



Office of Audits  
Office of Inspector General  
U.S. General Services Administration

# Audit of the Public Buildings Service's Photovoltaic Installations in the New England and Northeast and Caribbean Regions

Report Number A170056/P/2/R20003  
March 27, 2020

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## ***Executive Summary***

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### **Audit of the Public Buildings Service's Photovoltaic Installations in the New England and Northeast and Caribbean Regions**

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#### **Why We Performed This Audit**

This audit was included in the GSA Office of Inspector General's *Fiscal Year 2017 Audit Plan*. GSA's extensive investment in green buildings was expected to contribute to an overall reduction in the carbon footprint of federal buildings. A major component of GSA's strategy to accomplish this reduction is renewable power generation using photovoltaic (PV) solar arrays.

The objectives of our audit were to determine whether the Public Buildings Service (PBS) in the New England and Northeast and Caribbean Regions: (1) is collecting and reporting accurate power generation numbers from its PV installations to ensure data integrity, (2) is properly maintaining and inspecting its PV installations to ensure effective and continued operations, and (3) took advantage of rebates that were available at the time of its various PV installations in order to minimize installation costs.

#### **What We Found**

PBS has invested extensively in PV installations to serve as a primary means of reducing the carbon footprint of its inventory of federal buildings. To that end, PBS installed 15 PV solar arrays to generate solar power at federal buildings in the New England and Northeast and Caribbean Regions. We tested nine of these installations and found that PBS is not reporting consistent, reliable, and accurate power generation totals. We also found that PBS is not maintaining and inspecting PV installations in accordance with applicable guidance.

#### **What We Recommend**

Based on our findings, we developed several recommendations to improve PBS's management of its PV installations. The recommendations include issuing comprehensive policies and procedures to ensure PV power generation reporting is consistent, reliable, and accurate. We also recommend developing a system to validate that the PV power generation numbers are fully supported and documented and ensuring property management is aware of and enforces the semiannual maintenance and inspection requirements for the PV installations. Detailed recommendations can be found in the ***Conclusion*** section of the report.

In its response to our draft report, PBS agreed with our recommendations. It also provided technical comments in response to our statement in ***Finding 1*** that PBS does not have policies or procedures that detail actions required to collect and report PV power generation numbers.

We considered PBS's comments and made minor adjustments to the report; however, those adjustments did not affect our findings and conclusions.

PBS's response is included in its entirety in ***Appendix C***.

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## Introduction

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We performed an audit of the Public Buildings Service's (PBS's) photovoltaic (PV) installations in GSA's New England Region (Region 1) and Northeast and Caribbean Region (Region 2).<sup>1</sup>

### Purpose

This audit was included in the GSA Office of Inspector General's *Fiscal Year 2017 Audit Plan*. GSA's extensive investment in green buildings was expected to contribute to an overall reduction in the carbon footprint of federal buildings. A major component of GSA's strategy to accomplish this reduction is renewable power generation using PV solar arrays. Accordingly, the initial focus of this audit was to determine whether recent PV installations at federal facilities were functioning as intended and generating the kilowatt hours expected. However, as a result of survey work, we determined that regional controls may be lacking. Therefore, our audit objectives reflect our evaluation of control issues.

### Objectives

The objectives of our audit were to determine whether PBS in Regions 1 and 2: (1) is collecting and reporting accurate power generation numbers from its PV installations to ensure data integrity, (2) is properly maintaining and inspecting its PV installations to ensure effective and continued operations, and (3) took advantage of rebates that were available at the time of its various PV installations in order to minimize installation costs.

See **Appendix A** – Scope and Methodology for additional details.

### Background

As the landlord for the civilian federal government, PBS has extensively invested in green building technologies to reduce the carbon footprint of federal buildings. Among these technologies, PBS relies on PV installations to generate solar power without producing environmental emissions. A PV installation is comprised of one or more solar panels, inverters, and other electrical hardware that together use energy from the sun to generate electricity. A typical PV installation involves the use of an inverter to convert electricity produced by the solar arrays as direct current into usable electricity in the form of alternating current for a building's consumption.

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<sup>1</sup> PBS's New England Region manages government-owned and leased space for federal agencies in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. PBS's Northeast and Caribbean Region manages government-owned and leased space in New York, Northern New Jersey, Puerto Rico, and the U.S. Virgin Islands.

Section 548(a) of the National Energy Conservation Policy Act requires federal agencies to submit an annual report on their activities to meet the Act's energy management requirements to the U.S. Department of Energy (DOE). This report includes the results of each agency's effort to conserve energy and use renewable energy sources.<sup>2</sup> DOE uses the information and data collected from all agencies to develop its *Annual Report to Congress on Federal Government Energy Management*.

DOE developed an Annual Energy Management Data Report spreadsheet template to facilitate agencies' data reporting. GSA's Office of Sustainability Performance is responsible for the completion and submission of the Agency's report using the DOE template. To accomplish this, the Office of Sustainability Performance gathers the data on renewable energy sources that it submits to DOE using its own Google spreadsheet. The spreadsheet displays the renewable energy type (including solar) by building, along with the data source. PBS regions input their respective renewable power generation numbers into this spreadsheet for each fiscal year.

Within each region, PBS's Facilities Management Division oversees renewable energy technologies as part of its energy program.<sup>3</sup> Energy program personnel in PBS's Facilities Management Division are responsible for inputting their respective region's PV power generation data into the aforementioned spreadsheet for each fiscal year.

Additionally, the Facilities Management Division oversees each facility's operations and maintenance. The division is responsible for providing facility-related solutions and services to federal tenants located in government-owned and leased workspaces.

For Fiscal Year 2016, PBS reported power generation data to the Office of Sustainability Performance for eight operating PV installations in Region 1 and seven operating PV installations in Region 2. We selected a judgmental sample of the nine PV installations, which are listed in *Figure 1* on the following page.

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<sup>2</sup> 42 USC 8258(a).

<sup>3</sup> The responsible branches under the Facilities Management Division vary by region. In Region 1, the Energy and Utilities Branch oversees the energy program. In Region 2, the Energy and Sustainability Branch oversees the energy program.

Figure 1 – PBS PV Installations Sampled

Region	Location of PV Installation	City, State
1	Frederick C. Murphy Federal Center <sup>a</sup>	Waltham, MA
1	Thomas P. O'Neill, Jr. Federal Building	Boston, MA
1	James C. Cleveland Federal Building and Warren B. Rudman U.S. Courthouse	Concord, NH
1	Burlington Federal Building, U.S. Post Office and Courthouse	Burlington, VT
1	Margaret Chase Smith Federal Building and Courthouse	Bangor, ME
2	Conrad B. Duberstein U.S. Bankruptcy Courthouse	Brooklyn, NY
2	Jacob K. Javits Federal Building	New York, NY
2	Joseph P. Addabbo Federal Building <sup>b</sup>	Queens, NY
2	Federico Degetau Federal Building and Clemente Ruiz Nazario U.S. Courthouse Parking Garage	Hato Rey, PR
<p><sup>a</sup> During our audit, PBS officials informed us that PBS shut down the Frederick C. Murphy Federal Center PV installation on July 13, 2017, due to deterioration. Therefore, for the purposes of <i>Finding 1</i>, we did not consider this as an operational installation. However, we did include it in our evaluation of how PBS maintains and inspects PV installations, which is discussed under <i>Finding 2</i>.</p> <p><sup>b</sup> This is a delegated building. This means that the Social Security Administration, the sole tenant agency, has been granted full authority and responsibility to operate and maintain the building. While PBS is not responsible for reporting power generation and maintenance for this installation, we still included it in our audit sample as the installation is on a GSA-owned building.</p>		

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## Results

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PBS has invested extensively in PV installations to serve as a primary means of reducing the carbon footprint of its inventory of federal buildings. To that end, PBS installed 15 PV arrays to generate solar power at federal buildings in Regions 1 and 2. We tested nine of these installations and found that PBS is reporting inconsistent, unreliable, and inaccurate power generation totals. We also found that PBS is not maintaining and inspecting PV installations in accordance with applicable guidance.

### **Finding 1 – PBS Regions 1 and 2 are using inconsistent, unreliable, and unsupported data to report power generation totals for their PV installations.**

We found that PBS Regions 1 and 2 reported inaccurate power generation data for five of the eight PV installations we examined—two installations in Region 1 and three installations in Region 2.<sup>4</sup> The regions used inconsistent, unreliable, and unsupported data sources as the basis for reporting the power generation data for the PV installations. This occurred because PBS does not have effective policies and procedures in place to ensure the consistency and accuracy of the power generation data reporting for PV installations.

#### **Region 1**

PBS Region 1 has been reporting unreliable and unsupported power generation data for two PV installations: the Thomas P. O’Neill, Jr. Federal Building (O’Neill) and the James C. Cleveland Federal Building (Cleveland). Based on available data, PBS appears to have overreported the power generation of the PV installation at the O’Neill building and underreported the power generation at the Cleveland building.

The details regarding the power generation reporting for the O’Neill and Cleveland PV installations are discussed below:

- *Thomas P. O’Neill, Jr. Federal Building* – PBS reported that the O’Neill PV installation generated a total of 317,167 kilowatt-hours (kWh) of electricity between 2011 and 2017. However, according to a service report provided by the PV maintenance contractor to PBS building personnel, the O’Neill PV installation only generated 216,850 kWh over this same time period. As shown in *Figure 2* on the following page, this resulted in a difference of 100,317 kWh.

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<sup>4</sup> During our audit, PBS officials informed us that PBS shut down the Frederick C. Murphy Federal Center PV installation on July 13, 2017, due to deterioration. Therefore, for the purposes of *Finding 1*, we did not consider it as an operational installation.



**Figure 2 – O’Neill Reported Power versus Maintenance Contractor Readings**

Fiscal Year	kWh Reported by PBS	kWh Recorded by Maintenance Contractor	Difference
2011	18,760	24,290	-5,530
2012	34,954	34,389	565
2013	32,883	33,356	-473
2014	74,376	33,606	40,770
2015	58,268	31,902	26,366
2016	35,012	33,436	1,576
2017	<u>62,914</u>	<u>25,871</u>	<u>37,043</u>
<b>Totals</b>	<u>317,167</u>	<u>216,850</u>	<u>100,317</u>

The reason for the discrepancy between PBS’s reported power generation figures for the PV solar array and those of the contractor cannot be determined because the source of the reported data is unclear. The PV maintenance contractor extracted its figures directly from the system monitor that provides performance data for the O’Neill PV installation.<sup>5</sup> We verified the reliability of this data by comparing the inverter reading we observed on April 17, 2018, to readings reported by the PV maintenance contractor on September 26, 2017. Based on this comparison, we determined that the contractor’s data is reliable.

However, the source of PBS’s reported data is unclear. PBS officials from the Region 1 Energy and Utilities Branch told us that they retrieved the figures reported for 2016 and 2017 from PBS’s regional advanced metering database. Advanced meters (also called "smart meters") are devices that collect and transmit energy and water data in near real-time to a database. The Energy Policy Act of 2005 mandated installation of "advanced meters for electricity only" in all government buildings by 2012. Advanced metering systems are designed to monitor and store energy consumption data for specific building systems (such as a PV installation) or the building in its entirety. Typically these systems will collect, analyze, and provide reports for the collected data. These systems can also be integrated with building automation systems.

However, as shown in *Figure 3* on the following page, the power generation data contained in the advanced metering database differed significantly from the data reported by PBS.

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<sup>5</sup> The statement of work for the O’Neill PV installation required PV system monitoring. This allows PV performance data to be “displayed graphically in a user-friendly manner.” The PV maintenance contractor accessed this information remotely and included a screenshot in its service report.

**Figure 3 – O’Neill Reported Power versus Advanced Meter Data**

Fiscal Year	kWh Reported by PBS	kWh Recorded by Advanced Metering Database	Difference (in kWh)
2015	58,268	14,209	44,059
2016	35,012	19,398	15,614
2017	62,914	57,873	5,041

As shown in *Figure 3*, the reported data does not correspond to the data from the advanced metering database. Given the discrepancies, the source of PBS’s data remains in question and the reported data is unsupported and unreliable.

- *James C. Cleveland Federal Building* – PBS reported that the Cleveland PV installation generated a total of 405,381 kWh of power between 2011 and 2017. However, a reading from the Cleveland PV installation’s five inverters for the same period indicates that the installation generated about 448,500 kWh. This data implies that PBS underreported this installation’s output by 43,119 kWh.

However, missing historical data may have resulted in inconsistent data collection and may have affected the reliability of the reported data. The PBS energy specialist, in response to a 2017 data call from GSA’s Office of Sustainability Performance to report Cleveland’s annual PV power generation, could not use the inverter readings in October 2017 because the prior inverter readings had not been recorded. As a result, he could not subtract the “last” reading from his current reading to derive the past year’s kWh generated.

The energy specialist also compared the October 2017 inverter readings of 448,500 kWh to the power generation figures previously reported by PBS through 2016 of 341,680 kWh. This resulted in a difference of 106,820 kWh. The energy specialist concluded that this was such a large disparity that he “didn’t trust any of the [reported] numbers.”

Accordingly, he used the amount recorded in the advanced metering database, which he believed was “likely the more accurate number.” During our virtual site visit in April 2018, we observed that the inverters displayed a reading of 474,800 kWh, which aligns reasonably with the 448,500 kWh observed by the energy specialist in October 2017.

**Region 2**

Rather than reporting actual, verified power generation data, PBS Region 2 has been reporting estimates of power generation for three PV installations: the Conrad B. Duberstein U.S. Bankruptcy Courthouse, the Jacob K. Javits Federal Building, and the Federico Degetau Federal Building and Clemente Ruiz Nazario U.S. Courthouse Parking Garage.

However, we found that these estimates were unsupported and unreliable. The power generation data for the three PV installations were included on a regional summary spreadsheet, which purportedly showed the annual kWh of solar power generated for each of the regional PV installations. According to PBS officials, the data on this spreadsheet is what PBS Region 2 reported as the power generation numbers for each PV installation to the Office of Sustainability Performance.

However, as shown in *Figure 4*, the power generation figures reported on the Office of Sustainability Performance’s spreadsheet for the three installations were different than those included on the Regional Summary Spreadsheet.

**Figure 4 – Comparison of Power Generation Numbers in Region 2**

Fiscal Year	Conrad B. Duberstein U.S. Bankruptcy Courthouse		Jacob K. Javits Federal Building		Federico Degetau Federal Building and Clemente Ruiz Nazario U.S. Courthouse Parking Garage	
	Regional Summary Spreadsheet (kWh)	Office of Sustainability Performance Spreadsheet (kWh)	Regional Summary Spreadsheet (kWh)	Office of Sustainability Performance Spreadsheet (kWh)	Regional Summary Spreadsheet (kWh)	Office of Sustainability Performance Spreadsheet (kWh)
2009			[installed] 5,100			
2010			10,200			
2011			10,200			
2012	[installed] 3,500		10,200		[installed] 16,000	
2013	7,088		10,200		196,000	
2014	7,088		10,200		196,000	
2015	7,088	12,322	10,200	10,200	196,000	200,000
2016	7,088	12,322	10,200	5,100	196,000	200,000
2017 <sup>6</sup>		10,407		10,200		176,400

A PBS energy conservation engineer in the Region 2 Energy and Sustainability Branch initially told us that the power generation totals listed on the regional summary spreadsheet were derived from “field surveys” and represented “total annualized averages.” However, as shown in *Figure 4*, PBS Region 2 reported the same totals each year; a clear indication that actual readings were not collected. When we asked the PBS energy conservation engineer to explain the static readings, he told us that these amounts “were estimated based on the previous Regional Energy Engineer’s calculations.”

<sup>6</sup> PBS did not have complete Fiscal Year 2017 data when we initiated the audit.

Additionally, PBS officials in the Region 2 Energy and Sustainability Branch could not provide evidence to support the power generation numbers they reported on the Office of Sustainability Performance's spreadsheet. Region 2's entries on the Office of Sustainability Performance spreadsheet indicated that the source of these power generation numbers was manual readings validated with photos. However, PBS could not provide these photos.

### **Lack of Policies and Procedures Impedes Accurate Reporting of PV Power Generation**

We found that PBS does not have effective policies and procedures to ensure the accuracy and reliability of the PV power generation data being reported. PBS has processes in place for the collection and reporting of PV power generation data to the Office of Sustainability Performance. However, these processes largely consist of instructions for completing and submitting a spreadsheet and do not include steps for verifying the accuracy of the data. Therefore, PBS does not have a formal policy detailing actions required to collect and report accurate power generation numbers. This led to the use of inconsistent approaches for data collection both between and within Regions 1 and 2, which compromised data integrity.

Additionally, PBS has not established clearly defined roles or responsibilities for data collection and reporting. For example, in response to our question about the process for recording and reporting PV power generation data, one building manager told us that he "does not keep records of meter readings for the solar array's output. It is not in the O&M [operations and maintenance] contract. Energy/Environment branch may have more information."

PBS also failed to establish an effective review process to ensure the accuracy and reliability of PV power generation data reporting. For example, as previously noted, although Region 2 reported that the power generation numbers that it input into the Office of Sustainability spreadsheet were "photo validated," PBS could not provide any of these photos.

During the course of our audit, PBS Region 2 management issued guidance in an attempt to address the data inaccuracies we identified. On January 17, 2018, the Director of the Facilities Management Division in Region 2 issued a memorandum to regional directors of the service centers, instructing them to collect actual monthly PV power generation readings. However, when we followed up several months later with PBS building officials for two installations, they told us that they had not seen the memorandum and could not provide actual monthly PV readings.

While limited in its effectiveness, PBS Region 2 management's effort to provide guidance on data collection and reporting was a positive step. PBS should take more comprehensive measures to ensure it accurately reports PV power generation data for use in, among other things, making informed decisions about the performance of its PV installations.

## **Finding 2 – PBS is not maintaining and inspecting PV installations in accordance with guidance.**

PV installations need regular maintenance and inspections to maximize their performance and life span. However, we found that PBS is not maintaining and inspecting eight PV installations in accordance with its *Preventive Maintenance Guide* and in one case, PBS did not provide sufficient oversight of a maintenance contract for a PV installation.

### **Lack of Adherence to PBS's *Preventive Maintenance Guide***

PBS's *Preventive Maintenance Guide* requires semiannual maintenance for its PV installations. Additionally, the guide requires users to maintain proper documentation stating "It is paramount to maintain equipment history records to facilitate decision making throughout the life of the equipment." Despite this guidance, we found that: (1) installations lacked maintenance and inspection records, (2) installations were not maintained and inspected semiannually, and (3) maintenance reporting was inadequate.

**Lack of maintenance and inspection records.** PBS could not provide complete maintenance or inspection records for the following two installations:

- *Conrad B. Duberstein U.S. Bankruptcy Courthouse* – PBS stated that the building's O&M contractor performed some of the maintenance on the PV installation. However, PBS could not provide documentation to confirm that any maintenance work was actually performed.
- *Frederick C. Murphy Federal Center* – PBS could only provide limited maintenance records. PBS shut down this \$3 million PV installation in July 2017 due to deterioration. When we requested documentation from PBS regarding the installation's maintenance history, PBS could only provide maintenance records from 2011 and 2012. Although the 2011 maintenance record reported that the PV installation was operating at a normal acceptable range despite minimum required repair, the 2012 maintenance record stated that much of the installation was underwater and "the physical degradation is severe ...."

None of the PBS personnel responsible for overseeing the maintenance of the installation during this timeframe were available to explain the reason for the significant change between the 2011 and 2012 maintenance records. Without historical information on the causes of the installation's deterioration, or any prior maintenance records, we cannot determine whether improper maintenance or neglect contributed to the installation's deterioration.

PBS informed us that it planned to replace the damaged sections of the PV installation to reactivate it. However, PBS should investigate and address the root cause of the

installation’s deterioration prior to reactivation to avoid a recurrence and potential waste of taxpayer dollars.

**Lack of semiannual maintenance.** The *Preventive Maintenance Guide* requires that PV installations undergo semiannual maintenance to maximize their useful life. However, we found that PBS only provided annual maintenance for four of the eight sampled PV installations (O’Neill, Burlington, Margaret Chase Smith, and Federico Degetau federal buildings).

**Inadequate maintenance reporting.** The *Preventive Maintenance Guide* lists nine special instructions for maintenance of PV installations (see **Appendix B**). However, we could not determine whether the required maintenance was performed for the PV installations at the Burlington and Cleveland federal buildings due to inadequate maintenance records.

PBS maintenance staff and contractors did not report the specific maintenance and inspection tasks performed for these PV installations. Instead, the maintenance records were included as part of larger property maintenance check sheets to show that PBS staff or contractors completed an inspection of the installation. Maintenance staff and contractors simply placed either an “x” or their initials and date to indicate that PV installation maintenance occurred as illustrated below in *Figures 5 and 6*, respectively.

**Figure 5 – Burlington Federal Building Property Maintenance Check Sheet Excerpt**

GS-01P-17-BW-D-0006															Updated: 6/7/2017		
			New														
Guide #	PBS Guide	Equip Description	Qty	Freq.	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Notes
E-PL		Panels	43	A		x											

**Figure 6 – James C. Cleveland Federal Building Property Maintenance Check Sheet Excerpt**

Quantity, frequency, assignments																		
PM GUIDE	NEW GUIDE										in house!	MAY						
X-26	PLMB-HWS-02-01Y	Solor Electrical	PV Modules (Manufacture's PM only)	300	2									5/22	5/23	PLS	Jin CP	Tightrocks

Due to the lack of detail provided on the check sheets, we were unable to determine if the maintenance performed complied with the instructions outlined in the *Preventive Maintenance Guide*.

**Lack of Contract Oversight**

PBS did not provide contract oversight for the inspection of its PV installation at the Jacob K. Javits Federal Building. PBS provided us with an O&M subcontractor proposal for three PV installation inspections for the facility. These proposed inspections were incorporated into the O&M contract for the building for the period of November 1, 2017, to October 31, 2018. Under the contract, the subcontractor was required to perform three inspections during this timeframe. PBS provided us with the planned inspection dates and resulting reports from the

inspections. However, we found that the subcontractor performed only two of the three inspections during the agreed-upon time period. Consequently, PBS paid \$1,608 to the O&M contractor for an inspection by a subcontractor that did not occur.

In summary, lack of maintenance and inspections may impair the ability of PBS Regions 1 and 2 to maximize the performance and life span of their PV installations. We found that PBS is not maintaining and inspecting its PV installations in Regions 1 and 2 in accordance with guidance. This lapse in oversight puts GSA's investments in these PV installations at risk. Accordingly, PBS needs to ensure PBS maintenance staff and contractors are aware of and adhere to the maintenance and inspection requirements as outlined in the *Preventive Maintenance Guide*. PBS also needs to strengthen its oversight of the contract administration for the maintenance and inspection of the PV installations.

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## Conclusion

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PBS has invested extensively in PV installations to serve as a primary means of reducing the carbon footprint of its inventory of federal buildings. To that end, PBS installed 15 PV solar arrays to generate solar power at federal buildings in Regions 1 and 2. We tested nine of these installations and found that PBS is reporting inconsistent, unreliable, and inaccurate power generation totals. We also found that PBS is not maintaining and inspecting PV installations in accordance with applicable guidance.

To correct its reporting deficiencies, PBS should implement comprehensive, nationwide policies and procedures to ensure that it collects and reports accurate power generation data for its PV installations. PBS Regions 1 and 2 should correct their methods for collecting and reporting PV power generation readings.

Additionally, PBS Regions 1 and 2 should improve their oversight of PV installation maintenance and inspections to ensure compliance with PBS's *Preventative Maintenance Guide*.

## Recommendations

We recommend that:

1. The PBS Commissioner develop and implement policies and procedures to ensure that PV power generation data is consistent, reliable, and supported.
2. The PBS Regional Commissioner for the New England Region direct regional management to:
  - a. Correct the deficiencies of the advanced metering system for reporting PV power generation numbers to GSA's Office of Sustainability Performance.
  - b. Develop a directive for building personnel to track and collect PV readings directly from the equipment and for officials in the Energy and Utilities Branch to verify those readings with the corrected advanced metering system.
  - c. Determine the cause of deterioration for the Frederick C. Murphy Federal Center PV installation and implement corrective actions prior to replacing the damaged panels.
3. The PBS Regional Commissioner for the Northeast and Caribbean Region direct regional management to:
  - a. Implement and reinforce the instructions for monthly tracking of PV power generation readings set forth in its January 17, 2018, memorandum.
  - b. Recover the \$1,608 payment for a PV installation maintenance inspection that did not occur.



4. The PBS Regional Commissioners for the New England and Northeast and Caribbean Regions direct regional management to:
  - a. Develop a system to validate that the PV power generation numbers are fully supported and documented directly from the equipment before annual reporting to GSA's Office of Sustainability Performance.
  - b. Ensure property management is aware of and enforces the semiannual maintenance and inspection requirements for the PV installations.
  - c. Implement controls to ensure that data collection and reporting processes result in accurate and reliable sustainability reports for use by management and other key stakeholders, including DOE and Congress.

### GSA Comments

In its response to our draft report, PBS agreed with our recommendations. It also provided technical comments concerning our statement in *Finding 1* that PBS does not have policies and procedures that detail actions required to collect and report PV power generation numbers.

PBS stated that it has processes for collecting the PV power generation numbers periodically and annually, but no formal policy. These processes largely consist of instructions for completing and submitting a spreadsheet to the Office of Sustainability Performance. However, we found that PBS does not verify the accuracy of the data collection numbers recorded on the spreadsheet. We considered PBS's comments and made minor adjustments to the report; however, those adjustments did not affect our findings and conclusions.

PBS's response is included in its entirety in **Appendix C**.

### Audit Team

This audit was managed out of the Northeast and Caribbean Region Audit Office and conducted by the individuals listed below:

Arthur Maisano	Acting Regional Inspector General for Auditing
Gregory Ventola	Audit Manager
Marcia Raghubar	Auditor-In-Charge

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## Appendix A – Scope and Methodology

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Our audit scope consisted of a judgmental sample of 9 out of 15 PV installations in PBS Regions 1 and 2 which PBS reported as operating during Fiscal Year 2016. Five of the PV installations were located in Region 1 and four of the PV installations were located in Region 2.

To accomplish our objectives, we:

- Reviewed relevant sustainability mandates, including the Energy Independence and Security Act, Executive Order 13693 (Planning for Federal Sustainability in the Next Decade), and the National Energy Conservation Policy Act (42 USC 8258[a]);
- Reviewed DOE’s website for relevant annual energy reporting requirements;
- Obtained a list of PBS’s operating PV installations for Fiscal Year 2016;
- Reviewed PBS’s performance measurements as specified in its strategic blueprint for Fiscal Year 2017 specific to sustainability and energy;
- Reviewed PBS’s *Preventive Maintenance Guide* effective October 2012;
- Reviewed available contract files, warranty information, and related documents for the sampled PV installations;
- Obtained and reviewed available maintenance and inspection records to ascertain compliance with PBS’s *Preventive Maintenance Guide*;
- Conducted site visits to three PV installations;
- Conducted virtual site visits via iPhone FaceTime Meeting to five PV installations;
- Interviewed building managers, property managers, and building personnel for each building housing a PV installation in our sample;
- Examined the O&M contract files to determine if maintenance and inspection of PV installations were included in O&M contract scopes;
- Communicated with energy program personnel within PBS’s Facilities Management Division in Regions 1 and 2;
- Communicated with officials within GSA’s Office of Sustainability Performance;
- Analyzed GSA’s Office of Sustainability Performance’s Renewable Energy System Tracker spreadsheet for Fiscal Years 2015, 2016, 2017, and 2018;
- Analyzed PV generation numbers collected from multiple sources;
- Analyzed rebates available during the time of each PV’s installation;
- Reviewed the Government Accountability Office’s *Standards for Internal Controls in the Federal Government* (GAO-14-704G); and
- Reviewed prior GSA Office of Inspector General audit reports on energy savings.

Using the audit procedures listed above, we identified the deficiencies described in *Finding 1* and *Finding 2* of this report; however, we found no reportable issues related to our objective to determine whether PBS Regions 1 and 2 took advantage of rebates that were available at the time of its various PV installations in order to minimize installation costs.

We conducted the audit between February 2017 and January 2019 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.

### **Internal Controls**

Our assessment of internal controls was limited to those necessary to address the objectives of the audit.

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## Appendix B – Excerpt from PBS’s Preventive Maintenance Guide

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General Services Administration  
Effective Date: October, 2012

Preventive Maintenance Guide

ELEC-PVS-01-06M

Frequency: Semi-annually

### Photovoltaic Systems

#### Application

This standard applies to maintenance testing of photovoltaic systems.

#### Special Instructions:

1. Remove any debris. Clean PV panels per manufacturer's recommendations. At a minimum, rinse with water to remove accumulated dust, etc.
2. Perform visual inspection of combiner boxes and control panels. Clean combiner boxes and control panels using compressed air and vacuum. Verify wiring is neat and orderly, Panduit and control covers are in place.
3. Test PV arrays voltage/current at the combiner boxes
4. Inspect components for moisture, verify proper operation of any panel temperature controls.
5. Grease actuator gears and top off hydraulic fluid on tracker components (if applicable).
6. Test of SCADA and meteorological connections and signal strength.
7. Install any software, firmware updates.
8. Inspect cables for binding or wear (tracking systems).
9. Check and calibrate sensors, verify operation of wind sensors (tracking panels should "flatten" during high wind conditions).

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## Appendix C – GSA Comments


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Public Buildings Service

March 17, 2020

MEMORANDUM FOR: ARTHUR MAISANO  
ACTING REGIONAL INSPECTOR GENERAL FOR  
AUDITING  
NORTHEAST AND CARIBBEAN REGION AUDIT OFFICE  
(JA-2)

FROM: DANIEL W. MATHEWS   
COMMISSIONER  
PUBLIC BUILDINGS SERVICE (P)

SUBJECT: Response to the Office of Inspector General's (OIG) Draft  
Audit Report, *Audit of the Public Buildings Service's  
Photovoltaic Installations in the New England and Northeast  
and Caribbean Regions (A170056)*

The Public Buildings Service (PBS) appreciates the opportunity to review and comment on the subject draft audit report.

PBS agrees with the OIG's recommendations. Technical comments are attached for your office's consideration as you develop the final report.

If you have any questions, please contact Andrew Heller, PBS Assistant Commissioner, Office of Facilities Management, at (202) 501-0772.

Attachment: Technical Comments

**Attachment**

**U.S. General Services Administration  
Technical Comments on OIG Draft Report  
*Audit of the Public Buildings Service's Photovoltaic Installations in the New  
England and Northeast and Caribbean Regions (A170056)***

Page 8 - 1st paragraph under "Lack of Policies and Procedures Impedes Accurate Reporting of PV Power Generation," 2nd sentence now reads: "First, PBS does not have policies or procedures that detail actions required to collect and report power generation numbers."

Replace with: "PBS has processes in place for collecting the PV power generation numbers periodically and annually, which includes identifying large variances in production year over year for the larger systems, as well as individual reviews with each region to ensure all systems are being reported on. PBS does not have a formal policy detailing actions required to collect and report power generation numbers."

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## ***Appendix D – Report Distribution***

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GSA Administrator (A)

GSA Deputy Administrator (AD)

Commissioner (P)

Acting Deputy Commissioner (P)

Acting Chief of Staff (WPB)

Deputy Chief of Staff (PB)

Assistant Commissioner for Facilities Management and Services Program (PM)

Regional Administrator (2A)

Regional Commissioner (2P)

Regional Administrator (1A)

Regional Commissioner (1P)

Deputy Regional Commissioner for PBS (2P)

Supervisory Program Officer (2PMT)

Program Management Officer (2PM)

Program Management Officer (2PQX)

Facilities Management and Services Program Manager (1PM)

Project Manager (1PCM)

Chief Administrative Services Officer (H)

Audit Management Division (H1EB)

Assistant Inspector General for Auditing (JA)

Director, Audit Planning, Policy, and Operations Staff (JAO)