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AUDIT REPORT

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NASA'S MANAGEMENT OF ENERGY SAVINGS CONTRACTS

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration

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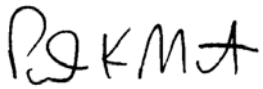


Paul K. Martin
Inspector General

Acronyms

COR	Contracting Officer's Representative
FEMP	Federal Energy Management Program
GAO	Government Accountability Office
JPL	Jet Propulsion Laboratory
M&V	Measurement and Verification
NPR	NASA Procedural Requirements
OIG	Office of Inspector General

OVERVIEW

NASA'S MANAGEMENT OF ENERGY SAVINGS CONTRACTS

The Issue

In response to Federal mandates to reduce energy consumption, several NASA Centers have entered into energy savings performance contracts (energy contracts) to fund conservation measures. An energy contract is a partnership between a Federal agency and a private company (energy company) that allows the agency to undertake conservation measures without having to fund the associated upfront capital costs.[1] The company guarantees the conservation measures will generate cost savings sufficient to pay for the capital improvements (including finance costs) over the term of the contract, and the agency pays the company out of proceeds generated by those cost savings. As such, energy contracts are designed to have no impact on an agency's budget – positive or negative – although any cost savings generated from the conservation measures after the contract ends accrue to the agency. The guarantee of a specified level of cost savings and performance is at the heart of these energy contracts and, consequently, effective management and oversight of the contracts is crucial to ensure the mechanism works as designed.

NASA's Johnson Space Center (Johnson) awarded the Agency's first energy contract to Honeywell International, Inc., (Honeywell) in 1999. The $42.7 million fixed-price contract was designed to save approximately $2 million a year in energy and operational costs for 22 years.[2] Subsequently, NASA awarded six additional contracts at five other Centers with total guaranteed savings of almost $93 million and performance periods of 10 or more years depending on the Center. NASA has committed to awarding another $19 million of energy contracts by December 2013.[3] NASA is responsible for ensuring that energy companies deliver on the savings guarantees contained in these contracts and for adjusting the contracts if they fail to do so.

In this audit, we evaluated whether NASA effectively managed, monitored, and controlled energy contracts to ensure that payments do not exceed the savings guaranteed in the contracts.

[1] 1986 Amendments to the National Energy Conservations Policy Act of 1978.

[2] Under the contract, performance payments are scheduled as follows: 10 annual payments of $2.1 million, 11 annual payments of $1.8 million, and a final payment of $1.3 million.

[3] Presidential Memorandum, "Implementation of Energy Savings Projects and Performance-Based Contracting for Energy Savings," December 2, 2011, requires the Federal Government to enter into a minimum of $2 billion of energy contracts for energy efficiency within 24 months.

Although NASA has awarded seven energy contracts, two of these contracts have ended (Goddard Space Flight Center and Glenn Research Center) and two others are early in their performance periods (Jet Propulsion Laboratory and Wallops Flight Facility). Accordingly, we focused our review on contracts at Johnson and Ames Research Center (Ames) in an effort to provide "lessons learned" for contracts underway or planned at other Centers. Details of the audit's scope and methodology are in Appendix A.

Results

We found that Johnson mismanaged its $42.7 million energy contract. Specifically, Johnson officials did not require Honeywell to submit annual savings verification reports and accepted a flawed report for the first year, did not consider the effect of renovations to or demolition of facilities on the guaranteed savings rate, and added work to the contract without ensuring that energy savings would cover the additional costs. Based on our interviews and document review, it was apparent that Johnson contracting officials did not effectively administer the energy contract. Moreover, neither Johnson nor NASA had developed sufficient guidance or an effective training program regarding administration of energy contracts. As a result, Johnson may have overpaid Honeywell because it could not verify that the conservation measures installed under the contract resulted in the guaranteed $2 million in annual energy savings.[4]

To avoid similar problems at other Centers, the Agency should improve its guidance and training. For example, although Ames appears to be effectively managing its energy contracts, it has not yet faced the situation of needing to adjust the contracts to account for facility renovation or demolition. In addition, because the energy contracts at the Jet Propulsion Laboratory and Wallops Flight Facility are in their first year of performance, issuance of improved guidance and training could help managers there avoid future problems.

Poor Verification Reporting Leads to Mismanagement of Energy Contracts at Johnson. Johnson did not require annual savings verification reports and the sole verification report submitted was flawed. After receiving the initial verification report in 2001 following installation of the conservation measures, Johnson officials did not require Honeywell to submit annual reports verifying that the measures continued to generate the guaranteed savings. Nevertheless, Johnson officials accepted Honeywell's claim that the approximately $2 million of guaranteed energy savings had been achieved each year. In addition, we found that Honeywell's initial report contained mathematical errors and unsupported data that resulted in an overstatement of energy savings. Since 2000, Johnson has paid Honeywell more than $24 million for guaranteed energy savings and is scheduled to pay the company an additional $18.7 million over the next 10 years.

[4] Due to a flawed first year verification report and the lack of subsequent reports, we were unable to quantify the actual amount of energy savings Johnson is receiving from the installed conservation measures.

In the absence of reliable and regular verification reports, Johnson managers cannot ensure that the conservation measures Honeywell installed are performing as promised or that the Center is not overpaying the energy company.

Johnson Did Not Adjust the Contract for Changed Circumstances that Affected Energy Savings Generated by Conservation Measures. Since 2008, Johnson has renovated three buildings and demolished a fourth, all of which contained conservation equipment installed by Honeywell.[5] The renovations included the complete removal of the interior finishes and systems as well as the exterior windows and walls. Accordingly, the conservation measures Honeywell installed in these buildings are no longer providing energy savings. However, Johnson has not modified the contract to reflect this fact.

The Johnson contracting officer and contracting officer's representative both informed us that they were unaware of any guidance on adjusting the contract for the renovations and demolition and did not seek assistance at the Center or NASA Headquarters to address this issue.[6] We confirmed that NASA's current energy savings performance contracting guidance does not address adjusting energy contracts to reflect building renovations and demolitions. In addition, NASA's facility project guidance does not address the issue of how to consider the impact on installed guaranteed energy saving measures when calculating a building's renovation or demolition costs.[7]

Johnson Failed to Incorporate Cost Savings Measures to the Contract Modifications for Additional Work. Work performed under an energy contract must be funded by the energy savings it generates. Contrary to this requirement, between 1999 and 2008, Johnson negotiated 26 standalone modifications worth $2.9 million to Honeywell's energy contract without incorporating required cost savings or verification methods designed to ensure that Johnson would not pay more for the work than the energy savings generated. In 2008, the Johnson contracting officer at the time recognized that these modifications were inappropriate and awarded Honeywell a separate five-year indefinite-delivery/indefinite-quantity contract, currently valued at $12.5 million. However, we found that NASA lacked guidance on this issue.

Other Matters of Interest. During our review, we found that Johnson overstated the value of its energy contract with Honeywell by more than $730,000. We also found that by not taking into consideration the possible discrepancy regarding the guaranteed savings rate discussed earlier, Johnson may owe Honeywell more than $331,000 as a result of inaccurate monthly invoicing.

[5] From 2008 to 2012, Johnson renovated Building 2 North, Building 12, and Building 29, and demolished Building T-585, the Space Operations Modular Complex. Installed energy measures in the buildings included variable speed drives, energy efficient lighting, and occupancy sensors.

[6] Contracting officer's representative was formerly titled contracting officer's technical representative.

[7] NASA Procedural Requirements (NPR) 8570.1, "Energy Efficiency and Water Conservation w/Change 2 (04/04/08) Revalidated," March 15, 2001, and NPR 8820.2F "Facility Project Requirements," January 28, 2008.

Conclusion. The guarantee of a specified level of cost savings is at the heart of an energy contract. Johnson officials failed to ensure that the conservation modifications made to its facilities justify the approximately $2 million annual payment made to Honeywell since 2001. In our judgment, without additional measures to improve management and oversight of these contracts, it will be difficult for NASA Centers to ensure that payments do not exceed guaranteed energy savings.

Management Action

NASA officials we spoke with acknowledged that the Agency's energy savings policy is out of date and officials were in the process of updating the policy during our audit. We reviewed a draft of the revised policy and suggested additional changes. In addition, NASA officials said they plan to prepare a handbook that will contain guidance specific to energy contracts.

In order to reduce the risk of overpayments on energy contracts and implement sound management practices, we recommended the Agency:

- ensure that guaranteed energy savings are being achieved at Johnson and if not, determine whether the Honeywell contract needs to be modified by revising expected savings and payments, partially terminating the contract, or fully terminating the contract;

- finalize the new policy and handbook and ensure that both provide specific guidance on management of energy contracts;

- revise NPR 8820.2F, "Facility Project Requirements," to require that estimates for renovation or demolition of facilities include the loss of guaranteed savings from conservation measures installed pursuant to energy contracts; and

- ensure that procurement and technical staff who are responsible for awarding and administering energy contracts are adequately trained.

In response to a draft of this report, NASA disagreed with our first recommendation, stating that Johnson's accounting practices were consistent with Department of Energy standards and that implementing changes to the contract would be almost impossible and certainly impractical. We disagree. As stated in our report, the Energy Act and Code of Federal Regulations require annual verification of savings and this requirement is essential to ensuring NASA receives the promised return. Consequently, the Agency's pledge to "continue to review the contract to determine whether modifications are necessary to ensure that there are no conflicting contract requirements" was not wholly responsive to the recommendation's intent. Therefore, this recommendation remains unresolved and we will continue to monitor NASA's efforts to ensure that guaranteed energy savings are being achieved at Johnson.

The Agency concurred with our other recommendations, agreeing to finalize the new policy and handbook, provide guidance on the impact of renovations and demolitions of facilities to energy savings, and ensure that energy contract team members obtain adequate training and is in the process of implementing corrective actions. We consider management's comments to those recommendations to be responsive. Accordingly, we are resolving the recommendations and will close them upon verification they have been completed. Management's response is reprinted in Appendix C.

CONTENTS

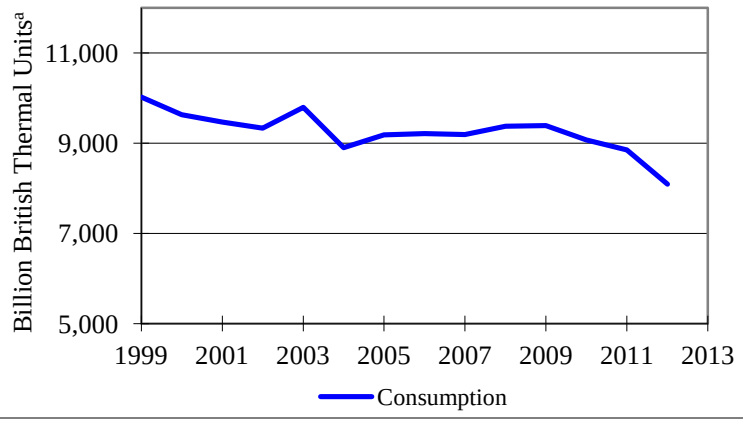
INTRODUCTION

Background

As early as the mid-1980s, Congress recognized that Federal agencies operating under tight budgets had difficulty funding improvements to their facilities and operations aimed at reducing energy consumption. Consequently, in 1986, Congress amended the National Energy Conservation Policy Act of 1978 to authorize agencies to enter into contracts with private business to finance energy conservation measures.[8] These contracts are commonly referred to as energy savings performance contracts (energy contracts).

The Energy Policy Act of 1992 and several subsequent executive orders require Federal agencies to reduce the consumption of energy in Federal facilities. Most notably, a January 2007 executive order requires agencies to improve energy efficiency through reduction of energy use by (1) 3 percent annually through the end of fiscal year 2015, or (2) 30 percent by the end of fiscal year 2015, relative to the agency's energy use in fiscal year 2003.[9]

Figure 1. NASA's Energy Consumption
Fiscal Years 1999 - 2012



Source: NASA Energy Manager.

[a] British Thermal Unit is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

In 1999, the Johnson Space Center (Johnson) was the first NASA Center to enter into an energy contract with a private company. Since then, NASA Centers have awarded six additional energy contracts, and the Agency is on track to meet the requirements of the 2007 executive order (see Figure 1).

Energy Savings Performance Contracts. An energy contract is a partnership between a Federal agency and an energy service company (energy company) that allows the agency to undertake energy conservation measures without having to fund the associated upfront

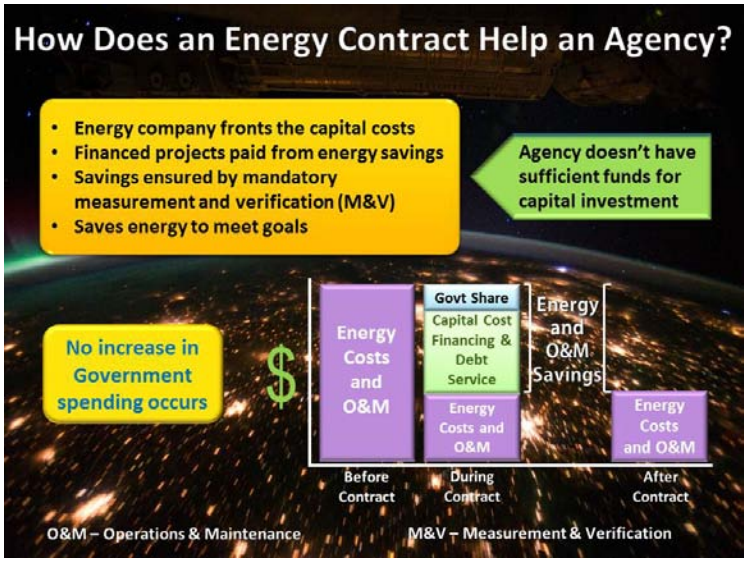
[8] Public Law 95–619, 92 Stat. 3206, 42 U.S. Code, ch. 91.

[9] Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," January 24, 2007.

capital costs. The contracts, which may have terms as long as 25 years, are designed to help Federal agencies meet energy efficiency, renewable energy, water conservation, and emissions reduction goals by streamlining private-sector contract funding for energy management projects.

In consultation with the Federal agency, the energy company designs a set of conservation measures that meet the agency's energy savings goals – for example, energy efficient lighting; building management control systems; and heating, ventilating, and air-conditioning system improvements – and arranges the necessary funding.[10] The energy company guarantees the conservation measures will generate cost savings sufficient to pay for themselves (including finance costs) over the term of the contract, and the agency pays the company out of proceeds generated by those cost savings. As such, energy contracts are designed to have no impact on an agency's budget – positive or negative – although any cost savings generated from the conservation measures after the contract ends accrue to the agency (see Figure 2).

Figure 2. Benefits of Energy Savings Performance Contracts



Source: NASA Office of Inspector General (OIG) analysis of program information.

Measurement and Verification of Energy Conservation Measures. Both the energy company and the Federal agency have a role in ensuring that energy conservation measures financed by an energy contract generate the guaranteed savings throughout the term of the contract, and the Energy Policy Act requires an annual verification of cost savings – referred to as measurement and verification (M&V) – to support the savings guarantee. The energy company is responsible for ensuring that conservation measures are life-cycle cost effective, that is, that the savings they generate meet or exceed the total cost of the project over the life of the contract.

During contract negotiations, the energy company submits an M&V plan outlining the methods that will be used to determine whether the agency's actual energy savings meet or exceed the guaranteed amount. Verification methods include surveys, inspections,

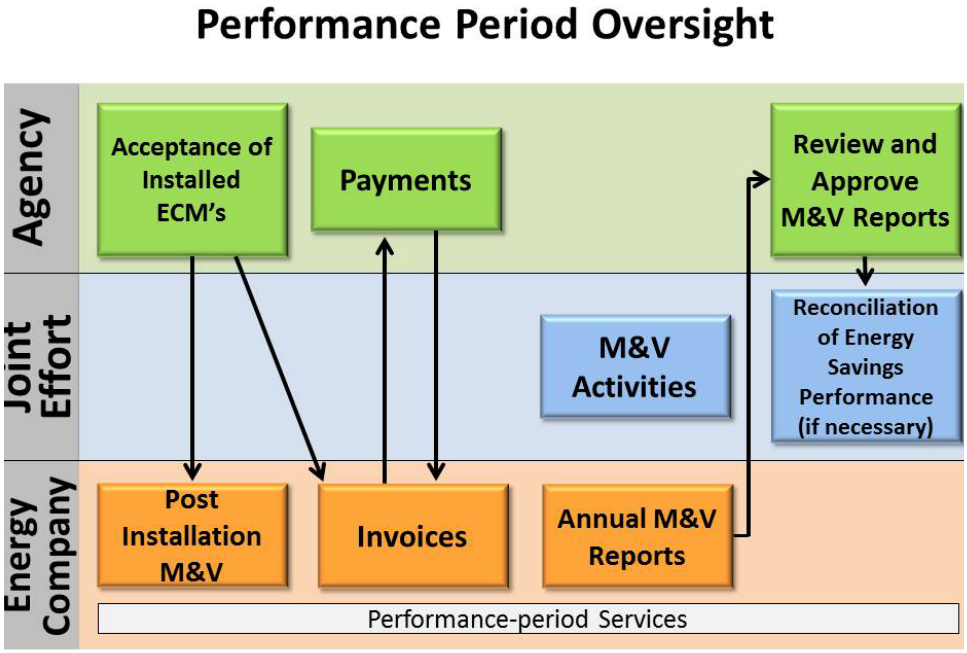
[10] A building management control system allows the Center to program schedules for operating lighting and heating systems within buildings. Energy savings are gained by setting air temperatures to maximize efficiency and still maintain comfort.

spot measurements, and short-term metering. Once the conservation measures have been implemented, the energy company and the agency verify that the new equipment or systems installed are operating properly and have the potential to generate the predicted savings. At least annually thereafter, the energy company and the Federal agency verify that the installed equipment is being properly maintained, continues to operate, and continues to have the potential to generate the predicted savings.

As part of the ongoing verification process, the energy company is required to identify any change in conditions that will affect the guaranteed savings rate, such as physical changes to the buildings or changes in hours of use and occupancy. Savings are determined by comparing the agency's energy use before and after acceptance of the installed energy conservation measures while making appropriate adjustments for changes in conditions. The agency is ultimately responsible for ensuring that the energy company delivers on the savings guarantee specified in the contract.

The main goal of the M&V process is to reduce the risk to agencies of overpayment by providing a mechanism to assess actual savings and verify that the guaranteed savings amount is being achieved throughout the term of the contract. The agency coordinates with the energy company and observes the agreed upon procedures, tests, and calculations that support the report. If the report demonstrates that conservation measures have not achieved the guaranteed annual savings, the agency is supposed to adjust the payment schedule to recover any overpayments, or alternatively, terminate or partially terminate the contract (see Figure 3). Every energy contract contains an annual

Figure 3. Flowchart of Agency and Energy Company Responsibilities during Contract Performance Period



Source: NASA OIG analysis of program information.

cancellation ceiling schedule that establishes the maximum termination liability in the event of cancellation.[11] The ceiling amount represents the remaining unpaid principal plus any prepayment charges, but does not include any amount for lost profit.

Department of Energy, Federal Energy Management Program. The Department of Energy's Federal Energy Management Program (FEMP) provides Federal agencies with legal and funding guidance, project facilitators, experts on emerging and underutilized technologies, and training regarding Federal energy management, including the implementation of energy contracts. FEMP training is delivered through Federal Financing Specialists, project facilitators, and an experienced training team.[12] In addition, to simplify and shorten the process of negotiating energy contracts, FEMP created "Super Energy Savings Performance Contracts." Pursuant to this program, FEMP awarded indefinite-delivery/indefinite-quantity energy contracts to 16 energy companies who have demonstrated the capability to provide energy conservation projects to Federal customers (FEMP umbrella contract). Agencies implement energy conservation projects by awarding delivery orders against the FEMP umbrella contract. Although agencies may still choose to enter into stand-alone energy contracts, using the umbrella contract allows agencies to get these projects underway more quickly.

NASA Guidance on Energy Contracts. NASA's current guidance addresses various aspects of energy contract implementation, including the contracting concept; statutory requirements; the Department of Energy's program; establishing and adjusting a baseline, performance guarantee, and payments; and M&V procedures.[13] However, NASA published the guidance two years after the Agency entered into its first energy contract and has not updated the policy since 2001. NASA is in the process of updating the guidance and developing a corresponding handbook.

NASA Energy Contracts. Since 1999, NASA Centers have awarded seven energy contracts. Johnson awarded NASA's first energy contract to Honeywell International, Inc., (Honeywell) in February 1999 using the FEMP umbrella contract. The contract provides for installation of 15 conservation measures in various Johnson facilities and guarantees energy cost savings of $42.7 million over 22 years, which Johnson will pay Honeywell in monthly installments.[14] Conservation measures implemented under the contract include variable speed drives for chilled and hot water pumps, air-handling units, and cooling towers; lighting improvements; building management control system; and

[11] Actual termination charges will be negotiated as part of any termination settlement, per established Federal Acquisition Regulation requirements.

[12] FEMP training includes all phases of the energy contract process including acquisition planning, energy company selection, negotiation and award, cost elements, design, construction and acceptance, and performance period. See http://www1.eere.energy.gov/femp/ (accessed on April 3, 2013) for more details.

[13] NASA Procedural Requirements (NPR) 8570.1, "Energy Efficiency and Water Conservation w/Change 2 (4/04/08) Revalidated," March 15, 2001.

[14] Under the contract, payments are scheduled as follows: $969,285 during the construction period, 10 annual payments of $2.1 million, 11 annual payments of $1.8 million, and a payment of $1.3 million for the last year of the performance period.

occupancy sensors.[15] To facilitate the installation of these measures, the Center was separated into five Zones, and Honeywell installed between 1 and 15 measures in each Zone. See Appendix B for a complete listing of installed measures at Johnson and a diagram of the Zones.

In August 1999, Glenn Research Center (Glenn) awarded a 10-year, $1.9 million energy contract to Ameresco Solutions, Inc., for energy saving measures including lighting system upgrades and lighting controls.[16] In August 2000, Ames Research Center (Ames) awarded a $5.1 million energy contract to Johnson Controls, Inc., for installation of energy efficient lighting systems in some buildings and enhancements to its building management control system. Ames awarded a second energy contract to Johnson Controls in March 2002 for $4.7 million to install efficient lighting in more buildings. Wallops Flight Facility (Wallops) awarded an energy contract to Ameresco Select, Inc., in December 2009 for improvements such as high-resolution lighting retrofits, boiler decentralization, and building automation system upgrades.[17] In 2012, Wallops added another phase to the contract for installation of geothermal heat pumps, for a total contract value of $35.8 million. The first phase of construction was completed in May 2012, and Wallops received the post-installation report from Ameresco Select, Inc., in November 2012. Construction on the second phase of the contract is expected to be complete in April 2013.

Goddard Space Flight Center (Goddard) awarded a $6.8 million energy contract to Ameresco Select, Inc., in March 2010 for improvements in lighting efficiency and installation of a water side economizer, which is a device used to create chilled water from the evaporative cooling capacity of cooling towers during winter months. Installation of the measures was completed in February 2012, and Goddard received the post-installation report from the company in June 2012. Four months into the first M&V reporting cycle, Goddard paid off the contract, saving more than $1.8 million in financing costs that would have accrued over the life of the contract.

Lastly, the Jet Propulsion Laboratory (JPL) awarded an energy contract to Clark Energy Group, LLC (Clark), in January 2011 for lighting improvements, modifying air-handling units, and installing high-efficiency chillers and boilers. JPL awarded a second phase of the contract in November 2012 for additional lighting improvements, high-efficiency chillers, and other improvements for a total contract value of $36.5 million. The first phase of the contract was completed in March 2012, and JPL received the post-installation report from Clark in May 2012. JPL plans to have Phase 2 completed in 2014.

[15] A variable speed drive on a pump motor saves energy by allowing the motor to adapt to changing requirements compared to a constant speed pump, which consistently runs at maximum speed.

[16] Because this contract was completed three years prior to the start of our audit, we did not review files associated with the awarding and administering of the contract.

[17] Ameresco Solutions and Ameresco Select are both subsidiaries of Ameresco, Inc.

In all, NASA has awarded more than $130 million of energy contracts since 1999, and all but the Glenn and Goddard contracts remain active (see Table 1). In addition, following a December 2011 Presidential Memorandum that requires the Federal government to enter into a minimum of $2 billion of energy contracts within 24 months, NASA committed to awarding $19 million in contracts by December 2013.[18]

Table 1. NASA's History of Energy Savings Performance Contracts Awarded

Center	Contractor	Contract Value	Award Date	Period of Performance	Total Guaranteed Cost Savings
Ames Research Center	Johnson Controls, Government Systems	$5,127,880	8/21/2000	19 years	$5,127,899
Ames Research Center	Johnson Controls, Government Systems	$4,716,178	3/29/2002	17 years	$4,749,187
Glenn Research Center	Ameresco Solutions, Inc.	$1,948,474	8/5/1999	10 years	$1,980,919
Goddard Space Flight Center	Ameresco Select, Inc.	$6,789,717	3/2/2010	11 years	$7,568,760
Jet Propulsion Laboratory	Clark Energy Group, LLC	$36,543,526	1/21/2011	20 years	$36,633,066
Johnson Space Center	Honeywell International, Inc.	$42,709,006	2/18/1999	22 years	$42,709,006
Wallops Flight Facility	Ameresco Select, Inc.	$35,823,353	12/22/2009	14 years	$36,931,056
NASA's Total Energy Savings Performance Contracts		**$133,658,134**			**$135,699,893**

Objectives

We evaluated whether NASA effectively managed, monitored, and controlled energy contracts to ensure that payments do not exceed the savings guaranteed in the contracts. Specifically, we examined if NASA adequately:

- reviewed annual M&V reports to ensure contracts generate the guaranteed cost savings;
- reviewed and verified that baselines were supported, justified, and kept current with subsequent changes to facilities; and
- complied with applicable laws and regulations that govern modification of the contracts.

[18] "Implementation of Energy Savings Projects and Performance-Based Contracting for Energy Savings," December 2, 2011.

As noted, Glenn and Goddard closed out their energy contracts in 2009 and 2012, respectively. Moreover, JPL and Wallops' energy contracts are still early in their performance periods, and neither facility had received an M&V report at the time of our field work. Accordingly, this report discusses our findings with regard to the Johnson and Ames contracts in an effort to provide "lessons learned" for efforts underway or planned at other NASA Centers. See Appendix A for details of the audit's scope and methodology, our review of internal controls, and a list of prior coverage.

NASA'S MANAGEMENT OF ENERGY SAVINGS PERFORMANCE CONTRACTS NEEDS IMPROVEMENT

We found that Johnson mismanaged its $42.7 million energy contract. Specifically, Johnson officials did not require Honeywell to submit annual M&V reports and accepted a flawed M&V report for the first year, did not consider the effect of renovations to or demolition of facilities on the guaranteed savings rate, and added work to the contract without ensuring that energy savings would cover the additional costs. Based on our interviews and document review, it was apparent that Johnson contracting officials did not effectively administer the energy contract. Moreover, neither Johnson nor the Agency had developed sufficient guidance or an effective training program regarding administration of energy contracts. As a result, Johnson may have overpaid Honeywell because it cannot verify that the conservation measures installed under the contract resulted in the guaranteed $2 million in annual energy savings.[19]

To avoid similar problems at other Centers, NASA needs to improve its guidance and training. For example, although Ames appears to be effectively managing its energy contracts, it has not yet faced the situation of needing to adjust its energy contracts to account for facility renovation or demolition. In addition, because the energy contracts at JPL and Wallops are in their first year of performance, issuance of improved guidance and training could help managers there avoid future problems.

Poor Verification Reporting Leads to Mismanagement of Energy Contracts at Johnson

Johnson did not require annual M&V reports, and the sole M&V report submitted was flawed. After receiving the initial M&V report in 2001 following installation of the energy conservation measures, Johnson officials did not require Honeywell to submit annual M&V reports verifying that the contract's conservation measures continued to generate the guaranteed savings. In addition, we found that Honeywell's sole M&V report contained unreliable data. Since 2000, Johnson has paid Honeywell more than $24 million for guaranteed energy savings as specified in the contract and is scheduled to pay the company an additional $18.7 million over the next 10 years. In the absence of reliable and regular M&V reports, Johnson managers cannot ensure that the conservation measures Honeywell installed are performing as promised or that the Center is not overpaying the energy company.

[19] Due to a flawed first year verification report and the lack of subsequent reports, we were unable to quantify the actual amount of energy savings Johnson is receiving from the installed conservation measures.

Reporting Requirements in the Contract. In our review of Johnson's energy contract, we found conflicting requirements regarding the M&V reporting required of Honeywell. For example, the contract included requirements that Honeywell measure, document, and report energy savings through year five of the contract (2004) via an annual M&V report, and that the format and frequency of reporting beyond that period would be determined later. However, this provision conflicts with another section of the contract that requires Honeywell to perform an annual audit to measure the performance of the conservation measures. It also conflicts with the FEMP umbrella-contract, which requires that energy savings must be verified annually.[20]

Reports Submitted Do not Verify Guaranteed Savings. Only one of Honeywell's reports compared energy costs after installation of energy measures with costs before installation. In 2001, Honeywell submitted and Johnson accepted an initial M&V report purporting to show that the conservation measures had generated the guaranteed first-year savings of $2 million.[21] Honeywell did not submit another report until 2003, when it began annually submitting energy usage reports by facility in lieu of the M&V reports.[22] Unlike M&V reports, these reports do not measure and verify guaranteed energy savings. Rather, they simply report the difference between the actual energy used and the amount the facility was expected to use that year. For example, in 2004, Honeywell reported that Johnson used 338,000 more kilowatt-hours than it had planned to use that year. This data is not sufficient to verify that the installed conservation measures generated the savings guaranteed in the contract.

We could not find any documentation in the contract file discussing M&V reporting requirements, whether Johnson had authorized Honeywell to change its reporting format, or the reporting requirements beyond the initial M&V report. Further, Johnson's contracting officer's representative (COR) told us that he was not aware of his responsibilities for ensuring Honeywell documented guaranteed savings. He also said he had not initially received any training specific to energy contracts and told us that the COR who served before him had not requested annual M&V reports. Nonetheless, Johnson officials continued to approve monthly payments even though guaranteed savings were not verified. Contrary to the contract language, Honeywell officials told us they did not provide M&V reports because they did not believe they were contractually obligated to do so since they verified the first-year savings.

M&V Report Received after Installation was Unreliable. Further, when we reviewed that sole M&V report, we identified discrepancies that Johnson should have identified

[20] Code of Federal Regulations, Title 10, "Energy, Part 436 - Federal Energy Management and Planning Programs," defines an annual energy audit as a verification of the achievement of the guaranteed energy cost savings resulting from implementing energy conservations measures and a determination of whether an adjustment to the energy baseline is justified by conditions beyond the company's control.

[21] Honeywell's performance period is 22 years and the first year verification period ran from September 1, 2000, through August 31, 2001.

[22] Honeywell refers to the submitted energy usage reports as the Heating, Ventilation, and Air Conditioning and Lighting Energy Report.

and addressed prior to approving the $2.1 million payment. Specifically, we found that the supporting spreadsheets contained mathematical errors and unsupported data that resulted in an overstatement of savings. Because of the errors, we were not able to accurately determine the savings actually obtained.

Honeywell's M&V Plan. During contract negotiations, Johnson and Honeywell agreed to an M&V Plan that described the methodology Honeywell would follow for measuring and documenting energy savings for each conservation measure in each Zone. For example, for the conservations measure where Honeywell installed variable speed drives on the motors of chilled and hot water pumps and air-handling units, Honeywell was to calculate a motor load factor to estimate the motor's true performance.[23] To calculate the motor load factor, Honeywell statistically sampled the exact voltage and current measurements from 37 percent of the existing motors, which resulted in an estimated motor load factor of 0.65.[24] The statistical approach also stated that because exact voltage and current measures were obtained from the sampling set, motor inefficiencies were then incorporated in the measured performance parameters. Honeywell would then utilize the statistically calculated motor load factor (0.65) to calculate energy savings by comparing the motors' performance before installation of the variable speed drives to their performance during the year after installation.

Overstated Savings from Installed Variable Speed Drives. Honeywell submitted documentation to support the $2 million guaranteed energy savings for the installed conservation measures in all Zones for the first year. To test Honeywell's support, we analyzed Honeywell's calculation of savings generated from the variable speed drives installed in Zone 1 facilities.[25] Honeywell claimed that at the end of the first year, the drives produced $24,829 more in energy savings then the amount they guaranteed for Zone 1. However, we calculated the additional savings were only $4,753, or less than one-fifth the amount it claimed because of Honeywell's inconsistent use of the motor load factor.

Specifically, Honeywell inappropriately adjusted actual energy costs based on the motor load factor for the installed variable speed drives. If the factor adjustment was in their favor, they adjusted actual energy costs. However, if the adjustment was in Johnson's favor, Honeywell did not make the adjustment. Honeywell agreed in the M&V Plan to use a statistically determined 0.65 motor load factor that took into account motor

[23] Motor load factor represents the ratio of the load the motor actually draws when in operation as compared to the full load it could draw at 100 percent. For example, a 20 horsepower motor that draws a constant 13 horsepower load whenever it is on would have a motor load factor of 65 percent or "0.65" (13/20).

[24] Honeywell performed the statistical sample with a 90 percent confidence level using 5 percent precision which means Honeywell was 90 percent confident that the "0.65" motor load factor was within 5 percent of the true motor load.

[25] Zone 1 represents 12 buildings at Johnson that had variable speed drives installed on chilled and hot water pumps and air handling units as an energy saving measure. We did not perform similar reviews on the other Zones at the Center, but Honeywell installed the same type of equipment in some of the other Zones.

inefficiencies. Because the statistical sampling already accounted for motor inefficiencies, Honeywell should not have made any adjustments to actual energy costs and at the very least, if adjustments were made, all adjustments should have been accepted, not just adjustments in Honeywell's favor.

Although our calculation still results in more energy savings than the guaranteed amount for Zone 1, we found other deficiencies in Honeywell's documentation that cast further doubt on whether guaranteed savings were actually achieved. For example, the spreadsheet showed the cumulative actual costs for one chilled water pump remained the same from June 2001 through August 2001, while the cumulative actual costs for another pump unexplainably decreased by more than 50 percent between June 2001 and July 2001. Based on this and other discrepancies, we could not determine with certainty that the installation of the variable speed drives had actually resulted in the amount of savings guaranteed in the contract. We asked FEMP representatives – the authoritative experts on the energy contract process – to examine Honeywell's M&V report and supporting documentation that we reviewed. They agreed with our assessment, identified additional discrepancies, and concluded that it would be difficult to run alternate calculations to see if savings were actually obtained.

Based on our review, it was apparent that Johnson contracting officials failed to provide appropriate oversight to ensure Honeywell's energy contract produces guaranteed savings. The current COR did not review any M&V reports and did not take action to ensure that Honeywell submitted annual M&V reports. Moreover, neither the Center nor the Agency offers sufficient guidance or an effective training program relating to these contracts. Training focused specifically on overseeing these type contracts is critical given the complexities of verifying guaranteed savings and the long-term nature of energy contracts to ensure that Centers do not make payments that exceed the guaranteed savings amount.

Johnson Did Not Adjust the Contract for Changed Circumstances that Affected Energy Savings Generated by Conservation Measures

In addition to not receiving M&V reports, we found that the contracting officer at Johnson did not adjust the Honeywell contract after buildings in which conservation measures had been installed were demolished or extensively renovated. Because energy contracts can last up to 25 years, it is inevitable that changes in site conditions like occupancy rates, renovations, demolitions, and technological advances will affect savings rates. As such, Federal law requires agencies and energy companies to audit conservation projects at least once a year and, as part of that audit, determine whether an adjustment to the contract is justified to reflect significant changes to the site.[26] If such

[26] Energy Policy Act of 1992 and Code of Federal Regulations, Title 10, Part 436.

changes are identified, the agency is required to update the contract by documenting the changes in the contract file (normally this would be part of the annual M&V report), modifying the contract to reflect revised expected savings rates, or partially or fully terminating the contract.

Since 2008, Johnson has renovated three buildings and demolished a fourth, all of which contained energy conservation equipment installed by Honeywell (see Figure 4). The renovations included the complete removal of the interior finishes and systems as well as the exterior windows and walls. Accordingly, the conservation measures Honeywell installed are no longer providing energy savings.[27] However, Johnson took no action to modify the Honeywell contract to reflect the renovation or demolition of all four of these buildings.

Figure 4. Demolition of Johnson's Building T-585 July 2012

Source: NASA.

The Johnson contracting officer and COR told us they were not aware of any guidance on the subject. We reviewed NASA's energy savings performance contracting guidance and found that while it does discuss adjusting the baseline for such changes as usage of a building, it does not specifically discuss adjusting energy contracts to reflect renovations and demolitions.[28] In addition, NASA's facility project guidance does not suggest procedures to ensure that the impact on installed guaranteed energy saving measures is considered when calculating a building's renovation or demolition costs.[29]

Johnson Failed to Incorporate Cost Savings Measures to the Contract Modifications for Additional Work

Work performed under an energy contract must be funded by the energy savings the work generates. Contrary to this requirement, Johnson negotiated separate fixed-price task orders for additional work from Honeywell without assessing the required guaranteed

[27] Johnson renovated Building 2 North (Office of Communications and Public Affairs), Building 12 (Administrative Support), and Building 29 (Crew Exploration Vehicle Integrated Avionics Laboratory) to meet Leadership in Energy and Environmental Design criteria. In July 2012, Johnson demolished Building T-585 (Space Operations Modular Complex). Honeywell had installed variable speed drives and efficient lighting and occupancy sensors in each of these buildings.

[28] NPR 8570.1, "Energy Efficiency and Water Conservation w/Change 2 (4/04/08) Revalidated."

[29] NPR 8820.2F, "Facility Project Requirements," January 28, 2008.

energy savings.[30] Specifically, between 1999 and 2008 Johnson negotiated 26 standalone modifications to Honeywell's energy contract worth $2.9 million, which increased the contract value from $42.7 million to $45.6 million. Johnson paid Honeywell about $2.7 million for this additional work.[31] While it appears that the work was within the scope of the contract, the modifications failed to incorporate required cost saving measures or verification methods designed to ensure that Johnson would not pay more for the work than the energy savings it generated. Rather, Johnson negotiated the modifications as if they were changes to a standard fixed-price contract.

In 2008, Johnson officials recognized that these modifications were inappropriate and awarded Honeywell a separate five-year, indefinite-delivery/indefinite-quantity contract, currently valued at $12.5 million. Similarly, we found that NASA lacked written guidance on this issue.

Ames Contracts Have Been Effectively Managed to Date

We found that Ames has effectively managed its energy contracts with Johnson Controls, Inc. In August 2000, Ames awarded a $5.1 million energy contract to Johnson Controls for installation of energy efficient lighting systems in several buildings and enhancements to its building management control system. Ames awarded a second energy contract to Johnson Controls in March 2002 for $4.7 million to install energy efficient lighting in additional buildings at the Center.[32] The same contracting officer and COR team has provided consistent oversight of the contracts since award and they have consistently received and reviewed annual M&V reports. In addition, although Johnson Controls estimated that the installed energy measures would produce a certain level of savings, they guaranteed a lesser amount and based Ames' payment stream on this lesser amount. This methodology left a cushion in the event the conservation measures did not produce as much savings as expected over the life of the contract.

Unlike at Johnson, Ames has received and reviewed annual M&V reports from its energy company (Johnson Controls) for the last 10 years. The reports certified that the installed conservation measures are continuing to generate the guaranteed savings and accounted for the effect renovated or demolished buildings had on those projected savings. Additionally, in February 2012, Johnson Controls offered Ames the option to modify the contracts due to demolished buildings and document the changed conditions. Ultimately, the site changes did not require adjustment to contract payments because actual savings have not dropped below the negotiated guaranteed savings rate.

[30] The additional work included consultation for to provide lighting for parking lots, streets, mall walks, and high bays at the Center.

[31] Johnson paid Honeywell about $2.7 million for the negotiated $2.9 million in modifications.

[32] The Ames energy contracts terms are 19 and 17 years, respectively.

Conclusion

The guarantee of a specified level of cost savings and performance is at the heart of an energy contract. By that measure, Johnson officials failed to ensure that modifications made to its facilities justify the approximately $2 million annual payment made to Honeywell since 2001. In our judgment, without additional measures to improve management and oversight of these contracts, it will be difficult for NASA Centers to ensure that payments do not exceed guaranteed energy savings.

NASA officials we spoke with acknowledged that the Agency's energy savings policy is out of date, which NASA was in the process of updating the policy during our audit. We reviewed a draft of the revised policy and suggested additional changes. In addition, NASA officials said it plans to prepare a handbook, which will contain guidance specific to energy contracts.

Recommendations, Management's Response, and Evaluation of Management's Response

In order to reduce the risk of overpayments on energy contracts and implement sound management practices, we recommended that the Johnson Director, Office of Procurement:

Recommendation 1. Ensure that guaranteed energy savings are being achieved at Johnson and if not, determine if the Honeywell contract needs to be modified by revising expected savings and payments, partially terminating, or fully terminating the energy contract.

Management's Response. Johnson's Center Director and Johnson's Director of Procurement disagreed with the recommendation, stating that energy savings have been validated in accordance with the contract, arguing that the OIG's "preferred metrics" for measuring energy savings are not in conformance with the contract and would be almost impossible and certainly impractical to implement. They also noted that while Johnson will continue to review the contract to determine if any modifications are necessary to ensure there are no conflicting contract requirements, further review to modify, partially terminate, or fully terminate the contract would be unwarranted.

Specifically, Johnson officials contend that the contract did not require Honeywell to submit annual M&V reports because Johnson selected FEMP-approved Option A for energy savings reporting. Their response notes that Option A is an approach designed for projects in which the potential to generate savings must be verified, but the actual savings can be determined from short-term measurements, estimates, and engineering calculations. Further, they state that while the contract required M&V reports for several energy measures for the first year, thereafter it required only annual reporting of kilowatt-hour savings, which Honeywell supplied in the form of monthly heating, ventilation, air conditioning, and lighting reports that detailed hours of operation, kilowatt hours, equipment operating costs and identified equipment that operated more than the

scheduled operating hours. Finally, Johnson officials did not agree that Honeywell's initial M&V report was flawed and contained unreliable data or that Honeywell inappropriately adjusted actual energy costs relative to the motor load factor.

Evaluation of Management's Response. We disagree with the assertion that Johnson appropriately validated energy savings and that the recommendation reflects the OIG's preferred metrics for energy savings verification. Rather, as stated in our report the Energy Act and Code of Federal Regulations require annual verification of savings. In addition, Johnson's contract with Honeywell requires the measurement, documentation, and reporting of energy savings through year five, as well as delivery of an annual energy audit (defined by the Code as a verification of the achievement of guaranteed energy cost savings) and annual reporting of kilowatt-hour savings. Therefore, the metrics we identified are statutory and contractual requirements. Further, we believe it is not possible to determine whether promised energy savings are being achieved absent these measures.

While we found conflicting requirements in the Johnson contract regarding M&V reporting, the contract requires measurement of documented annual energy savings. We disagree that Johnson's selection of FEMP's Option A for validating guaranteed energy savings relieves the Center from complying with this requirement. Further, we disagree that Honeywell is identifying kilowatt-hour savings and meeting contractual requirements by providing monthly heat, ventilation, air conditioning, and lighting reports. These reports do not verify that the energy savings were achieved as required by the Act and Code of Federal Regulations and do not identify kilowatt-hour energy savings as required in the contract. Rather, they identify only the difference between actual energy usage and the amount the facility was scheduled to use that year. For example, in 2004, Honeywell reported that Johnson used 338,000 more kilowatt-hours than it had planned to use that year. This data is not sufficient to verify that the installed conservation measures generated the savings guaranteed in the contract.

Moreover, we continue to believe that Honeywell's first year M&V report was overstated and unreliable due to inappropriate adjustments and mathematical errors. For example, the statistical sampling method used to derive the motor load factor already accounted for motor inefficiencies and Honeywell should not have adjusted for the true motor load factor. In addition, while we acknowledge that we limited our review to deficiencies found in Zone 1, FEMP officials corroborated our finding that the M&V report was unreliable. In fact, these officials identified additional discrepancies in the M&V data and concluded that it would be difficult to run alternative calculations to see if savings were actually achieved.

Finally, we contend that further review of the contract with regard to energy savings is warranted due to changed site conditions to four buildings. Because of renovations and demolition, Honeywell's installed conservation measures in the affected buildings are no longer providing energy savings and Johnson has taken no action to document or modify the Honeywell contract to reflect this fact. As stated in our report, Federal law requires an annual audit to determine whether an adjustment to the contract is needed to reflect

significant changes to the site. If such changes are identified, the agency is required to update the contract by documenting the changes in the contract file, modifying the contract to reflect revised expected savings rates, or partially or fully terminating the contract.

Given these concerns, our recommendation remains unresolved and we will continue to monitor Johnson's efforts to ensure that guaranteed energy savings are being achieved at Johnson.

We also recommended that NASA's Assistant Administrator, Office of Strategic Infrastructure:

Recommendation 2. Finalize the new policy and handbook and ensure that both provide specific guidance on management of energy contracts.

Management's Response. NASA's Assistant Administrator, Office of Strategic Infrastructure concurred, stating that NASA will ensure Agency guidance references Department of Energy, energy savings performance contract guidance, and contract management tools. The estimated completion date is September 22, 2014.

Evaluation of Management's Response. Management's proposed actions are responsive; therefore, the recommendation is resolved and will be closed upon completion and verification of the corrective actions.

Recommendation 3. Revise NPR 8820.2F, "Facility Project Requirements," to require that estimates for renovation or demolition of facilities include the loss of guaranteed savings from conservation measures installed pursuant to energy contracts.

Management's Response. NASA's Assistant Administrator, Office of Strategic Infrastructure concurred, but stated that in lieu of modifying NPR 8820.2F, NASA will ensure Agency energy contract guidance requires CORs to perform periodic surveys of facilities during the course of the contract to capture building configuration changes that impact energy contracts funded systems. The representatives will be required to modify the energy contract to account for those configuration changes. The estimated completion date is September 22, 2014.

Evaluation of Management's Response. Management's proposed actions are responsive; therefore, the recommendation is resolved and will be closed upon completion and verification of the corrective actions.

Recommendation 4. In conjunction with the Assistant Administrator, Office of Procurement, ensure that procurement and technical staff who are responsible for awarding and administering energy contracts are adequately trained.

Management's Response. NASA's Assistant Administrator, Office of Strategic Infrastructure concurred, stating that NASA will ensure Agency energy guidance requires team members to obtain adequate training such as courses available from Department of Energy. The estimated completion date is September 22, 2014.

Evaluation of Management's Response. Management's proposed actions are responsive; therefore, the recommendation is resolved and will be closed upon completion and verification of the corrective actions.

OTHER MATTERS OF INTEREST

Contract Administration Lacked Oversight and Good Recordkeeping

During our review of Johnson's energy contract, we found that Johnson reported a contract value of $46.32 million in the NASA Procurement database. However, we could not account for more than $730,000 in our review of the contract files, including $2.9 million of modifications (see Table 2).

Table 2. Computation of Discrepancy in Johnson Contract # NAS9-99075 Value

Contract Award Amount	$42,709,006.00
Awarded Modifications	$ 2,877,908.05
Contract Value	$45,586,914.05
Reported Value	$46,317,063.00
Difference	$ 730,148.95

Not taking into consideration the possible discrepancy regarding the guaranteed savings rate discussed previously, we found that Johnson may owe Honeywell more than $331,000 as a result of inaccurate monthly invoicing.

In conjunction with energy savings verification, the energy contract obligated NASA to make 120 monthly payments of $172,807 beginning in August 2000 and ending in July 2010. Then beginning with year 11 (August 2010), the payments were reduced to $149,473 per month for the remaining 12 years. While we found Honeywell submitted 120 invoices for $172,807, two payments came after the end of the period ending July 2010. We could not determine why Honeywell did not submit an invoice or receive payments for August 2002 and February 2003 or submitted invoices for the first two months of year 11 (August and September 2010) at the $172,807 rate instead of reducing the invoice to $149,473 per month. As a result, Honeywell overbilled $46,668 of guaranteed savings for August and September 2010. In our judgment, Honeywell erroneously overbilled the guaranteed savings because they did not realize that they failed to submit invoices for August 2002 and February 2003. All subsequent invoices have been at the reduced rate of $149,473. Further, we did not find any documentation in the file that would relieve the Agency from owing Honeywell for energy savings from August 2002 and February 2003, which, if validated, would result in a $345,614 expenditure.

In addition, we discovered that Honeywell under-billed one month of $31,783 in servicing costs during the first year of performance (August 2000 to July 2001). During

the four months between October 2000 and January 2001, Honeywell did not include $31,783 of servicing costs in their monthly invoices. It appears Johnson and Honeywell tried to correct the error, and Honeywell added $31,783 to the invoices for the next three months, February 2001 through April 2001. This resulted in one month of servicing costs going unbilled. Finally, between August 2000 and August 2001, Johnson made an additional $499 of miscellaneous adjustments to invoices, which included an adjustment to a previous payment.

These discrepancies could result in a net liability to Johnson of $331,228 (see Table 3).

Table 3. Summary of Johnson's Potential Liability to Honeywell International, Inc., NAS9-99075
Performance Periods 1 - 12

Post-Construction Performance Period August - July	Guaranteed Savings	Amount Invoiced by Honeywell	Difference
1. 2000 - 2001	$ 2,073,684.00	$ 2,041,768.84	($31,915.16)[a]
2. 2001 - 2002	$ 2,073,684.00	$ 2,073,316.75	($367.25)[b]
3. 2002 - 2003	$ 2,073,684.00	$ 1,728,070.00	($345,614.00)[c]
4. 2003 - 2004	$ 2,073,684.00	$ 2,073,684.00	$0
5. 2004 - 2005	$ 2,073,684.00	$ 2,073,684.00	$0
6. 2005 - 2006	$ 2,073,684.00	$ 2,073,684.00	$0
7. 2006 - 2007	$ 2,073,684.00	$ 2,073,684.00	$0
8. 2007 - 2008	$ 2,073,684.00	$ 2,073,684.00	$0
9. 2008 - 2009	$ 2,073,684.00	$ 2,073,684.00	$0
10. 2009 - 2010	$ 2,073,684.00	$ 2,073,684.00	$0
11. 2010 - 2011	$ 1,793,676.00	$ 1,840,344.00	$46,668.00[d]
12. 2011 - 2012	$ 1,793,676.00	$ 1,793,676.00	$0
Total	**$ 24,324,192.00**	**$ 23,992,963.59**	**($331,228.41)**

[a] No invoice for one month of Service Fee ($31,783.00) + $132.16 adjustments
[b] Reduction for fiscal year 2001 payment
[c] No invoice for August 2002 and February 2003 ($172,807.00 each month)
[d] Overbilling for August and September 2010 ($23,334.00 each month)

If Honeywell does submit an invoice for the amounts in question, Johnson will have to determine if the claim is valid taking into consideration the other weaknesses we identified in the audit. In addition, because the amounts in question were from previous year obligations, a determination would have to be made if expired or cancelled funds are

available. Any invoice reflecting a valid charge that is received after an account has closed must be obligated against and disbursed from budget authority that is available for the same general purpose but still in the unexpired phase.

Management Actions. We informed Agency officials of the overstated contract value and Honeywell's erroneous billing. The contracting officer is attempting to reconcile the discrepancies and is working with Honeywell to address the matter.

APPENDIX A

Scope and Methodology

We performed this audit from May 2012 through March 2013 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.

The scope of our audit included controls and management of active energy contracts at Ames, Goddard, JPL, Johnson, and Wallops. We excluded the energy contract at Glenn since it was completed in 2009. Our review included establishment of the baseline for energy cost savings, subsequent changes to the baseline, M&V, reporting requirements, payments that did not exceed actual energy cost savings, and possible energy contract termination. For this review, we performed audit field work at NASA Headquarters, Ames, Goddard, JPL, Johnson, and Wallops.

To accomplish the review, we identified and reviewed laws, regulations, policies, procedures, and controls pertaining to the management of energy contracts. Specifically, we reviewed the Energy Policy Act and amendments; Energy Independence and Security Act of 2007; Federal Energy Management Improvement Act of 1988; executive orders; Presidential Memorandum; Title 42 of U.S. Code – The Public Health and Welfare, Chapter 91 – National Energy Conservation Policy, Subchapter III – Federal Energy Initiative; and Title 10 of the Code of Federal Regulations, Part 436 – Federal Energy Management Planning Programs.

We reviewed the Memorandum of Understanding between NASA and the Department of Energy for participation in Super Energy Savings Performance Contracts, dated April 1997. We also reviewed the Interagency Agreements between the NASA Centers and Department of Energy.

To understand NASA's energy contract policies and their implementation of that policy, we reviewed NPR 8570.1, "Energy Efficiency and Water Conservation w/Change 2 (4/04/08) Revalidated," and NPR 8820.2F, "Facility Project Requirements." In addition, we reviewed Johnson Policy Directive 8500.1, "JSC Environmental Excellence Policy," March 2, 2004, and Johnson Work Instruction 8570.1, "Energy Conservation," November 18, 2009.

To obtain an understanding of FEMP requirements and involvement in energy contracts, we interviewed Department of Energy experts including contracting officers, finance specialist, and technical experts. We also attended the "Energy Savings Performance

Contract Comprehensive Workshop," administered by the Department of Energy's FEMP representatives. In addition, we reviewed the Department of Energy website, related to FEMP and FEMP "M&V Guidelines: Measurement and Verification for Federal Energy Projects." We also reviewed the contracts each of the energy companies had with the Department of Energy and the associated contract modifications during the period of 1998 through 2008.

To accomplish our review of the processes used to manage NASA's energy contracts, we interviewed NASA Headquarters officials with the Office of Strategic Infrastructure and Office of Procurement. At the NASA Centers, we interviewed the energy contract's contracting officer, CORs, Financial Management Directorate representatives, and the Energy Manager.

We reviewed the contract files and manually listed payment files for Honeywell at Johnson; the contract files and payment records for Johnson Controls Government Systems at Ames; Clark Energy Group at JPL; and Ameresco Select, Inc., at Goddard and Wallops.

Use of Computer-Processed Data. We reviewed computer-processed data, such as Johnson supplied spreadsheet supporting Honeywell's M&V report. We found that the spreadsheets supporting Honeywell's M&V report contained mathematical errors and unsupported data that resulted in an overstatement of energy savings. Because of the inaccuracy of the data, we were unable to quantify the actual amount of energy savings Johnson was receiving from the installed conservations measures and discuss the impact on our review in the "Results" section of the report.

Review of Internal Controls

We reviewed NASA's compliance with polices and guidance over the management of energy contracts, such as the U.S. Code, executive orders, the Code of Federal Regulations, NASA regulations, and FEMP Measurement and Verification Guidelines. The audit identified weaknesses in NASA's internal controls over energy contracts and found that NASA's administration of energy contracts need improvements. See the "Results" section of the report for details.

Prior Coverage

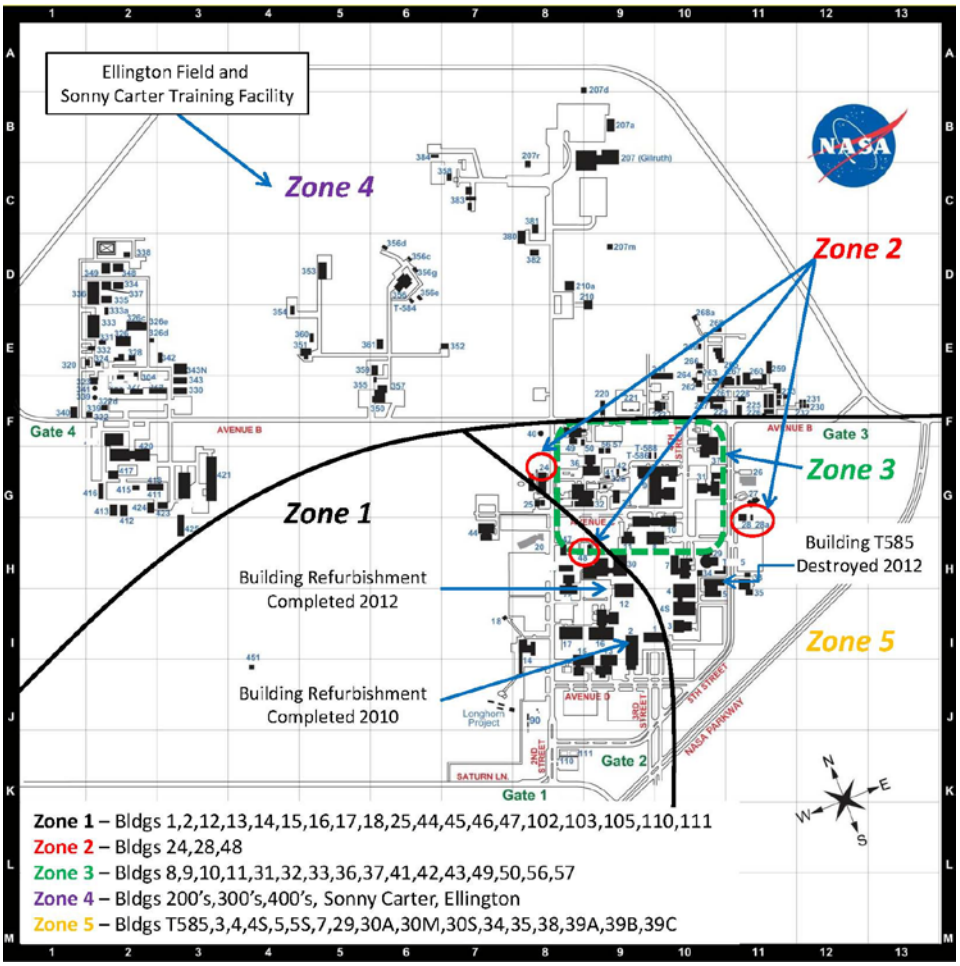
During the last five years, the NASA OIG and the Government Accountability Office (GAO) have not issued any reports of relevance to the subject of this report. However, GAO issued "Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests," (GAO-05-340, June 22, 2005). The report examined steps for agencies to better ensure that savings cover the costs of energy contracts and prompted the Department of Energy to do more to facilitate oversight of energy contracts. Unrestricted reports can be accessed at http://www.gao.gov.

ENERGY CONSERVATION MEASURES AND ZONES AT JOHNSON SPACE CENTER

Map of Johnson Space Center Zones 1 - 5

Figure 5 is a site map of Johnson. The Center was divided into five Zones and energy conservation measures were installed in each Zone. Zone 1 covers 19 buildings in the southwest section of the Center, Zone 2 covers 3 buildings in the central section, Zone 3 covers 16 buildings in the north section, Zone 4 covers buildings in sections 200, 300, 400 and facilities in the Sonny Carter Training Facility and Ellington Field, and Zone 5 covers 17 buildings in the southeast section. See Table 4 for a description of each measure and the applicable Zone.

Figure 5. Site Map of Johnson Space Center



Source: Map obtained from Johnson Space Center with OIG presentation of Zones.

Table 4. Energy Conservations Measures Installed by Honeywell at Johnson Under NAS9-99075

Description	Installed in Building
Variable Speed Fan Drives on chilled Water Pumps	All Buildings in Zones 1 - 5
Flush Valve Retrofit	All Buildings in Zones 1 - 5
Variable Speed Fan Drives on Air Handling Units	All Buildings except Zone 2
Variable Speed Fan Drives on Cooling Towers	Zone 2 only
Energy Management Control System and Direct Digital Controls	All Buildings except 24, 25, & 48
Occupancy Sensors	All Buildings except 24, 25, & 48
Lighting	All Building in Zones 1 - 5
Synchronous Belts	All Buildings except 24, 25, & 48
Low-Flow Faucet Aerators	All Buildings in Zones 1 - 5
Condenser Water Retrofit	Zone 2 only
Process Water Retrofit	Zone 3 only
Compressed Air Retrofit	Zone 2 only
Plantscape Energy Management Control System	Zone 2 only

MANAGEMENT COMMENTS

National Aeronautics and Space Administration

Headquarters
Washington, DC 20546-0001

MAR 2 8 2013

Reply to Attn of: Office of Strategic Infrastructure

TO: Assistant Inspector General for Audits

FROM: Assistant Administrator for Strategic Infrastructure

SUBJECT: Response to the Office of Inspector General (OIG) Draft Report, "NASA's Management of Energy Savings Contracts" (Assignment No. A-12-020-00)

The Office of Strategic Infrastructure (OSI) appreciates the opportunity to review and provide comments on OIG draft report entitled, "NASA's Management of Energy Savings Contracts" (Assignment No. A-12-020-00), dated March 4, 2013.

In the draft report OIG makes four recommendations intended to reduce the risk of overpayments on energy contracts and implement sound management practices. Specifically, the OIG recommends the following:

Recommendation 1: Ensure that guaranteed energy savings are being achieved at the Johnson Space Center (JSC) and if not, determine whether the Honeywell contract needs to be modified by revising expected savings and payments, partially terminating, or fully terminating the contract.

Management's Response: Management non-concurs with Recommendation 1 because the JSC 'accounting processes' were/are adequate, both as designed and as applied, for the contract, and they were in keeping with Department of Energy (DOE) standards. We acknowledge that the processes are not in line with the OIG's preferred metrics for the later years of the contract. However, we believe that the OIG's preferred metrics do not conform to the contract, would be almost impossible and certainly impractical to implement, and would possibly constitute a breach of the contract should we implement them and then attempt to enforce the results on Honeywell. Therefore, the JSC Director and the Office of Procurement consider that the energy savings have been validated in accordance with the contract.

The Energy Conservation Measures (ECMs) in Honeywell contract NAS 9-99075 are divided into two groups: 1) ECMs stipulated as part of the base contract, and 2) ECMs stipulated as a result of a review of the first-year Measurement and Verification (M&V) report, which demonstrated the guaranteed savings were being achieved within the contractually required plus or minus 5percent. This approach was clearly spelled out in the Honeywell proposal and incorporated into the data reporting requirements in the contract: reference Data Reporting

Requirements AN-1-13, Energy Savings Performance Service Plan; and AN-1-14, Energy Savings Performance Technical Proposal.

This accepted means of determining actual savings is in accordance with the DOE's Federal Energy Management Program's (FEMP) M&V Option A. The FEMP M&V Guidelines state that "Option A is an approach designed for projects in which the potential to generate savings must be verified, but the actual savings can be determined from short-term measurements, estimates, and engineering calculations. Performance period energy use is not measured throughout the term of the contract." The approach was reviewed and discussed with FEMP who did not take any exception to the approach, and as a result the final M&V plan was implemented, including the use of Option A. Therefore, the executed contract did not require Honeywell to submit annual M&V reports. However, the contract did require detailed M&V reports for ECMs 1, 10, 11, and 41 the first year, which were provided. After the first year the contractor was required to periodically review and document equipment operation and provide annual reporting of kilowatt hours (KWH) savings. Honeywell meets this contractual requirement by providing monthly Heating, Ventilation, and Air Conditioning (HVAC) and Lighting Energy Reports that detail, for example, hours of operation, KWH, and equipment operating costs and also identifies the equipment that operates more than the scheduled operating hours. This satisfies the contract's reporting requirements for ECMs 1, 10, 12, 13, 14, 15, and 16 and represents approximately 80 percent of the guaranteed energy savings. ECMs 11 and 32 were reported sporadically for the first six years and annually thereafter, but only represent approximately two percent of the energy savings. ECM 41 was reported every year since 2000 with the exception of 2008.

Further, JSC does not agree that the initial M&V report submitted by Honeywell was flawed and contained unreliable data as described in the OIG report section "M&V Report received after installation was unreliable." The OIG review of the Honeywell Energy Savings Performance Contract (ESPC) first year Measurement and Verification Reports energy calculations and data collection addressed only a small sampling set of building ECM 1, Variable Speed Drives (VSD) on chilled water and hot water distribution pumps, and ECM 10, VSDs on ventilation motors. The sampled set of calculations that the OIG reviewed is extensible to only approximately four percent of the total guaranteed energy savings and a fraction of the M&V reports provided. The sample relates only narrowly to the broad sweep of energy-savings methods and technologies and is thus a suspect representative sample of the whole. From this limited sample the OIG determined that the entire ESPC calculated energy savings were erroneous based on what they perceived as two-key data errors. However, the first of the two noted errors, an unexplained 50 percent decrease, was in fact a typographical error with a value of approximately $1,600. The second error noted regarding the cumulative actual costs for one chilled water pump which remained the same from June 2001 through August 2001 was not an error, but there was no accumulated energy consumption for the noted time period because the piece of equipment was not in operation at all for that three-month time period.

The OIG also states that Honeywell inappropriately adjusted actual energy costs relative to the motor load factor. The FEMP guidelines determined the process to discern the motor load factor to calculate the proposed energy savings. It was agreed by NASA and Honeywell that Honeywell would adjust the baseline for motor load factor in accordance with the contract after confirming each motor's energy consumption with the installed VSD through the Energy

Management Control System. If the true motor load factor was greater than 0.65, the baseline was adjusted and guaranteed energy savings were reduced accordingly. If the true motor load factor was less than 0.65, NASA was already receiving the savings by reduced energy consumption; therefore, no adjustment was necessary. After all the adjustments were made and energy savings for each ECM totaled, the resulting total energy savings were within plus or minus five percent of the original guarantee.

Therefore, energy savings have been appropriately validated in accordance with FEMP guidelines and the terms of the contract. While JSC will continue to review the contract to determine if any modifications are necessary to ensure there are no conflicting contract requirements, further review to modify, partially terminate, or fully terminate the contract with regard to energy savings would be unwarranted. Consequently, we request that this recommendation be closed upon issuance of the final report.

Recommendation 2: Finalize the new policy and handbook and ensure that both provide specific guidance on management of energy contracts.

Management's Response: Concur. NASA will ensure Agency energy guidance references Department of Energy, ESPC guidance and contract management tools: estimated completion September 22, 2014.

Recommendation 3: Revise NASA Procedural Requirements (NPR) 8820.2F, "Facility Project Requirements," to require that estimates for renovation or demolition of facilities include the loss of guaranteed savings from conservation measures installed pursuant to energy contracts.

Management's Response: Concur. In lieu of modifying NPR 8820.2F, NASA will ensure Agency energy guidance to ESPC Contracting Officer Representatives (CORs) requires periodic surveys of facilities during the course of the ESPC contract to capture building configuration changes that impact ESPC funded systems. CORs will be required to modify the ESPC to account for those configuration changes; estimated completion September 22, 2014.

Recommendation 4: Ensure that procurement and technical staff who are responsible for awarding and administering energy contracts are adequately trained.

Management's Response: Concur. NASA will ensure Agency energy guidance requires ESPC project team members obtain adequate ESPC training such as courses available from Department of Energy: estimated completion September 22, 2014.

Again, thank you for the opportunity to review and comment on the subject draft report. If you have any questions or require additional information regarding this response, please contact Natasha McNeill at (202) 358-2638.

Olga M. Dominguez

cc:
Assistant Administrator for Procurement/Mr. McNally
Director, Johnson Space Center/Ms. Ochoa
Procurement Director, Johnson Space Center/Ms. Johnson

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Assistant Administrator, Office of Procurement
Director, Environmental Management Division
NASA Advisory Council's Audit, Finance, and Analysis Committee
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  Deputy Associate Director, Energy and Science Division
    Branch Chief, Science and Space Programs Branch
Government Accountability Office
  Director, Office of Acquisition and Sourcing Management
Department of Energy, Federal Energy Management Program,
  Golden Service Center, Acquisitions Contracting Officer

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  Subcommittee on Commerce, Justice, Science, and Related Agencies
Senate Committee on Commerce, Science, and Transportation
  Subcommittee on Science and Space
Senate Committee on Homeland Security and Governmental Affairs
House Committee on Appropriations

Subcommittee on Commerce, Justice, Science, and Related Agencies
House Committee on Oversight and Government Reform
Subcommittee on Government Operations
House Committee on Science, Space, and Technology
Subcommittee on Oversight
Subcommittee on Space

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