

TASK 2

ENERGY & WATER AUDIT REPORT

Orlando VA Medical Center
Orlando, Florida



U.S. DEPARTMENT OF VETERANS AFFAIRS, VISN 8
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PREFACE

This Energy Assessment project was conducted by RetroCom Energy Strategies, Inc. under Task Order No. VA701-14-F-0148 and issued to RetroCom under our GSA Contract No. GS-21F-0214W. The work associated with this Task Order was awarded by the U.S. Department of Veterans Affairs (VA) pursuant to a competitive proposal process.

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Abbreviations/Acronyms

AC	Air conditioning
AH/AHU	Air handler / Air handling unit
BAS	Building automation system
BTU	British Thermal unit
CBECS	Commercial building energy consumption survey
CCF	Hundred cubic feet (measure of natural gas usage)
CFM	Cubic feet per minute
CFR	Current facility requirements
CHW	Chilled water
CHWS/CHWR	Chilled water supply / Chilled water return
CO ₂	Carbon dioxide
COV	Change of value
CV	Constant volume
CW	Condenser water
CWS/CWR	Condenser water supply / condenser water return
DA/DAT	Discharge air / Discharge air temperature
DDC	Direct digital control
DHW	Domestic hot water
DX	Direct expansion
EA/EAT	Exhaust air / Exhaust air temperature
EF	Exhaust fan
EUI	Energy utilization index
F	Fahrenheit
FCU	Fan coil unit
FY	Fiscal year
GHG	Green House Gas
GPM	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating, and air-conditioning
HV	Heating ventilating unit
HW	Hot water
HWS/HWR	Hot water supply / Hot water return
HX	Heat exchanger
kBtu	Thousands of British Thermal units
kW	Thousand watts
kWh	Thousand watt-hours
MA/MAT	Mixed air / Mixed air temperature
MAU	Makeup air unit
MW	Mega watt
OA/OSA	Outside air
OAT	Outside air temperature
PTAC	Packaged terminal air conditioner
RA/RAT	Return air / Return air temperature
RCx	Retro-Commissioning
RF	Return fan

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RH	Relative humidity
RTU	Rooftop (packaged HVAC) unit
SA/SAT	Supply air / Supply air temperature
SF	Supply fan
SP	Static pressure
SPD	Supply processing and distribution
Sq. Ft	Square Foot
TAB	Test, adjust and balance
Therms	Heat equal to 100,000 British Thermal units (BTU)
TU	Terminal unit
VAV	Variable air volume
VFD	Variable frequency drive

1.0 Executive Summary

The Department of Veterans Affairs (VA) contracted with RetroCom Energy Strategies Inc. (RetroCom) to conduct Energy, Water and Renewable Energy Assessments at 9 VA Medical Centers located in VISN 8 covering mainland Florida and Puerto Rico. This Task 2 – Energy & Water Audit Report covers Orlando VAMC in Orlando, Florida.

This audit report provides details and recommendations concerning Energy and Water efficiency measures, and Renewable Energy opportunities. These measures and opportunities are the result of a site audit conducted between November 10 and November 14, 2014.

Although relevant portions of the Task 1 - Energy Baseline and Benchmark Report for the Orlando VAMC are contained within this Site Audit Report, Baseline and Benchmarking information found in the Task 1 Report for this site should be reviewed to provide greater context for the recommendations found here.

This report provides recommendations for energy & water conservation measures, renewable energy applications, building envelope corrective measures, and maintenance & operations enhancements. Recommendations found in this report provide:

- Measure or enhancement description
- Cost of implementation
- Annual measure cost savings
- Annual measure consumption/demand savings
- Annual maintenance cost savings (where applicable)
- Simple payback duration
- GHG savings

The ECMs outlined in this report have been calculated using a variety of accepted energy efficiency calculation methodologies. This includes EQuest Modelling, Hand Calculations, standard Deemed Savings Calculations, Extrapolation Methodologies and Simple Prescriptive Measure comparative analysis.

A summary of the energy & water conservations measures (ECMs) discovered during the audit of this VAMC are summarized in Figure 1 below.

Figure 1 – Energy & Water Conservation Measure Summary

ECM #	ECM Description	Cost of Installation	kWh Saved	Therms Saved	Water Saved (1000 gal)	Utility Savings (\$)	GHG Savings (tons)	Simple Payback (yrs)
IL-ECM # 1	Hallway Lighting Retrofits in the CLC	\$4,428	22,573	61.55	-	\$1,967	13.03	2.3
IL-ECM # 2	Lighting Retrofits- Kitchen & Canteen	\$5,072	22,573	86.53	-	\$1,993	13.16	2.5
IL-ECM # 3	Lighting Retrofits- Hallways of the Main Hospital	\$12,560	45,877	208	-	\$4,084	26.92	3.1
IL- ECM # 4	Blinky System in the Stairwells	\$7,100	17,798	-	-	\$1,502	10.01	4.7
EL-ECM # 1	Metal Halide Shoebox Retrofits	\$39,200	61,152	-	-	\$5,161	34.39	7.6
EL-ECM # 2	Ornamental Metal Halide Fixture Retrofits	\$25,790	39,356	-	-	\$3,321	22.13	7.8
HVAC-ECM # 1	Supply Air Temperature Reset	\$5,000	226,666	87,300	-	\$107,740	598.87	0.05
HVAC-ECM # 2	Chilled Water Reset	\$5,000	190,000	-	-	\$16,036	106.84	0.3
HVAC-ECM # 3	Unoccupied Temperature Setbacks in the Domiciliary	\$25,000	140,460	50,000	-	\$62,604	348.98	0.4
HVAC- ECM # 4	AHU 10 & 11 Setbacks For Main Hospital 3rd & 4th Floor	\$5,000	30,000	6,700	-	\$9,332	53.05	0.5
HVAC-ECM # 5	Condenser Water Reset	\$5,000	66,666	-	-	\$5,626	37.49	0.9
HVAC-ECM # 6	Setback Areas B & C of the CLC	\$5,000	11,900	4,055	-	\$5,120	28.59	0.98

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ECM #	ECM Description	Cost of Installation	kWh Saved	Therms Saved	Water Saved (1000 gal)	Utility Savings (\$)	GHG Savings (tons)	Simple Payback (yrs)
HVAC-ECM # 7	Cooling Tower Fan Optimization	\$5,000	60,000	-	-	\$5,064	33.74	1.0
HVAC-ECM # 8	AHU Economizer Repair	\$36,480	210,000	(400.00)	-	\$17,318	115.92	2.1
HVAC-ECM # 9	Electronically Commutated Motors in Walk-in Coolers	\$1,920	7,744	-	-	\$653	4.35	2.9
HVAC-ECM # 10	Conduct and Implement Retro-Commissioning	\$393,802	1,150,000	29,500	-	\$127,002	805.95	3.1
HVAC-ECM # 11	Insulate Boilers	\$4,926		1,477		\$1,499	7.98	3.3
HVAC-ECM # 12	Automate Exhaust Fans	\$25,000	72,197	-	-	\$6,093	40.60	4.1
HVAC-ECM # 13	Replace Air Handling Units on M-Deck & Bldg 503	\$1,920,000	480,000	65,200		\$106,690	621.98	18.0
HVAC-ECM # 14	Waterside Economizer for Tower "Free-Cooling"	\$70,600	43,333	-	-	\$3,657	24.37	19.3
OE-ECM # 1	Generator Block Heater Heat Pumps	\$19,434	93,440	-	-	\$7,886	52.54	2.5
OE-ECM # 2	Solar Powered Trash Compactors	\$33,000	-	-	-	\$7,238	-	4.6
OE-ECM # 3	Install Solar on Roof of CLC and Domiciliary	\$1,240,000	663,712	-	-	\$56,017	373.21	22.1

In some cases, the above listed energy conservation measures are inter-dependent and as such they cannot be considered additive. For example, if a Retro-Commissioning investigation and implementation took place as recommended, then it would be typical that Chilled Water and Supply Air Reset would be included in that effort. Adding those ECMs together would misrepresent the total energy saving available from these recommendations.

Energy savings in general are also contingent on the amount of time between ECM discovery (this report date) and ECM implementation. For example, the energy or water savings calculated against the site's current utility rates will improve if the cost of energy increases, or degrade if the cost of energy decreases. These conditions are equally true when considering the cost of implementation. Increases or decreases in labor or material costs associated with an ECM will naturally impact the cost of implementation, simple payback and return on investment.

Maintenance & Operations Enhancements

In general, the energy consuming systems at Orlando VAMC are reasonably well cared for. Many of the older Air Handling Units have been replaced with systems that are considerably more energy efficient than the systems they have replaced. Although most Air Handling Units are old and reaching the end of their useful life, maintenance staff have done a good job keeping them in working order.

The age of the equipment is not entirely responsible for a lack of control of energy consuming components associated with air distribution. Very few variable frequency drives appear to be operating per their design, leading to questions regarding the status of downstream ductwork. Poor ductwork renovation in the past has led to challenges when spaces are remodeled. For instance, repurposing of a space to convert it to an infusion lab has caused the need for 3 DX units to be installed in the ceiling of this area in order to meet load. Economizer linkage has been disconnected in many Air Handling Units and outside air dampers have been locked into position.

As is normal for almost all of the buildings we evaluate, knowledge and expertise relative to HVAC control system operation is not optimal amongst the maintenance staff. Given that advanced control of typical HVAC systems is critical to energy efficiency in general, investments in training in this area will pay long-term dividends. This can be easily accomplished by altering the tasks within an existing control system service contract to allow for one-on-one training with site staff responsible for the system. By educating the maintenance staff as to the energy implications related to the control of equipment on the Building Automation System, further emphasis may be placed on the importance of maintaining control components at the site.

Per facility staff, steam traps are internally audited on an annual basis and repairs and replacements are made as needed. Few steam leaks were witnessed during RetroCom's audit of this site. However because of the tremendous impact that steam leaks and failures can have on energy use, more effort should be focused on maintaining steam traps.

Renewable Energy Applications

There is currently no solar photovoltaic installation on site or any other source of renewable energy. This study recommends installing solar on the Domiciliary and Community Living Center buildings.

Building Envelope Corrective Measures

Building envelope efficiency opportunities have consistently long simple paybacks and as such should be considered at a time when structural or other types of major renovations are already in the planning phase.

Orlando VAMC campus contains buildings that date back to the 1940's though the main hospital was built in 1981. Many areas have been repurposed to accommodate current occupancies and uses. Orlando VAMC is currently replacing most of the existing windows with more efficient models that meet Florida's Hurricane preparedness standards. No excessive heat losses or gains were noted in the building envelopes. It should be noted that temperatures were unseasonably mild during this site assessment.

Previous Energy Assessments

At least two previous Energy Assessments and one Retro-Commissioning (RCx) Investigation have been conducted at this campus since 2009. Each Energy Assessment, one by Teng & Associates and the other conducted by Alares LLC, have provided common energy and water efficiency recommendations and ECM selections.

According to the Orlando VAMC General Engineer and assistant Energy Manager, Hector Vargas, none of the recommendations contained in the most recent Energy Assessment from 2012 have been implemented. It is understood that this site's future has been questionable and as such funding for implementation was at least temporarily unavailable.

This is not to say that a significant amount of energy efficiency work has not taken place at this site. There is ample evidence of that across the campus. Lighting systems have been upgraded to T8 lamp and ballast combinations; HVAC systems, particularly AHUs, have received considerable attention. Simply, the measures suggested in the last Energy Assessment have yet to be funded.

In terms of the Retro-Commissioning Investigation that was conducted by Alares LLC during 2012, we were not provided with copies of that report so we are unable to comment on the specific findings of that investigation. Regardless, our assessment of the operating characteristics of Air Handling Units, the condition of the steam system, terminal HVAC units, pumping systems, central plant equipment (chillers, cooling towers & boilers) and in particular the strategies used to control the operation of this equipment, indicates that the Orlando VAMC is a good candidate for implementation of common RCx Investigation findings. ***We strongly recommend that RCx findings implementation be the primary and first strategy for reducing energy costs and improving indoor environmental quality at this site.***

General Comments & Observations

- Since the Orlando VAMC is a building type that is not contained in the Energy Star database, it is not eligible for an actual score. However, Energy Star analysis of the site did generate a site EUI of 177.5 kbtu/sqft and a Source EUI of 395.4 kbtu/sqft. This analysis used data from the most recent three year period, FY2012 to FY2014. The previous Energy Star report, generated in 2013 by the VAMC, produced a site EUI of 140 kbtu/sqft. The current EUI of 177.5 kbtu/sqft represents an increase of 21 percent over the 2013 EUI
- An overall lack of control exists at most of the Air Handling Units. Economizers are incorrectly sequenced, or locked out, and VFD control logic is inappropriate for the application. Simply addressing these issues would provide significant improvement in energy efficiency and occupant comfort conditions.
- Control components on Air Handling Units need to be repaired or replaced. Actuator linkage is broken or missing in many units, dampers are locked into position, and sensors are out of calibration. Variable frequency drives are turned off, placed in hand, or not fluctuating in frequency to control fan speeds based on demand.
- Major energy consuming systems and equipment like chillers, pumps and air-handling units are not well controlled or simply run 24/7. This challenge includes a combination of improper scheduling, inefficient sequences of operation and a lack of operator training. Optimizing control of large energy consuming systems will provide improvement in efficiency and reductions in energy consumption and demand. Implementation of Retro-Commissioning recommendations would provide huge improvements in this area.
- Given the number of ECMs available to the site as a result of this and past energy assessments and RCx investigations, and with sufficient access to ECM implementation funding, the Orlando VAMC should have little difficulty meeting the requirements of Federal Mandates regarding energy & GHG reduction and water conservation.
- It is important to note that the Orlando VAMC has been a state of uncertainty concerning the future use of the facility. This is due to the construction of a replacement facility nearby and a lack of a clear mandate on whether this site would continue to operate once the new facility was operational.

2.0 Facility Characteristics

The future use of the Orlando VAMC is currently in a state of uncertainty. A new full-service hospital is being built at Lake Nona, Florida and the ongoing use of this existing facility is not yet known. While there are expectations that it will continue to function, a final decree, according to site staff, has not been received. Because of this, RetroCom has approached the investigation of this site as if it was going to continue to function. Outpatient services continue to be provided in the main building and the Community Living Center has been converted to offices.

Figure 2 – Orlando VAMC Site Plan



According to the VA CAI inventory of buildings, the Orlando campus encompasses 653,214 square feet. This does not include the square footage associated with the new Lake Nona VA Medical Center. Benchmarking and Baseline information for this facility was based on the Orlando campus square footage and energy costs alone.

Operating Hours

With the exception of purely administrative areas within the Main Hospital and most of the support buildings scattered around the campus that serve out-patient and other needs, this site operates 24 hours a day, 7 days a week. Calculations for ECMs are based on the estimated operating hours for individual equipment, systems and spaces. These vary according to building use.

Central Energy Plant

The Orlando VAMC Central Energy Plant (CEP) provides chilled water for cooling from 3-350 ton and 1-450 ton centrifugal chillers. Chilled water for space cooling is delivered at 42 degrees and is circulated by four-variable speed primary pumps and four-variable speed secondary pumps. Three cooling towers provide heat rejection to the water cooled chillers, each with variable speed fans. Steam for heating, zone re-heat, domestic water and sterilization, is produced by 2 older – 800 lb/hr steam boilers.

HVAC Systems

Building-occupied spaces on this site are provided with HVAC services from a variety of system types and configurations. Most of the stand-alone buildings are served by steam, converted to hot water at the building, and chilled water, from the Central Energy Plant. Larger or standalone packaged DX systems, air-cooled condensers and a few small split systems exist to serve buildings that are not connected to Central Plant services. The Main Hospital building is served by the Central Plant with DX units serving some supplementary cooling.

Many of the older Air Handling Units are maintained for functionality, but do not operate well from an energy perspective. Most Air Handling Unit fans have VFDs, and in some cases economizers exist, but components are broken or they are not operating in an efficient manner. For the most part, the VFDs on these units are used as soft start controllers rather than controlling fan speeds. During our site investigation many of the VFDs we inspected were running near 100 percent capacity. This generally means that fan speeds are constant. This defeats the purpose of having VFDs controlling fan speeds based on demand and actually increases energy use because of the inherent inefficiencies of VFDs. Other issues with VFDs are that many are either turned off or locked in at a given value.

Steam trap failures, steam losses and the resulting condensate return at Orlando VAMC is potentially significant. A steam trap maintenance program is currently in place, but should be improved upon. Facility maintenance personnel manually inspect steam traps annually, but the infrequency of the inspection leads to many leaks going unnoticed for a significant period of time. This contributes to condensate losses, the need for additional make-up water and increased water treatment costs.

HVAC Control Systems

Orlando VAMC operations and maintenance personnel are making progress in understanding how equipment is operating, and they have a control system in place that will help them to improve equipment efficiency across the campus. However, an analysis of demand data for

the winter and summer seasons, indicates that improvement in scheduling and operational sequences has yet to take place.

As seen in Figure 6 of the Task 1- Baseline and Benchmark report for Orlando, electrical demand generally follows a bell curve one would expect throughout the day. However, a large base load persists even during unoccupied periods; leading to the conclusion that equipment is operating more than is required.

While some areas are occupied 24/7, these areas can be setback when occupancy is at a minimum. Overcooling, simultaneous heating and cooling, constant chilled water supply temperature, and faulty re-heat valves in VAV boxes were observed. These conditions also contribute to a higher than necessary base load.

Demand curves are created by plotting the 15-minute demand data available from the utility's electrical meter. The utility uses this information to bill the Kilowatt, or Load portion of the electrical bill. Tracking this information tells the utility how much electricity will be needed to meet the worst case scenario at the site. The customer pays for this portion of their bill by setting demand peaks through a given billing period.

Peak demand reduction can be achieved by improving the schedules and the control associated with large energy consuming systems. This will normally include chillers, large pumps, large fans motors in AHUs, and cooling towers. By controlling peak demand more diligently, through optimized control strategies, Orlando VAMC will see a reduction in electrical demand and subsequently, related costs.

Lighting

Lighting systems at the Orlando VAMC have been upgraded to efficient T-8 lamp and ballast combinations. With the exception of mechanical rooms and a few specialty areas, this is consistent across the campus. During our site visit we were unable to identify any areas in the building that contained older generation, T-12 lamp and ballast combinations.

Overall, our general impression of interior lighting was that the Main buildings were appropriately lit in hallways, offices and clinical spaces. Lighting level measurements did reveal a few areas where de-lamping would be appropriate, but these areas are not abundant enough for us to recommend a wholesale de-lamping program. Rather we are recommending that the site begin to replace T-8 lamps with LED lamps as T-8 lamp failures occur. New generation LED lamps can replace existing T-8 lamps without the need to retrofit the fixture or replace the ballast. This is a simple one for one change out that could be accomplished economically by existing maintenance staff over time.

In terms of lighting control, there are many areas across the site where the application of Occupancy Sensors would be valuable. Conference and meeting rooms, locker rooms and storage rooms would all benefit from the application of this type of control.

The exterior lighting has generally not been upgraded to current technologies. There are three types of outside lights, which include ornamental pole lamps in some areas of the parking lots,

different style ornamental lights along Raymond Street and standard shoe box style pole lamps.

In terms of exterior lighting schedules, we did not witness any areas on the campus where fixtures were operating during daylight hours.

Water/Wastewater

Domestic water systems at Orlando, like toilets and sink faucets, were evaluated for conservations opportunities. Toilets were, with very few exceptions, manual flush models rated at 1.6 gallons per flush. Although toilet fixtures are available with lower flush rates, the difference in consumption is not significant between the two models and the costs of replacement are generally prohibitive.

Faucets across the campus have not been converted to automatic flow and because of uncertainty about future use of the facility we do not recommend any conversions, at this time.

An evaluation of the rate structure and billing practices associated with water and wastewater was conducted. This evaluation revealed that the site has two 2.5-inch and two 8-inch meters. One of the 8-inch meters is dedicated to fire flow, but the purpose of the second 8 inch meter is unknown. We suggest that the facilities staff investigate this second 8-inch pipe and determine its usefulness.

Renewable Energy

Currently, the Orlando VAMC has no solar photovoltaic or other renewable energy systems installed on the campus. RetroCom has recommended that the VAMC consider installing solar photovoltaic panels on the roof at the Domiciliary and the old CLC buildings. The size of this possible array will not however, meet the requirements for VAMCs to provide at least 30% of their power from renewable or clean resources.

Building Envelope

Building envelope systems across the campus differ according to the year of construction. Older buildings have been constructed of materials that have naturally greater mass and as such outside air temperatures are considerably slower to impact conditions in the occupied spaces.

Windows in the Main Hospital and in many areas around the campus are currently being replaced in order to meet Florida's Hurricane risk management policies. Thermal scans of many those glazing and door surfaces reveal little to no significant leakage or heat transfer. Certainly additional insulation would improve the R-value of any building on this campus, but the cost of doing so would not provide a reasonable return on investment. Rather, we recommend that improvement in building envelope insulation take place when renovations to spaces occur. The additional costs of doing so would be much reduced by approaching these sorts of improvements in this manner.

Maintenance & Operation Improvements

Equipment found in the CEP is in good condition and it is well maintained. Many Air Handling Units are at the end of their useful life and much attention should be made regarding their control logic and the functionality of controlled components. Further investigation should be conducted during a Retro-Commissioning investigation regarding functionality of terminal devices because simultaneous heating and cooling was witnessed in neighboring VAV boxes in many areas in the main hospital building. Furthermore, patchwork ducting has created a nightmare for VAV systems operation. **Developing Air Handling Unit zone maps to show what units distribute air to each area will allow for temperature setbacks in non-critical zones.**

As mentioned earlier, steam distribution systems are in need of maintenance attention. Condensate loss appears to be low, but steam traps are unreliable and actual makeup water has not been consistently documented. Significant manpower is required for a thorough survey of steam traps, and continuous monitoring will ensure minimal steam loss.

Training in control systems operations would be valuable for site maintenance and operations staff. As mentioned earlier, this can be accomplished under an existing control system maintenance contract. Specialized training available from the Association of Energy Engineers would also be helpful. Either of these improvements would reap long-term energy efficiency benefits.

3.0 Utility Analysis & Measure Calculations

The Energy Assessment for the Orlando VAMC was conducted in accordance with the Statement of Work (SOW) provided at the time of proposal submission. Preliminary work after receiving the Notice to Proceed included requests for information concerning site utility costs, previous reports and assessments, and other site information required to commence the project. A site visit was conducted to gather detailed information about site utility infrastructure and utility history, to inspect the condition and operating characteristics of building systems and equipment, and to discuss past audit measures implementation and priorities with the site Energy Manager, Hector Vargas. Facility maintenance personnel were extremely helpful in assisting us to understand the unique characteristics of this campus.

The site investigation for this project was conducted according to industry standard procedures for evaluating opportunities for Energy and Water conservation measures, building envelope conditions, renewable energy applications and maintenance and operations procedures.

RetroCom conducted a visual inspection of the condition and operating characteristics of major energy consuming equipment, collected information concerning the control of that equipment, requested trending information concerning equipment operation, reviewed existing lighting conditions, existing water & wastewater systems, existing building envelope conditions, and evaluated renewable energy applications.

After first conducting a preliminary walk through with the facilities staff in order to familiarize ourselves with site conditions and layout, the RetroCom team conducted a more detailed evaluation of energy and water consuming systems at the Orlando VAMC. Major energy consuming systems were assessed for their present operating schedules and sequences of operation. Maintenance staff were interviewed and queried regarding methods used to operate and maintain equipment contained in the CEP and in building mechanical spaces. Information was gathered to determine the scope of existing outside vendor services contracts. In conjunction with the CEP evaluation, trending information that would confirm the current operating schedules and sequences of operation of major systems was requested and provided.

Water and Wastewater systems were inventoried and their operation was evaluated for efficiency. Interior and exterior lighting systems were inspected for potential retrofit or de-lamping opportunities. Selected infrared photographs and temperatures were recorded to assess the general condition of building envelope systems. A review of the existing Solar PV system was conducted and opportunities for additional renewable energy system application were conducted.

In addition to the above, RetroCom completed a review of the previous Energy Assessment report for this site. This report was discussed with the site Energy Manager in an effort to understand what measures previously recommended had actually been completed. At this time, none of the measures from that report have been acted upon.

A variety of Energy & Water Conservation opportunities were discovered as a result of the information collected during the site investigation phase of this project. Calculations used to

arrive at conservative ECM implementation costs, energy cost savings and consumption savings were arrived at using industry standard methodologies. This includes modeling using EQuest software, common hand calculations using weather normalization, and extrapolations based on known conditions. For lighting systems, where retrofits are easily predictable, prescriptive measure calculations were used to arrive at conservative implementation costs and deemed energy savings.

The costs of implementation, for individual ECMs, were arrived at using “RS Means” data and/or historical costs sourced from RetroCom’s database of previous projects. In general, implementation costs were arrived at using outside contractor costs and not internal labor. The use of internal labor to complete this work would naturally reduce the overall implementation cost for any ECM.

Energy savings calculations for this report were based on the blended costs for electricity and natural gas as shown in Figure 3 below.

Figure 3 – Energy and Water/Sewer Rates

Electricity (\$/kWh)
\$ 0.0844
Natural Gas (\$/Therm)
\$ 1.015
Water & Sewer (\$/Kilo Gallon)
\$14.40

Blended costs shown above contain all charges associated with a given utility costs. For example, Electricity Costs are arrived at by adding consumption costs (kWh), demand costs (KW) and additional costs like taxes, transportation fees, base meter charges, etc.

It is important to note that funding for the implementation of ECMs by the VA is always dependent upon available and often limited funding. Therefore, we recommend that if long delays occur between the date of this report and actual implementation, that the individual projects contained in this report be re-evaluated from both a cost and savings perspective at that time. Energy, material and labor costs can fluctuate over time and these conditions may change the economics of any given measure.

4.0 Energy Conservation Measures

Energy Conservation Measures listed in this section provide a summary of discovered opportunities that directly impact electrical and/or natural consumption and cost. These include lighting, HVAC, building system controls and other measures.

Individual Energy Conservation Measure identification is segregated by measure type and ranked within each category by simple payback, using the following descriptors:

- Interior Lighting Measures – IL-ECM #
- Exterior Lighting Measures – EL-ECM #
- HVAC System Measures – HVAC-ECM #

Other Energy Measures – OE-ECM

Interior Lighting Measures

The Figure below provides guidance on lighting levels for differing areas within a VA facility. Lighting retrofit ECMs contained in this section meet or exceed these guidelines.

Figure 4 – VA Recommended Lighting Levels

Appendix A: Illumination Levels	
Area Description	Lighting Levels (fc)
ACTIVITIES ROOM AND DINING SPACE	50
ASSEMBLY	30
BATHROOM	20 (Note: b)
BOILER ROOM	20; Burner Platforms 30
CONSULTATION	50
CORRIDORS SURGICAL SUITE	50
FOOD SERVICE: DINING ROOM/AREA/SPACE	30
FOOD PROCESS AND PREPARATION	50
LABORATORIES; GENERAL	50
OFFICES; GENERAL	50
PATIENT ROOMS (VARIES)	10FC - 50FC
PHARMACY (VARIES)	70FC - 100FC
RECEPTION AND WAITING	20
SURGICAL SUITE: OPERATING ROOMS	300FC - 1000FC
TOILETS	30
WAITING ROOMS	30

INTERIOR LIGHTING***IL-ECM #1- Hallway Lighting Retrofits in the CLC***

Issue: A combination of 2 foot U-tube and 4 foot linear fluorescent fixtures are used as area lighting in the Hallways of the CLC.

Recommendation: Tubular LEDs offer the same light output at less than 50% of the energy use. As compared to the 20,000 hour life of fluorescent lamps, LEDs last upwards and exceeding 60,000 hours. Most current tubular LEDs can be driven by electronic ballasts currently used in the Hallway fixtures of the CLC. Replace the U-tube fluorescent fixtures with 2- 8.5 watt, 2 foot LEDs. Replace the 4 foot linear fluorescent fixtures with 17 watt, 4 foot LEDs.

Estimated Installation Costs: \$4,428

Annual Energy Savings: 22,573 kWh; 61.55 Therms

Annual Energy Cost Savings: \$1,967

Annual Greenhouse Gas Savings: 13.03 Tons

Simple Payback: 2.3 years

Method of Calculation: Yearly energy and cost analysis

Figure 5 – Lighting in Entry to CLC



IL-ECM #2- Lighting Retrofits- Kitchen & Canteen

Issue: A combination of 2 foot U-tube and 4 foot linear fluorescent fixtures are used as area lighting in the Canteen and Kitchen.

Recommendation: Tubular LEDs offer the same light output at less than 50% of the energy use. As compared to the 20,000 hour life of fluorescent lamps, LEDs last upwards and exceeding 60,000 hours. Most current tubular LEDs can be driven by electronic ballasts currently used in the Hallway fixtures of the CLC. Replace the U-tube fluorescent fixtures with 2- 8.5 watt, 2 foot LEDs. Replace the 4 foot linear fluorescent fixtures with 17 watt, 4 foot LEDs.

Estimated Installation Costs: \$5,075

Annual Energy Savings: 22,570 kWh; 86.53 Therms

Annual Energy Cost Savings: \$1,990

Annual Greenhouse Gas Savings: 13.16 Tons

Simple Payback: 2.5 years

Method of Calculation: Yearly energy and cost analysis

Figure 6 – U-Tube Fixture in the Canteen



IL-ECM #3- Lighting Retrofits- Hallways of the Main Hospital

Issue: A combination of 2 foot U-tube and 4 foot linear fluorescent fixtures are used as area lighting in the Hallways of the Main Building.

Recommendation: Tubular LEDs offer the same light output at less than 50% of the energy use. As compared to the 20,000 hour life of fluorescent lamps, LEDs last upwards and exceeding 60,000 hours. Most current tubular LEDs can be driven by electronic ballasts currently used in the Hallway fixtures of the CLC. Replace the U-tube fluorescent fixtures with 2- 8.5 watt, 2 foot LEDs. Replace the 4 foot linear fluorescent fixtures with 17 watt, 4 foot LEDs.

Estimated Installation Costs: \$12,560

Annual Energy Savings: 45,877 kWh; 209 Therms

Annual Energy Cost Savings: \$4,084

Annual Greenhouse Gas Savings: 26.9 Tons

Simple Payback: 3.1 years

Method of Calculation: Yearly energy and cost analysis

Figure 7 – Hallway Lighting in Main Hospital



IL-ECM #4- Blinky System in the Stairwells

Issue: Lighting in stairwells throughout the campus is operated 24 hours a day, 7 days a week. These lights operate even when the facility or stairwell is unoccupied. All stairwells were evaluated to determine counts and fixture types.

Recommendation: Install “Blinky’s” in stairwell lighting fixtures. Blinky’s mount to existing fluorescent fixtures and run at a reduced light level and reduced wattage when the stairwell is unoccupied. An occupancy sensor detects motion and commands the existing fluorescent fixtures ON when occupancy is detected. This ensures that stairwell lighting is available when the stairwell is occupied.

Estimated Installation Costs: \$7,100

Annual Energy Savings: 17,800 kWh

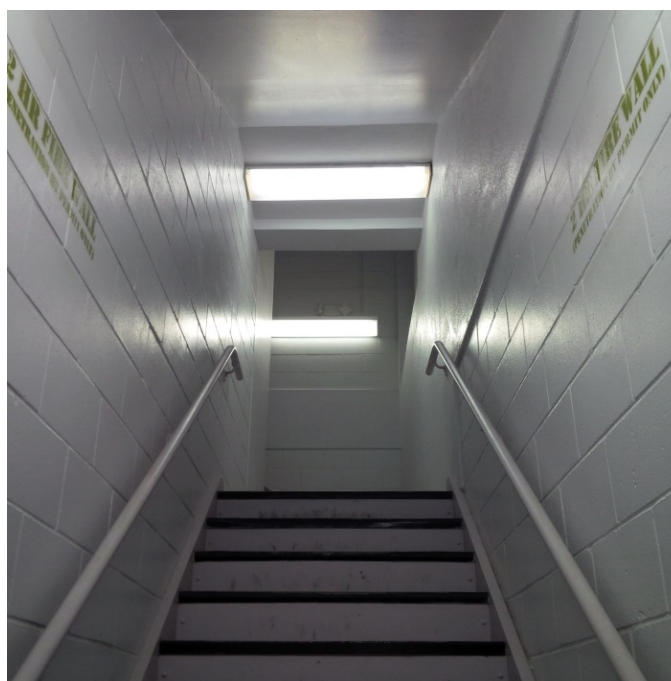
Annual Energy Cost Savings: \$1,500

Annual Greenhouse Gas Savings: 10.01 Tons

Simple Payback: 4.7 years

Method of Calculation: Yearly energy and cost analysis

Figure 8 – Stairwell Lighting

**EXTERIOR LIGHTING**

EL-ECM #1- Metal Halide Shoebox Retrofits

Issue: A combination of 175 watt and 250 watt Metal Halide fixtures are used for exterior area lighting in parking lots and roadways around the campus.

Recommendation: Convert exterior lighting to LED type fixtures. LED retrofit kits mount in an existing fixture making installation simple and keeping the aesthetic of the building. LED retrofit kits consume 75% less energy while lasting on average four times as long as Metal Halide lamps. Replace the 175 watt metal halides with 40 watt LED retrofit kits. Replace the 250 watt Metal Halides with 60 watt LED retrofit kits.

Estimated Installation Costs: \$39,200

Annual Energy Savings: 61,150 kWh

Annual Energy Cost Savings: \$5,160

Annual Greenhouse Gas Savings: 34.39 Tons

Simple Payback: 7.6 years

Method of Calculation: Yearly energy and cost analysis

Figure 9 – Metal Halide Shoebox

***EL-ECM #2- Ornamental Metal Halide Fixture Retrofits***

Issue: A combination of 175 watt and 250 watt Metal Halide ornamental fixtures are used for exterior area lighting.

Recommendation: Convert exterior lighting to LED type fixtures. LED retrofit kits mount in an existing fixture making installation simple and keeping the aesthetic of the building. LED retrofit kits consume 75% less energy while lasting on average four times as long as Metal Halide lamps. Replace the 175 watt metal halides with 40 watt LED retrofit kits. Replace the 250 watt Metal Halides with 60 watt LED retrofit kits.

Estimated Installation Costs: \$25,790

Annual Energy Savings: 39,356 kWh

Annual Energy Cost Savings: \$3,322

Annual Greenhouse Gas Savings: 22.13 Tons

Simple Payback: 8.9 years

Method of Calculation: Yearly energy and cost analysis

Figure 10 – Ornamental Pole Lamp on Raymond Street



HVAC SYSTEMS

HVAC -ECM #1- Supply Air Temperature Reset

Issue: Cooling air is supplied to the VAV boxes in the occupied spaces at a constant temperature of 55°F. This results in a higher load on the chillers and additional gas use for reheating purposes at the VAV boxes.

Recommendation: Reset the supply air temperature based on the outside air temperature. At 60° outside air temperature set the cooling air supply temperature to 60° and at 80° outside air temperature set the cooling air supply temperature to 55°.

Estimated Installation Costs: \$5,000

Annual Energy Savings: 226,667 kWh; 87,300 Therms

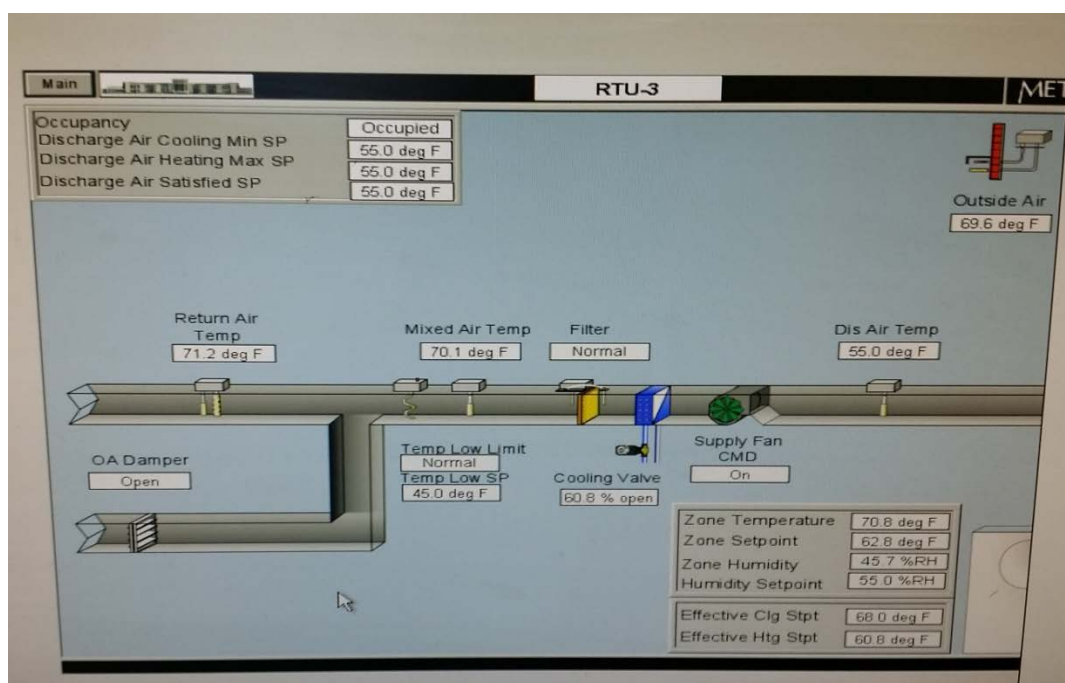
Annual Energy Cost Savings: \$107,740

Annual Greenhouse Gas Savings: 598.87 Tons

Simple Payback: 0.05 years

Method of Calculation: Yearly energy simulation

Figure 11 – Screenshot of Constant Supply Air Temperature Setpoint



HVAC -ECM #2- Chilled Water Reset

Issue: The chiller plant supplies chilled water at a constant temperature of 42°F and chillers are cycled on or off based on the chilled water supply temperature.

Recommendation: Reset the chilled water temperature based on the chiller load. At low load, set the chilled water temperature to 52 degrees and at high load, set the chilled water temperature to 42 degrees

Estimated Installation Costs: \$5,000

Annual Energy Savings: 190,000 kWh

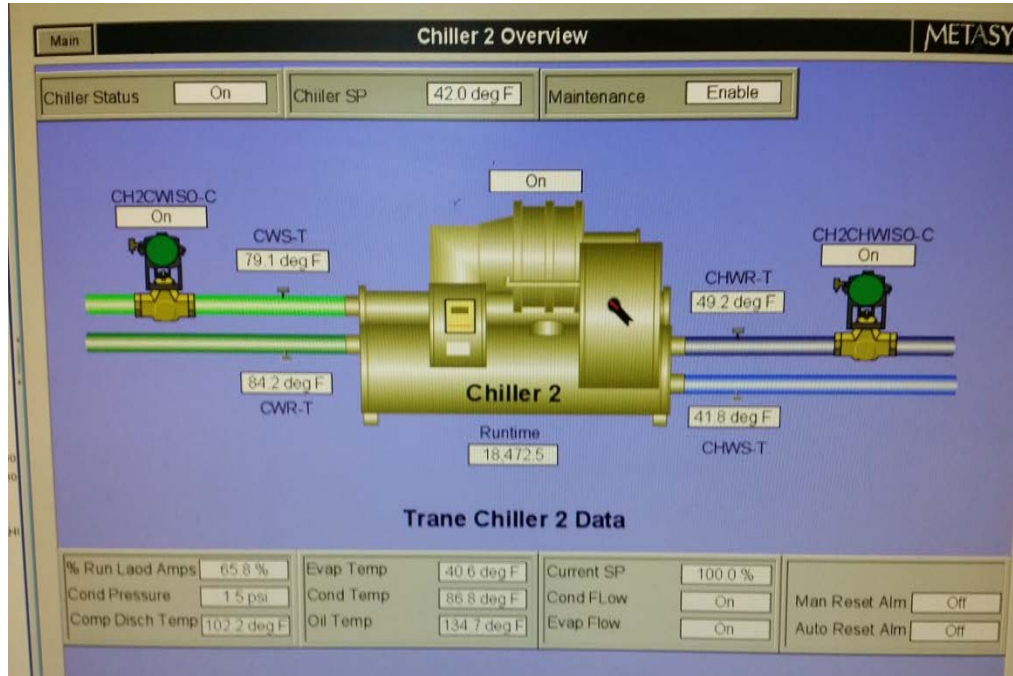
Annual Energy Cost Savings: \$16,000

Annual Greenhouse Gas Savings: 106.84 Tons

Simple Payback: 0.3 years

Method of Calculation: Yearly energy simulation

Figure 12 – Screenshot of Constant Chilled Water Temperature Setpoint



HVAC -ECM #3- Unoccupied Temperature Setbacks in the Domiciliary

Issue: The domiciliary is currently being converted to office spaces and will no longer be occupied 24x7. The current system maintains a space temperature of between 70 and 74 degrees 24 hours per day.

Recommendation: Update the current facility requirements per the VA Design Guidebook to maintain a proper space temperature for the new application for this space. During unoccupied periods, program the air handling units to maintain a higher (for cooling) or lower (for heating) space temperature set point.

Estimated Installation Costs: \$25,000

Annual Energy Savings: 140,450 kWh; 50,000 Therms

Annual Energy Cost Savings: \$62,600

Annual Greenhouse Gas Savings: 348.98 Tons

Simple Payback: 0.4 years

Method of Calculation: Yearly energy simulation

HVAC -ECM #4- AHU 10 & 11 Setbacks For Main Hospital 3rd & 4th Floor

Issue: The third and fourth floor of the hospital does not operate 24x7 nor does it contain critical zones requiring round the clock operation yet the space is maintained at a constant 72 degrees.

Recommendation: Schedule the air handling units to setback the space temperature setpoint when the space is not occupied.

Estimated Installation Costs: \$5,000

Annual Energy Savings: 30,000 kWh; 6,700 Therms

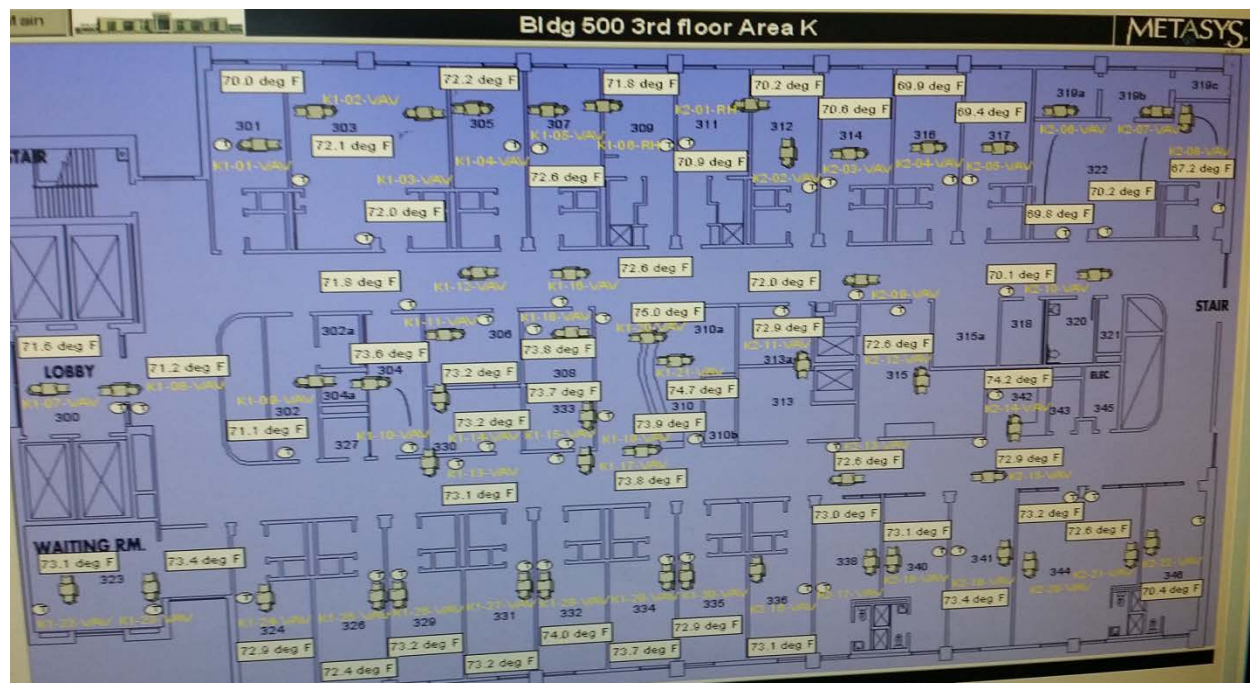
Annual Energy Cost Savings: \$9,332.5

Annual Greenhouse Gas Savings: 53.05 Tons

Simple Payback: 0.5 years

Method of Calculation: Yearly energy simulation

Figure 13 – Screenshot of Areas Served by AHU 10



HVAC -ECM #5- Condenser Water Reset

Issue: The cooling towers provide condenser water at a constant temperature of 73 degrees.

Recommendation: Reset the condenser water temperature based on outside air temperature. At an outside air temperature of 50 degrees set the condenser water temperature to 75 degrees, and at 90 degrees ODA, set the water temperature to 70 degrees.

Estimated Installation Costs: \$5,000

Annual Energy Savings: 66,600 kWh

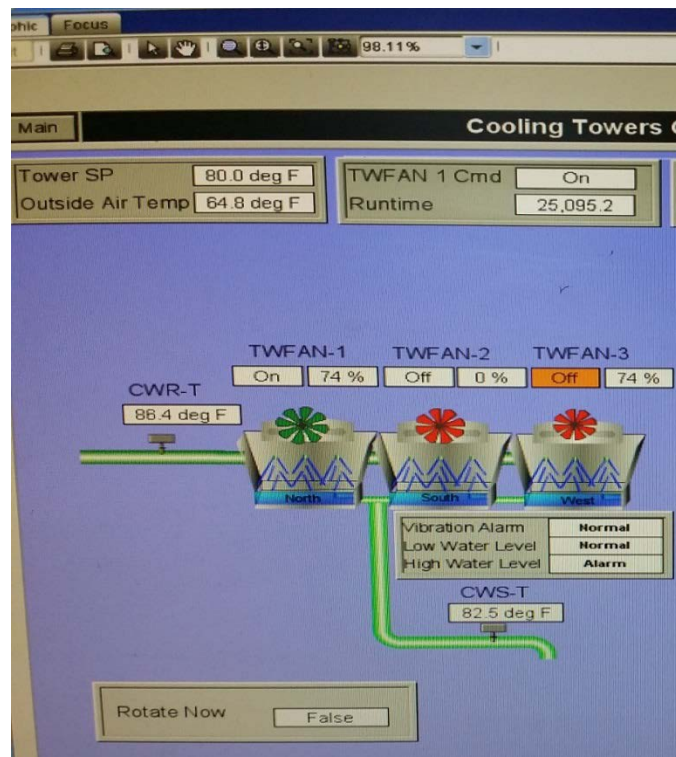
Annual Energy Cost Savings: \$5,620

Annual Greenhouse Gas Savings: 37.49 Tons

Simple Payback: 0.9 years

Method of Calculation: Yearly energy simulation

Figure 14 – Screenshot of Constant Chilled Water Temperature Setpoint



HVAC -ECM #6- Setback Areas B & C of the CLC

Issue: Areas B & C of the CLC are used as office space and are not occupied 24x7. The current system maintains a space temperature of between 70 and 74 degrees around the clock.

Recommendation: Update the current facility requirements per the VA Design Guidebook to maintain a proper space temperature for the new use type in this area. During unoccupied periods, program the air handling units to maintain a higher (for cooling) or lower (for heating) space temperature setpoint.

Estimated Installation Costs: \$5,000

Annual Energy Savings: 11,900 kWh; 4,055 therms

Annual Energy Cost Savings: \$5,120

Annual Greenhouse Gas Savings: 28.59 Tons

Simple Payback: 1.0 years

Method of Calculation: Yearly energy simulation

HVAC -ECM #7- Cooling Tower Fan Optimization

Issue: Currently the cooling towers are loaded sequentially. When the first cooling tower is loaded to 100%, the second cooling tower is started. When the second cooling tower is fully loaded, the third tower is commanded on. This sequence of operation results in higher than necessary fan energy use.

Recommendation: When the first tower is loaded more than 50%, start the second tower and use the VFD to maintain the same speed for both the towers. When both the towers are loaded more than 50%, start the third tower and maintain the same speed for all the three tower fans. Keep loading the towers in parallel and use the maximum number of towers at the same time. Two cooling towers running at 50% speed uses 25% less energy compared to one tower running at full speed.

Estimated Installation Costs: \$5,000

Annual Energy Savings: 60,000 kWh

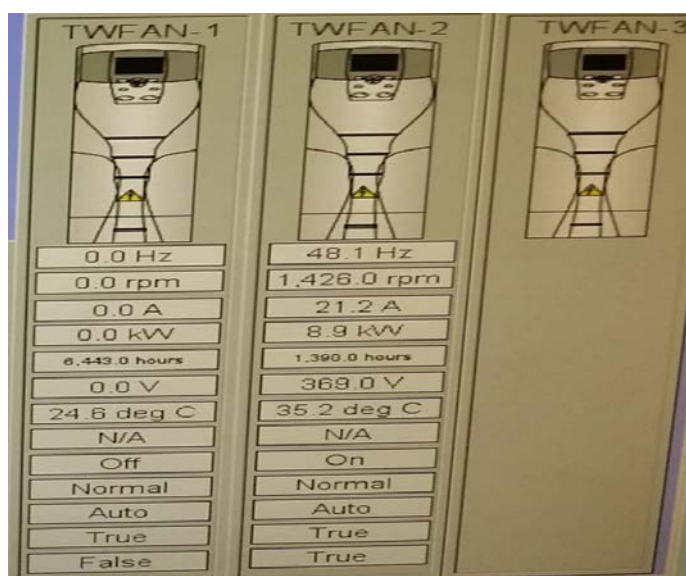
Annual Energy Cost Savings: \$5,060

Annual Greenhouse Gas Savings: 33.74 Tons

Simple Payback: 1.0 years

Method of Calculation: Yearly energy simulation

Figure 15 – Screenshot of Improper Cooling Tower Fan Speed Sequencing



HVAC -ECM #8- AHU Economizer Repair

Issue: Economizers are already installed in many air handling units, but many are non-functional or are controlled incorrectly.

Recommendation: Repair damper actuators and apply appropriate control in air handlers. Convert minimum/ maximum outside air damper units to allow full modulation of outside air. Update and optimize economizer sequences of operation to reduce the amount of mechanical cooling demanded by the air handling units.

Estimated Installation Costs: \$36,480

Annual Energy Savings: 210,000 kWh (+400 Therms)

Annual Energy Cost Savings: \$17,300

Annual Greenhouse Gas Savings: 115.92 Tons

Simple Payback: 2.1 years

Method of Calculation: Yearly energy simulation

Figure 16 – Improper Economizer Damper Positions



HVAC -ECM # 9- Electronically Commutated Motors in Walk-in Coolers

Issue: Evaporator fan motors in walk-in coolers and freezers are of the shaded-pole type. Many evaporators cannot meet load and consequently run 24x7.

Recommendation: Install new electronically commutated motors in all walk-in coolers and freezers. The increased efficiency of these motors should help to better meet load, and the variable speed feature of the fans consumes less energy.

Estimated Installation Costs: \$1,920

Annual Energy Savings: 7,740 kWh

Annual Energy Cost Savings: \$650

Annual Greenhouse Gas Savings: 4.35 Tons

Simple Payback: 2.9 years

Method of Calculation: Yearly energy and cost analysis

HVAC -ECM #10- Conduct and Implement Retro-Commissioning

Issue: As illustrated in the demand graph below, large energy consuming HVAC systems at the Orlando VAMC are running fairly efficiently, but not optimally. Spikes, valleys and significant variances in electrical demand throughout the day are not as a result of weather or occupancy, but rather inefficient control of that equipment. The observed high base load indicates that there are energy conservation opportunities through improved control. The process of Retro-Commissioning would help to identify those additional opportunities that are not readily identified during the Energy Assessment process.

Recommendation: All major energy consuming HVAC systems at this facility should be Retro-Commissioned. This does not simply mean performing another RCx study. Instead, the recommendations from the previous RCx study should be implemented, assuming that the study was conducted in accordance with industry standards and comprehensive findings were recorded and presented. In any event, each AHU and terminal VAV box should be inspected and receive repairs where required, and efficient control of all HVAC systems established.

Estimated Installation Costs: \$393,800

Annual Energy Savings: 1,150,000 kWh; 29,500 Therms

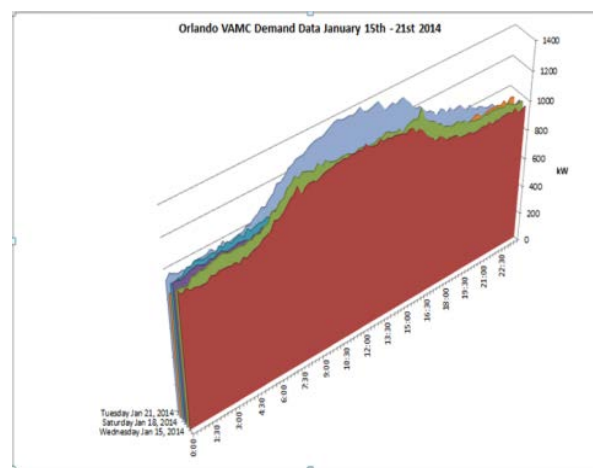
Annual Energy Cost Savings: \$127,000

Annual Greenhouse Gas Savings: 805.95 Tons

Simple Payback: 3.1 years

Method of Calculation: Past Retro-Commissioning Studies & Extrapolation

Figure 17 – 3-D Load Profile of Summer Months



HVAC -ECM # 11- Insulate Boilers

Issue: Aside from the factory insulation beneath the jacket, the laundry boilers are not insulated on the outside. Temperature of the outer surface is over 130°F.

Recommendation: Insulate the boilers with blanket or spray on insulation.

Estimated Installation Costs: \$4,930

Annual Energy Savings: 1,478 Therms

Annual Energy Cost Savings: \$1,500

Annual Greenhouse Gas Savings: 7.98 Tons

Simple Payback: 3.3 years

Method of Calculation: Yearly energy and cost analysis

Figure 18 – Uninsulated Boilers



HVAC -ECM # 12- Automate Exhaust Fans

Issue: Exhaust fans serving the main building are not connected to the Energy Management System and operate 24x7.

Recommendation: Install a digital controller to connect the exhaust fans to the Energy Management System. Schedule the exhaust fans to run only during occupied periods.

Estimated Installation Costs: \$25,000

Annual Energy Savings: 72,200 kWh

Annual Energy Cost Savings: \$6,090

Annual Greenhouse Gas Savings: 40.60 Tons

Simple Payback: 4.1 years

Method of Calculation: Yearly energy and cost analysis

Figure 19 – Exhaust Fans on Roof of M-Deck



HVAC -ECM # 13- Replace Air Handling Units on M-Deck & Bldg 503

Issue: The Air Handling Units on M-Deck and Building 503 are old and are nearing the end of their useful life. Air leaks, old dampers, broken actuators, low efficiency fans, and scaled and corroded coils were observed during RetroCom's audit of Air Handling units.

Recommendation: Replace the Air Handling Units with new, high efficiency units.

Estimated Installation Costs: \$1,920,000

Annual Energy Savings: 480,000 kWh; 65,200 therms

Annual Energy Cost Savings: \$106,690

Annual Greenhouse Gas Savings: 621.98 Tons

Simple Payback: 18.0 years

Method of Calculation: Yearly energy and cost analysis

Figure 20 – AHUs on Roof of M-Deck



HVAC -ECM #14- Waterside Economizer for Tower “Free-Cooling”

Issue: Chiller compressors need to run year-round to provide chilled water for dehumidification. The chillers are therefore running when outside air temperatures are very low and demand is light.

Recommendation: Install a plate and frame heat exchanger between the chilled water and condenser water loops. When the outside air temperature is below 55 degrees, the cooling tower can produce condenser water temperatures cold enough to create a sufficient temperature drop through the heat exchanger. If the chilled water temperature at the outlet of the heat exchanger meets setpoint, the chillers can be staged off.

Estimated Installation Costs: \$70,600

Annual Energy Savings: 43,300 kWh

Annual Energy Cost Savings: \$3,650

Annual Greenhouse Gas Savings: 24.37 Tons

Simple Payback: 19.3 years

Method of Calculation: Yearly energy simulation

Figure 21 – Cooling Tower



OTHER ENERGY MEASURES

OE -ECM #1- Generator Block Heater Heat Pumps

Issue: One 750 kW generator has an electric block heater drawing a 1.4 KW load. Two 650 kW generators have electric block heaters each drawing a 4 KW load. These heaters operate at all times to ensure quick start ability for each generator.

Recommendation: Replace the block heaters with a diesel heat pump. Heat pumps use less energy compared to electric heaters, and the rejected cooling from the heat pump can be dispersed into the space.

Estimated Installation Costs: \$19,430

Annual Energy Savings: 94,440 kWh

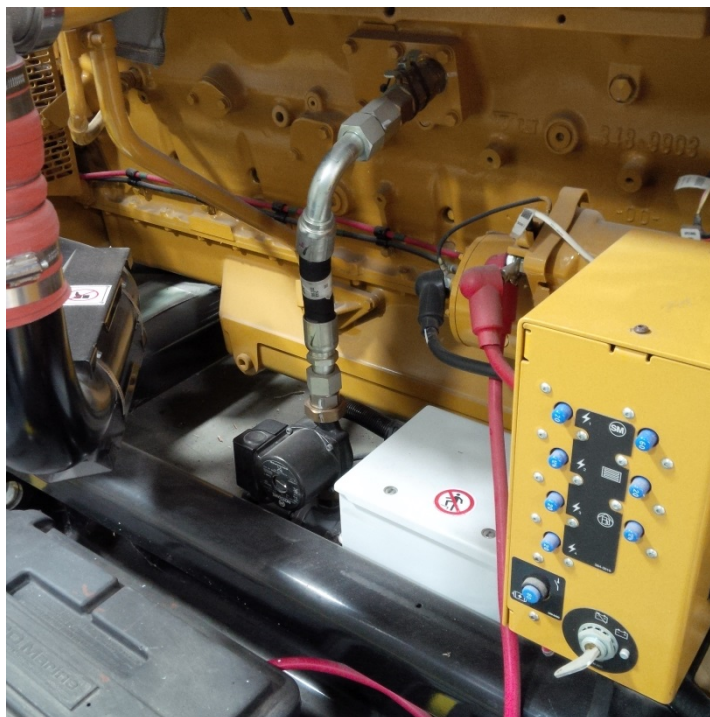
Annual Energy Cost Savings: \$7,890

Annual Greenhouse Gas Savings: 52.54 Tons

Simple Payback: 2.5 years

Method of Calculation: Yearly energy and cost analysis

Figure 22 – Generator Block Heater



OE -ECM #2- Solar Powered Trash Compactors

Issue: The Orlando VAMC EMS Department has staff dedicated to emptying outdoor trash containers throughout the campus. Solar powered compactors would reduce the frequency of required collections. This type of compactor can also be provided for recyclables. Over the past two years, the facility has collected an average of 600 tons of solid waste per year. There are approximately 10 trash containers on the Orlando campus.

Recommendation: Install 25 solar powered trash compactors on the site. This would allow the facility to reduce trash handling costs by 33%.

Estimated Installation Costs: \$33,000

Annual Energy Savings: N/A

Annual Energy Cost Savings: \$7,240 (savings in labor)

Annual Greenhouse Gas Savings: N/A

Simple Payback: 4.6 years

Method of Calculation: Yearly cost analysis

Figure 23 – Solar Powered Trash Compactor

- ☒ Saves Money
- ☒ Reduces Litter
- ☒ Increases Recycling
- ☒ Conserves Fuel
- ☒ Reduces Carbon Footprint
- ☒ Eliminates Overflows
- ☒ Frees Up Labor
- ☒ Lowers Tipping Fees



OE -ECM #3- Install Solar on Roof of CLC and Domiciliary

Issue: Orlando VAMC does not currently produce any on site renewable energy.

Recommendation: Install solar photovoltaic arrays on the roof the CLC and Domiciliary. The CLC has just over 37,000 square feet of available roof space and will accommodate a 419 kW solar array. The Domiciliary has 7000 square feet of available roof space and will accommodate a 77 kW solar array.

Estimated Installation Costs: \$1,240,000

Annual Energy Savings: 663,700 kWh

Annual Energy Cost Savings: \$56,020

Annual Greenhouse Gas Savings: 373.21 Tons

Simple Payback: 22.1 years

Method of Calculation: Yearly energy and cost analysis

Figure 24 – Roof Space for Solar Installation



5.0 Water/Wastewater Conservation Measures

As was discussed earlier in this Report, the toilets at this site use 1.6 gallons per flush and there are no or limited savings for replacing the existing faucets with automatic faucets. Discussions with staff indicated that they would not endorse having replacement water fixtures until the future of the facility is confirmed.

In addition there are two 8-inch water meters that are seldom used. One is dedicated for fire flow and must be retained. The purpose of the second 8-inch meter is not known by current staff and its purpose should be investigated to determine if continued use is necessary.

6.0 Maintenance & Operations Improvements

In general, the condition of HVAC and mechanical equipment at the Orlando VAMC is fair to good. Central Plant equipment is excellently maintained and air distribution systems are in working order for the most part. However, significant opportunity exists by improving the operation of large energy consuming equipment. Many of the ECMs addressed in Section 4 illustrate the enormous impact simple programming changes can have on energy use. These savings are nullified, however, if efficient control of equipment is not maintained.

As discussed in the Task 1 Energy Baseline and Benchmark Report, the high base energy load at Orlando VAMC indicates a general lack of control of energy consuming equipment. An example of this lack of control is with economizers and the percent of outside air ventilated through the buildings. Many Air Handling Units have broken or missing damper actuators, meaning a fixed amount of outside air is being delivered to the space at all times. While the Air Handling Units are doing their general job of circulating cold/ hot air through the facility, the ability to efficiently control the units is possible only if the controlling equipment is adequately maintained.

Aside from maintaining the controlled equipment, Orlando VAMC could also make improvements in how major energy consuming systems on-site are actually controlled. As evidenced by trending information provided to us while on-site, and supported by the analysis of utility demand data, it is apparent that major pieces of equipment are operating under less than optimal conditions. Correcting this situation is a function of optimizing the control of equipment in order that it operates only when absolutely required or in its most efficient state.

Although this can be accomplished by providing control system operational training to maintenance staff and we would suggest that this challenge can be more quickly addressed by altering the terms and relevant tasks contained in the existing outside vendor controls maintenance contract with JCI. Rather than having the vendor visit the site to simply address alarms or other simple fixes on the BAS, the maintenance contract could be re-written to include system optimization activities. This might include implementing new, more efficient sequences of operation, reviewing equipment scheduling, implementing resets, or calibrating and proving the operation of sensors. Any number of these activities would improve the efficiency of energy consuming building systems. Perhaps more importantly, this change in scope could be implemented without cost.

Although we cannot place an exact energy savings opportunity amount on this strategy because we cannot predict how quickly this can be acted upon, we can predict that having JCI place a greater focus within their contract on issues that help to reduce energy costs, would certainly contribute to a more efficiently operated facility.

7.0 Renewable Energy Systems

The Orlando VAMC is not currently producing energy via a renewable energy system and as such this site does not meet the EISA goal for renewable energy production.

Recommendations concerning the installation of a Solar PV system are provided in Section 4 of this report.

In addition to Solar PV, a Pyrolysis waste-to-energy system was also evaluated for Orlando VAMC but was deemed incompatible. Pyrolysis technology systems generate electricity or other energy sources from waste and the Orlando facility does not produce sufficient waste to make such an installation cost effective.

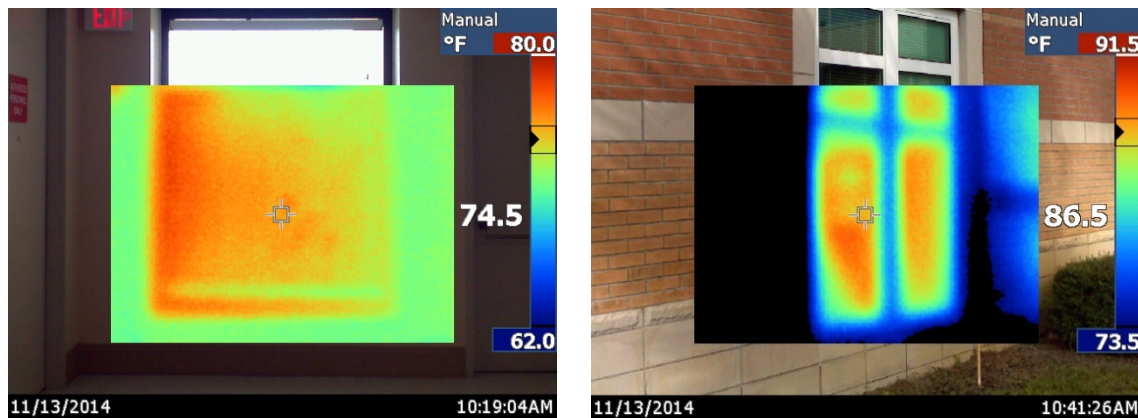
RetroCom reviewed the previous Alares study for Biomass application and we agree with their findings that this application does not provide a viable return on investment. Further, we can agree that the application of Wind Turbines would have little to no value given that Florida in general has unreliable wind velocity rates.

8.0 Building Envelope Systems

RetroCom performed Thermographic Imaging (Infrared Scans) at a number of locations at the Main Hospital building and other buildings on campus. Copies of some of those images are shown below.

Windows at Orlando VAMC are double pane with a metal frame original to construction. These windows meet Florida's Hurricane Preparedness mandate and as seen in Figure 25 below, thermal images show they remain in good condition. While new low-emissivity window glazing and high U-value windows are available, RetroCom does not recommend a large-scale window replacement. Window replacements have traditionally long paybacks and are always better addressed during planned renovations.

Figure 25 – Temperature Differential Between the Inside & Outside of a Window



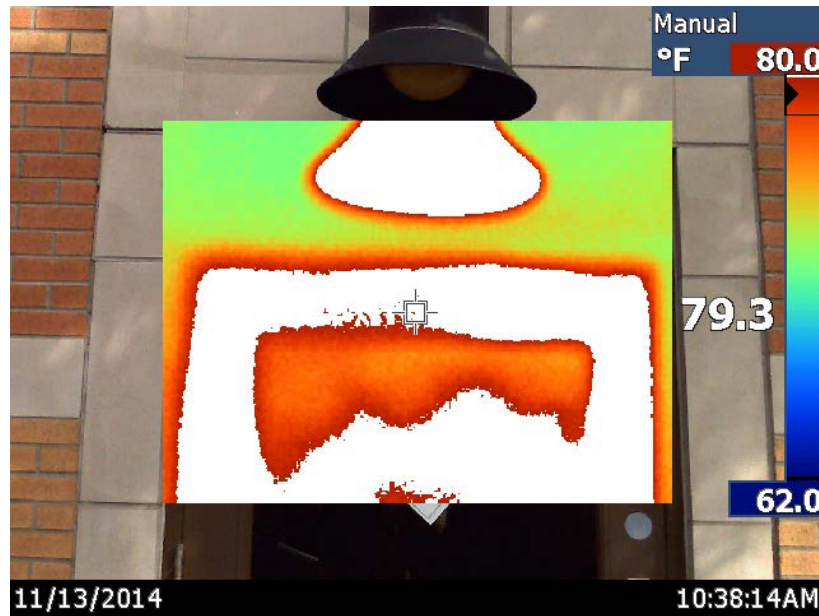
An evaluation of the roofs and walls of several buildings was conducted. Roofing materials in general appear to be in good condition and temperature readings at the roofing surface did not reveal significant insulation voids.

Figure 26 – Roof of M-Deck



Temperature readings and scans of walls and doorway openings were conducted around the campus. With the exception of exterior doorways, where door-jam voids existed, we were unable to discover evidence of widespread wall surface leakage or penetrations that would warrant a detailed investigation. In the case of exterior doorway voids, we suggest that building maintenance staff simply inspect each doorway and replace door gaskets as required.

Figure 27 – Infrared Scan of an Exterior Door



9.0 Audit Team Participants

The Site Audit Team for the Orlando VAMC was comprised of RetroCom employees with varying experience and background. The team included a Professional Civil Engineer, a Mechanical Engineer, an Energy Analyst, a Certified Infrared Technologist, a QA/QC Project Manager, and the managing principal of the company. Further back office support was provided by a Professional Mechanical Engineer who performed energy efficiency calculations while the audit team was on-site.

The RetroCom Site Audit Team was assisted by Steve Gunter, Maintenance & Operations General Foreman for this site, Jane Hall, Utility Billings Administrator, James Jameson, HVAC Foreman for this site and Hector Vargas, the General Engineer. The assistance of each of these individuals was instrumental in helping us to better understand the many energy challenges and opportunities at this site.

Richard F. Cull, CEO & President
Field Auditor
RetroCom Energy Strategies, Inc.

Stephany L. Cull, CBCP, BEP, CSDP
QA/QC Project Manager
RetroCom Energy Strategies, Inc.

Ed Marlow, PE (Civil)
Project Manager
RetroCom Energy Strategies, Inc.

Brett Watson, Mechanical Engineer
RetroCom Energy Strategies, Inc.

Judy Wong, Energy Analyst
RetroCom Energy Strategies, Inc.

Jennifer Medley-Yates, CIT
RetroCom Energy Strategies, Inc.

Ram Verma, PE (Mechanical)
RetroCom Energy Strategies, Inc.

Appendices

Facility Audit Report – Orlando VAMC

ORLANDO

IL-ECM # 1

LIGHTING RETROFITS- HALLWAY CLC

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 4,428	22,573	61.55	-	\$ 1,967	13.03	2.3

Energy Cost Analysis for Existing and Proposed LED Fixtures

Existing Fixture					Proposed Fixture					Energy Savings			Cost			
Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Demand Reduction (kW)	Energy Savings (kWh)	GHG Emissions (tons CO ₂)	Equipment Cost	Labor Hrs	Labor Cost	Total Retrofit Cost
T8-4 ft-32 watt-1 lamp-NBF	164	4,592	4,368	22,923.3	LED 17W Retrofit Kit	164	2.79	4,368	12,177.98	1.80	10,745.28	6.04	15.00	0.20	12.00	\$ 4,428.00

Facility Audit Report – Orlando VAMC

ORLANDO

IL-ECM # 2

LIGHTING RETROFITS- KITCHEN & CANTINA

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,072	22,574	86.53	-	\$ 1,990	13.16	2.5

Energy Cost Analysis for Existing and Proposed LED Fixtures:

Proposed Fixture					Energy Savings				Cost				Area & Fixture Notes	
Fixture Name	Qty	kW	Yearly Hrs	Yearly kWh	kW Reduction	Energy Savings (kWh)	Therm Savings	GHG Emissions (tons CO ₂)	Equipment Cost	Labor Hrs	Labor Cost	Total Retrofit Cost	Area Name	Notes
LED 17W Retrofit Kit	51	0.87	4,368	3,787.06	0.82	10,470.10	27.84	5.89	20.00	0.20	12.00	\$ 1,632.00	Cantina (main hospital)	inside
LED 34W Retrofit Kit	12	0.41	4,368	1,782.14	0.25	1,572.48	8.60	0.88	30.00	0.20	12.00	\$ 504.00	Cantina (main hospital)	inside
LED 17W Retrofit Kit	13	0.22	4,368	965.33	0.21	2,668.85	7.10	1.50	20.00	0.20	12.00	\$ 416.00	Kitchen (main hospital)	inside
LED 34W Retrofit Kit	60	2.04	4,368	8,910.72	1.26	7,862.40	42.99	4.42	30.00	0.20	12.00	\$ 2,520.00	Kitchen (main hospital)	inside

Facility Audit Report – Orlando VAMC

ORLANDO

IL-ECM # 3

LIGHTING RETROFITS- HALLWAYS OF THE MAIN HOSPITAL

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$12,560	45,877	209	-	\$4,084	26.9	3.1

Energy Cost Analysis for Existing and Proposed LED Fixtures

Existing Fixture					Proposed Fixture				Energy Savings			Cost				
Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Demand Reduction (kW)	Energy Savings (kWh)	GHG Emissions (tons CO ₂)	Equipment Cost	Labor Hrs	Labor Cost	Total Retrofit Cost
T8-4 ft-32 watt-2 lamp-NBF	100	5.5	4,368	27,955.2	LED 34W Retrofit Kit	100	3.40	4,368	7,425.60	2.10	20,529.60	11.54	30.00	0.20	12.00	\$ 4,200.00
T8-2 ft-17 watt-2 lamp-NBF	8	0.264	4,368	2,236.4	LED 17W Retrofit Kit	8	0.14	4,368	594.05	0.13	1,642.37	0.92	20.00	0.20	12.00	\$ 256.00
T8-4 ft-32 watt-1 lamp-NBF	127	3.556	4,368	17,751.6	LED 17W Retrofit Kit	127	2.16	4,368	9,430.51	1.40	8,321.04	4.68	15.00	0.20	12.00	\$ 3,429.00
T8-4 ft-32 watt-2 lamp-NBF	25	1.375	4,368	6,988.8	LED 34W Retrofit Kit	25	0.85	4,368	3,712.80	0.53	3,276.00	1.84	30.00	0.20	12.00	\$ 1,050.00
T8-4 ft-32 watt-1 lamp-NBF	41	1.148	4,368	5,730.8	LED 17W Retrofit Kit	41	0.70	4,368	3,044.50	0.45	2,686.32	1.51	15.00	0.20	12.00	\$ 1,107.00
T8-4 ft-32 watt-2 lamp-NBF	9	0.495	4,368	2,516.0	LED 34W Retrofit Kit	9	0.31	4,368	1,336.61	0.19	1,179.36	0.66	30.00	0.20	12.00	\$ 378.00
T8-2 ft-17 watt-2 lamp-NBF	5	0.165	4,368	1,397.8	LED 17W Retrofit Kit	5	0.09	4,368	371.28	0.08	1,026.48	0.58	20.00	0.20	12.00	\$ 160.00
T8-4 ft-32 watt-1 lamp-NBF	44	1.232	4,368	6,150.1	LED 17W Retrofit Kit	44	0.75	4,368	3,267.26	0.48	2,882.88	1.62	15.00	0.20	12.00	\$ 1,188.00
T8-4 ft-32 watt-4 lamp-NBF	8	0.872	4,368	4,472.8	LED 51W Retrofit Kit	8	0.27	4,368	1,188.10	0.60	3,284.74	1.85	45.00	0.20	12.00	\$ 456.00

ORLANDO
IL-ECM # 3
BLINKY SYSTEM IN THE STAIRWELLS OF THE MAIN HOSPITAL

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 7,100	10,745	41.97	-	\$ 942	6.3	4.7

Present Condition	
Total Quantity T-8 Fixtures	40
Total Wattage of T-8 Fixtures	2,320
Present "On" Hours per Year	8,760
Present Annual kWh Consumption	20,323.20
Present kW Demand	2.3

Proposed Condition	
Total Quantity of T-8 Fixtures	40
Total Wattage of 2-Lamp T-8 Fixtures less Cold Cathode Safety Lamp	2,320
Wattage Cold Cathode Safety Lamp	3
Projected "On" Hours for Cold Cathode Safety Lamps	8,760
Projected "On" Hours of T-8 Fixtures	635
Projected Annual kWh Consumption- Cold Cathode	1,051
Projected Annual kWh Consumption- T-8 Lamp	1,474
Projected Annual Total kWh Consumption	2,525
Projected Peak kW Demand	0.2

Cost Estimate		
Cost	Blinky Add on	\$125.00
Labour	3/4 hr @ 70	\$52.50
		\$177.50
Quantity	40	\$7,100.00

Facility Audit Report – Orlando VAMC

ORLANDO

EL-ECM # 1

METAL HALIDE SHOEBOX RETROFIT

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 39,200	61,150	-	-	\$ 5,160	34.39	7.6

Energy Cost Analysis for Existing and Proposed LED Fixtures

Existing Fixture					Proposed Fixture					Energy Savings			Cost			
Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Demand Reduction (kW)	Energy Savings (kWh)	GHG Emissions (tons CO ₂)	Equipment Cost	Labor Hrs	Labor Cost	Total Retrofit Cost
MH 175	80	17.2	4,368	75,129.6	LED 40W Retrofit Kit	80	3.20	4,368	13,977.60	14.00	61,152.00	34.39	400.00	0.50	30.00	\$ 34,400.00

Facility Audit Report – Orlando VAMC

ORLANDO

EL-ECM # 2

ORNAMENTAL METAL HALIDE FIXTURE RETROFIT

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 25,790	39,356	-	-	\$ 3,322	22.13	8.9

Energy Cost Analysis for Existing and Proposed LED Fixtures

Existing Fixture					Proposed Fixture					Energy Savings			Cost			
Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Fixture Name	Quantity	Total Demand	Yearly Hrs	Yearly kWh	Demand Reduction (kW)	Energy Savings (kWh)	GHG Emissions (tons CO ₂)	Equipment Cost	Labor Hrs	Labor Cost	Total Retrofit Cost
MH 250	16	4.72	4,368	20,617.0	LED 60W Retrofit Kit	16	0.96	4,368	4,193.28	3.76	16,423.68	9.24	450.00	1.50	90.00	\$ 8,640.00
MH 150	35	6.65	4,368	29,047.2	LED 40W Retrofit Kit	35	1.40	4,368	6,115.20	5.25	22,932.00	12.89	400.00	1.50	90.00	\$ 17,150.00

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 1

SUPPLY AIR TEMPERTURE RESET

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	266,667	87,300	-	\$ 100,740	598.87	0.05

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.25	0.25	0.29	0.29	0.34	0.36	0.39	0.39	0.36	0.34	0.29	0.25	3.8
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.05	0.04	0.03	0.01	0.01	0.27
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.05	0.74
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.85	0.8	0.91	0.89	0.96	1	1.05	1.05	1	0.98	0.88	0.86	11.23
Total Simulated kWh													11,230,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	3.91	3.32	3.51	3.23	3.19	2.99	3.06	3.08	3.05	3.28	3.39	3.9	39.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.94	3.34	3.53	3.26	3.21	3.01	3.08	3.1	3.07	3.3	3.41	3.92	40.18
Total Simulated Therms													401,800

Facility Audit Report – Orlando VAMC

eQuest Output with Supply Air Temperature Reset:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.21	0.2	0.24	0.24	0.29	0.34	0.36	0.36	0.33	0.3	0.24	0.21	3.31
Heat Reject.	0	0	0.01	0.01	0.01	0.02	0.03	0.03	0.02	0.01	0.01	0	0.16
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.05	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.65
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.8	0.74	0.84	0.83	0.89	0.96	1.01	1	0.95	0.92	0.82	0.81	10.55
Total Simulated kWh													10,550,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	2.97	2.55	2.7	2.47	2.5	2.39	2.47	2.49	2.45	2.61	2.63	2.96	31.2
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.99	2.57	2.72	2.5	2.52	2.41	2.49	2.51	2.47	2.63	2.65	2.99	31.45
Total Simulated Therms													314,500

Energy Savings Summary:

Energy Savings	
kWh Baseline	11,230,000
kWh proposed	10,550,000
kWh Savings	226,667
Therms Baseline	401,800
Therms Proposed	314,500
Therms Savings	87,300

Measure Cost Estimation:

Cost	
Programming Hour	40
Hourly Rate	\$ 125
Toal Cost	\$5,000

Facility Audit Report – Orlando VAMC

ORLANDO
HVAC-ECM # 2
CHILLED WATER RESET

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	190,000	-	-	\$ 16,000	106.84	0.3

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.08	0.1	0.15	0.17	0.25	0.32	0.35	0.36	0.31	0.25	0.15	0.07	2.54
Heat Reject.	0	0.01	0.01	0.01	0.01	0.04	0.06	0.07	0.04	0.02	0.01	0	0.28
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0.04
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.9
Pumps & Aux.	0.05	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.65
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.29	0.28	0.29	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.72	0.68	0.8	0.81	0.92	0.99	1.08	1.09	0.98	0.93	0.78	0.72	10.51
Total Simulated kWh													10,510,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.25	0.78	0.65	0.47	0.37	0.31	0.3	0.29	0.32	0.41	0.61	1.15	6.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.13	1.12	1.1	1.05	1.12	1.06	1.23	14.03
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.61	2.05	2.09	1.87	1.73	1.56	1.55	1.52	1.49	1.66	1.78	2.51	22.42
Total Simulated Therms													224,200

Facility Audit Report – Orlando VAMC

eQuest Output with Chilled Water Reset:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.06	0.08	0.13	0.15	0.23	0.3	0.34	0.34	0.29	0.23	0.14	0.06	2.34
Heat Reject.	0	0.01	0.01	0.01	0.01	0.04	0.06	0.07	0.04	0.02	0.01	0	0.27
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0.04
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.9
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.67
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.71	0.67	0.79	0.8	0.9	0.97	1.06	1.07	0.97	0.91	0.77	0.71	10.32
Total Simulated kWh													10,320,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.25	0.78	0.65	0.47	0.37	0.31	0.3	0.29	0.32	0.41	0.61	1.15	6.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.13	1.12	1.1	1.05	1.12	1.06	1.23	14.03
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.61	2.05	2.09	1.87	1.73	1.56	1.55	1.52	1.49	1.66	1.78	2.51	22.42
Total Simulated Therms													224,200

Energy Savings Summary:

Energy Savings	
kWh Baseline	10,510,000
kWh proposed	10,320,000
kWh Savings	190,000
Therms Baseline	224,200
Therms Proposed	224,200
Therms Savings	-

Measure Cost Estimation:

Cost	
Programing Hours	40
Hourly rate	\$ 125.00
Total Cost	\$ 5,000.00

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 3

UNOCCUPIED TEMPERATURE SETBACKS IN THE DOMICILIARY

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 25,000	140,450	50,000	-	\$ 62,600	348.98	0.4

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	6.55	8.46	13.33	15.97	23.27	28.36	31.71	31.51	27.08	21.83	13.57	6.1	227.76
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	7.98	2.38	1.19	0.24	0	0	0	0	0	0.03	0.66	6.34	18.81
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	6.1	5.51	6.1	5.9	6.1	5.9	6.1	6.1	5.9	6.1	5.9	6.1	71.79
Pumps & Aux.	0.12	0.04	0.02	0	0	0	0	0	0	0	0	0.1	0.29
Ext. Usage	0.74	0.6	0.66	0.64	0.53	0.51	0.53	0.74	0.72	0.74	0.72	0.74	7.87
Misc. Equip.	2.64	2.4	2.66	2.72	2.66	2.62	2.74	2.66	2.62	2.74	2.36	2.74	31.55
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	10.7	9.67	10.7	10.54	10.7	10.43	10.81	10.7	10.43	10.81	10.1	10.81	126.39
Total	34.84	29.05	34.66	36.01	43.26	47.83	51.89	51.71	46.75	42.24	33.3	32.92	484.45
Total Simulated kWh													484,450

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	5.41	5.01	5.56	5.67	5.26	4.99	5	4.7	4.65	4.96	4.38	5.41	61
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5.41	5.01	5.56	5.67	5.26	4.99	5	4.7	4.65	4.96	4.38	5.41	61
Total Simulated Therms													6,100,000

Facility Audit Report – Orlando VAMC

eQuest Output with Setbacks in Dom:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.28	6.57	9.39	10.82	14.81	17.4	19.64	18.81	16.78	13.82	9.24	5.06	147.63
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.95	0.15	0.11	0.02	0	0	0	0	0	0	0.04	1.11	3.39
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	2.22	2.04	2.3	2.31	2.3	2.22	2.31	2.3	2.22	2.31	2.03	2.31	26.89
Pumps & Aux.	0.12	0.04	0.02	0	0	0	0	0	0	0	0	0.1	0.28
Ext. Usage	0.74	0.6	0.66	0.64	0.53	0.51	0.53	0.74	0.72	0.74	0.72	0.74	7.87
Misc. Equip.	2.64	2.4	2.66	2.72	2.66	2.62	2.74	2.66	2.62	2.74	2.36	2.74	31.55
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	10.7	9.67	10.7	10.54	10.7	10.43	10.81	10.7	10.43	10.81	10.1	10.81	126.39
Total	23.66	21.46	25.84	27.05	31	33.19	36.03	35.21	32.77	30.42	24.49	22.87	343.99
Total Simulated kWh													343,990

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	5.38	4.99	5.52	5.63	5.21	4.93	4.94	4.64	4.6	4.92	4.34	5.39	60.5
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5.38	4.99	5.52	5.63	5.21	4.93	4.94	4.64	4.6	4.92	4.34	5.39	60.5
Total Simulated Therms													6,050,000

Energy Savings Summary:

Energy Savings	
kWh Baseline	484,450
kWh proposed	343,990
kWh Savings	140,460
Therms Baseline	6,100,000
Therms Proposed	6,050,000
Therms Savings	50,000

Measure Cost Estimation:

Cost	
Programming Hour	120
Hourly Rate	\$ 125.00
Equip Cost (Programmable T-Stats)	\$ 10,000.00
Toal Cost	\$ 25,000.00

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 4

SETBACKS FOR AHUS 10 AND/OR 11 FOR MAIN HOSPITAL 3RD & 4TH FLOOR

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	30,000	6,700	-	\$ 9,332.5	53.05	0.5

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.13	0.14	0.18	0.2	0.27	0.33	0.37	0.38	0.33	0.28	0.19	0.12	2.92
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.05	0.07	0.08	0.04	0.03	0.01	0.01	0.34
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.09
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.09	0.08	0.09	0.09	0.09	0.09	0.1	0.09	0.09	0.09	0.09	0.09	1.09
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.69
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.8	0.75	0.87	0.87	0.97	1.04	1.13	1.14	1.03	0.98	0.84	0.8	11.23
Total Simulated kWh													11,230,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.94	1.39	1.29	1.05	0.95	0.83	0.82	0.82	0.86	1.01	1.26	1.84	14.07
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.14	1.13	1.1	1.05	1.12	1.06	1.23	14.04
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.3	2.66	2.73	2.46	2.31	2.08	2.07	2.04	2.03	2.26	2.43	3.19	29.57
Total Simulated Therms													295,700

Facility Audit Report – Orlando VAMC

eQuest Output with Setbacks for AHUs:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.12	0.14	0.18	0.2	0.27	0.33	0.37	0.38	0.33	0.27	0.19	0.12	2.91
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.05	0.07	0.08	0.04	0.03	0.01	0.01	0.34
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.09	0.08	0.09	0.09	0.09	0.09	0.1	0.09	0.09	0.09	0.09	0.09	1.09
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.69
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.8	0.75	0.87	0.87	0.96	1.04	1.13	1.14	1.03	0.98	0.84	0.8	11.2
Total Simulated kWh													11,200,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.85	1.32	1.23	1.01	0.91	0.79	0.78	0.78	0.82	0.97	1.19	1.75	13.4
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.14	1.13	1.1	1.05	1.12	1.06	1.23	14.04
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.21	2.59	2.67	2.41	2.26	2.05	2.03	2	2.21	2.36	3.11	28.9	289,000
Total Simulated Therms													289,000

Energy Savings Summary:

Energy Savings	
kWh Baseline	11,230,000
kWh proposed	11,200,000
kWh Savings	30,000
Therms Baseline	295,700
Therms Proposed	289,000
Therms Savings	6,700

Measure Cost Estimation:

Cost	
Programming Hour	40
Hourly Rate	125
Toal Cost	5000

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 5

CONDENSER WATER RESET

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	66.600	-	-	\$ 5,620	37.49	0.9

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.25	0.25	0.29	0.29	0.34	0.36	0.39	0.39	0.36	0.34	0.29	0.25	3.8
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.05	0.04	0.03	0.01	0.01	0.27
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.05	0.74
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.85	0.8	0.91	0.89	0.96	1	1.05	1.05	1	0.98	0.88	0.86	11.23
Total Simulated kWh													11,230,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	3.91	3.32	3.51	3.23	3.19	2.99	3.06	3.08	3.05	3.28	3.39	3.9	39.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.94	3.34	3.53	3.26	3.21	3.01	3.08	3.1	3.07	3.3	3.41	3.92	40.18
Total Simulated Therms													401,800

Facility Audit Report – Orlando VAMC

eQuest Output with Condenser Water Reset:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.23	0.23	0.27	0.27	0.33	0.36	0.39	0.39	0.36	0.33	0.27	0.23	3.66
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.03	0.02	0.01	0.01	0.22
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.73
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.83	0.78	0.89	0.87	0.95	0.99	1.04	1.04	0.98	0.96	0.86	0.84	11.03
Total Simulated kWh													11,030,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	3.91	3.32	3.51	3.23	3.19	2.99	3.06	3.08	3.05	3.28	3.39	3.9	39.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.94	3.34	3.53	3.26	3.21	3.01	3.08	3.1	3.07	3.3	3.41	3.92	40.18
Total Simulated Therms													401,800

Energy Savings Summary:

Energy Savings	
kWh Baseline	11,230,000
kWh proposed	11,030,000
kWh Savings	66,667
Therms Baseline	401,800
Therms Proposed	401,800
Therms Savings	-

Measure Cost Estimation:

Cost	
Programming Hour	40
Hourly Rate	\$ 125
Toal Cost	\$5,000

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 6

SET BACK AREAS B AND C OF THE CLC

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	11,900	4,055	-	\$ 5,120	28.59	1.0

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	14.9	19.1	26.8	29	42.8	58.9	67.9	68.3	56.7	44.8	28.5	14.8	472.5
Heat Reject.	0.9	1.3	1.9	2.2	3.5	4.9	6.4	6.5	4.7	3.6	2.1	0.8	38.8
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0.3
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	6.5	6.7	8.4	9.2	11.3	11.8	12.7	12.5	10.9	10	7.9	6.4	114.4
Pumps & Aux.	21.1	19	21.1	20.4	21.1	20.4	21.1	21.1	20.4	21.1	20.4	21.1	248
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	85.6	77.4	85.8	83.5	85.8	83.1	86	85.8	83.1	86	82.2	86	1,010.40
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	70.7	64.1	71.3	70.1	71.3	69.1	71.6	71.3	69.1	71.6	66.9	71.6	838.9
Total	199.8	187.6	215.4	214.3	235.7	248.3	265.7	265.6	244.9	237.1	208.1	200.9	2,723.50
Total Simulated kWh													2,723,500

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	103.5	62.7	45.9	29.3	18.7	6.5	5	2.7	6.5	19.1	45.6	94.5	440.1
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	213.6	197.5	219.7	212	207.2	191.3	189.9	184.7	178.7	189.5	187	207.6	2,378.70
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	36.3	32.7	36.3	35	36.3	35.1	36.2	36.3	35.1	36.2	35.2	36.2	426.8
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	353.3	293	301.9	276.3	262.2	232.9	231.2	223.7	220.3	244.8	267.8	338.2	3,245.60
Total Simulated Therms													32,456

Facility Audit Report – Orlando VAMC

eQuest Output with CLC Setbacks:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	14.7	18.5	26.3	28.2	41.8	56.7	65.6	65.1	55.2	43.4	27.8	14.4	457.6
Heat Reject.	0.9	1.2	1.9	2.1	3.3	4.3	5.8	5.7	4.3	3.3	2	0.8	35.4
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	6.1	6.4	8.5	9.6	12.1	13.1	14.2	13.9	12.2	10.9	8.2	6	121.1
Pumps & Aux.	21.1	19	21.1	20.4	21.1	20.4	21.1	21.1	20.4	21.1	20.4	21.1	248
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	85.6	77.4	85.8	83.5	85.8	83.1	86	85.8	83.1	86	82.2	86	1,010.40
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	70.7	64.1	71.3	70.1	71.3	69.1	71.6	71.3	69.1	71.6	66.9	71.6	838.9
Total	199.1	186.7	214.9	213.9	235.4	246.8	264.2	262.8	244.3	236.3	207.4	199.9	2,711.60
Total Simulated kWh													2,711,600

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	15.9	4.2	1.4	0.1	0	0	0	0	0	0	0.9	12.1	34.6
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	213.6	197.5	219.7	212	207.2	191.3	189.9	184.7	178.7	189.5	187	207.6	2,378.70
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	36.3	32.7	36.3	35	36.3	35.1	36.2	36.3	35.1	36.2	35.2	36.2	426.8
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	265.7	234.5	257.4	247.1	243.5	226.4	226.1	221	213.8	225.7	223.1	255.9	2,840.10
Total Simulated Therms													28,401

Energy Savings Summary:

Energy Savings	
kWh Baseline	2,723,500
kWh proposed	2,711,600
kWh Savings	11,900
Therms Baseline	32,456
Therms Proposed	28,401
Therms Savings	4,055

Measure Cost Estimation:

Cost	
Programming Hour	60
Hourly Rate	\$ 125.00
Equip Cost (Programmable T-Stats)	\$ -
Total Cost	\$ 5,000.00

Facility Audit Report – Orlando VAMC

ORLANDO
HVAC-ECM # 7
COOLING TOWER FAN OPTIMIZATION

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 5,000	60,000	-	-	\$ 5,060	33.74	1.0

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.06	0.08	0.13	0.15	0.23	0.3	0.34	0.34	0.29	0.23	0.14	0.06	2.34
Heat Reject.	0	0.01	0.01	0.01	0.01	0.04	0.06	0.07	0.04	0.02	0.01	0	0.27
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0.04
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.9
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.67
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.29	0.28	0.29	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.71	0.67	0.79	0.8	0.9	0.97	1.06	1.07	0.97	0.91	0.77	0.71	10.32
Total Simulated kWh													10,320,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.25	0.78	0.65	0.47	0.37	0.31	0.3	0.29	0.32	0.41	0.61	1.15	6.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.13	1.12	1.1	1.05	1.12	1.06	1.23	14.03
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.61	2.05	2.09	1.87	1.73	1.56	1.55	1.52	1.49	1.66	1.78	2.51	22.42
Total Simulated Therms													224,200

Facility Audit Report – Orlando VAMC

eQuest Output with Cooling Tower Optimization:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.06	0.08	0.13	0.15	0.23	0.3	0.34	0.34	0.29	0.23	0.14	0.06	2.34
Heat Reject.	0	0	0	0.01	0.01	0.03	0.05	0.06	0.03	0.02	0.01	0	0.21
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0.04
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.9
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.67
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.71	0.67	0.78	0.79	0.89	0.96	1.05	1.06	0.96	0.9	0.76	0.71	10.26
Total Simulated kWh													10,260,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.25	0.78	0.65	0.47	0.37	0.31	0.3	0.29	0.32	0.41	0.61	1.15	6.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.13	1.12	1.1	1.05	1.12	1.06	1.23	14.03
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.61	2.05	2.09	1.87	1.73	1.56	1.55	1.52	1.49	1.66	1.78	2.51	22.42
Total Simulated Therms													224,200

Energy Savings Summary:

Energy Savings	
kWh Baseline	10,320,000
kWh proposed	10,260,000
kWh Savings	60,000
Therms Baseline	224,200
Therms Proposed	224,200
Therms Savings	-

Measure Cost Estimation:

Cost	
Programing Hours	40
Hourly rate	\$ 125.00
Total Cost	\$ 5,000.00

Facility Audit Report – Orlando VAMC

ORLANDO
HVAC-ECM # 8
AHU REPAIRS- ECONOMIZERS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 36,480	210,000	+400	-	\$ 17,300	115.92	2.1

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.12	0.14	0.18	0.2	0.27	0.33	0.37	0.38	0.33	0.27	0.19	0.12	2.91
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.05	0.07	0.08	0.04	0.03	0.01	0.01	0.34
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.09	0.08	0.09	0.09	0.09	0.09	0.1	0.09	0.09	0.09	0.09	0.09	1.09
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.69
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.8	0.75	0.87	0.87	0.96	1.04	1.13	1.14	1.03	0.98	0.84	0.8	11.2
Total Simulated kWh													11,200,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.85	1.32	1.23	1.01	0.91	0.79	0.78	0.78	0.82	0.97	1.19	1.75	13.4
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.14	1.13	1.1	1.05	1.12	1.06	1.23	14.04
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.21	2.59	2.67	2.41	2.26	2.05	2.03	2	2	2.21	2.36	3.11	28.9
Total Simulated Therms													289,000

Facility Audit Report – Orlando VAMC

eQuest Output with AHU Repairs:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.09	0.11	0.16	0.19	0.27	0.33	0.37	0.37	0.33	0.27	0.17	0.08	2.74
Heat Reject.	0	0.01	0.01	0.01	0.02	0.05	0.07	0.08	0.04	0.03	0.01	0	0.32
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0.01	0.01	0.01	0.01	0	0	0	0.01	0.01	0.01	0.01	0.08
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	1.06
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.68
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.75	0.72	0.84	0.85	0.96	1.04	1.13	1.13	1.03	0.97	0.82	0.75	10.99
Total Simulated kWh													10,990,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.97	1.38	1.26	1	0.86	0.74	0.73	0.73	0.77	0.93	1.2	1.88	13.44
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.14	1.13	1.1	1.05	1.12	1.06	1.23	14.04
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.33	2.65	2.69	2.4	2.21	1.99	1.98	1.95	1.94	2.18	2.37	3.23	28.94
Total Simulated Therms													289,400

Energy Savings Summary:

Energy Savings	
kWh Baseline	11,200,000
kWh proposed	10,990,000
kWh Savings	210,000
Therms Baseline	289,000
Therms Proposed	289,400
Therms Savings	(400)

Measure Cost Estimation:

Cost	
Number of dampers	16
Material cost per damper	\$ 1,000.00
labor cost (16 hour@ \$60/hr) each damper	\$ 1,280.00
Total Cost	\$36,480.00

ORLANDO
HVAC-ECM # 9
ELECTRONICALLY COMMUTATED MOTORS IN WALK-IN COOLERS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 1,920	7,740	-	-	\$ 650	4.35	2.9

Walk-in cooler ECM motors and controls savings calculations:

Walk-in Cooler ECM Savings
Existing Conditions

Area/ Unit Name	Kitchen R-1
Condensing Unit Voltage	230
Condensing Unit Amps	9.5
Condensing Unit Wattage	239.5
# Evaporator Fans	4
hp/ Evaporator Fan	0.2
Evaporator Fan Wattage	149.2
Total Evaporator Wattage	596.8
Total System Wattage	836.3
Daily Hrs	16
Annual Energy Use (kWh)	4,883.99

Estimated % Savings	50%
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Yearly Energy Savings	2,442.00
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Cost per Evaporator

Labor Rate/ hr	\$ 80.00
Labor hrs	2.75
Total Labor Cost	\$ 220.00
Equipment Cost	\$ 480.00
Total Cost	\$ 700.00

Total System Savings & Cost Summary

# of Evaporators	1
Total System Energy Savings	2,442.00
Total System Cost	\$ 700.00

Walk-in Cooler ECM Savings
Existing Conditions

Area/ Unit Name	Kitchen R-2
Condensing Unit Voltage	230
Condensing Unit Amps	9.5
Condensing Unit Wattage	239.5
# Evaporator Fans	4
hp/ Evaporator Fan	0.2
Evaporator Fan Wattage	149.2
Total Evaporator Wattage	596.8
Total System Wattage	836.3
Daily Hrs	16
Annual Energy Use (kWh)	4,883.99

Estimated % Savings	50%
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Yearly Energy Savings	2,442.00
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Cost per Evaporator

Labor Rate/ hr	\$ 80.00
Labor hrs	2.75
Total Labor Cost	\$ 220.00
Equipment Cost	\$ 480.00
Total Cost	\$ 700.00

Total System Savings & Cost Summary

# of Evaporators	1
Total System Energy Savings	2,442.00
Total System Cost	\$ 700.00

Walk-in Freezer ECM Savings
Existing Conditions

Area/ Unit Name	Kitchen F-1
Condensing Unit Voltage	230
Condensing Unit Amps	11
Condensing Unit Wattage	241
# Evaporator Fans	3
hp/ Evaporator Fan	0.33
Evaporator Fan Wattage	246.18
Total Evaporator Wattage	738.54
Total System Wattage	979.54
Daily Hrs	16
Annual Energy Use (kWh)	5,720.51

Estimated % Savings	50%
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Yearly Energy Savings	2,860.26
-----------------------	----------

Cost per Evaporator

Labor Rate/ hr	\$ 80.00
Labor hrs	2
Total Labor Cost	\$ 160.00
Equipment Cost	\$ 360.00
Total Cost	\$ 520.00

Total System Savings & Cost Summary

# of Evaporators	1
Total System Energy Savings	2,860.26
Total System Cost	\$ 520.00

Facility Audit Report – Orlando VAMC

Deemed Savings Values

hp	kWh Savings
1/5	2337.09
1/3	3529.89
1/2	4857.2

Total Measure Savings

kWh Saved	7,744.25
Cost	\$ 1,920.00

Cost Estimates

# of Fans	Labor Hrs	Mat'l
1	1	\$ 120.00
2	1.5	\$ 240.00
3	2	\$ 360.00
4	2.75	\$ 480.00

ORLANDO

HVAC-ECM # 10

CONDUCT AND IMPLEMENT RETRO-COMMISSING

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 393,800	1,150,000	-	-	\$ 127,000	805.95	3.1

Retro-commissioning:

% Savings of Total Energy	10%
Total Yearly kWh	11,500,000
Total Yearly therms	295,000

\$/ sq ft	\$ 1.00
GSF of major bldgs	393,802.00

Measure Cost Estimation:

kWh Savings	1,150,000
Therm Savings	29,500
Cost	\$ 393,802.00

ORLANDO
HVAC-ECM # 11
INSULATE BOILERS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 4,926	-	1,478	-	\$ 1,500	7.98	3.3

Heat loss calculation:

<http://www.armstronginternational.com/files/products/traps/pdf/charts/chart1111.pdf>

Temperature Diff	50	100	150	200
Facing up	2.03	2.37	2.67	2.97
Facing down	1.61	1.86	2.11	2.36
Average Heat loss Btu/hr/sqft/oF	1.82	2.12	2.39	2.67

Number of Boilers	Area to be insulated	Total Area	Surface temperature	Ambient Temperature	Boiler Efficiency	Current therms/yr loss	Proposed therms/yr loss	Therms/yr saving	\$/yr saving
2	181	362	130	90	0.80	1,847	369	1,477.72	\$ 1,501.37

Measure Cost Estimation:

Cost

Material Cost/sqft	\$ 3.00
Total Hours	64
\$/hr	\$ 60.00
Total Cost	\$ 4,926.17

ORLANDO

HVAC-ECM # 12

AUTOMATE EXHAUAST FANS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 25,000	72,197	-	-	\$ 6,090	40.60	4.1

Base Case

Fan cfm	Static Pressure	Fan Efficiency	Motor Efficiency	Hours/year	KW	KWH/yr
13,380	2	0.6	0.8	8760	6.55	57,419.07
19,980	0.5	0.5	0.8	8760	2.94	25,722.71
42,515	0.25	0.5	0.75	8760	3.33	29,191.89
32,957	0.125	0.45	0.75	8760	1.44	12,571.73
1,935	0.2	0.45	0.75	8760	0.13	1,181.00
Total KWHs	126086.4105					

Proposed Case

Fan cfm	Static Pressure	Fan Efficiency	Motor Efficiency	Hours/year	KW	KWH/yr
13,380	2	0.6	0.8	3744	6.55	24,540.75
19,980	0.5	0.5	0.8	3744	2.94	10,993.82
42,515	0.25	0.5	0.75	3744	3.33	12,476.53
32,957	0.125	0.45	0.75	3744	1.44	5,373.13
1,935	0.2	0.45	0.75	3744	0.13	504.75
Total KWHs	53,889					
KWH Saving per year	72,197					

Measure Cost Estimation:

Equipment Cost (Controller)	\$ 2,500.00
Programing Hours	180
Hourly rate	\$ 125.00
Labor cost	\$ 22,500.00
Total Cost	\$ 25,000.00

Facility Audit Report – Orlando VAMC

ORLANDO
HVAC-ECM # 13
REPLACE AIR HANDLING UNITS ON M-DECK & BLDG 503

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 1,920,000	480,000	65,200	-	\$ 106,690	621.98	18.0

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.09	0.11	0.16	0.19	0.27	0.33	0.37	0.37	0.33	0.27	0.17	0.08	2.74
Heat Reject.	0	0.01	0.01	0.01	0.02	0.05	0.07	0.08	0.04	0.03	0.01	0	0.32
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0.01	0.01	0.01	0.01	0	0	0	0.01	0.01	0.01	0.01	0.08
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	1.06
Pumps & Aux.	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.68
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.75	0.72	0.84	0.85	0.96	1.04	1.13	1.13	1.03	0.97	0.82	0.75	10.99
Total Simulated kWh													10,990,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.97	1.38	1.26	1	0.86	0.74	0.73	0.73	0.77	0.93	1.2	1.88	13.44
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.14	1.13	1.1	1.05	1.12	1.06	1.23	14.04
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.33	2.65	2.69	2.4	2.21	1.99	1.98	1.95	1.94	2.18	2.37	3.23	28.94
Total Simulated Therms													289,400

Facility Audit Report – Orlando VAMC

eQuest Output with New AHUs:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.08	0.1	0.15	0.17	0.25	0.32	0.35	0.36	0.31	0.25	0.15	0.07	2.54
Heat Reject.	0	0.01	0.01	0.01	0.01	0.04	0.06	0.07	0.04	0.02	0.01	0	0.28
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0.04
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.9
Pumps & Aux.	0.05	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.65
Ext. Usage	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
Misc. Equip.	0.29	0.26	0.29	0.28	0.29	0.28	0.29	0.29	0.28	0.29	0.28	0.29	3.42
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.22	0.2	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.59
Total	0.72	0.68	0.8	0.81	0.92	0.99	1.08	1.09	0.98	0.93	0.78	0.72	10.51
Total Simulated kWh													10,510,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	1.25	0.78	0.65	0.47	0.37	0.31	0.3	0.29	0.32	0.41	0.61	1.15	6.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1.24	1.16	1.31	1.28	1.23	1.13	1.12	1.1	1.05	1.12	1.06	1.23	14.03
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.12	0.11	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.13	1.46
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.61	2.05	2.09	1.87	1.73	1.56	1.55	1.52	1.49	1.66	1.78	2.51	22.42
Total Simulated Therms													224,200

Energy Savings Summary:

Energy Savings	
kWh Baseline	10,990,000
kWh proposed	10,510,000
kWh Savings	480,000
Therms Baseline	289,400
Therms Proposed	224,200
Therms Savings	65,200

Measure Cost Estimation:

Cost	
Number of AHUs	16
Cost per AHU	\$ 120,000.00
Total Cost	\$ 1,920,000.00

<http://www.aquissolutions.com/cost-savings.html>

Facility Audit Report – Orlando VAMC

ORLANDO

HVAC-ECM # 14

WATERSIDE ECONOMIZER FOR TOWER FREE-COOLING

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 70,600	43,300	-	-	\$ 3,650	24.37	19.3

eQuest Baseline:

Baseline kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.25	0.25	0.29	0.29	0.34	0.36	0.39	0.39	0.36	0.34	0.29	0.25	3.8
Heat Reject.	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.05	0.04	0.03	0.01	0.01	0.27
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.05	0.74
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.85	0.8	0.91	0.89	0.96	1	1.05	1.05	1	0.98	0.88	0.86	11.23
Total Simulated kWh													11,230,000

Baseline Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	3.91	3.32	3.51	3.23	3.19	2.99	3.06	3.08	3.05	3.28	3.39	3.9	39.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.94	3.34	3.53	3.26	3.21	3.01	3.08	3.1	3.07	3.3	3.41	3.92	40.18
Total Simulated Therms													401,800

Facility Audit Report – Orlando VAMC

eQuest Output with Waterside Economizer:

Proposed kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.22	0.24	0.28	0.28	0.34	0.37	0.4	0.4	0.37	0.34	0.28	0.22	3.74
Heat Reject.	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.04	0.03	0.02	0.01	0.01	0.2
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	0.38	0.35	0.38	0.37	0.38	0.37	0.38	0.38	0.37	0.38	0.37	0.38	4.51
Pumps & Aux.	0.06	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.73
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.69
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0.1	0.09	0.11	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.11	1.23
Total	0.82	0.79	0.9	0.88	0.96	1	1.05	1.04	0.99	0.97	0.87	0.83	11.1
Total Simulated kWh													11,100,000

Proposed Therms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	3.91	3.32	3.51	3.23	3.19	2.99	3.06	3.08	3.05	3.28	3.39	3.9	39.92
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.26
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	0	0	0	0	0	0	0	0	0	0	0	0	0
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.94	3.34	3.53	3.26	3.21	3.01	3.08	3.1	3.07	3.3	3.41	3.92	40.18
Total Simulated Therms													401,800

Energy Savings Summary:

Energy Savings	
kWh Baseline	11,230,000
kWh proposed	11,100,000
kWh Savings	43,333
Therms Baseline	401,800
Therms Proposed	401,800
Therms Savings	-

Measure Cost Estimation:

Cost	
Total Cost Of Economizer	\$ 70,600

ORLANDO
OE-ECM # 1
GENERATOR BLOCK HEATER PUMPS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 19,430	93,440	-	-	\$ 7,880	52.54	2.5

750 KW Generator	
Number of Block Heaters	1
KW/heater	6
Current KW	6
Current KWHs	52,560
Heat Pump capacity (Bth/hr.)	20,478
COP	4.2
KW/heater	1.43
Proposed KW	1.43
Proposed KWHs	12,514
KW Saving	4.57
KWH/yr. Saving	40,046
Cost Per Heat Pump (RS Means)	7,230
Total Cost	7,230

650 KW Generators	
Number of Block Heaters	2
KW/heater	4
Current KW	8
Current KWHs	70,080
Heat Pump capacity (Bth/hr.)	13,652
COP	4.2
KW/heater	0.95
Proposed KW	1.90
Proposed KWHs	16,686
KW Saving	6.10
KWH/yr. Saving	53,394
Cost Per Heat Pump (RS Means)	6,102
Total Cost	12,204

Cost Savings:

Total kWh Savings	93,440
Total Cost	\$ 19,434.00

ORLANDO

OE-ECM # 2

SOLAR POWERED TRASH COMPACTORS

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 33,000	-	-	-	\$ 7,240	-	4.6

Cost

Purchase Price	\$ 3,000.00
Incidental Cost	\$ 300.00
Quantity	10
Total Cost	\$ 33,000.00

Labor Savings

Total Labor Hrs	2080
Labor \$/ hr	\$ 12.00
Labor \$/ hr + 45% Benefits	\$ 17.40
% Labor Reduction	20%
Total Labor Hrs Reduced	416
Total Labor Savings	\$ 7,238.40

ORLANDO

IL-ECM # 3

INSTALL SOLAR ON ROOF OF CLC & DOMICILIARY

Installation Cost	Energy Savings (kWh)	Energy Savings (Therms)	Water Savings (Gallons)	Annual Utility Savings	GHG Savings (Tons)	Simple Payback (Years)
\$ 1,240,000	663.712	-	-	\$ 56,017	373.21	22.1

Site Availability and Power Generation:

CLC	
Area Available (ft ²)	37357
PV Array Area (ft ²)	31753
Annual Generation (kWh/ft ²)	17.62
Total Generation (kWh)	559706

Domiciliary	
Area Available (ft ²)	7000
PV Array Area (ft ²)	5950
Annual Generation (kWh/ft ²)	17.47
Total Generation (kWh)	104006

Site Availability and Power Generation:

CLC	
Power Generation (kWh)	559706
Power Generation (kw DC)	419
Cost to Install (\$/DC watt)	2.5
Installation Cost (\$)	\$1,047,500
Savings (\$/yr)	48134.716
Simple Payback (yrs)	\$ 21.76

Domiciliary	
Power Generation (kWh)	104006
Power Generation (kw DC)	77
Cost to Install (\$/DC watt)	2.5
Installation Cost (\$)	\$192,500
Savings (\$/yr)	8944.516
Simple Payback (yrs)	\$ 21.50