to provide energy management services focused on energy efficiency or demand reduction; long-term PPAs, which purchase electricity for periods of up to 30 years; short-term PPAs, which are similar to long-term PPAs, but are for periods of 10 years or less; GSA areawide contracts, which are preexisting agreements limited to 10 years and are negotiated between GSA and a local electricity supplier allowing government agencies in specified areas to purchase electricity and other utility services at established terms and conditions; enhanced use leases, which are long-term leases of property—typically 25 years or more—to a private developer for various uses, including the installation of renewable energy systems in exchange for cash or in-kind services; and the Energy Conservation Investment Program, which provides up-front appropriated funds made available through annual military construction appropriations.

[b]Land use agreements refer to the types of ways that DOD provided the developer temporary use of land for a renewable energy project. These agreements include the following: Leases refer to agreements under which the secretary of a military department may lease land in exchange for the payment of a cash or in-kind consideration in an amount that is not less than the fair market value of the lease interest, as determined by the secretary. Easements are agreements under which the secretary of a military department may provide an easement for rights-of-way, upon terms that the secretary considers advisable, which might include a cash or in-kind consideration. Access licenses or permits refer to agreement provisions through which DOD provides contractors access to and use of a site for the purposes of the contract, without compensation. For some projects, where DOD owns the generating system on its own land, providing developers land to use for the project is not applicable. We are identifying the agreement for the site of the generating system and not necessarily for other lands such as for transmission lines, unless otherwise noted.

[c]Generating capacity is measured in megawatts and refers to the maximum capability of a project to produce electricity. All selected projects are greater than 1 megawatt, including those that were rounded down to 1 megawatt in the table.

[d]Because the site for the generating plant at Fort Drum, New York, had been leased to the developer prior to this project, the Army paired the project agreement with a lease for substation areas.

[e]According to Navy officials, the Navy used an access license or permit for the roof and carport-mounted portion of the solar array project and developed a site occupancy agreement for the ground-mounted portion of the project to provide the developer access to and use of the project sites. They told us that the site occupancy agreement has features of a lease but did not require the developer to provide the Navy with cash or in-kind considerations equal to the fair market value of the land.

Appendix III: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY,
INSTALLATIONS,
AND ENVIRONMENT

AUG 15 2016

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 Government Accountability Office (GAO) Draft Report, GAO-16-487, "DoD Renewable Energy Projects: Improved Guidance Needed for Analyzing and Documenting Costs and Benefits" dated July 1, 2016 (GAO Code 100163). Comments on the recommendations and supporting technical comments on the report are enclosed.

Sincerely,

Michael McAndrew
Deputy Assistant Secretary of Defense
(Facilities Investment and Management)
Performing the Duties of Assistant Secretary of Defense
(Energy, Installations, and Environment)

Enclosure:
As stated

GAO DRAFT REPORT DATED JULY 1, 2016
GAO-16-487 (GAO CODE 100163)

"DOD RENEWABLE ENERGY PROJECTS: IMPROVED GUIDANCE NEEDED FOR ANALYZING AND DOCUMENTING COSTS AND BENEFITS"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense should direct the Assistant Secretary of Defense for Energy, Installations and Environment and the secretaries of the Army, Navy, and Air Force to improve DOD's analyses of the financial costs and benefits of renewable energy projects by:

- modifying the guidance for presenting land values in project documentation to apply to the range of alternative financing mechanisms DOD has used, and
- clarify the guidance to direct all project documentation for alternatively financed projects involving land use agreements to include the value of the land, the compensation DOD would receive for it, and how the value of the land compared with the value of the compensation.

DoD RESPONSE: Concur.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense should direct the Assistant Secretary of Defense for Energy, Installations and Environment and the secretaries of the Army, Navy, and Air Force to improve DOD's analyses of the financial costs and benefits of renewable energy projects involving long-term PPAs on its land, revise guidance to:

- develop consistent sources for assumptions for escalation;
- clarify how to describe sensitivity analyses in project documentation; and
- clarify how project documentation should present information on all costs of a project, including the value of the land and compensation received for it and in turn how that value and compensation would affect the estimated costs and benefits of purchasing electricity from the project. (e.g., whether compensation could be used to reduce electricity costs for the project when estimating cost-effectiveness).

DoD RESPONSE: Concur.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense should direct the Assistant Secretary of Defense for Energy, Installations and Environment and the secretaries of the Army, Navy, and Air Force to improve the information available to approving officials on projects' contributions to DOD's renewable energy goals and energy security objective and help ensure the consistency and completeness of project documentation, develop guidance to:

- clarify that projects should specify their contribution to DOD's energy production and consumption goals;
- clarify the type of energy security benefit projects will provide and state whether any such benefit is immediately available or would require additional investments and, for projects that would require additional investment, provide a detailed estimate of those investments; and
- clarify that a consistent approach is to be taken to estimate the value of the energy security benefit of providing assured access to power during a grid outage and that a description of this approach is provided in project documentation.

DoD RESPONSE: Concur.

Appendix IV: GAO Contacts and Staff Acknowledgments

GAO Contacts

Frank Rusco, (202) 512-3841 or ruscof@gao.gov

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

Staff Acknowledgments

In addition to the contacts named above, Jon Ludwigson (Assistant Director), Laura Durland (Assistant Director), Tracy Barnes, Emily Biskup, Lorraine Ettaro, Emily Gerken, Timothy Guinane, Terry Hanford, Alberto Leff, Alison O'Neill, Jodie Sandel, Kiki Theodoropoulos and Michael Willems made key contributions to this report.

Appendix V: Accessible Data

Agency Comment Letter

Text of Appendix III: Comments from the Department of Defense

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AUG 15 2016

ENERGY, INSTALLATIONS, AND ENVIRONMENT

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Director, Defense Capabilities and Management

U.S. Government Accountability Office

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Performing the Duties of Assistant Secretary of Defense (Energy, Installations, and Environment)

Enclosure: As stated

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DoD RESPONSE: Concur.

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DoD RESPONSE: Concur.

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- clarify that a consistent approach is to be taken to estimate the value of the energy security benefit of providing assured access to power during a grid outage and that a description of this approach is provided in project documentation.

DoD RESPONSE: Concur.

Related GAO Products

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