INTERNAL AUDIT REPORT

Audit of Return on Energy Conservation Efforts

Fairfax County Internal Audit Office

FAIRFAX COUNTY, VIRGINIA
INTERNAL AUDIT OFFICE
MEMORANDUM

TO: Anthony H. Griffin
County Executive

DATE: February 4, 2003

FROM: Larry Hertzog, Acting Director
Internal Audit Office

SUBJECT: Report on the ***"Return on Energy Conservation Efforts"***

Attached is the Internal Audit report entitled, ***"Audit of Return on Energy Conservation Efforts.*** This audit was performed as part of our Annual Audit Plan.

The results of this audit were discussed with the Facilities Management Division. We have reached agreement on the recommendation, and I will follow up periodically until implementation is complete. The department's response is incorporated into the report and the full response is attached at the end of the report. After your review and approval, we will release the report to the Board of Supervisors.

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Attachment

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Introduction

In an effort to reduce the energy used at Fairfax County facilities and to fund Heating, Ventilation and Air Conditioning (HVAC) equipment replacements the Facilities Management Division (FMD) implemented Energy Conservation Measures (ECM) through energy savings performance contracting.

The development and implementation of an energy conservation program involves four major steps:

- Assignment of a team to make decisions concerning energy conservation investments
- Performance of an energy audit for each building being considered for upgrades. This may include an assessment of the physical HVAC equipment, lighting systems, equipment use and building operation
- Develop a prioritized program based on estimated payback, lowest costs, and potential for largest savings
- Monitor and evaluate the energy savings results

FMD's initial performance energy contract was awarded in March 1998 to Evantage, a division of Dominion Virginia Power. This was an amendment to the agreement for the purchase of Electric Service by Municipalities and Counties of the Commonwealth of Virginia dated March 1995. The second contract, resulting from an RFP, was also awarded to Evantage in February 1999. As of October 2001, the County had contracted for nearly $6,000,000 of performance energy contracts with an estimated annual savings of over $600,000. These savings have in turn been used to finance $1.3 million in HVAC equipment replacements that, per FMD, would have otherwise required Capital Construction Budget funding from the General Fund. Contract amendments were issued to implement energy conservation measures on 54 buildings throughout the County. The contracts required:

- a comprehensive energy audit, and the design, selection and installation of equipment and systems, modifications and retrofits to improve energy efficiency;

- documentation of maintenance requirements and service procedures of the installed measures;

- training the County's operations and maintenance personnel in energy practices and maintenance procedures;
- monitoring and associated field support, test audits and reports;
- financing payments for energy efficiency improvements or related services were to be within anticipated energy savings so that the County would not have any financial obligation that exceeds the County's avoided utility costs.

From the program's inception in 1997, FMD used the method of stipulated savings to avoid the costly implications of contractually guaranteed or shared savings and the associated measurement and verification protocols that include the installation of sub-metering and often times require maintenance agreements for installed equipment. FMD employed its own in-house engineering expertise to review the estimated savings calculated by the contractor on energy savings performance contract amendments. This method of stipulated savings allowed the full savings amounts to be available to the County for reinvestment.

FMD has used savings from ECM's to perform additional capital improvement work. This work may not meet the standards for cost-effective energy conservation measures, but does improve long-term maintainability, reduce operating costs, enhance working conditions, protect the facility investment, or alleviate environmental concerns.

ECM's are used by many organizations including the U. S. Army and Navy to achieve more efficient energy consumption and realize significant savings in existing buildings. The mainstay of the ECM's are lighting system retrofits comprised of energy efficient lamps and ballasts which can have paybacks of about 4 years. Other ECM's with potential paybacks include the replacement of old inefficient HVAC equipment, the installation of Building Automation Systems, conversion of heating systems from electric to gas-fired infrared, the installation of lighting control systems, and the installation of special electric meters to monitor demand loads to achieve lower electric demand charges. Fairfax County's new South County Center, where construction was completed in March 2002, likewise uses low energy use lighting to reduce electrical consumption.

Purpose and Scope

The Internal Audit Office (IAO) was requested to review the Performance Energy Savings contracts awarded by FMD. This audit was performed as part of our FY2002 Long-Range Audit Plan. Our major audit objective was to determine whether identifiable cost savings resulted from the ECM's. Additional objectives were to:

1) Obtain all ECM contracts and determine the status of each
2) Determine the availability and accuracy of records maintained for electric bills
3) Compare energy costs before and after the implementation of energy conservation measures
4) Determine how management monitors and evaluates the results of energy conservation investments

The scope of our audit included a review of contract provisions, savings estimates, and a sample of County facilities where ECM's have been completed. The Audit period covered FY 1999 through FY 2002.

Our audit included the first two Performance Energy Contract awards used–by FMD: RQ 98-11114817A and RQ 99-255976-17. The Energy Conservation Measures taken by FMD include lighting retrofits, water conservation and infrared heat which conserve the use of electricity, gas and water. We evaluated only those ECM's which conserve use of electricity in this audit. ECM's using gas and water were not considered in this audit and may be reviewed in a subsequent examination.

Methodology

Our goal was to compare post implementation energy use with what the facilities would have used if the ECM had not been installed. We evaluated savings at the whole building level using current year and historical utility data in a straight comparison. We considered the potential effect of adjusting electricity expenses from year to year for various factors including weather differences, KWh rate changes and the useful life of the existing equipment. However, after a thorough analysis, we determined that adjustments in our sample would not be necessary for the years included in our calculations. We also considered building additions or deletions which would have an impact on energy consumption. We met with key Facilities Management Division (FMD) personnel during the audit survey phase and at its completion and agreed on an evaluation methodology.

We compared "post-implementation" (FY 2001, FY 2002) electricity energy expenses at nine buildings that have had Energy Conservation Measure (ECM) retrofits with "baseline" (FY1999) electricity expenses (see Exhibit A). Our sample selection was taken on a judgmental basis in consideration of the need to collect post implementation utility expenses. Additionally, we compared electricity expenses at four buildings that had additional lighting installed as well as the ECM's (see Exhibit B). Electric bills are comprised of "peak demand charges" (account for in excess of 50% of the monthly bill), use charges and a smaller amount of fixed charges. Peak demand charges are based on electricity demand charges that are billed 11 months prior. The lowered peak demand charges are not fully reflected in the monthly invoice for at least one year.

Our audit did not include an examination of the internal controls in the FMD operation. We did not perform an examination of the FASER system, which is used to accumulate, monitor and analyze monthly energy expenses at the various buildings throughout Fairfax County. We tested the accuracy of utility billing data.

The audit was performed in accordance with generally accepted government auditing standards. In addition we used references and authoritative guides to best practices in the energy conservation field. We used the "International Performance Measurement and Verification Protocol" (IPMVP) published by the U.S. Department of Energy to provide guidance throughout the audit. The IPMVP states that <u>all methods of defining savings are estimates</u>. There will be assumptions in any savings analysis.

The Fairfax County Internal Audit Office is free from organizational impairments to independence in our reporting as defined by Government Auditing Standards. We report directly to and are accountable to the County Executive. Organizationally, we are outside the staff or line management function of the units that we audit. We report the results of our audits to the County Executive, the Board of Supervisors, and reports are available to the public.

Executive Summary

In our opinion, energy conservation measures implemented at County facilities by FMD to reduce electrical consumption have been successful. The County is achieving annual cost savings, especially in the case of electric lighting retrofits. Our audit of the ECMs at the sampled nine County buildings indicates that electricity expenses were lower by approximately $200,000 and $140,000 in FY 2002 and FY 2001 respectively when compared to the 1999 base year (see exhibit A). Furthermore, in our opinion, energy savings in FY 2003 should be somewhat greater before leveling off in later years. The County's initial investment for the ECMs at the nine buildings amounted to $759,000 resulting in a payback period to recover the initial investment of about four years. No information was available to Internal Audit to isolate savings for individual equipment retrofits. In consideration of the fact that many facilities were upgraded with multiple equipment changes, we can project savings estimates for individual facilities, but not the specific impact of various ECM's within those same facilities. The ability to isolate savings was affected by additional non-ECM equipment upgrades during the same time frame. Each facility was an individual case study.

We noted positive results concerning the management of ECM efforts. In addition we found opportunities for improving the measurement of savings and have made the appropriate recommendations to management. These findings are briefly described below.

Measurement of Savings in Ongoing and Future Projects

FMD should establish a method to measure, verify, and estimate utility expense savings subsequent to the installation of ECM's. This will complete the ECM business process and provide a means to facilitate further investment. At a minimum, this should include organizing records for each facility to track historical and post ECM implementation energy consumption.

Accuracy of Utility Billing Data

The FMD recording of monthly expense amounts from vendor invoices is accurate. This enables FMD to assess the utility expenditure trends by facility.

Comments and Recommendations

1. FMD is not measuring and verifying energy savings from the implementation of the ECM's.

The International Performance Measurement and Verification Protocol, states that it is critical for an organization that has retrofitted with ECM's to measure and verify cost savings. The County's future investment decisions in energy saving measures will depend upon how much was saved and how long the savings will last.

FMD advised that since they elected not to use guaranteed or shared savings contracts, costly measurement and verification was not required in view of the employed methodology of stipulated savings.

Recommendation

FMD should establish project files to include documentation for each facility. Project management techniques should be applied to the ECM investments. This should include a project plan with priorities and ranking of investments. Minimum documentation should include contract amendments for each facility, specific investments to be implemented, pre-implementation energy consumption data and cost, and a schedule of estimated energy savings per facility, per year.

Department Response

We propose to develop a spreadsheet which would track utility consumption and cost data for the individual facilities involved. The spreadsheet will also show the estimated savings for the ECM's initiated at each facility for comparison purposes. Rather than having a project folder for each facility, a contract amendment folder is suggested for each group of facilities since a financing package has a group of several facilities. This would avoid duplication of information and data if individual project folders were established. The spreadsheet would contain the pertinent data for individual facilities. We propose to have the spreadsheet developed in August 2003 after the FY 2003 utility data is available, and then updated annually. The contract amendment folders will be assembled by June 30, 2003.

2. The recording of monthly expense amounts from vendor invoice is accurate.

We scheduled and analyzed monthly expense information relative to electric bills from the FASER report. The FASER report includes a listing of all energy bills by month and is used by FMD to make management decisions about which buildings to modify and retrofit with energy-efficient lights and HVAC equipment as well as monitor and control utility expenses. It also permits FMD management to identify which buildings are operating efficiently and those that are not.

We summarized and compared 636 monthly bills that had been recorded into the FASER system. We determined that only 4 months were missing or otherwise incomplete out of the 636 monthly bills. This represents an error rate of less than one percent.

We commend FMD on the good job they have done transferring expense amounts from the monthly bills to the FASER system with such accuracy and completeness.

Recommendation

No response necessary

Exhibit A

Audit of Return on Energy Conservation Efforts
Summary of Estimated Electricity Cost Savings – Sampled Buildings
Fiscal Year 1999 vs Fiscal Year 2001 and 2002

Description	FY2001 Savings	FY2002 Savings	ECMS	Amount Financed	Interest Expense 5%
County Government Center	$94,261	$128,222	$496,561	$403,685	20,184
Seven Corners Fire Station	2,807	3,450	7,282	NA	NA
Sherwood Regional Library	8,275	9,461	15,499	12,123	606
Woodlawn fire Station	2,083	1,694	12,182	10,691	535
North County Gov't Center	3,879	7,230	15,805	14,305	715
Reston Human Services	11,639	25,642	44,593	40,545	2,027
Pohick Regional Library	1,101	2,703	18,118	16,510	826
Criminal Justice Academy	15,730	19,405	89,690	80,721	4,036
Franconia Gov't Center	2,480	4,964	19,228	17,521	876
Total Amount	**$142,255**	**$201,771**	**$718,958**	**$596,101**	**29,805**

The Payback Period for ECM's in our sample is approximately 4 years

Exhibit B

Audit of Return on Energy Conservation Efforts
Summary of Electricity Cost Savings
Sampled Buildings with Additional Lighting Installed
Fiscal Year 1999 vs. Fiscal Year 2001 and 2002

Descriptions	FY 2001 SAVINGS	FY 2002 SAVINGS	ECMs
Mount Vernon Mental Health [1]	$ (1,843) [2]	$(4,360) [2]	$22,980
Herrity Building [1]	1,433	(2,642) [2]	227,873
Centreville Regional Library [1]	(8,862)	(7,631) [2]	22,609
Jefferson Fire Station [1]	(1,266)	(1,494) [2]	15,376
Total Amount	**$(10,538)**	**$(16,127)**	**$ 288,838**

[1] These building had work performed that required electricity and/or lighting that was in addition to the Energy Conservation Measures.

[2] Negative amounts indicate additional utility energy expenses resulting from the additional work.