United States Government Accountability Office

Report to the Committee on Armed Services, U.S. Senate

November 2016

DEFENSE INFRASTRUCTURE

Actions Needed to Strengthen Utility Resilience Planning

Accessible Version

GAO-17-27

GAO Highlights

Highlights of GAO-17-27, a report to the Committee on Armed Services, U. S. Senate

November 2016

DEFENSE INFRASTRUCTURE

Actions Needed to Strengthen Utility Resilience Planning

Why GAO Did This Study

DOD installations rely on utilities, such as electricity, to accomplish their missions and disruptions can hamper military operations. Senate Report 114-49 included a provision for GAO to report on DOD-owned utility disruptions. This report (1) describes the number, causes and impacts of utility disruptions caused by the failure of DOD-owned utility infrastructure for fiscal years 2009 through 2015; (2) assesses the extent to which owners and managers of DOD-owned systems have access to utility disruption information; and (3) assesses the extent to which the implementation of a standardized facility condition assessment process provides DOD consistent information about its utility systems.

GAO surveyed a representative group of 453 DOD-owned electric, water, wastewater, and natural gas utility systems, evaluated DOD policies and reports, interviewed officials, and conducted interviews with several survey respondents who experienced the most disruptions.

What GAO Recommends

To improve utility system information, GAO is recommending that the Army, Air Force, and Marine Corps take steps or provide guidance to consistently collect disruption information, and that while the SMS utilities module is under development, DOD take steps to ensure that the services apply condition standards consistently. DOD concurred with the recommendations to collect disruption data and partially concurred with the other recommendation stating that it would determine if further consistent condition standards are needed.

View GAO-17-27. For more information, contact Brian Lepore at (202) 512-4523 or leporeb@gao.gov.

What GAO Found

Based on GAO's survey of Department of Defense (DOD) owned utility systems, there were 4,393 instances of utility disruptions caused by equipment failure for fiscal years 2009 through 2015 and the results of our survey and interviews with DOD installation officials indicated that these disruptions have caused a range of financial and operational impacts. Survey respondents identified several factors that contributed to equipment failures that led to disruptions, such as equipment operating beyond its intended life; poor equipment condition; and equipment not being properly maintained. Survey respondents reported over $29 million in financial impacts for fiscal years 2009 through 2015. Installation officials reported experiencing operational impacts such as a week-long shut down of operations at an Army facility on Joint Base McGuire-Dix-Lakehurst, New Jersey.

Information about utility disruptions is not consistently available to DOD utility owners and managers at the installation level. Specifically, 151 out of 364 survey respondents stated that they did not have information on utility disruptions for any fiscal year from 2009 through 2015. An overarching reason GAO found for disruption information not being available is that the services vary in the extent to which each has issued guidance to collect and retain utility disruption information at the installation level. The Army has some guidance to report utility disruptions, but we found that some installations did not consistently have this information available. The Air Force and Marine Corps do not have current guidance directing the installations to track utility disruption information. The Navy issued new guidance in 2015 which, if implemented as directed, may improve the collection of utility disruption information. According to installation and headquarters officials, there are benefits to collecting utility disruption information since it can be used to identify repairs and to prioritize funding for those repairs. However, without guidance directing installations to collect information about all types of utility disruptions, service officials may not have the information needed to make informed decisions or to compete effectively for limited repair funds.

DOD's implementation of the Sustainment Management System (SMS), a software tool to conduct standardized condition assessments, may not provide it with comparable and reliable facility condition index (FCI) data -- a metric used to make strategic investment decisions. In 2013, to improve the reliability of FCI data, DOD directed the services to use SMS which standardizes the way the services conduct condition assessments and calculate the FCI. According to officials, the SMS module for utility systems is still in development, but modules for other facilities, such as buildings, are complete and in use. While the SMS process is intended to provide DOD with credible FCI data, GAO found the process could result in differences in the FCI because the services are able to customize settings, called condition standards, within the process. Variation among the condition standards could result in facilities having differences in the FCI although the assessed physical conditions of the facilities are the same. As a result, the FCI data would not be comparable. Without taking steps to ensure that the services' condition standards for the utilities module, which is under development, will provide the department with comparable and reliable FCI data, the SMS utilities module may not provide DOD information that is comparable across the department.

Contents

Tables

Figures

Abbreviations

Department of Defense	DOD
Facility Condition Index	FCI
Office of the Secretary of Defense	OSD
Sustainment Management System	SMS

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

November 14, 2016

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

Department of Defense (DOD) installations serve as platforms from which the department employs forces across the full spectrum of military operations. These installations rely on the use of utilities, such as electricity and water, to accomplish their missions. For example, reliable electric and water utility services are critical to the launch missions at Cape Canaveral Air Force Station, Florida. Without electricity to power key communication and radar functions and water to absorb the excess heat and noise generated during rocket launches, a launch mission would have to be cancelled. Risks to the reliable provision of utility services on DOD installations can come from a variety of sources, such as extreme weather, mechanical failures, and even cyberattacks. For example, in 2015 we found that Vandenberg Air Force Base had experienced electrical disruptions in 2010 and 2013 due to failures from on-base equipment, resulting in delayed satellite launches.[1]

In 2015 we also found that disruptions caused by the failure of DOD-owned utility infrastructure, such as the disruption described above, may have played a larger role in disruptions experienced by DOD installations than had been indicated by DOD's annual reporting on disruptions.[2] We found that because DOD had not specifically identified and logged instances of disruptions caused by the failure of DOD-owned utility infrastructure, the department did not have comprehensive information

[1]GAO, *Defense Infrastructure: Improvements in DOD Reporting and Cybersecurity Implementation Needed to Enhance Utility Resilience Planning*, GAO-15-749 (Washington, D.C.: July 23, 2015).

[2]Section 2925 of Title 10 of the United States Code requires DOD to report to Congress on a number of facility energy requirements, including the number of utility disruptions on military installations. This information is reported in DOD's Annual Energy Management Reports. Copies of DOD's Annual Energy Management Reports can be found here: http://www.acq.osd.mil/eie/IE/FEP_Energy_Reports.html.

about utility disruptions.[3] Given the possibility that disruptions result in serious operational impacts, decision makers need reliable information to ensure that resources are available to take necessary steps at installations and across the department to increase resilience.[4] Furthermore, according to a DOD official, an ongoing DOD study found that the reliability of energy utility infrastructure on an installation is an important factor to consider when determining the cost-effectiveness of energy resilience strategies to enhance mission assurance.

According to DOD's real property inventory from fiscal year 2014, DOD manages nearly 562,000 facilities with a combined plant replacement value[5] that the department estimates at about $880 billion.[6] This includes more than 181,000-utility facilities with a plant replacement value of more than $158 billion. According to DOD, all facilities, to include utility infrastructure, are to be sustained and recapitalized, as necessary, to ensure that they are in the right condition to support the department's missions. However, according to DOD, the department has been accepting significant risk in its recent budgets for facilities, to include utility infrastructure. For example, in April 2016, the Acting Assistant Secretary of Defense for Energy, Installations, and Environment testified that DOD has been accepting significant risk in its budgets for maintaining facilities because its fiscal year 2017 budget request was 10 percent less

[3]See GAO-15-749.

[4]In order to provide DOD and Congress with improved information to use in DOD's utility resilience planning efforts, we recommended that DOD revise its reporting guidance to collect and report on disruptions caused by the failure of DOD-owned utility infrastructure. The department did not concur with our recommendation, stating that reporting on these disruptions provides a "low value proposition;" that the data collected by the department for the Energy Reports are not being used to guide its strategic decisions; and that collecting the data would be "onerous." However, we continue to believe that the collection of this information could benefit DOD's efforts to ensure that its installations are prepared for and have the ability to recover from utility disruptions that impact mission assurance on its installations. See GAO-15-749.

[5]Plant replacement value is used as a common measure of facility and inventory size, as well as a basis for generating facility condition ratings and estimating recapitalization requirements. Factors that determine a facility's plant replacement value include the facility's size; the average cost for constructing a similar, average-sized facility to current standards; costs for labor, equipment, materials, and currency exchange rates overseas; costs for project planning and design, historical architecture and materials, and overhead; and inflation adjustments.

[6]We obtained and analyzed records from DOD's Real Property Asset Database for fiscal year 2014 (the most recent data available at the time of our report).

from the previous year and the department and has seen worsening condition ratings for its facilities.[7]

Senate Report 114-49 accompanying S. 1376, a bill for the National Defense Authorization Act for Fiscal Year 2016, included a provision for us to review information on utility disruptions on DOD installations due to the failure of DOD-owned infrastructure, among other things. This report (1) describes the number, causes and impacts of utility disruptions caused by the failure of DOD-owned utility infrastructure for fiscal years 2009 through 2015; (2) assesses the extent to which owners and managers of DOD-owned utility systems have access to information about disruptions caused by equipment failures; and (3) assesses the extent to which the department's implementation of a standardized facility condition assessment process provides it with consistent information about the condition of utility systems.[8]

To determine the number of disruptions of DOD-owned utility systems[9] that occurred between fiscal years 2009 through 2015, their causes, and the impact of the disruptions, we conducted a survey of a stratified random sample of 453 DOD electric, water, wastewater, and natural gas utility systems that were owned by the active component of one of the four military services and located on a U.S. or overseas installation with a plant replacement value of $100 million or more. Our survey included questions about the disruptions caused by equipment failure, the impacts of those disruptions, and the characteristics of the DOD-owned utility systems, among other things. To inform the design of our survey instrument and help ensure the validity and reliability of our testimonial

[7]Hearing on the Fiscal Year 2017 Department of Defense Budget Request for Energy, Installations, and Environment before the Subcommittee on Military Construction, Veterans Affairs and Related Agencies; Statement of Mr. Pete Potochney, Performing the Duties of Assistant Secretary of Defense Energy, Installations and Environment.

[8]In 2013 the Office of the Secretary of Defense (OSD) directed the services to implement a standardized condition assessment process in order to improve the reliability of its facilities' condition data, called the facility condition index (FCI). See The Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, *Standardizing Facility Condition Assessments* (Sept. 10, 2013).

[9]In this report, when we refer to DOD-owned utility systems we are including systems that are owned by one of the military services and systems where the military service pays for the majority of the operation and maintenance of the utility system. Some utility systems, mostly those located overseas, may not be owned by the military service but the military service may be responsible for funding the operation and maintenance of the system. See appendix I for more information.

survey evidence, we discussed the survey topics and appropriate recipients with officials from the Office of the Secretary of Defense (OSD) and the military services, developed the survey with GAO subject matter analysts and technical survey experts, and conducted pretests with officials who had work experience managing and operating DOD-owned utility systems. Furthermore, the survey instrument was independently reviewed by a survey design expert within GAO.

We based the analysis in this report on 364 completed surveys, which is an 80 percent response rate.[10] Generally, in this report, the results of this survey are presented as statistical estimates about the population of 1,075 electric, water, wastewater, and natural gas utility systems described in appendix I. In cases where we use these estimates, we describe the results as estimates and we generally refer to the entire population of "utility systems" or "utility managers."[11] Because some questions did not apply to all respondents, some of the questions in our survey were answered by an insufficient number of respondents to reliably generate an estimate of the overall population. In these cases, rather than presenting a population estimate, we report on the number of respondents in our sample who answered that question. To obtain additional information about the impact of utility disruptions caused by the failure of DOD-owned utility infrastructure, we conducted follow-up interviews with selected respondents who reported the most disruptions. We asked respondents to describe the impacts of specific disruptions and we also collected and reviewed documentation, such as records in maintenance information systems and project proposals.

To assess the extent to which owners and managers of DOD-owned utility systems have information about disruptions caused by equipment failures, we included a question in our survey regarding the availability of information on disruptions for fiscal years 2009 through 2015 and a question about the usefulness of disruption information in managing utility

[10]We actually received 379 completed surveys, but determined through a screening question in our survey that 15 of the respondents did not own and were not responsible for paying the majority of the operation and maintenance of the system and excluded them from our analyses. The analysis in this report is based on those 364 survey responses, which is an 80 percent response rate. In addition, the full results from the 364 surveys are presented in appendix II.

[11]We express our confidence in the precision of estimates with a margin of error. This is the interval that would contain the actual population value for 95 percent of the samples we could have drawn. Margins of error are provided along with each sample estimate in the report.

systems. Based on the survey responses, we followed up with 143 survey respondents who reported not having any information on disruptions for any fiscal year, in order to confirm their responses and to determine the reasons why information was not available. We also interviewed service officials regarding policies and practices related to the collection and use of utility disruption information. Finally, we compared installation practices to standards regarding the identification, analysis and response to risks as described in Standards for Internal Control in the Federal Government.[12] In addition, we reviewed reports from federal agencies and utility management organizations, such as management guides issued by the Environmental Protection Agency and the American Public Power Association, which describe the information that is useful in the management and operation of utility systems.

To assess the extent to which the department's implementation of a standardized facility condition assessment process provides DOD with consistent information about the condition of utility systems, we reviewed policy documents and reports describing the development and implementation of a new standardized condition assessment process and reviewed how DOD plans to use the condition information to monitor and oversee the achievement of department-wide goals. Additionally, we collected and reviewed documents such as briefings, training documents, and a user guide that describe how the new standardized condition assessment process will assess and rate the condition of utility systems and related infrastructure. We also conducted interviews with DOD and service officials regarding the development of the standardized process and how the department intends to use the information to inform decisions. Finally, we compared DOD's process for generating the condition information with standards regarding the use and management of data as described in Standards for Internal Control in the Federal Government.[13] For more information about the scope and methodology, please see appendix I.

We conducted this performance audit from July 2015 to November 2016, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain

[12]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C., Nov. 1, 1999). There is a 2014 version of these standards. However, we are using the version from 1999 since the scope of our audit covers fiscal years 2009 through 2015.

[13]GAO/AIMD-00-21.3.1.

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

Utility Infrastructure Owned by DOD

A DOD-owned electric, water, wastewater, or natural gas system is composed of multiple components — the equipment, fixtures, pipes, wires, and other structures used in the generation and distribution of electric power, the supply of natural gas, the treatment and distribution of potable water, or the collection and treatment of wastewater. According to our review of records maintained by the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment, as of January 1, 2015, the military services own or have been operating and maintaining as many as 1,954 electric, potable water, wastewater, and natural gas utility systems located in the United States, in its territories, or overseas (see table 1).[14] From these 1,954 systems, we determined that 1,075 of these electric, water, wastewater and natural gas utility systems were owned by the active component of one of the four military services and located on an installation with a plant replacement value of $100 million or more.[15]

[14]The Assistant Secretary of Defense for Energy, Installations and Environment maintains records on the ownership status of utility systems serving DOD installations in support of its utilities privatization program. These records did not clearly indicate whether the overseas utility systems were owned or maintained by DOD. We took steps to verify the ownership of these systems through our survey. For more information, please see appendix I.

[15]For more information on how we determined the utility systems included in the scope of this review, please see appendix I.

Table 1: Status of Department of Defense Electric, Water, Wastewater and Natural Gas Utility Systems, as of January 1, 2015

Location	Privatized	Owned or Operated and Maintained by a Military Service[a]	Total
United States	331	1,252	**1,583**
U.S. Territories	3	27	**30**
Overseas	236	675	**911**
Total	**570**	**1,954**	**2,524**

Source: GAO analysis of DOD data. | GAO-17-27

[a]The records maintained by the Assistant Secretary of Defense for Energy, Installations, and Environment on the ownership status of utility systems serving DOD did not clearly indicate whether some systems, mostly those overseas, were owned or operated and maintained by DOD. We took steps to verify the ownership of these systems through our survey.

In addition, the records maintained by the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment indicate that DOD has privatized 570 electric, water, wastewater and natural gas utility systems. According to DOD, since 1997 the department has been attempting to privatize its utility systems because military installations have been unable to maintain reliable utility systems due to inadequate funding and competing installation management priorities. DOD officials stated that privatization is the preferred method for modernizing and recapitalizing utility systems and services by allowing military installations to benefit from private-sector financing and efficiencies. We previously reported that with private-sector financing, installations obtain major upgrades to their utility systems and pay for these improvements over time through the utility services contracts using operation and maintenance funds.[16] Furthermore, in 2005, that while utility privatization may have provided for quicker system improvements than otherwise

[16]We reviewed DOD's utility privatization program in 2005 and 2006 and made several recommendations to include that DOD revise the guidance for preparing economic analyses in order to be able to compare costs of privatization and continued government ownership. DOD disagreed with these recommendations and we consider them closed and not implemented. See GAO, *Defense Infrastructure: Managing Issues Requiring Attention in Utility Privatization*, GAO-05-433 (Washington, D.C.: May 12, 2005). GAO, *Defense Infrastructure: Actions Taken to Improve the Management of Utility Privatization, but Some Concerns Remain*, GAO-06-914 (Washington, D.C.: Sept. 5, 2006).

might have been available, the services' economic analyses of the costs of privatization gave an unrealistic sense of savings.[17]

Real Property Condition Metric: The Facility Condition Index

To promote efficient and economical use of America's real property assets and ensure management accountability for implementing federal real property management reforms, the President on February 4, 2004, signed Executive Order 13327, *Federal Real Property Asset Management*. This executive order created the Federal Real Property Council, established the role of the senior real property officer, and authorized the creation of a centralized real property database. The Federal Real Property Council worked with the General Services Administration to develop and enhance an inventory system known as the Federal Real Property Profile, which was designed to meet the executive order's requirement for a centralized database that includes all real property under the control of executive branch agencies. The 2013 Federal Real Property Council guidance for real property inventory reporting defines 25 real property data elements. One data element is the facility condition index (FCI).[18]

The FCI of real property under the control of executive branch agencies is collected in the Federal Real Property Profile database. The FCI provides a general measure of a building's or structure's condition at a specific point in time, see figure 1.

Figure 1: Facility Condition Index (FCI) Equation

$$\textbf{FCI} = \left[1 - \left(\frac{\text{\$ repair needs}}{\text{\$ plant replacement value}} \right) \right] \times 100$$

Source: Federal Real Property Council. | GAO-17-27

[17]At the time of our 2005 report, DOD and service officials stated that utility privatization had helped installations achieve major system improvements which would not have been otherwise possible due to inadequate funding caused by the competition for funds and budget allocation decisions. See GAO-05-433.

Repair needs, as defined by the Federal Real Property Council, signify the amount necessary to restore a building or structure to a condition substantially equivalent to the original condition. Plant replacement value, as defined by the Federal Real Property Council, signifies the cost of replacing an existing building or structure so that it meets today's standards. The FCI is reported on a scale from 0 to 100 percent, in which the higher the FCI, the better the condition of the building or structure.

According to a DOD official, the FCI is used to understand the health of the department's portfolio so that decision makers can be better informed when making investment decisions. DOD guidance requires that each service maintain a current inventory count and up-to-date information regarding, among other things, the FCI of each facility in its inventory.[19] DOD calculates the FCI as defined by the Federal Real Property Council, and records the FCI in its Real Property Assets Database. DOD grouped FCI calculated ratings into four bands, ranging from good to failing condition, to allow the services and defense agencies to group facilities by condition for the purpose of developing investment strategies. The four FCI categories are shown in table 2.

Table 2: Department of Defense Facility Condition Index Categories

Facility Condition Index	Condition Category
90 to 100 percent	Good condition
80 to 89 percent	Fair condition
60 to 79 percent	Poor condition
0 to 59 percent	Failing condition

Source: Department of Defense. | GAO-17-27

Real Property Management

Since 2003 we have issued several reports on federal real property issues such as repair and maintenance backlogs, among other things.[20] For example, in October 2008 we reported that six real property holding agencies, including DOD, respectively use different methods to define and estimate their repair and maintenance backlogs.[21] Further, we

[19] DOD Instruction 4165.14, *Real Property Inventory and Forecasting (*Jan. 17, 2014).

[20] For the list of these reports, see the Related GAO Products section at the end of this report.

[21] GAO, *Federal Real Property: Government's Fiscal Exposure from Repair and Maintenance Backlogs Is Unclear*, GAO-09-10 (Washington, D.C.: Oct. 16, 2008).

reported that the backlog estimates do not necessarily reflect the costs that agencies expect to incur to repair and maintain assets essential to their missions or to avert risks to their missions. For example, the General Services Administration identified $7 billion in repair needs for work to be done from fiscal year 2007 and within the next 10 years on its facilities, and DOD provided an FCI value for its facilities.[22] We recommended that the Office of Management and Budget, in conjunction with the Federal Real Property Council and in consultation with the Federal Accounting Standards Advisory Board, should explore the potential for developing a uniform reporting requirement in the Federal Real Property Profile that would capture the government's fiscal exposure related to real property repair and maintenance. We further recommended that such a reporting requirement should include a standardized definition of repair and maintenance costs related to all assets that agencies determine to be important to their mission, and therefore capture the government's fiscal exposure related to its real property assets. The Office of Management and Budget generally concurred with the report and agreed with our recommendation. Our recommendation was implemented in 2011 when the Federal Accounting Standards Advisory Board, as supported by the Office of Management and Budget and in coordination with other federal agencies, amended existing standards for financial reporting of deferred repairs and maintenance to establish uniformity across reporting agencies.

We also previously reviewed DOD's efforts to manage its real property inventory, including the need for continued management attention to support installation facilities and operations, among other things. In 2011 we reported that within the DOD Support Infrastructure Management high risk area, the management and planning for defense facilities sustainment—maintenance and repair activities necessary to keep facilities in good working order—no longer remained on the high risk list because DOD had made significant progress in this area at that time.[23] Specifically, we found that DOD took steps to verify the accuracy of its inventory of real property and to develop a facilities sustainment model that provides a consistent and reasonable framework for preparing estimates of DOD's annual facility sustainment funding requirements. In

[22] While DOD's report to the Federal Real Property Profile in 2007 only reported the FCI, the department did report about $72 billion in deferred maintenance for its real property in its 2007 financial report.

[23] GAO, *High Risk Series: An Update,* GAO-11-278 (Washington, D.C.: Feb. 2011).

addition, since 2011 DOD has continued to take steps to improve its ability to assess and record the condition of its infrastructure. One improvement is the development of a standardized process for assessing facility conditions. In 2016 we reported that individual services have reported varying levels of progress in implementing this process. We recommended that DOD revise its guidance to clarify how the services are to indicate when a facility condition rating recorded in DOD's Real Property Assets Database is based on the standardized process.[24] DOD partially concurred with our recommendation and stated that the OSD conducts periodic reviews of the service's implementation of the standardized process to ensure they are making progress.

Reported Disruptions of DOD-Owned Utility Systems Cause a Range of Financial and Operational Impacts

Respondents to our survey of DOD-owned utility systems identified 4,393 instances of utility disruptions caused by the failure of DOD-owned equipment for fiscal years 2009 through 2015, and the results of our survey and interviews with DOD installation officials indicated that these disruptions have caused a range of financial and operational impacts. Several factors contributed to the equipment failures that lead to disruptions to DOD-owned utility systems, such as the utility equipment operating beyond its intended life.

Reported Disruptions of DOD-Owned Utility Systems Caused by Equipment Failure

Of the 364 respondents to our survey, 143 reported a total of 4,393 utility disruptions caused by equipment failure for fiscal years 2009 through 2015.[25] Table 3 shows the number of survey respondents, respondents reporting disruptions, and the total number of disruptions reported for fiscal years 2009 through 2015, by service.

[24] GAO, *Defense Facility Condition: Revised Guidance Needed to Improve Oversight of Assessments and Ratings*, GAO-16-662 (Washington, D.C.: Jun. 23, 2016).

[25] We asked survey respondents to report the number of disruptions their utility systems experienced each fiscal year. We defined a disruption as being caused by the failure of DOD-owned equipment or by the under-performance of utility infrastructure based on operating environment standards and based on lasting more than 5 minutes. We clarified that we did not want survey respondents to report disruptions to the system that were caused by the failure of a commercial or privatized utility system; natural events such as a storm, earthquake, or fire; intentional or planned disruptions; or disruptions lasting less than 5 minutes.

Table 3: Responses to GAO Survey of DOD-Owned Utility Systems: Number of Reported Disruptions by Military Service, Fiscal Years 2009-2015

Military Service	Air Force	Army	Marine Corps	Navy	Total
Number of respondents	103	93	34	134	**364**
Respondents reporting one or more disruption	56	24	5	58	**143**
Number of disruptions reported	2,036	784	86	1,487	**4,393**

Source: GAO 2015 Survey of DOD-Owned Utility Systems. | GAO-17-27

Of the 4,393 reported disruptions, the majority were on electric and water utility systems. Specifically, 1,838 disruptions were on electric utility systems and 1,942 were on water utility systems. In addition, 270 disruptions were on natural gas utility systems and 343 were on wastewater systems. Figure 2 shows the number of reported disruptions for fiscal years 2009 through 2015, by utility system type and by service.

Figure 2: Responses to GAO Survey of DOD-Owned Utility Systems: Number of DOD Reported Utility Disruptions for Fiscal Years 2009 through 2015 by Utility System Type and by Military Service

Source: GAO 2015 survey of Department of Defense-owned utility systems. | GAO-17-27

Several Factors Contribute to Utility Disruptions

According to our survey results and interviews with installation officials, several factors contribute to causing equipment failures that lead to disruptions of DOD-owned utility systems. Survey respondents indicated that some causes of equipment failures that led to utility disruptions between fiscal years 2009 and 2015 included:

- the equipment was used beyond its intended life;
- the condition of the equipment was poor;
- the equipment had not been properly maintained;

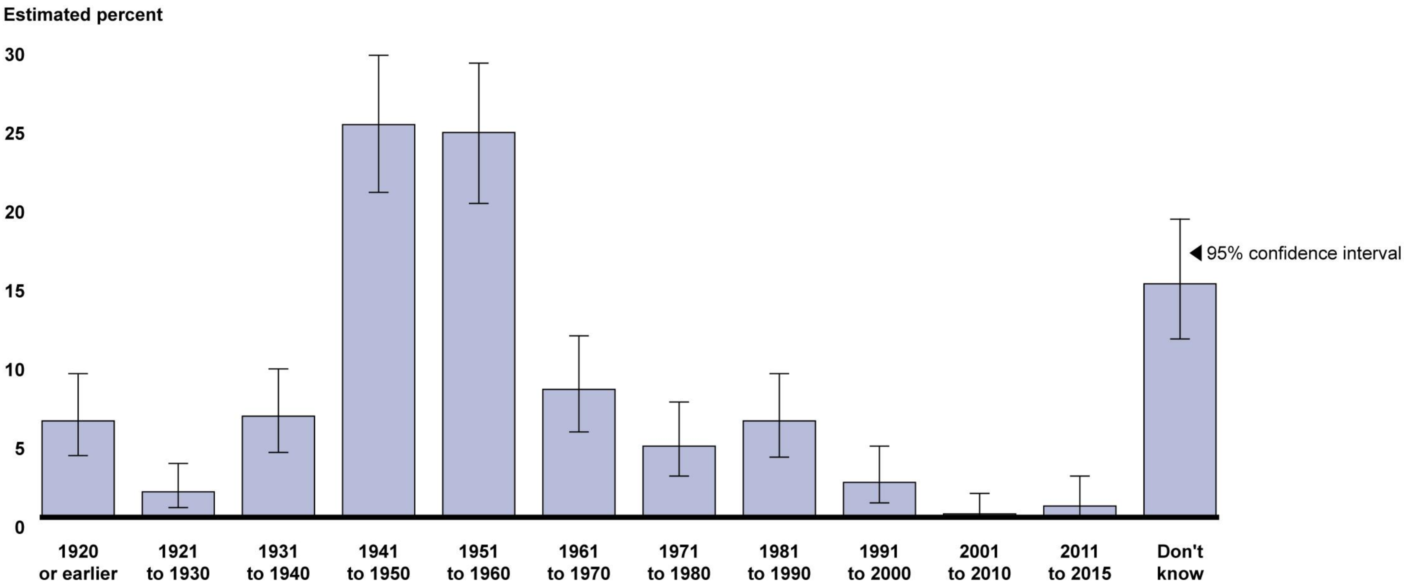
- or the equipment was handling service volumes beyond its intended capacity.[26]

According to installation officials, some utility systems are experiencing or are at risk of experiencing disruptions because the equipment is operating beyond its intended life. For example, an official from Naval Station Great Lakes, Illinois, stated that the water system is more than 90 years old — beyond its serviceable life which she estimates at about 50-60 years. The increasing age of the system causes the system's condition to deteriorate and results in more unplanned disruptions. In another example, Air Force officials from Joint Base Elmendorf-Richardson, Alaska, stated that the majority of the installation's water distribution pipes were originally installed in the 1940's and due to the age of these pipes there is an increased risk for a significant disruption. However, officials stated that they are currently not experiencing frequent or severe disruptions to the water system due to equipment failure.

Based on our survey results, the majority of DOD-owned utility systems are between 55 and 65 years old but have also completed a repair project that replaced a significant part or parts of the system in the last 15 years. Specifically, we estimate, based on information reported in our survey responses, that approximately 25 percent of DOD-owned utility systems were originally installed between 1941 and 1950 and approximately 24 percent between 1951 and 1960 (see figure 3).

[26] In our survey we asked respondents to indicate if various causes of disruptions to their utility systems were common or uncommon. Our survey results did not indicate that a particular cause was more common than others. For more information, see the full presentation of the survey results in appendix II.

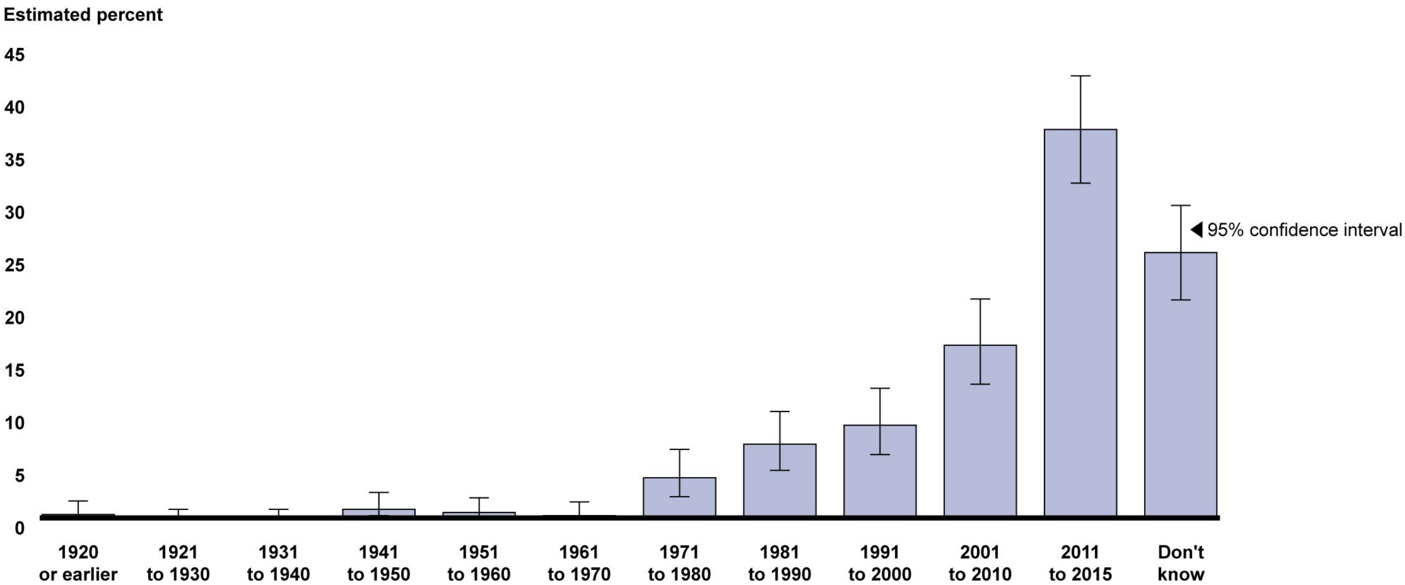
Figure 3: Responses to GAO Survey of DOD-Owned Utility Systems: Reported Decade of Original Installation of DOD-Owned Utility Systems



Source: GAO 2015 survey of Department of Defense owned utility systems. | GAO-17-27

To supplement the information about the age of the utility systems, through our survey we also collected information on when a significant part or parts of the system was repaired or replaced. Over time parts of the utility systems are repaired and replaced through maintenance activities because certain parts have a shorter serviceable life than others. Describing the age of the system based on when the system was originally installed does not capture the fact that parts have been replaced over time and that certain components of a system may be newer than other components. Based on our survey results, more than half of DOD-owned utility systems have had a significant part or parts of the systems replaced in the last 15 years. Specifically, we estimate that approximately 16 percent of DOD-owned utility systems have most recently completed a significant repair between 2001 and 2010, and 37 percent between 2011 and 2015 (see figure 4).

Figure 4: Responses to GAO Survey of DOD-Owned Utility Systems: Reported Decade of Most Recent Project to Repair a Significant Part or Parts of the DOD-Owned Utility System



Source: GAO 2015 survey of Department of Defense owned utility systems. | GAO-17-27

In addition, according to our survey results the poor condition of equipment is a contributing factor leading to disruptions. For example, officials from Naval Station Mayport, Florida, stated that some of the disruptions they reported in the survey were caused by electrical equipment that was in poor condition. Specifically, the officials reported that the existing distribution system serving the installation's on-base housing is unreliable, not in compliance with code, poorly designed, and past its expected useful lifespan of 50 years.

Furthermore, according to some installation officials we interviewed, the utility systems experienced failures because the systems have not been properly maintained. For example, officials from Joint Base Lewis-McChord, Washington, stated that some of the disruptions they reported resulted from the lack of expertise to perform maintenance. Specifically, these officials stated that a well failed in the summer of 2015 because prior repairs to the well were performed improperly, in part because they were performed by personnel without specialized training, and tools had been mistakenly left inside the well. In other examples, officials told us that they are aware of necessary repairs, however, they have been unable to complete them due to lack of funding. According to responses provided to our survey, we estimate that approximately 29, 32, and 35 percent of DOD-owned utility systems experienced funding shortfalls for fiscal years 2013, 2014, and 2015 respectively.[27]

To mitigate the funding shortfall, based on the survey responses we estimate that approximately 33 percent of utility managers deferred entire planned maintenance and repair projects and 41 percent deferred portions of planned maintenance and repair projects.[28] In an interview with officials from Naval Station Bremerton, they stated that an electrical substation has experienced several failures, disrupting electricity to shipyard operations, because there are several condition deficiencies and it is poorly configured (i.e., the substation has a mixture of different parts and equipment that do not function efficiently together), making the operation and maintenance of the substation challenging. Officials reported that they have known about these issues with the substation for years, but they have not submitted a project to update the system because they believed it would not compete well for funding. Officials said that a lack of available funding for the electric system has caused them to delay a utility infrastructure project on this substation, a critical component of the electric system. In another example, an official from Naval Station Great Lakes, Illinois, stated that an assessment study of the water system recommended a phased recapitalization of the system, however, these repairs have been deferred due to lack of funding. In another example, officials from Marine Corps Air Station Yuma stated that the installation's wastewater 50-year old infrastructure does not comply with current standards and guidelines, but due to funding shortfalls repairs or replacements have not been completed.

[27]These estimates have a margin of error no larger than plus or minus 4.8 percent at the 95 percent level of confidence.

[28]These estimates have a margin of error of no larger than plus or minus 6.9 percent at the 95 percent level of confidence. In addition, we asked about factors that led to the funding shortfall. We estimate that approximately 55 percent of respondents stated that a contributing factor to why they experienced a funding shortfall was because other funding needs within their respective military services or and 54 percent stated that other funding needs at the installation had a higher priority than the utility system. Approximately 30 percent stated that a contributing factor was an increase in unplanned maintenance needs for the system. These estimates have a margin of error of no larger than plus or minus 6.9 percent at the 95 percent level of confidence. For more information, see appendix II.

Reported Financial and Operational Impacts of Utility Disruptions

Based on our survey responses and follow-up interviews with installation officials, disruptions of utility systems caused by the failure of DOD-owned equipment caused a range of financial and operational impacts.[29] Of the 143 respondents who reported experiencing one or more utility disruptions, 100 reported information about financial impacts – the money spent repairing the disruption and mitigating its effects. These respondents reported experiencing a total of over $29 million in financial impacts for fiscal years 2009 through 2015 (see table 4). Respondents reported experiencing financial impacts that ranged from no financial impacts, or zero, to those indicating as much as $7.5 million in impacts in 1 year. Table 4 shows the total financial impacts by survey respondents for utility disruptions caused by equipment failure for fiscal years 2009 through 2015 by service and utility type.

Table 4: Responses to GAO Survey of DOD-Owned Utility Systems: Reported Financial Impacts of Disruptions on DOD-Owned Utility Systems Caused by Equipment Failure for Fiscal Years 2009 through 2015

Service	Utility Type	Total Reported Financial Impacts for Fiscal Years 2009 through 2015
Army	Electric	$1,144,074
	Water	$3,164,000
	Wastewater	$421,000
	Natural Gas	$25,000
Navy	Electric	$2,811,300
	Water	$2,233,400
	Wastewater	$1,014,000
	Natural Gas	$75,100
Air Force	Electric	$2,590,127
	Water	$5,279,514
	Wastewater	$706,188
	Natural Gas	$264,698
Marine Corps	Electric	$17,646
	Water	$9,375,000
	Wastewater	$500,000
	Natural Gas	$0
Total		**Total $29,621,047**

Source: GAO 2015 Survey of DOD-Owned Utility Systems. | GAO-17-27

[29]We defined fiscal impacts as the money spent repairing the disruption and mitigating its effects. For example, the costs of the replacement part and the cost of the personnel needed to complete the repair would be considered in the fiscal impact.

In our follow-up interviews with survey respondents, some officials explained that they were unable to estimate the financial impacts of disruptions. For example, an official from MacDill Air Force Base, Florida, stated that they did not report any financial impacts of disruptions because it would have been too difficult and time consuming to manually search through all of the records to identify the costs. In addition, officials from Naval Station Bremerton explained that any estimate of the costs associated with the fiscal impacts of the disruptions would be unreliable because they could not definitively calculate the total costs of all of the repair work performed for each disruption. However, they stated that the Navy conducted an in-depth study of unplanned utility outages on the four major Navy shipyards, in part to determine the causes of the outages and the impacts of the outages on the Navy's ship repair and maintenance efforts. According to Navy officials, the study determined that the unplanned outages were mostly caused by the equipment failure of Navy-owned utility equipment and that the outages had led to delays in repair efforts and approximately $58 million in lost productivity.[30]

In addition, based on our survey responses, disruptions caused by the failure of DOD-owned equipment cause a range of operational impacts. In our survey, we asked the respondents who reported one or more utility disruptions to report how common various operational impacts were. Based on their responses, in fiscal year 2015, we estimate that approximately 39 percent of DOD-owned utility managers commonly or very commonly experienced no operational impacts from disruptions, approximately 51 percent commonly or very commonly experienced minor operational impacts, and approximately 27 percent commonly or very commonly experienced moderate operational impacts, such as delays or reduced capability of some assets. Further, major operational impacts were less common. Also in fiscal year 2015, we estimate that approximately 9 percent of DOD-owned utility managers commonly or very commonly experienced major operational impacts.[31]

Our interviews with installation officials provided additional examples of operational impacts of disruptions. For example, an official from Joint

[30]The Navy's costs and the costs obtained through our survey are not comparable. The Navy study included costs associated with lost productivity in their calculation of the fiscal impacts of the unplanned outages. Our survey did not include costs associated with lost productivity.

[31]These estimates have a margin of error no larger than plus or minus 9.4 percent at the 95 percent level of confidence.

Base McGuire-Dix-Lakehurst, New Jersey, provided an example of a moderate operational impact. He stated that a power line exploded on the Lakehurst annex and caused an electric disruption to a major Army facility. The official explained that the power line that exploded was installed in 1945 and was past its expected service life. Operations at the Army facility were shut down for an entire week while staff arranged to have several large generators installed at the facility. The facility ran on generator power for the next 3 weeks while contracted repairs to the line were completed. Figure 5 shows a burnt electrical feeder cable that caused a major disruption to this Army facility.

Figure 5: Burnt Electrical Feeder Cable That Caused a Major Disruption to an Army Facility on Joint Base McGuire-Dix-Lakehurst, New Jersey

Source: U.S. Air Force. | GAO-17-27

Similarly, in another example the Naval Undersea Warfare Center located in Keyport, Washington, officials stated that in 2013 a complete base electrical disruption was caused when a battery failed at a switching station and then led to cascading failures across the base. Officials stated that operations at the Naval Undersea Warfare Center stopped because there was minimal back-up electricity generating capability at the time.

In addition, the lack of preventive maintenance has led to disruptions. Officials from Naval Auxiliary Landing Field San Clemente Island, California, stated that the installation experienced an 8-hour island-wide electrical disruption because seven utility poles caught fire in May 2014. Officials were able to re-route power to some areas of the island, but some areas were without power for the full 8 hours. The utility poles caught fire because the insulator – a specific type of support used to attach an electrical distribution line to the utility pole that prevents the electricity from flowing to the pole itself – was corroded and covered with salt, dust and debris. The salt and dirt formed a conductive layer on the insulator that can create a “flashover” where the electricity flashes over the corroded and polluted insulator and can lead to a fire on the utility pole. Officials stated that these insulators can be washed to mitigate the potential for such incidents. However, the system needs to be shut down in order to perform the work, and, because of the installation’s continuous training operation schedule, it is difficult to schedule this maintenance.

In another example, Navy officials from Naval Station Mayport, Florida, stated that a series of electric disruptions in enlisted housing resulted in a proposed $2.9 million project for improvements to the distribution system. According to the project documentation from April 2015 we reviewed, the poor condition of the infrastructure had caused 20 disruptions in the past two years. Some of the disruptions affected the entire neighborhood, and the disruptions lasted between 6 and 20 hours each.

Navy officials from Naval Support Facility Indian Head, Maryland, stated that in 2012 the installation’s water system experienced a major rupture to a segment of pipe that typically carries approximately 4,000 gallons per minute. The rupture caused a drop in pressure that decreased the volume of water going through the pipe to about 700 to 800 gallons per minute. This disruption caused a temporary shut-down in mission activities because the drop in water pressure impacted the fire suppression capabilities. The officials stated that they ultimately replaced 5 of their 60 miles of water pipe due to this incident which cost approximately $2.0 million. Figure 6 shows a water pipe rupture at Naval Support Facility, Indian Head, Maryland.

Figure 6: Water Pipe Rupture at Naval Support Facility, Indian Head, Maryland

Source: U.S. Navy. | GAO-17-27

In situations with smaller leaks in the water pipes, it may be more difficult to find the problem. Figure 7 below demonstrates an example of repair work associated with a leak or break in a water pipe at Naval Station Great Lakes, Illinois. Officials explained that the trench is not typically this large, but the leak could not be found initially. The maintenance workers had to dig the trench where the water was initially seen to be coming out of the ground and had to continue expanding the trench until the leak was found.

Figure 7: Example of a Water System Repair at Naval Station Great Lakes, Illinois

Source: U.S. Navy. | GAO-17-27

Owners and Managers of DOD-Owned Utility Systems Do Not Have Consistently Available Information about Utility Disruptions

Based on our analysis of survey responses and our follow-up interviews, we determined that information on utility disruptions is not consistently available to owners and managers of utilities at the installation level. According to our survey responses, 151 out of 364 survey respondents reported that they did not have information on utility disruptions for any fiscal year from 2009 through 2015.[32] By contrast, 213 out of 364 survey respondents stated that they had information on disruptions for at least one fiscal year, and the availability of information on disruptions increased for the more recent years.

We followed up with the respondents who reported not having information on disruptions to confirm their responses and to determine why such information was not available. We confirmed that 53 respondents did not have information, 52 stated that they did have information, several of whom said that they misread the question and their answer should have been that they had information but experienced no disruptions, and 38 did not respond to our follow-up. In addition, we did not follow up with 8 respondents, 6 of whom said that they were unfamiliar with the system or whom did not believe they had the information necessary to complete the survey, and 2 of whom submitted survey responses after we began our follow up efforts.

The 53 respondents who reported not having disruption information provided various reasons why the information was not available. Some reasons include that the maintenance of the system is provided by a contractor and the contract does not require the collection and reporting of the disruption information; that the maintainers of utilities do not always indicate in the records they keep the cause of the outage, such as disruptions caused by equipment failure, versus other causes, such as storm damage; and that the maintenance history is not always available due to personnel turnover.[33] In addition, some respondents reported that they might be able to determine the number of disruptions caused by

[32]This result was unexpected because during our pre-tests with each military service, the pre-testers indicated that information on the disruptions would be available at the installation level. Some of these officials explained that information on disruptions may not be available all the way back to fiscal year 2009, however. Also, as explained in our scope and methodology in appendix I, we asked each military service to identify the most appropriate officials to respond to our survey. Based on our survey results, our respondents have been in their current roles for an average of 4.5 years and have an average of about 6 years of experience working with their respective utility systems.

[33]Our survey collected information about the types of staff members who maintain the utility systems. See appendix II for more information.

equipment failure, but that they would need to manually search through the maintenance records which is a time-consuming task.

An overarching reason we found for disruption information not being available is that the services vary in the extent to which each has issued guidance to collect and retain utility disruption information at the installation level. Specifically,

- The Army has an annual requirement for utility managers to report a wide range of information about utility systems through the Installation Status Report process. This process requires utility managers to report unplanned electric utility disruptions and interruptions to water distribution infrastructure. Further, the process has requirements to report instances of equipment failure for water treatment and distribution equipment and wastewater treatment and collection equipment. There is not a specific requirement to report disruptions of natural gas systems, but there is a requirement to report on surveys done to detect the presence of leaks in the distribution piping. However, we found that some of the Army installations did not consistently have information about disruptions.
- The Air Force does not have a requirement for installations to collect and retain utility disruption data. Air Force installation officials stated that there used to be an instruction from a major Air Force command that required the reporting of utility disruption information, but that this instruction was superseded and the reporting requirement for utility disruptions was not included in the new guidance.
- The Marine Corps also does not have a requirement for installations to collect and retain utility disruption data. A Marine Corps headquarters official stated that he was considering developing such guidance.
- The Navy issued guidance in September 2015 to improve its ability to collect timely and accurate information about utility disruptions that occur on Navy installations by requiring the collection and reporting of disruption data beginning in fiscal year 2016.[34] According to the guidance, the Navy needs accurate utility disruption data in order to make informed decisions for utility investments because disruption data is a key factor utilized in prioritizing utility repair projects, among

[34]Navy Facilities Engineering Command Memorandum, *Utility Outage Reporting Metrics and Accountability Plan* (Sept. 18, 2015).

other things.[35] In the guidance, the Navy included specific instructions for how the utility disruption data were to be documented at the installation level. Specifically, the guidance instructs the public works departments or base operations and support contractors to track all utility outages in the Navy's maintenance work order information system known as "MAXIMO". For example, for unplanned utility outages lasting greater than 5 minutes, the installation officials or contracting staff are to enter information about the incident, response and repair in a MAXIMO work order outage log. In addition, installation officials or contracting staff are required to identify the cause of the utility outage and to enter that numerical code into MAXIMO (that is, 0 for false alarm, 1 for loss of commercial power/utility, 2 for weather-related disruptions, 3 for equipment failures, and so on). Furthermore, the guidance states that any new base operating and support contracts should include a provision for the contractors to report utility disruption information into MAXIMO and to include instructions on how to report that information.

Standards for Internal Control in the Federal Government states that management should identify, analyze, and respond to risks related to achieving the defined objectives, and that analyzing and estimating the significance of risks provides the basis for responding to the risks.[36] In addition, we reviewed reports from federal agencies and utility management organizations that recommend that utility system managers record and use information about the disruptions that occur on their systems in order to manage their systems effectively.[37] For example, according to the American Public Power Association, reliability statistics calculated by using data on disruption frequency and duration constitute a quantitative basis for good decision making.

[35]The Navy's process is called the Utility Investment Risk Assessment. A Center for Naval Analyses study was performed on the Navy's process and found, among other things, that it was worthwhile to collect more accurate, comprehensive data on utility disruptions. For example, data on the number of unplanned utility disruptions may be useful indicators on when to spend money on maintenance and whether future disruptions may be more likely to occur. Moreover, the accurate and comprehensive data are needed to make certain that the prioritization process provides a solid basis for distributing funds among installations.

[36]GAO/AIMD-00-21.3.1

[37]Industry leading practices included information from organizations such as the International Standards Organization, the Institute of Electrical and Electronics Engineers, the Environmental Protection Agency, and the Department of Transportation Pipeline and Hazardous Materials Safety Administration.

The collection and retention of utility disruption information is useful for two reasons. First, installation-level officials stated that disruption information is useful in operating and maintaining the utility system. Based on the responses to our survey, we estimate that 82 percent of utility managers considered this information to be somewhat or very useful.[38] In addition, installation officials we interviewed identified several ways in which they used disruption information. For example, at Naval Station Great Lakes, Illinois, an official stated that while she was not aware of a policy requiring that she track disruptions to the utility systems, she did track disruptions on the water system, including information on the disruption's location and date. She stated that she used the information to focus on areas of the water system that were experiencing multiple disruptions, to plan maintenance, and to inform funding decisions. In addition, an official from Fort Campbell, Kentucky, stated that he tracks outages because it is considered a good engineering practice. He stated that tracking disruptions on the electric system helped him to determine reliability, operations and maintenance budgets, preventative maintenance requirements, and areas of the system that needed more attention.

Second, utility disruption information may help installations compete for project repair funding. According to Army, Navy, and Air Force officials, they use disruption information, among other information, when prioritizing funding for utility repairs in a particular budget year. For example, the Air Force's risk-based project funding model uses utility outage information, among other variables, to prioritize projects. Also, as discussed above, the Navy's utility project prioritization process to make risk-based investment decisions uses utility disruption information, among other variables, to determine the highest priority projects. According to the Navy's guidance, the prioritization process helps them ensure that limited repair funding is directed to the most important projects.

Installations that collect and retain information about utility disruptions may be better able to manage and operate the utility system and compete for scarce project funds because they have the available data to justify the project. A Marine Corps official stated that he was considering developing a requirement for installations to track utility disruption information. In addition, as stated above, the Navy recently issued

[38]This estimate has a margin of error no larger than plus or minus 4.1 percent at the 95 percent level of confidence.

guidance to improve its ability to track utility disruptions because it needs this information to make informed decisions. The Navy's guidance, if implemented as directed, may help installations track utility disruption information and thus enable them to make sound decisions. On the other hand, installation-level utility system owners and managers who do not have access to information about disruptions may not have the information they need to make informed decisions or to compete effectively for limited repair funds.

DOD Is Implementing a Standardized Condition Assessment Process to Improve Data Reliability, but It Could Result in Differences in the Facility Condition Index across the Services

DOD is currently implementing a standardized condition assessment process to improve the data reliability of its facility condition data. DOD's standardized assessment process for utility systems is currently in development, and the initial version has limited capabilities to assess the condition of the utility infrastructure. Further, the military services are allowed to customize certain settings within the process which could result in differences in the FCI across the services.

DOD Is Implementing a Standardized Condition Assessment Process to Improve Data Reliability

In 2013, the Office of the Secretary of Defense (OSD) directed the services to implement a standardized condition assessment process in order to improve data reliability, and specifically the credibility of the FCI.[39] Prior to 2013 the guidance issued by OSD did not require a standardized condition assessment process, and the respective services used different methodologies to assess the condition of their facilities, including utility systems. As a result of the services' nonstandardized approach, OSD determined that the FCI data lacked credibility as a measure of DOD facility quality.

[39]Memorandum from the Under Secretary of Defense for Acquisition, Technology, and Logistics, Subject: *Standardizing Facility Condition Assessments* (Sept. 10, 2013).

According to the 2013 OSD memorandum, the department needed to implement the standardized assessment process to ensure that it had consistent and reliable condition data in order to make sound strategic investment decisions. According to an OSD official, the department relies on the FCI to make these decisions, in part, because the FCI allows OSD to assess the department's and the individual services' abilities to maintain the facilities at the condition necessary to achieve the department's missions. In addition, decision makers use the FCI to monitor progress toward department-wide goals and to prevent further accumulation of deferred maintenance. Those goals include the establishment of an inventory-wide 80 percent minimum FCI score for each military service to meet annually for the facilities they manage, beginning in fiscal year 2016. Another goal is the identification of facilities in failing condition, with an FCI of below 60, in support of the department's efforts to reduce the inventory of failing facilities.[40]

Our survey results indicate that operators of DOD-owned utility systems stated that knowledge about the condition of the infrastructure is useful. Specifically based on our survey responses, we estimate that utility managers consider knowledge about the condition of the system to have a somewhat or very positive effect on the ability to avoid or prevent equipment failure (68 percent); to manage risk associated with equipment failure (72 percent); to identify funding needs (76 percent); and to extend the utility system's usable service life (71 percent), among other things.[41]

The 2013 OSD memorandum directed the services to use the Sustainment Management System (SMS) software, developed by the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, as the standardized condition assessment process. SMS is a suite of web-based software modules designed to help facility engineers, technicians, and managers make asset management decisions regarding when, where, and how best to maintain facilities and their key

[40]In 2014 OSD issued a memorandum requiring the services to submit certain information in the mitigation plans for facilities in failing condition, including estimated cost-to-demolish, mothball, repair, or replace the failing facility, and a notional fiscal year for funding the mitigation. The memorandum does not require the services to fund the inventory-wide condition rating goal or plans for addressing failing facilities, citing budgetary challenges facing the department. See the Under Secretary of Defense for Acquisition, Technology and Logistics Memorandum, *Facility Sustainment and Recapitalization Policy* (Apr. 29, 2014).

[41]These estimates have a margin of error of no larger than plus or minus 5.0 percent at the 95 percent level of confidence.

components. According to the 2013 OSD memorandum, the services are required to use SMS both to derive and to record the FCIs of facilities supported by SMS in their respective real property databases by September 2017. For assets not yet supported by SMS, such as utilities, the 2013 OSD memorandum directed the services to perform inspections with qualified personnel to determine existing physical deficiencies and to estimate the cost of maintenance and repairs using industry cost guides.[42] According to U .S. Army Corps of Engineers officials, they are still in the process of developing modules that will respectively cover the following utilities: water, sewer, storm sewer, electrical, gas, and thermal systems.

Standardized Condition Assessment Process for Utility Infrastructure is under Development, and the Initial Version Has Limited Capabilities

According to officials from the U.S. Army Corps of Engineers, DOD's standardized process for assessing the condition of utility infrastructure is currently under development, and the initial version has limited capabilities to assess the condition of the utility infrastructure. U.S. Army Corps of Engineers officials stated that the initial version of the SMS module for electric and water utility systems has been under development since 2014 and is scheduled to undergo initial testing in November 2016. Further, according to U.S. Army Corps of Engineers officials, their organization and the Air Force are the two organizations working on development of the utilities SMS module, but representatives from the other services have participated in the utilities SMS working committee meetings. In addition, according to Air Force Officials, the Air Force has provided funding to the U.S. Army Corps of Engineers to fund the development of the initial version of the SMS utilities module for electric and potable water utility systems. However, according to U.S. Army Corps of Engineer officials, additional funding from the other services is needed to further develop the capabilities of the electric and water modules and to develop additional modules for other utility systems, such as for wastewater or natural gas systems.

U.S. Army Corps of Engineers officials responsible for developing DOD's initial version of the utilities module stated that the initial version uses a simplified condition assessment process. The simplified condition assessment process uses two variables, age and expected service life, to determine the condition of the utility infrastructure. Alternatively, in SMS modules for other facilities, such as buildings, more comprehensive

[42]The operational SMS modules include BUILDER and ROOFER for assessing building conditions, PAVER for pavements, and RAILER for railroad infrastructure.

assessment processes are used to determine the condition of the facility. These comprehensive assessment processes provide objective and repeatable inspections on various facility components based on knowledge of component criticality, the expected and observed deterioration of components, among other things. Upon completion of the inspection any identified defects are recorded and categorized by distress type (for example, blistered, broken, damaged, cracked, or corroded), among other things.

According to U.S. Army Corps of Engineers officials, the rating criteria for future versions of the SMS utilities module will be established with consideration of existing rating systems from within DOD and industry. For example, Navy officials told us that they provided funding to U.S. Army Corps of Engineers in fiscal year 2015 to evaluate the integration of Navy utility condition assessment rating methods into the SMS utilities module. This study examines the Navy's utility condition assessment and risk-based rating methods for integration into the SMS condition assessment process for utilities. According to Navy officials, as of May 2016, the service has not received the results of the U.S. Army Corps of Engineer integration study. Navy officials indicated that they use disruption information as one variable in their rating methodology.

As discussed previously in this report, installation officials and our survey respondents have stated that disruption information is useful when making decisions about the utility system. The Army, Navy, and Air Force use disruption information as one variable in their frameworks for prioritizing funding for utility projects. According to one installation official at Altus Air Force Base, Oklahoma, the official would like to be able to use the disruption information with the SMS module to support repair and investment decisions. The installation officials stated that age may not always be a good indicator of condition for a utility system, as a component or part might be relatively new but causing disruptions nonetheless. Furthermore, Navy installation officials from Naval Station Mayport, Florida, told us that information about disruptions is especially useful when much of the utility infrastructure is below ground and cannot be easily observed.[43]

[43]We estimate that 22 percent and 37 percent of DOD-owned utility managers considered it somewhat or very challenging, respectively, to update information about the condition of the utility system because the infrastructure is underground and difficult to access. These estimates have a margin of error no greater than plus or minus 4.9 percent at the 95 percent confidence interval. For additional challenges, see appendix II.

Differences among Services' Settings within the Standardized Condition Assessment Process Could Result in Differences in the Facility Condition Index

DOD's standardized process allows the military services to customize certain settings in the SMS system that affect repair need decisions, which can result in differences in the FCI. The customizable settings are called "condition standards," and these are the standards at which the service wishes to maintain the facility's components or equipment. These condition standards may vary depending upon how critical a particular component is to the overall facility or mission and each service develops their own condition standards. For example, U.S. Army Corps of Engineers hypothetically explained that on the one hand the Navy may want to set a high condition standard for a water system that is used to supply water to cool nuclear reactors for its home-ported nuclear submarines because this is a critical mission. On the other hand, the Army may want to set a lower condition standard for its water system that is used to supply water for grounds maintenance because this is a lower priority.

These standards are compared to the current condition assessment of the facility. Differences between the standards and the assessment determine when repair work is needed for a particular piece of infrastructure, and whether or not repair work is needed affects the FCI calculation. If the inspected condition is above the condition standard then the SMS system does not identify any repair work. If the inspected condition falls below the condition standard then the SMS system identifies the necessary repair work. SMS estimates the costs of the identified repair work and then the system users determine if they want to conduct the repairs. The SMS system uses the estimated cost of the repair as the numerator in the FCI equation.

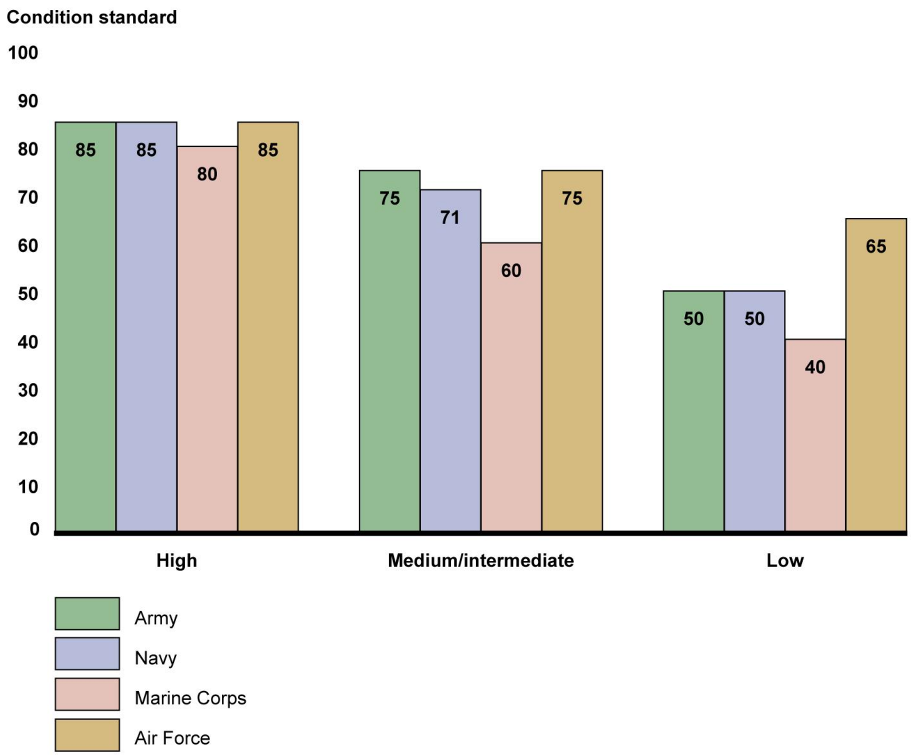
According to U.S. Army Corps of Engineers officials, the services have not yet developed condition standards for their utilities because the SMS module for utilities is still being developed. However, the services have developed condition standards for use in other SMS modules and U.S. Army Corps of Engineers officials stated that the design of the SMS module for utilities will be similar to other existing SMS modules. Further, the officials stated that the condition standards for the utilities module will operate similarly to how the condition standards operate in existing SMS modules. Therefore, to conduct our analysis we reviewed the condition standards used by the services in an existing SMS module for buildings, called "BUILDER".

The services have grouped condition standards into categories, such as high, medium, and low. According to U.S. Army Corps of Engineer officials, condition standards in the high category would be assigned to facilities that are mission-critical or generally more important to maintain. For example, officials at Cape Canaveral Air Force Station, Florida, stated that the installation's electric and water systems are critical to supporting the launch mission, however, the wastewater system is not as essential. Specifically, the electric system powers equipment for communication and radar tracking and the water system provides water to the launch pads to absorb excess heat and noise generated during launches. If the utility SMS module is implemented at Cape Canaveral, an Air Force official indicated that they would likely assign high condition standards to the electric and water systems and a lower condition standard to the wastewater system.[44]

We found that while the four services generally use similar categories of condition standards – such as high, medium, and low – they respectively assign different numerical values to standards within the same category. For example, each service has a category called "medium," but the values range from 60 to 75 depending on the service. Figure 8 depicts the service condition standards for the BUILDER SMS module.

[44]According to officials from Cape Canaveral Air Force Station, Florida, the installation may not transition to the SMS module for utility systems because the electric, water, and wastewater utility systems are currently being considered for privatization.

Figure 8: Condition Standards for Determining Repair Needs Used in DOD's Sustainment Management System Module for Buildings (BUILDER), by Military Service [45]



Source: GAO Analysis of Service Condition Standards for BUILDER. | GAO-17-27

To illustrate how different condition standards affect the FCI calculation, we developed a notional example, as illustrated in table 5, showing an electric distribution system.[46] The example assumes that each

[45]We depicted three condition standards (High, Medium/Intermediate, and Low) used by the services. However there are condition standards not used by all the services. For example, the Army has a condition standard for maintaining an asset in "Very High" condition that sets the threshold for repair at 90, while the other services highest condition rating is to maintain an asset in a "High" condition. Further the Navy has a condition standard to maintain an asset in "Run-to-Failure" condition with a condition standard value of 0; while the Air Force also has a condition standard to maintain an asset in "Run-to-Failure" condition with a condition standard value of 40.

[46]According to U.S. Army Corps of Engineer officials, the utilities SMS module is currently under development. We used the condition assessment framework used in the operational SMS module called BUILDER to derive the notional electric utility system example.

hypothetical organization owns and operates an electric distribution system, A through D, and each system has exactly the same infrastructure – overhead power lines, a transformer, and a switching station — was installed at the same time, and has the exact same plant replacement value ($500,000). Also, each part of the system has the same assessed physical condition from SMS. However, each hypothetical organization has different condition standards for this notional electric distribution system. We used the “Medium/Intermediate” condition standard found in figure 8 for this notional example. We created notional maintenance and repair costs for cases when the assessed physical condition from SMS was lower than the condition standard.[47] As shown in our example, the result of differences in the condition standards is that the FCIs are different, even though the assessed physical condition is the same. In this notional example, hypothetical organizations A, B, and D appear to have repair needs, while hypothetical organization C does not appear to have any repair needs. Table 5 illustrates how different condition standards from four hypothetical organizations produce different FCI values.

[47]The notional repair cost for the overhead power lines is $15,000 and for the transformer $85,000. Since the condition of the switching station never falls below the condition standard, we did not create a repair cost. Also, in this example, since each electrical distribution system is exactly the same, the repair costs to address the deficiencies in the condition would also be the same.

Table 5: Hypothetical Example of How Different Condition Standards Affect the Calculation of the Facility Condition Index for an Electric Utility (Sustainment Management System (SMS) Steps to Calculate the Facility Condition Index (FCI))

	System and Components	Physical Condition from SMS	Condition Standard	Repair Needed (Yes or No)	SMS- Derived Repair Costs (in $)	SMS Derived (FCI)
Electrical Distribution System A	Overhead power line	65	75	Yes	$15,000	FCI = [1-($100,000/$500,000) x 100] = 80
	Transformer	75	75	Yes	$85,000	FCI = [1-($100,000/$500,000)
	Switching Station	85	75	No	$0	x 100] = 80
	Sum of All Repair Costs (in $)	Na	Na	Na	$100,000	FCI = [1-($100,000/$500,000)
Electrical Distribution System B	Overhead power line	65	71	Yes	$15,000	FCI = [1-($15,000/$500,000) x 100] = 97
	Transformer	75	71	No	$0	FCI = [1-($15,000/$500,000) x 100] = 97
	Switching Station	85	71	No	$0	FCI = [1-($15,000/$500,000) x 100] = 97
	Sum of All Repair Costs (in $)	Na	Na	Na	$15,000	FCI = [1-($15,000/$500,000) x 100] = 97
Electrical Distribution System C	Overhead power line	65	60	No	$0	FCI = [1-($0/$500,000) x 100] = 100
	Transformer	75	60	No	$0	FCI = [1-($0/$500,000) x 100] = 100
	Switching Station	85	60	No	$0	FCI = [1-($0/$500,000) x 100] = 100
	Sum of All Repair Costs (in $)	Na	Na	Na	$0	FCI = [1-($0/$500,000) x 100] = 100
Electrical Distribution System D	Overhead power line	65	75	Yes	$15,000	FCI = [1-($100,000/$500,000) x 100] = 80
	Transformer	75	75	Yes	$85,000	FCI = [1-($100,000/$500,000) x 100] = 80
	Switching Station	85	75	No	$0	FCI = [1-($100,000/$500,000) x 100] = 80
	Sum of All Repair Costs (in $)	Na	Na	Na	$100,000	FCI = [1-($100,000/$500,000) x 100] = 80

Source: GAO notional information based on analysis of service condition standards used in the BUILDER module of the Sustainment Management System. | GAO-17-27

According to the 2013 OSD memorandum, the department requires reliable condition information, in the form of the FCI, to manage the department's facilities and to make informed investment decisions. OSD officials stated that the FCI is one of multiple sources of information that can be used to support the department's investment decisions concerning a single asset or portfolio of assets. Further, according to Standards for Internal Control in the Federal Government, to be useful, information should be accurate, complete, and credible, among other factors.[48]

However, DOD has not taken action to ensure that the condition standards to be developed by the services for the utilities module will provide the department with comparable and reliable FCI data. According to DOD officials, the services should have the flexibility to set the condition standards for their utility infrastructure and other facilities as they deem appropriate based on mission criticality and other factors. DOD officials stated that the services need to have the flexibility to prioritize the condition of some utility systems and facilities above others so that they can direct their limited repair and maintenance budgets to the most important needs. We agree that some facilities may need to be put in the high standard versus the low or medium standard based on mission criticality, but it is unclear why the standards vary within the same category (i.e., high, medium low). Further, according to the OSD 2013 memorandum, DOD is implementing a new standardized process to assess the condition of its facilities because its previous guidance allowed the services to implement an unstandardized approach to assessing the condition of their facilities, which resulted in a FCI that lacked credibility.

OSD officials also stated that they had not compared the services' existing condition standards and that they would consider looking into the differences of these standards across the services. Without taking steps to ensure that the services' condition standards for the utilities module and other modules will provide the department with comparable and reliable FCI data, the SMS utilities module, currently under development, may not provide DOD information that is comparable across the department's facilities. As a result, DOD may not be able to reliably assess progress toward meeting department-wide goals and DOD may continue to receive FCI data that lacks credibility as a measure of DOD facility quality.

Conclusions

Disruptions to DOD-owned utility systems have caused financial impacts and impacts to DOD operations and missions. Information about these disruptions can help DOD operate and maintain the utility systems,

[48]GAO/AIMD-00-21.3.1.

including identify these impacts and take steps to prevent or mitigate such disruptions. However, utility disruption information is not consistently available at the installation-level. We determined that some military services had guidance in place that required installations to collect and report some utility disruption data, and others did not. The Army has a service-wide requirement to collect and report electric and water utility disruption data, instances of equipment failure for water and wastewater systems, and to perform leak detection surveys for natural gas systems. However, we found that some of the Army installations did not consistently have information about disruptions available. The Air Force and Marine Corps do not have a service-wide requirement to collect and report utility disruption data. The Navy issued new reporting guidance beginning in fiscal year 2016 that if implemented as directed may provide the Navy installations with the guidance and procedures necessary to collect disruption information to make informed decisions for utility investments.[49] The majority of DOD-owned utility system owners and managers consider this type of information to be beneficial, for example some officials stated they use this information to determine where resources need to be focused to maintain the utility infrastructure. As a result, those who do not have such information may be at a disadvantage when making maintenance decisions or competing effectively for limited repair funds.

The current standardized process for assessing condition in the SMS modules already developed allows the military services to customize certain settings – called condition standards. The military services have developed different thresholds for the various categories of condition standards, which can result in different FCI ratings across the services for facilities assessed in the same condition. OSD’s goal for implementing the SMS assessment system is to have consistent, comparable and reliable FCIs across its portfolio of assets to make informed management decisions. Without taking steps to ensure that the services’ condition standards for the utilities module will provide the department with comparable and reliable FCI data, the SMS utilities module, currently under development, may not provide DOD information that is comparable across the department’s facilities. As a result, DOD may not be able to reliably assess progress toward meeting department-wide goals. Further,

[49]The time frame of our review included fiscal years 2009 through 2015. Therefore, the disruption data we collected through our survey was not affected by the Navy’s guidance, which went into effect in fiscal year 2016.

DOD risks continuing to receive FCI data that lacks credibility as a measure of DOD facility quality.

Recommendations for Executive Action

To improve the information that DOD, military service officials, and installation-level utility system owners and maintainers need to make maintenance or other investment decisions, we recommend that the Secretary of Defense take the following three actions:

- Direct the Secretary of the Army to take steps to implement existing guidance so that disruption information is consistently available at the installation level;
- Direct the Secretary of the Air Force to issue guidance to the installations to require the collection and retention of disruption; and
- Direct the Commandant of the Marine Corps to issue guidance to the installations to require the collection and retention of disruption information.

To provide DOD with more consistent information about the condition of DOD-owned utility systems as DOD continues to develop the SMS module for utility systems, we recommend that the Secretary of Defense direct the Assistant Secretary of Defense for Energy, Installations, and Environment, in coordination with the military services, take actions to govern the consistent use of condition standards of utility systems to be assessed using the SMS utilities module, and if applicable, for other facilities assessed using other SMS modules.

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. In its written comments, reproduced in appendix III, DOD concurred with our first three recommendations that the Secretary of Defense direct the Army, Air Force, and Marine Corps to take steps or provide guidance to consistently collect disruption information. DOD partially concurred with our fourth recommendation that the Secretary of Defense take steps to implement the consistent use of condition standards for utility systems to be assessed using the SMS utilities module. DOD stated it will continue to work with the Military Departments to determine if further opportunities exist to establish consistent condition standards within the SMS for utility systems. We continue to believe, by taking such steps the department will have assurances that the SMS utilities module will provide the department with comparable and reliable FCI data, which decision makers use to monitor progress towards department-wide goals and prevent further accumulation of deferred maintenance.

We are providing copies to the appropriate congressional committees; the Secretaries of Defense, the Army, the Navy, and the Air Force; the Assistant Secretary of Defense for Energy, Installations, and Environment; and the Commandant of the Marine Corps. 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 me at (202) 512-4523 or leporeb@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Brian J. Lepore
Director, Defense Capabilities and Management

Appendix I: Scope and Methodology

To determine the number of disruptions of DOD-owned utility systems that occurred between fiscal years 2009 and 2015, their causes, and the impact of the disruptions, we administered a survey to a representative sample of 453 DOD-owned utility systems located in the United States and overseas, producing results generalizable to the DOD-owned utility population.

A copy of the full questionnaire and aggregate responses for all close-ended questions are included in appendix II. The practical difficulties of conducting any survey may introduce errors, commonly referred to as nonsampling errors. For example, difficulties in interpreting a particular question or sources of information available to respondents can introduce unwanted variability into the survey results. We took steps in developing the questionnaire, collecting the data, and analyzing them to minimize such nonsampling error (see below).

Sample Design and Survey Development and Administration

Using records maintained to manage and oversee DOD's Utility Privatization Program within the Office of the Secretary of Defense of Energy, Installations, and Environment, we took several steps to identify the utility systems included in our study population and our sample design. Our scope included electric, water, wastewater, and natural gas utility systems that were owned by the active component of one of the four military services and located on a U.S. or overseas installation with a plant replacement value of $100 million or more. Some utility systems, mostly those located overseas, may not be owned by the military service but the military service may be responsible for funding the operation and maintenance of the system. When we refer to DOD-owned utility systems in this report we are including both systems that are owned by one of the military services and systems where the military service pays for the majority of the operation and maintenance of the utility system.

To determine the electric, water, wastewater and natural gas systems owned by DOD, we reviewed records maintained by the Installation Energy Office under the Assistant Secretary of Defense for Energy, Installations, and Environment and we identified 1,954 systems located within and outside the United States. Next, we compared this list of utility systems with the fiscal year 2015 Base Structure Report to determine which systems resided on installations with a plant replacement value of $100 or more and that were owned by the active component of one of the military services. This resulted in a total of 1,075 systems — 770 systems located in the United States and 305 systems located outside the United States – that made up our study population (see table 6).

Table 6: Study Population for GAO Survey on DOD-Owned Utility Systems

Service	Component	Systems within the United States	Systems Located Outside the United States	Total
Air Force	**Total Air Force Active**	**234**	**42**	**276**
	Electric	53	14	
	Water	66	14	
	Wastewater	67	14	
	Natural Gas	48	0	
Army	**Total Army Active**	**150**	**181**	**331**
	Electric	39	64	
	Water	42	52	
	Wastewater	40	61	
	Natural Gas	29	4	
Marine Corps	**Total Marine Corps Active**	**61**	**33**	**94**
	Electric	19	11	
	Water	18	10	
	Wastewater	15	11	
	Natural Gas	9	1	
Navy	**Total Navy Active**	**325**	**49**	**374**
	Electric	93	16	
	Water	92	14	
	Wastewater	97	13	
	Natural Gas	43	6	
All	**Total**	**770**	**305**	**1,075**

Source: GAO analysis of Department of Defense data.

We drew a random stratified sample of 469 utility systems from the population frame of 1,075 systems (see table 7). In order to be able to make generalizable statements about each of the four types of utilities, we did the following. First, we split the sample population into five strata; the first four correspond to the four types of utilities located in the United States.[1] The fifth stratum comprises all utilities located on U.S. military

[1]A strata is a mutually exclusive subdivision of a population defined in such a way that each sampling unit can belong to only one subdivision or stratum.

installations outside the United States. The reason we used a fifth stratum for the systems outside of the United States was because the ownership status of these systems was not clear from the records maintained by the department. By separating these systems into their own strata we could draw our sample in such a way that we would still be able to generalize the survey results for the utility systems within the United States even if all of the overseas systems were in fact not owned by one of the military services nor did the services pay for the majority of the operation and maintenance of the utility system. Furthermore, in order to verify that the systems we included in our sample were within our scope, we included a question in the survey which asked respondents to state if the system was owned by the military service and if the service was responsible for paying the majority of the operation and maintenance of the system, as discussed below.

In each stratum we used systematic random selection to identify the systems to include in the sample. Each armed service was represented in the sample in proportion to the total number of each type of utility system which they operate. In addition, the sample from each stratum received an allocation large enough to support an estimate with a margin of error no larger than plus or minus 10 percentage points at the 95 percent level of confidence. This was then adjusted for an expected response rate of 70 percent. See table 7 for the original sample size adjusted for an assumed 70 percent response rate.

Table 7: Original Sample Size for GAO Survey on DOD-Owned Utility Systems

Stratum	Sample size adjusted for assumed 70 percent response rate
Electric Systems in the United States or its territories	93
Water Systems in the United States or its territories	96
Wastewater Systems in the United States or its territories	96
Natural Gas Systems in the United States or its territories	79
All utility system types located outside the United States	105
Total	**469**

Source: GAO analysis of Department of Defense data. | GAO-17-27

To identify the survey respondents, we supplied a list of the sampled utility systems to each of the military services, which reviewed the list and identified the appropriate official at the installation to respond to our survey. During this process, 16 of the systems were removed because, for example the military service officials informed us that the system had been privatized, or that the installation on which the survey was located had been closed, among other things. We removed these 16 systems from our original sample of 469 systems, which left 453 systems.

To inform the design of our survey instrument and help ensure the validity and reliability of our results, we met with officials from OSD and the military services and explained the intent and design of the survey to ensure that, in general, the intended survey recipients would have the knowledge and resources to respond to our survey. GAO analysts and technical survey experts designed the survey and conducted four pretests, one with each military service, with officials who had work experience managing and operating DOD-owned utility systems at the installation level to ensure that survey questions collected the expected information and to obtain any suggestions for clarification. Furthermore, the survey instrument was independently reviewed by a survey design expert within GAO. Our survey included questions about the number of disruptions that occurred on the installation for fiscal years 2009 through 2015 caused by equipment failure, the impacts of those disruptions, and the characteristics of DOD-owned utility systems, among other things.

To distribute the survey, we sent an email to each respondent with a link to the web-based version of the survey with a unique user name and a password. To ensure the most possible responses, we kept the military services informed of the completion status and we also kept the survey open from December 18, 2015, through March 31, 2016. In total, we distributed 453 surveys.

Analysis of Respondents

Out of the 453 surveys distributed, 379 managers or operators of DOD-owned utility systems completed the survey for a response rate of 84 percent. To verify that the completed surveys were within our scope, we analyzed the results of a question in the survey which asked respondents to state if the system was owned by the military service and if the service was responsible for paying the majority of the operation and maintenance of the system. We determined that 15 respondents reported that the utility system was neither owned by the military service nor operated and maintained using a majority of appropriated funds. We removed these 15 surveys from our list of completed surveys, which resulted in a list of 364 completed and in-scope surveys. The analysis in this report is based on those 364 survey responses.

Because we followed a probability procedure based on random selections, our sample is only one of a large number of samples that we might have drawn. Since each sample could have provided different estimates, we express our confidence in the precision of our particular sample's results as a 95 percent confidence interval. This is the interval that would contain the actual population value for 95 percent of the samples we could have drawn. Confidence intervals are provided along with each sample estimate in the report. Generally in this report the results of this survey are presented as statistical estimates about the population of 1,075 electric, water, wastewater, or natural gas utility systems described above. In cases where we are using these estimates, we describe the results as estimates and generally refer to the entire population of "utility systems" or "utility managers." Because some questions did not apply to all respondents, some of the questions in our survey were answered by an insufficient number of respondents to reliably generate an estimate of the overall population. In these cases, rather than presenting a population estimate, we reported on the number of respondents in our sample who answered that question.

To obtain additional information about the impact of utility disruptions caused by the failure of DOD-owned utility infrastructure, we conducted follow-up interviews with a selected set of respondents who reported the most disruptions. We asked respondents to describe the impacts of specific disruptions and we also collected and reviewed documentation, such as records in maintenance information systems and project proposals.

To assess the extent to which owners and managers of DOD-owned utility systems have information about disruptions caused by equipment failures, we included a question in our survey regarding the availability of information on disruptions from fiscal year 2009 through 2015 and a question about the usefulness of disruption information in managing utility systems. Based on the survey responses, we followed-up with all 146 survey respondents who reported not having any information on disruptions for any fiscal year to confirm their responses and to determine the reasons why information was not available. We received responses from 89 survey respondents. We also interviewed service officials regarding policies and practices related to the collection and use of utility disruption information. Finally, we compared installation practices to standards regarding the identification, analysis, and response to risks as described in Standards for Internal Control in the Federal Government.[2] In addition, we reviewed reports from federal agencies and utility management organizations, such as management guides issued by the Environmental Protection Agency and the American Public Power Association, which describe the information that is useful in the management and operation of utility systems.

To assess the extent to which the department's implementation of a standardized facility condition assessment process provides DOD consistent information about the condition of utility systems, we reviewed policy documents and reports regarding DOD's efforts to improve the reliability of the condition information it collects to manage its infrastructure. We reviewed policies and documents describing the development and implementation of a new standardized condition assessment process, called the Sustainment Management System, developed by the U.S. Army Corps of Engineers, and how DOD plans to use the condition information to monitor and oversee the achievement of department-wide goals. Additionally, we collected and reviewed documents such as briefings, training documents, and user guides that describe how the new standardized condition assessment process will assess and rate the condition of utility systems and related infrastructure. We also conducted interviews with DOD officials and the military services regarding the development of the standardized process and how the department intends to use the information to inform decisions. Finally, we compared DOD's process for generating the condition information with standards regarding the use and management of data as described in Standards for Internal Control in the Federal Government.[3]

We conducted this performance audit from July 2015 to November 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.

[2]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C., Nov. 1, 1999).

[3]GAO/AIMD-00-21.3.1.

Appendix II: Survey on DOD-Owned Utility Resilience

Survey Overview

The questions that we asked in our survey on DOD-owned utility systems are shown below. Our survey was comprised of mostly close-ended questions. In this appendix, we include all survey questions and aggregate results of responses to the closed-ended questions; we do not provide information on responses provided to the open-ended questions. See appendix I for details of the analysis that led to the results reported here.

Section 1: Respondent Characteristics

1. What is your current role with the utility system?

   [Open ended]

2. How long have you been in this role?

Estimated average number of months	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
54.1	47.7	60.4

3. How long have you worked with the utility system?

Estimated average number of months	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
71.9	63.6	80.2

   a) Does your military service own the infrastructure of this utility system? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Yes	91.1	87.6	93.9
No	8.2	5.5	11.6
Don’t know	0.7	0.1	2.2

4. Does your military service pay for the majority of the operation and maintenance of this utility system through appropriated sustainment, restoration and modernization (SRM) funding? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Yes	79.5	75.4	83.6
No	18.1	14.2	22.0
Don’t know	2.4	1.1	4.5

Section 2: DOD-Owned Utility System Characteristics

This section asks about some of the characteristics of this utility system. Please answer only for utility infrastructure that is DOD-owned.

5. Does the utility system perform the following functions? (Check one per row.)

	Response	**Estimated Percentage**	**95 percent confidence interval – lower bound (percentage)**	**95 percent confidence interval – upper bound (percentage)**
Electric Utility Systems	Produce Electricity	0.0	0.0	2.9
	Distribute Electricity	75.5	65.6	83.7
	Both Produce and Distribute Electricity	23.6	15.5	33.4
	No or Don’t know to Both	0.9	0.0	5.3
Wastewater Utility Systems	Treat wastewater	1.3	0	6.9
	Collect Wastewater	53.7	43.5	64
	Both treat and collect wastewater	34.4	24.7	44.2
	No or Don’t Know to Both	10.5	5.1	18.6
Water Utility Systems	Treat potable water	0	0	3
	Distribute potable water	42.8	33	52.6
	Both treat and distribute potable water	56.2	46.4	66.1
	No or Don’t know to both	0.9	0	5.6
Natural Gas Utility System	Distribute Natural Gas - Yes	92.3	82.8	97.5
	Distribute Natural Gas - No	6.2	1.7	15.1

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Distribute Natural Gas - Don’t Know	1.5	0	8.4

6. When was this utility system originally installed? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
1920 or earlier	6.1	3.9	9.1
1921-1930	1.6	0.6	3.4
1931-1940	6.4	4.1	9.4
1941-1950	24.9	20.6	29.3
1951-1960	24.4	19.9	28.8
1961-1970	8.1	5.4	11.5
1971-1980	4.5	2.6	7.3
1981-1990	6.1	3.8	9.1
1991-2000	2.2	0.9	4.5
2001-2010	0.2	0.0	1.5
2011-2015	0.7	0.1	2.6
Don’t know	14.8	11.3	18.9

7. When was the most recent recapitalization project completed on this utility system, which replaced a significant part or parts of the system? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
1920 or earlier	0.3	0.0	1.6
1921-1930	0.0	0.0	0.8
1931-1940	0.0	0.0	0.8
1941-1950	0.8	0.2	2.4
1951-1960	0.5	0.0	1.9
1961-1970	0.2	0.0	1.5
1971-1980	3.8	2.0	6.5
1981-1990	7.0	4.5	10.1
1991-2000	8.8	6.0	12.3
2001-2010	16.4	12.7	20.8
2011-2015	36.9	31.8	42.0
Don't know	25.2	20.7	29.7

8. Which of the following best describes the types of employees that conduct maintenance on this utility system, as of September 30, 2015? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Mostly Government Employees	61.7	56.6	66.7
About equally split between Government and Contractors	7.5	4.9	10.8
Mostly Contractors	30.1	25.4	34.8
Don't know	0.7	0.1	2.3

9. How many full-time equivalent (FTE) government employees operate and maintain this utility system, as of September 30, 2015? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
0	19.7	15.7	23.7
1-10	54.8	49.6	60.1
11-20	13.5	10.1	17.7
21-30	4.1	2.2	6.9
31-40	2.6	1.1	5.0
41-50	1.3	0.4	3.0
51 or more	3.3	1.6	5.9
Don’t know	0.7	0.1	2.3

10. For fiscal year 2015, what was the size of this utility system in terms of the amount of commodity delivered on a typical day? (Enter number.)

[open ended]

11. How many people use this utility system during a typical weekday? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Less than 499	8.9	6.1	12.5
500-1,000	9.0	6.1	12.6
1,001-5,000	25.5	20.9	30.2
5,001-10,000	26.6	22.0	31.3
10,001-20,000	14.6	11.2	18.7
20,001-30,000	7.1	4.6	10.3
30,001-40,000	2.1	0.9	4.1
40,001-50,000	0.0	0.0	0.8
50,001 or more	1.9	0.8	3.9
Don’t know	4.3	2.4	6.9

Section 3: DOD-Owned Utility System Condition Information

12. In which fiscal year (FY) were the facility condition index ratings for the infrastructure associated with this utility system last updated? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
FY 2015	48.0	42.7	53.2
FY 2014	12.2	9.0	16.0
FY 2013	3.1	1.6	5.5
FY 2012	1.5	0.5	3.4
FY 2011	1.4	0.5	3.3
FY 2010	1.3	0.4	3.1
Before FY 2010	9.4	6.5	13.1
Don’t know	23.1	18.7	27.5

13. How frequently is the facility condition index rating for the infrastructure associated with this utility system updated? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
More than once a year	5.2	3.1	8.2
Once a year	35.6	30.5	40.6
Once every 2 years	2.4	1.1	4.5
Once every 3 years	7.7	5.1	11.1
Once every 4 years	1.8	0.7	3.7
Once every 5 years	5.8	3.6	8.7
Less than once every 5 years	14.6	11.0	18.8
Don’t know	27.0	22.3	31.6

14. Did you use any of the following to update the facility condition index rating for the infrastructure associated with this utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Inspections performed during scheduled preventative maintenance	Yes	57.5	52.4	62.6
	No	17.7	13.8	21.7
	Don’t know	24.8	20.3	29.3
Operator inspection, performed by system engineers or utility system operators	Yes	62.9	57.9	67.9
	No	13.6	10.2	17.5
	Don’t know	23.6	19.2	27.9
Formal condition assessment, performed by specialists	Yes	47.9	42.8	53.1
	No	25.4	21.0	29.9
	Don’t know	26.6	22.1	31.2
Other	Yes	13.0	9.5	17.1
	No	11.6	8.5	15.3
	Don’t know	75.4	70.9	80.0

15. To what extent do the following represent challenges in updating the facility condition index of the utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Lack of time to conduct an assessment	Not a challenge	15.6	11.9	19.9
	A minor challenge	18.6	14.4	22.7
	Somewhat challenging	28.1	23.4	32.7
	Very challenging	28.6	23.9	33.3
	Don't know	9.2	6.3	12.8
Lack of trained or qualified personnel	Not a challenge	25.4	20.8	30.1
	A minor challenge	23.1	18.6	27.6
	Somewhat challenging	25.0	20.5	29.5
	Very challenging	18.2	14.3	22.1
	Don't know	8.3	5.5	11.7
Lack of the necessary equipment to perform the assessment	Not a challenge	25.4	20.8	30.1
	A minor challenge	21.1	16.7	25.5
	Somewhat challenging	26.8	22.2	31.4
	Very challenging	16.3	12.5	20.1
	Don't know	10.4	7.4	14.2
Infrastructure is underground and difficult to access	Not a challenge	15.3	11.6	19.6
	A minor challenge	17.3	13.2	21.3
	Somewhat challenging	21.6	17.4	25.8
	Very challenging	36.9	32.0	41.8
	Don't know	8.9	6.1	12.5

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Conducting the assessment requires that the utility system be shut down	Not a challenge	32.1	27.1	37.0
	A minor challenge	17.4	13.3	21.4
	Somewhat challenging	21.8	17.4	26.1
	Very challenging	15.7	12.1	19.9
	Don't know	13.1	9.7	17.1
Conducting the assessment may damage the utility infrastructure	Not a challenge	50.1	44.8	55.3
	A minor challenge	20.5	16.2	24.8
	Somewhat challenging	11.3	8.2	15.0
	Very challenging	4.9	2.9	7.6
	Don't know	13.3	9.9	17.3
Assessment results do not provide useful information	Not a challenge	50.7	45.4	56.0
	A minor challenge	18.2	14.0	22.3
	Somewhat challenging	10.3	7.4	14.0
	Very challenging	2.9	1.4	5.2
	Don't know	17.9	13.9	21.9
Other	Not a challenge	13.6	9.4	18.9
	A minor challenge	1.8	0.5	4.6
	Somewhat challenging	0.3	0.0	2.4
	Very challenging	6.5	3.7	10.4
	Don't know	77.8	72.3	83.2

16. Does information about the condition of the utility system positively or negatively effect your ability to do the following? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Provide required level of service	Very or somewhat negative effect	9.1	6.3	12.6
	No Effect	31.3	26.4	36.2
	Very or somewhat positive effect	55.3	50.1	60.5
	Don't know	4.3	2.5	6.9
Avoid/prevent equipment failures	Very or somewhat negative effect	9.1	6.3	12.6
	No Effect	18.5	14.4	22.7
	Very or somewhat positive effect	67.8	62.9	72.8
	Don't know	4.6	2.6	7.3
Manage risk associated with equipment failures	Very or somewhat negative effect	8.0	5.4	11.2
	No Effect	15.0	11.3	19.3
	Very or somewhat positive effect	72.3	67.6	77.0
	Don't know	4.7	2.8	7.5
Identify, refine and improve maintenance strategies and plans	Very or somewhat negative effect	7.2	4.8	10.4
	No Effect	9.9	6.9	13.5
	Very or somewhat positive effect	78.7	74.4	82.9
	Don't know	4.3	2.5	6.9

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Predict and plan short-term repairs and maintenance needs	Very or somewhat negative effect	6.8	4.4	9.9
	No Effect	11.8	8.6	15.7
	Very or somewhat positive effect	77.4	73.0	81.8
	Don't know	4.0	2.3	6.6
Predict and plan long-term repairs and maintenance needs	Very or somewhat negative effect	7.1	4.7	10.3
	No Effect	7.7	5.1	11.0
	Very or somewhat positive effect	80.9	76.9	85.0
	Don't know	4.3	2.4	6.9
Identify funding requirements	Very or somewhat negative effect	7.4	4.9	10.7
	No Effect	10.7	7.6	14.6
	Very or somewhat positive effect	76.5	72.0	80.9
	Don't know	5.4	3.3	8.3
Extend the utility system's usable service life	Very or somewhat negative effect	7.4	4.9	10.6
	No Effect	16.2	12.5	20.6
	Very or somewhat positive effect	71.1	66.3	75.8
	Don't know	5.3	3.2	8.1

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Other	Very or somewhat negative effect	0.4	0.0	2.5
	No Effect	16.7	11.9	22.5
	Very or somewhat positive effect	2.9	1.1	6.0
	Don't know	79.9	74.5	85.3

17. How confident are you about the current reliability of this utility system? (For the purposes of this survey, reliability is the ability of a utility system to perform its functions under normal and extreme operating conditions.) (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Extremely confident	9.5	6.7	13.0
Very confident	37.7	32.6	42.8
Moderately confident	39.4	34.2	44.5
Somewhat confident	9.5	6.6	13.0
Not at all confident	3.2	1.6	5.7
Don't know	0.7	0.1	2.3

18. Do the following issues negatively impact your confidence in the current reliability of this utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Deferred maintenance	Yes	57.1	51.9	62.3
	No	39.5	34.4	44.6
	Don't know	3.4	1.8	5.9

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Lack of personnel	Yes	58.1	52.9	63.2
	No	39.7	34.5	44.8
	Don't know	2.3	1.0	4.4
Lack of funding	Yes	65.7	60.8	70.6
	No	30.9	26.1	35.7
	Don't know	3.4	1.8	5.8
Weather conditions	Yes	33.7	28.9	38.5
	No	65.4	60.6	70.2
	Don't know	0.9	0.2	2.6
Climate change	Yes	18.0	13.9	22.1
	No	78.1	73.8	82.5
	Don't know	3.8	2.1	6.4
Poor condition of the infrastructure	Yes	58.3	53.2	63.4
	No	39.0	33.9	44.1
	Don't know	2.7	1.3	5.0
Wildlife interference	Yes	12.2	9.0	16.0
	No	86.3	82.3	89.7
	Don't know	1.5	0.5	3.4
Excessive demand beyond designed system capabilities	Yes	17.4	13.4	21.3
	No	79.3	75.0	83.5
	Don't know	3.4	1.7	5.9
Age (the system is nearing or has reached its expected serviceable life)	Yes	63.2	58.2	68.3
	No	33.3	28.3	38.2
	Don't know	3.5	1.8	5.9
Other	Yes	6.6	4.2	9.8
	No	6.8	4.4	10.0
	Don't know	86.6	82.5	90.0

Section 4: DOD-Owned Utility System Funding Information

19. How many major maintenance and repair projects (projects costing more than $250,000) were completed on this utility system in the following fiscal years? (Please only include those major maintenance and repair projects that were planned projects, please do not include unplanned projects.) (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
FY 2013	0	56.3	51.1	61.6
	1	20.0	15.7	24.3
	2	6.7	4.3	10.0
	3	2.2	1.0	4.4
	4	2.0	0.8	4.2
	5	0.3	0.0	1.6
	More than 5	0.6	0.1	2.3
	Don't know	11.7	8.5	15.6
FY 2014	0	62.7	57.6	67.8
	1	15.8	12.1	20.1
	2	5.9	3.6	8.9
	3	3.4	1.7	5.8
	4	0.8	0.2	2.4
	5	0.8	0.2	2.4
	More than 5	1.1	0.3	2.9
	Don't know	9.4	6.5	13.1
FY 2015	0	64.3	59.3	69.4
	1	17.8	13.8	21.9
	2	6.8	4.4	10.0
	3	0.8	0.2	2.4
	4	0.6	0.1	2.0
	5	1.3	0.4	3.1
	More than 5	0.9	0.2	2.6
	Don't know	7.5	4.9	10.9

20. From fiscal years 2013 to 2015, were there funding shortfalls for this utility system?

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
FY 2013	Yes	29.0	24.4	33.6
	No	52.6	47.4	57.8
	Don't know	18.4	14.3	22.5
FY 2014	Yes	31.7	27.0	36.3
	No	53.2	48.0	58.3
	Don't know	15.2	11.5	19.4
FY 2015	Yes	34.9	30.2	39.7
	No	51.9	46.8	57.0
	Don't know	13.2	9.7	17.2

21. From fiscal years 2013 to 2015, did the following factors contribute to a shortfall of funding for this utility system?

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Other funding needs within the service had a higher priority	Yes	54.9	48.0	61.8
	No	30.4	23.9	36.8
	Don't know	14.7	10.1	20.4
Other funding needs on the installation had a higher priority	Yes	53.9	47.0	60.8
	No	32.6	26.0	39.2
	Don't know	13.5	9.1	19.0
Sequestration	Yes	20.6	15.1	27.1
	No	50.7	43.6	57.8
	Don't know	28.7	22.3	35.1
Increase in unplanned maintenance needs	Yes	29.6	23.3	35.9
	No	55.2	48.4	62.1
	Don't know	15.2	10.5	21.0
This utility system is going	Yes	9.4	5.7	14.4
	No	79.7	74.0	85.3

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
to be privatized or therwise removed from DOD ownership	Don't know	11.0	7.0	16.1
Other	Yes	12.4	7.2	19.5
	No	17.0	11.1	24.4
	Don't know	70.6	62.8	78.4

22. From fiscal years 2013 to 2015, did you take any of the following actions to mitigate the shortfall?

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Deferred entire planned maintenance and repair projects	Yes	33.2	26.7	39.6
	No	54.7	47.9	61.6
	Don't know	12.1	7.9	17.4
Deferred portions of planned maintenance and repair projects	Yes	40.9	34.0	47.7
	No	46.1	39.2	53.1
	Don't know	13.0	8.7	18.4
Sought opportunities to obtain alternative funding sources (i.e., 3rd party financed projects)	Yes	26.7	20.7	32.7
	No	62.2	55.5	68.8
	Don't know	11.2	7.2	16.4
Other	Yes	6.4	2.7	12.4
	No	22.7	15.7	31.0
	Don't know	70.9	63.0	78.8

a. If you deferred entire maintenance and repair projects due to funding shortfalls then to what extent did this deferred maintenance effect the reliability of this utility system?

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
No negative effect	3.0	0.4	10.4
Minor negative effect	57.6	45/6	69.6
Moderately negative effect	23.1	13.5	35.4
Major negative effect	8.5	3.1	17.9
Don’t know	7.8	2.5	17.6

b. If you deferred portions of maintenance and repair projects due to funding shortfalls then to what extent did this deferred maintenance effect the reliability of this utility system?

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
No negative effect	5.1	1.4	12.8
Minor Negative effect	56/4	45.6	67.2
Moderately negative effect	22.4	13.9	33.0
Major negative effect	5.9	1.9	13.2
Don't know	10.2	4.4	19.4

Section 5: DOD-Owned Utility System Disruption Information

For the purposes of this survey, please report the following type of disruptions on this utility system.

Include:

- Disruptions in this utility system to users or to (a) mission-reliant asset(s) lasting more than 5 minutes due to the failure of DOD-owned equipment or the under-performance of utility infrastructure based on operating environment standards

Do not include:

- Disruptions of less than 5 minutes
- The failure of a commercial or privatized electricity generation system
- Natural events such as a storm, earthquake, fire, etc. that damage the equipment
- Intentional or planned disruptions

23. To what extent is information about utility disruptions due to equipment failures useful in operating and maintaining the utility system? (Check one.)

Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Very or somewhat useful	82.2	78.1	86.2
Not very or not at all useful	9	6.2	12.5
Don't Know	8.9	6.1	12.4

24. For which of the following fiscal years do you have information on the disruptions cause by equipment failure on this utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
FY 2009	Yes	34.2	29.1	39.2
	No	35.6	30.5	40.8
	Don't know	30.2	25.3	35.1
FY 2010	Yes	36.3	31.1	41.4
	No	33.8	28.7	38.8
	Don't know	29.9	25.0	24.8
FY 2011	Yes	38.2	33.0	43.4
	No	32.4	27.4	37.4
	Don't know	29.4	24.6	34.3
FY 2012	Yes	41.2	35.9	46.5
	No	32.1	27.1	37.2
	Don't know	26.7	21.9	31.4
FY 2013	Yes	47.2	41.9	52.5
	No	28.9	24.0	33.7
	Don't know	23.9	19.4	28.5
FY 2014	Yes	49.8	44.5	55.1
	No	28.0	23.3	32.8
	Don't know	22.2	17.8	26.6
FY 2015	Yes	56.1	50.9	61.4
	No	26.4	21.7	31.0
	Don't know	17.5	13.4	21.5

a. In each fiscal year, how many disruptions did this utility system experience?

   (For zero disruptions, check “no disruptions”.)

   Disruptions_____________

   No disruptions______

   Section completed (If there were no disruptions in this fiscal year, skip the rest of the questions in this fiscal year and go to next fiscal year)

   [Open ended]

b. Approximately how many minutes was the utility service disrupted for during each fiscal year?

   Minutes_________________

   [Open ended]

c. Approximately what were the fiscal impacts of the utility disruptions reported for each fiscal year?
   (Fiscal impact is the money spent repairing the disruption and mitigating the effects. For example, the cost of the replacement parts and the cost of the personnel needed to complete the repair would be considered in the fiscal impact.)

   Dollars_____________

   [Open ended]

d. How common were the following operational impacts of the utility disruptions reported in each fiscal year?
   (Operational impacts are any impacts that the disruptions had on the ability of the installation to operate and to accomplish its mission.)

No Operational Impacts.

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2009	Very uncommon or uncommon	50.0	36	64
	Very common or common	43.7	29.7	57.7
	Don't know	6.3	1.4	17
2010	Very uncommon or uncommon	44.8	32.1	57.6
	Very common or common	45.9	33.0	58.7
	Don't know	9.3	3.3	19.7
2011	Very uncommon or uncommon	47.3	34.9	59.7
	Very common or common	45.7	33.3	58.1
	Don't know	7.0	2.1	16.3
2012	Very uncommon or uncommon	58.5	46.9	70.0
	Very common or common	35.1	23.8	46.3
	Don't know	6.5	2.0	14.9
2013	Very uncommon or uncommon	52.6	42.3	63.0
	Very common or common	39.3	29.1	49.5
	Don't know	8.1	3.4	15.7
2014	Very uncommon or uncommon	55.0	44.7	65.2
	Very common or common	40.2	30.0	50.3
	Don't know	4.9	1.5	11.4

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2015	Very uncommon or uncommon	57.0	47.6	66.3
	Very common or common	39.4	30.2	48.7
	Don't know	3.6	0.9	9.2

Minor Operational Impacts, such as causing minimal delays.

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2009	Very uncommon or uncommon	41.0	26.9	56.2
	Very common or common	50.6	36.4	64.7
	Don't know	8.5	2.4	20.0
2010	Very uncommon or uncommon	43.8	30.7	56.8
	Very common or common	46.6	33.4	59.7
	Don't know	9.7	3.4	20.4
2011	Very uncommon or uncommon	45.1	32.5	57.7
	Very common or common	48.7	36.0	61.4
	Don't know	6.2	1.6	15.6
2012	Very uncommon or uncommon	48.9	37.2	60.6
	Very common or common	44.7	33.1	56.4
	Don't know	6.4	2.0	14.7

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2013	Very uncommon or uncommon	47.6	37.0	58.2
	Very common or common	45.2	34.7	55.7
	Don’t know	7.2	2.8	14.8
2014	Very uncommon or uncommon	43.9	33.7	54.2
	Very common or common	51.2	40.9	61.5
	Don’t know	4.9	1.5	11.4
2015	Very uncommon or uncommon	46.0	36.6	55.4
	Very common or common	51.4	42.0	60.7
	Don’t know	2.6	0.5	7.8

Moderate Operational Impacts, such as causing delays or the reduced capability of some systems.

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2009	Very uncommon or uncommon	66.6	51.5	79.5
	Very common or common	25.0	13.5	39.8
	Don't know	8.4	2.4	20.0
2010	Very uncommon or uncommon	69.5	55.5	81.3
	Very common or common	20.7	10.8	34.2
	Don't know	9.8	3.5	20.7
2011	Very uncommon or uncommon	64.5	51.2	76.2
	Very common or common	26.9	16.5	39.7
	Don't know	8.6	3.0	18.4
2012	Very uncommon or uncommon	60.6	49.0	72.1
	Very common or common	32.9	22.1	45.1
	Don't know	6.6	2.1	15.2
2013	Very uncommon or uncommon	67.8	58.2	77.4
	Very common or common	25.1	16.6	35.4
	Don't know	7.1	2.7	14.5
2014	Very uncommon or uncommon	66.2	56.3	76.2
	Very common or common	29.5	20.0	39.0

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
	Don't know	4.2	1.1	10.8
2015	Very uncommon or uncommon	68.4	59.7	77.0
	Very common or common	27.3	19.3	36.5
	Don't know	4.4	1.4	10.1

Major Operational Impacts, such as causing major delays or shutting down large number of systems or assets.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2009	Very uncommon or uncommon	89.5	77.5	96.5
	Very common or common	2.0	0.1	10.9
	Don't know	**8.5**	2.4	20.0
2010	Very uncommon or uncommon	87.2	75.0	94.8
	Very common or common	4.2	0.5	14.4
	Don't know	8.6	2.7	19.4
2011	Very uncommon or uncommon	85.3	74.1	92.9
	Very common or common	6.2	1.7	15.2
	Don't know	8.6	3.0	18.4
2012	Very uncommon or uncommon	88.6	78.9	94.9
	Very common or common	5.0	1.3	12.9
	Don't know	6.4	2.0	14.7
2013	Very uncommon or uncommon	87.5	78.9	93.6

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
	Very common or common	5.4	1.7	12.3
	Don’t know	7.1	2.7	14.5
2014	Very uncommon or uncommon	85.2	76.2	91.8
	Very common or common	9.8	4.5	17.9
	Don’t know	5.0	1.5	11.6
2015	Very uncommon or uncommon	87.8	80.2	93.2
	Very common or common	8.6	4.1	15.4
	Don’t know	3.6	0.9	9.1

(Other)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
2009	Very uncommon or uncommon	18.4	6.1	38.4
	Very common or common	0.0	0.0	10.9
	Don’t know	81.6	61.6	93.9
2010	Very uncommon or uncommon	13.9	4.5	30.1
	Very common or common	0.0	0.0	8.4
	Don’t know	86.1	69.9	95.5
2011	Very uncommon or uncommon	15.2	5.0	32.3
	Very common or common	0.0	0.0	8.9

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
	Don't know	84.8	67.7	95.0
2012	Very uncommon or uncommon	14.7	4.9	31.4
	Very common or common	2.9	0.1	15.5
	Don't know	82.3	65.1	93.3
2013	Very uncommon or uncommon	15.0	6.2	28.7
	Very common or common	4.4	0.5	15.1
	Don't know	80.5	66.1	90.8
2014	Very uncommon or uncommon	10.3	3.4	22.8
	Very common or common	4.2	0.5	14.5
	Don't know	85.4	72.0	94.0
2015	Very uncommon or uncommon	9.8	3.6	20.3
	Very common or common	3.2	0.4	11.2
	Don't know	87.0	75.8	94.3

25. How common are the following causes of disruptions on this utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
The equipment is being used beyond its intended life	Very uncommon or uncommon	49.2	43.8	54.5
	Common or very common	43.7	38.5	48.9
	Don't know	7.1	4.6	10.4
The condition of the equipment is poor	Very uncommon or uncommon	52.2	46.8	57.5
	Common or very common	41.2	36.0	46.4
	Don't know	6.6	4.2	9.9
Factors external to the system are causing disruptions such as a disruption on another utility system, wildlife interference, external construction, or operator fault	Very uncommon or uncommon	57.6	52.3	62.9
	Common or very common	35.7	30.6	40.9
	Don't know	6.7	4.2	10.0
The equipment is not performing according to operating environment standards	Very uncommon or uncommon	82.0	77.8	86.1
	Common or very common	10.8	7.6	14.6
	Don't know	7.3	4.7	10.6

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
The equipment has not been properly maintained	Very uncommon or uncommon	70.0	65.1	74.9
	Common or very common	24.1	19.6	19.6
	Don't know	5.9	3.6	9.0
The equipment is being asked to handle service volumes beyond its intended capacity	Very uncommon or uncommon	79.8	75.4	84.2
	Common or very common	13.3	9.7	17.6
	Don't know	6.9	4.4	10.2
Other	Very uncommon or uncommon	3.6	1.4	7.4
	Common or very common	9.5	5.6	14.7
	Don't know	86.9	81.2	91.4

26. How likely would any of the following prevented some of the disruptions on this utility system? (Check one per row.)

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
Improved preventative maintenance, inspections and repairs	Not at all likely	19.8	15.6	24.0
	Somewhat likely	37.3	32.0	42.5
	Very likely	35.7	30.5	40.8
	Don't know	7.2	4.7	10.5
Replacement of degraded and unreliable	Not at all likely	12.3	9.0	16.3
	Somewhat likely	25.9	21.2	30.7

	Response	Estimated Percentage	95 percent confidence interval – lower bound (percentage)	95 percent confidence interval – upper bound (percentage)
equipment	Very likely	54.9	49.6	60.2
	Don't know	6.9	4.4	10.1
Increase in personnel to perform maintenance and repairs	Not at all likely	18.2	14.1	22.4
	Somewhat likely	32.2	27.1	37.3
	Very likely	40.8	35.5	46.1
	Don't know	8.8	6.0	12.3
Other	Not at all likely	2.8	1.0	6.1
	Somewhat likely	0.0	0.0	1.5
	Very likely	8.1	4.5	13.1
	Don't know	89.1	83.8	92.2

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

OCT 20 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:

Enclosed is the Department of Defense (DoD) response to GAO Draft Report, GAO-17-27, "DEFENSE INFRASTRUCTURE: Actions Needed to Strengthen Utility Resilience Planning," dated September 6, 2016 (GAO Code 100229).

I appreciate the collaboration your team provided through this engagement. Of the four recommendations in the draft report, the Department concurs with three and partially concurs with the fourth.

The partial concur results from the draft report's implication that all infrastructure is equivalent. The Department's approach to using the Sustainment Management System (SMS) inspection modules provides us with a number of useful asset management metrics, two of which are the Condition Index (CI) and the Facility Condition Index (FCI). The CI measures asset condition only and is intended to provide consistent results across DoD Components. The FCI applies condition standards, or triggers, to the CIs in order to arrive at a cost to correct or mitigate deficiencies relative to differences in their functions and importance. Specifically, DoD intended to have the DoD Components set the triggers to reflect an individual facility's mission priority. The flexibility of customized repair triggers not only addresses varied mission requirements and levels of acceptable risk between DoD Components, but also within each Component. For example, a utility line running to an administrative facility will be inspected the same as the utility line to a hospital, and all factors being equal (e.g., age, material, and subcomponents), resulting CIs should be the same. However, the decision points for repair (FCI condition standard) will differ because the utility line to the hospital would be deemed more critical, therefore, requiring more frequent repair activity. The Department is confident the DoD Components are using the SMS, to include defining condition standards defining when facility degradation requires mitigation, based on mission requirements and risk to operations, as intended.

If you would like to continue the dialog on the SMS and its day-to-day use, please contact Mr. Mike McAndrew, Deputy Assistant Secretary of Defense for Facilities Investment and Management, at 703-697-6195.

Sincerely,

Peter Potochney
Principal Deputy Assistant Secretary of Defense
(Energy, Installations, and Environment)
Performing the Duties of the Assistant Secretary of Defense
(Energy, Installations, and Environment)

Enclosure: As stated

GAO DRAFT REPORT DATED SEPTEMBER 6, 2016
GAO-17-27 (GAO CODE 100229)

"DEFENSE INFRASTRUCTURE: ACTIONS NEEDED TO STRENGTHEN UTILITY RESILIENCE PLANNING"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

To improve the information that DOD, military service officials, and installation-level utility system owners and maintainers need to make maintenance or other investment decisions, GAO makes the following recommendations:

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense direct the Secretary of the Army to take steps to implement existing guidance so that disruption information is consistently available at the installation level.

DoD RESPONSE: Concur.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense direct the Secretary of the Air Force to issue guidance to the installations to require the collection and retention of disruption information.

DoD RESPONSE: Concur.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense direct the Commandant of the Marine Corps to issue guidance to the installations to require the collection and retention of disruption information.

DoD RESPONSE: Concur.

RECOMMENDATION 4: To provide DOD with more consistent information about the condition of DOD-owned utility systems as DOD continues to develop the SMS module for utility systems, the GAO recommends that the Secretary of Defense direct the Assistant Secretary of Defense for Energy, Installations, and Environment, in coordination with the military services, take actions to govern the consistent use of condition standards for utility systems to be assessed using the SMS utilities module and, if applicable, for other facilities assessed using other SMS modules.

DoD RESPONSE: Partially Concur. The Department will continue working with the Military Departments to determine if further opportunities exist to establish consistent condition standards within the SMS for utility systems. However, consistent with our comments to GAO previously, the Department adopted the SMS to standardize the inspection criteria/process (i.e., all pavements should use the same inspection criteria), not to establish single condition standards by facility or subcomponent type. Some assets/subcomponents, as pointed out in the report, depend on a greater degree of reliability, necessitating different condition standards for those assets both across Services and within each Service. DoD views the condition standards as trigger points that let Components know when repairs to individual assets are required. The DoD Components need to manage their assets in light of the multitude of assets and missions supported. Having the ability to adjust the condition standards (triggers) allows them to tailor maintenance programs to mission requirements.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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

Staff Acknowledgments

In addition to the contact named above, Laura Durland, Assistant Director; Michael Armes; Carl Barden; Tracy Barnes; Jon Ludwigson; Carolyn Cavanaugh; Randy De Leon; Steven Putansu; Amie Lesser; Cheryl Weissman; Erik Wilkins-McKee; and Tonya Woodbury made key contributions to this report.

Appendix V: Accessible Data

Agency Comment Letter

Comments from the Department of Defense

Page 1

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:

Enclosed is the Department of Defense (DoD) response to GAO Draft Report, GA0-17-27 , "DEFENSE INFRASTRUCTURE: Actions Needed to Strengthen Utility Resilience Planning," dated September 6, 2016 (GAO Code I 00229).

I appreciate the collaboration your team provided through this engagement. Of the four recommendations in the draft report, the Department concurs with three and partially concurs with the fourth .

The partial concur results from the draft report 's implication that all infrastructure is equivalent. The Department 's approach to using the Sustainment Management System (SMS) inspection modules provides us with a number of useful asset management metrics, two of which are the Condition Index (CI) and the Facility Condition Index (FCI). The CI measures asset condition only and is intended to provide consistent results across DoD Components . The FCI applies condition standards, or triggers, to the Cis in order to arrive at a cost to correct or mitigate deficiencies relative to differences in their functions and importance . Specifically, DoD intended to have the DoD Components set the triggers to reflect an

individual facility's mission priority . The flexibility of customized repair triggers not only addresses varied mission requirements and levels of acceptable risk between DoD Components, but also with in each Component. For example, a utility line running to an administrative facility will be inspected the same as the utility line to a hospital , and all factors being equal (e.g., age, material, and subcomponents), resulting CIs should be the same. However, the decision points for repair (FCI condition standard) will differ because the utility line to the hospital would be deemed more critical , therefore , requiring more frequent repair activity. The Department is confident the DoD Components are using the SMS, to include defining condition standards defining when facility degradation requires mitigation , based on mission requirements and risk to operations, as intended.

If you would like to continue the dialog on the SMS and its day-to-day use, please contact

Mr. Mike McAndrew , Deputy Assistant Secretary of Defense for Facilities Investment and Management , at 703-697-6195.

Sincerely,

Peter Potochney

Principal Deputy Assistant Secretary of Defense (Energy, Installations, and Environment)

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

Enclosure : As stated

Page 2

GAO DRAFT REPORT DATED SEPTEMBER 6, 2016 GA0-17-27 (GAO CODE 100229)

"DEFENSE INFRASTRUCTURE: ACTIONS NEEDED TO STRENGTHEN UTILITY RESILIENCE PLANNING"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

To improve the information that DOD, military service officials, and installation-level utility system owners and maintainers need to make maintenance or other investment decisions, GAO makes the following recommendations:

RECOMMENDATION 1:

The GAO recommends that the Secretary of Defense direct the Secretary of the Army to take steps to implement existing guidance so that disruption information is consistently available at the installation level.

DoD RESPONSE: Concur.

RECOMMENDATION 2:

The GAO recommends that the Secretary of Defense direct the Secretary of the Air Force to issue guidance to the installations to require the collection and retention of disruption information .

DoD RESPONSE : Concur.

RECOMMENDATION 3:

The GAO recommends that the Secretary of Defense direct the Commandant of the Marine Corps to issue guidance to the installations to require the collection and retention of disruption information.

DoD RESPONSE: Concur.

RECOMMENDATION 4:

To provide DOD with more consistent information about the condition of DOD-owned utility systems as DOD continues to develop the SMS module for utility systems, the GAO recommends that the Secretary of Defense direct the Assistant Secretary of Defense for Energy, Installations , and Environment , in coordination with the military services, take actions to govern the consistent use of condition standards for utility systems to be assessed using the SMS utilities module and, if applicable, for other facilities assessed using other SMS modules .

DoD RESPONSE: Partially Concur.

The Department will continue working with the Military Departments to determine if further opportunities exist to establish consistent condition standards within the SMS for utility systems. However , consistent with our comments to GAO previously , the Department adopted the SMS to standardize the inspection criteria/process (i.e., all pavements should use the same inspection criteria), not to establish single condition standards by facility or subcomponent type. Some assets/subcomponents , as pointed out in the report , depend on a greater degree of reliability , necessitating different condition standards for those assets both across Services and within each Service. DoD views the condition standards as trigger points that let Components know when repairs to individual assets are required . The DoD Components need to manage their assets in light of the multitude of assets and missions supported. Having the ability to adjust the condition standards (triggers) allows them to tailor maintenance programs to mission requirements .

Data Tables

Data for Figure 1: Facility Condition Index (FCI) Equation

FCI = [1-($ Repair needs/$ plant replacement value)] x 100

Data Table for Figure 3: Responses to GAO Survey of DOD-Owned Utility Systems: Reported Decade of Original Installation of DOD-Owned Utility Systems

Timeframe	Estimated percent	Lower bound 95% confidence interval	Upper bound 95% confidence interval
1920 or earlier	6.1	3.9	9.1
1921 – 1930	1.6	0.6	3.4
1931 – 1940	6.4	4.1	9.4
1941 – 1950	24.9	20.6	29.3
1951 – 1960	24.4	19.9	28.8
1961 – 1970	8.1	5.4	11.5
1971 – 1980	4.5	2.6	7.3
1981 – 1990	6.1	3.8	9.1
1991 – 2000	2.2	0.9	4.5
2001 – 2010	0.2	0	1.5
2011 – 2015	0.7	0.1	2.6
Don't know	14.8	11.3	18.9

Data Table for Figure 4: Responses to GAO Survey of DOD-Owned Utility Systems: Reported Decade of Most Recent Project to Repair a Significant Part or Parts of the DOD-Owned Utility System

Timeframe	Estimated percent	Lower bound 95% confidence interval	Upper bound 95% confidence interval
1920 or earlier	0.3	0	1.6
1921 – 1930	0	0	0.8
1931 – 1940	0	0	0.8
1941 – 1950	0.8	0.2	2.4
1951 – 1960	0.5	0	1.9
1961 – 1970	0.2	0	1.5
1971 – 1980	3.8	2	6.5
1981 – 1990	7	4.5	10.1
1991 – 2000	8.8	6	12.3
2001 – 2010	16.4	12.7	20.8
2011 – 2015	36.9	31.8	42
Don't know	25.2	20.7	29.7

Data Table for Figure 8: Condition Standards for Determining Repair Needs Used in DOD's Sustainment Management System Module for Buildings (BUILDER), by Military Service

Classification	Army	Navy	Marine Corps	Air Force
High	85	85	80	85
Medium/intermediate	75	71	60	75
Low	50	50	40	65

Related GAO Products

Defense Facility Condition: Revised Guidance Needed to Improve Oversight of Assessments and Ratings. GAO-16-662. Washington, D.C.: June 23, 2016.

Facilities Modernization: DOD Guidance and Processes Reflect Leading Practices for Capital Planning. GAO-15-489. Washington, D.C.: July 27, 2015.

Defense Infrastructure: Improvements in Reporting and Cybersecurity Implementation Needed to Enhance Utility Resilience Planning. GAO-15-749. Washington, D.C.: July 23, 2015.

High Risk Series: An Update. GAO-11-278. Washington, D.C.: February 2011.

Defense Infrastructure: DOD Needs to Periodically Review Support Standards and Costs at Joint Bases and Better Inform Congress of Facility Sustainment Funding Uses. GAO-09-336. Washington, D.C.: March 30, 2009.

Federal Real Property: Government's Fiscal Exposure from Repair and Maintenance Backlogs Is Unclear. GAO-09-10. Washington, D.C.: October 16, 2008.

Defense Infrastructure: Continued Management Attention Is Needed to Support Installation Facilities and Operations. GAO-08-502. Washington, D.C.: April 24, 2008.

Defense Infrastructure: Actions Taken to Improve the Management of Utility Privatization, but Some Concerns Remain. GAO-06-914. Washington, D.C.: September 5, 2006.

Defense Infrastructure: Issues Need to Be Addressed in Managing and Funding Base Operations and Facilities Support. GAO-05-556. Washington, D.C.: June 15, 2005.

Defense Infrastructure: Managing Issues Requiring Attention in Utility Privatization. GAO-05-433. Washington, D.C.: May 12, 2005.

Defense Infrastructure: Changes in Funding Priorities and Strategic Planning Needed to Improve the Condition of Military Facilities. GAO-03-274. Washington, D.C.: February 19, 2003.

GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's website (http://www.gao.gov). Each weekday afternoon, GAO posts on its website newly released reports, testimony, and correspondence. To have GAO e-mail you a list of newly posted products, go to http://www.gao.gov and select "E-mail Updates."

Order by Phone

The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's website, http://www.gao.gov/ordering.htm.

Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537.

Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.

Connect with GAO

Connect with GAO on Facebook, Flickr, Twitter, and YouTube.
Subscribe to our RSS Feeds or E-mail Updates. Listen to our Podcasts.
Visit GAO on the web at www.gao.gov.

To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Website: http://www.gao.gov/fraudnet/fraudnet.htm
E-mail: fraudnet@gao.gov
Automated answering system: (800) 424-5454 or (202) 512-7470

Congressional Relations

Katherine Siggerud, Managing Director, siggerudk@gao.gov, (202) 512-4400, U.S. Government Accountability Office, 441 G Street NW, Room 7125, Washington, DC 20548

Public Affairs

Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800
U.S. Government Accountability Office, 441 G Street NW, Room 7149
Washington, DC 20548

Strategic Planning and External Liaison

James-Christian Blockwood, Managing Director, spel@gao.gov, (202) 512-4707
U.S. Government Accountability Office, 441 G Street NW, Room 7814, Washington, DC 20548