Steven Winter Associates, Inc. 293 Route 18 South Telephone (866) 676-1972
Building System Consultants East Brunswick, NJ 08816 Web: www.swinter.com

March 24th, 2010

Local Government Energy Program
Energy Audit Final Report

Township of Lower
Millman Center
209 Bayshore Road
Villas, NJ 08251Project
Number:LGEA31

TABLE OF CONTENTS

INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Township of Lower. The audit included a review of the Township of Lower Municipal Building, Planning and Zoning Annex, Recreation Building, Millman Senior Center, Public Safety Building, Department of Public Works Administrative Offices and Department of Public Works Garage. The buildings are located in Erma and Villas, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Millman Center located at 209 Bayshore Road Villas, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Millman Center located at 209 Bayshore Road was opened in 1980 and major renovation work was performed in 2000. It is a single story free standing building with approximately 4,766 square feet of conditioned space. The building is primarily used as a senior center and it contains a public meeting room, offices, pottery room, kitchen, bathrooms and numerous storage rooms, however, sometimes the meeting room is used for non senior center events. The Millman Center hosts the Cape May County Nutrition Program for Senior Citizens on weekdays between 8:30 AM - 12:30 PM. There are approximately 2 full time employees working in the building at any given time. The building hours vary depending upon the scheduled events but the typical operating hours are Monday through Friday from 8:30 AM – 4:30 PM and 6:00 PM – 9:00 PM, Saturday from 9:00 AM – 4:00 PM and Sundays from 9:00 AM – 9:00 PM.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Township of Lower to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

- Section 1 and section 2 of the report cover a description and analysis of the building existing conditions.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 7 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Millman Center, located at 209 Bayshore Road, which was opened in 1980 and major renovation work was carried out in 2000. It is a single story free standing building with approximately 4,766 square feet of conditioned space. The building is primarily used as a senior center and it contains a public meeting room, offices, pottery room, kitchen, bathrooms and numerous storage rooms, however, sometimes the meeting room is used for non senior center events.

Based on the field visit performed by the SWA staff on November 10th, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

Existing conditions

From October 2008 through September 2009, the period of analysis for this audit, the building consumed 52,237 kWh or $9,737 worth of electricity at an approximate rate of $0.186/kWh and 2,529 gallons or $4,218 worth of #2 fuel oil at an approximate rate of $1.668/gallon. The joint energy consumption for the building, including both electricity and fossil fuel was 530 MMBtus of energy that cost a total of $13,995.

SWA has entered energy information about the Millman Center in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building does not receive an energy star score, which can be used to compare Millman Center with other similar buildings, due to its current use as a senior center; however, a comparison with other buildings can be made based on an energy use index kBtu/sqft.. SWA encourages the Township of Lower to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 112.0 kBtu/sq ft yr compared to the national average of an "other type" commercial building consuming 104.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.8 kBtu/sqft yr, with an additional 7.6 kBtu/sq ft yr from the recommended ECMs.

Implementing this report's recommendations will reduce use by approximately 9.4 kBtu/ft^2yr, which would decrease the building's energy use intensity to 102.6 kBtu/ft^2yr.

Recommendations

The Millman Center is used as a Senior Center and occupancy varies. During the hours of operation, it is rare that all areas of the building are in use. The building is heated and cooled using air handling units located in the ceiling plenum that are oil-fired for heating and are cooled using a split system with condensers outside that use R-22 refrigerant. According to Lower Township staff as well as building staff at the Millman Center, fuel oil #2 is used because the building is located in the North end of town that has not been fully connected with Natural Gas service. Typically, Natural Gas is cheaper and has a smaller carbon footprint that fuel oil #2. The existing oil-fired equipment has approximately 4-6 years of useful lifetime. Natural Gas service is coming to the area and should be available in the next few years. SWA recommends that natural gas service is extended to the building as it becomes available. When natural gas service is available, the air handling units

should be close to the end of their useful lifetime and should be upgraded to gas-fired units, as well as the electric domestic hot water heater.

.

The package of recommended measures reduces electricity usage by upgrading lighting fixtures and introducing a 5 kW solar photovoltaic system. This building is a good opportunity for the Township of Lower to showcase a photovoltaic system since it is located on the northernmost side of town, right as cars enter the Township of Lower.

Based on the assessment of the building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Replace all original/single-glazed windows
- Replace oil-fired air handling units with gas-fired units when natural gas service becomes available
- Replace electric domestic hot water heater with a gas-fired unit when natural gas service becomes available

Category II Recommendations: Operations and Maintenance

- Install new vinyl siding at locations where it is missing
- Bi-annual maintenance inspections of the exterior walls
- Bi-annual inspections of roof surfaces
- Repair, replace or reposition all displaced shingles
- Regularly inspect and maintain existing windows
- Provide weather stripping / air sealing
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends **1** Energy Conservation Measure (ECM) for The Millman Center that is summarized in the following Table 1. The total investment cost for this ECM with incentives is **$753**. SWA estimates a first year savings of **$919** with a simple payback of **0.8 years**. SWA also recommends **3** ECMs with a 5-10 year payback that is summarized in Table 2 and no End of Life Cycle ECMs.

The implementation of all the recommended ECMs would reduce the building electric usage by 13,049 kWh annually, or 25% of the building's current electric consumption. Due to the remaining useful lifetime of existing oil-fired equipment there are no measures recommended that reduce oil consumption at this time. SWA estimates that implementing these ECMs will reduce the carbon footprint of The Millman Center by **23,364 lbs of CO_2**, which is equivalent to removing approximately 1 car from the roads each year or avoiding the need of 56 trees to absorb the annual CO_2 produced. SWA also recommends that Township of Lower contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.036/kWh, which would have equated to $1,881 for the past 12 months.

There are various incentives that Township of Lower could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Township of Lower apply for the NJ

SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project.

A new NJ Clean Power program, Direct Install, could also assist to cover 80% of the capital investment. SWA strongly encourages that the Township of Lower proceeds to move forward with the Direct Install program in order to offset the cost of the recommended lighting measures.

Renewable ECMs require application approval and negotiations with the utility and proof of performance. There is also a utility-sponsored loan program through Atlantic City Electric that would allow the building to pay for the installation of the PV system through a loan issued by Atlantic City Electric.

The following two tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 15 new CFL lamps	RS Means	753	0	753	2,486	0.5	0	1.8	457	919	5	4,187	0.8	456	91	120	3,434	4,451
	TOTALS		**753**	**0**	**753**	**2,486**	**0.5**	**0**	**1.8**	**457**	**919**	**-**	**4,187**	**0.8**	**-**	**-**	**-**	**3,434**	**4,451**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

Table 2 - Recommended 5-10 Year Payback ECMs																		
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install 95 new T8 fluorescent fixtures	RS Means	20,455	1,425	19,030	3,794	0.8	0	2.7	2,615	3,321	15	39,075	5.7	105	7	15	20,045	6,793
3	Install 3 new Pulse Start Metal Halide fixtures	RS Means	2,127	75	2,052	867	0.2	0	0.6	194	355	15	4,180	5.8	104	7	15	2,128	1,552
4	Install a 5 kW Solar Photovoltaic system	RS Means	35,000	5,000	30,000	5,902	5.0	0	4.2	0	4,098	25	69,791	7.3	133	5	11	23,998	10,568
	TOTALS		**57,582**	**6,500**	**51,082**	**10,563**	**6.0**	**0**	**7.6**	**2,809**	**7,774**	**-**	**113,046**	**6.6**	**-**	**-**	**-**	**46,171**	**18,913**

Note: For more details on End of Life Cycle ECMs and associated incremental cost for high efficiency equipment and performance see Section 4.

1. HISTORIC ENERGY CONSUMPTION

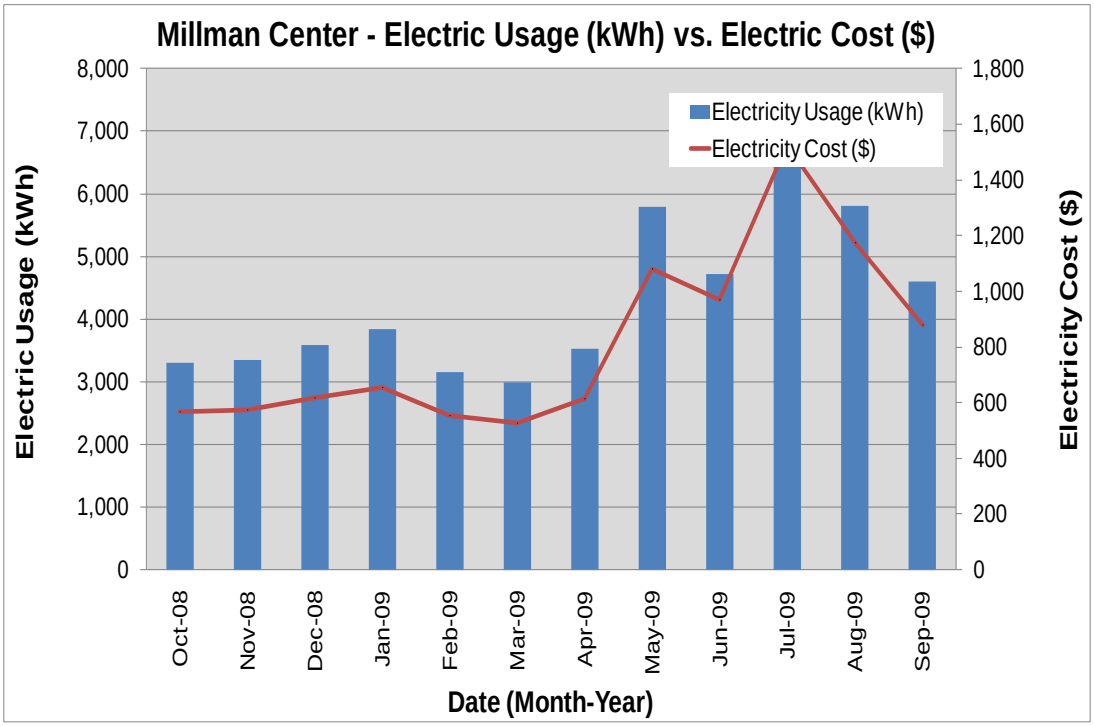
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **October 2008 through September 2009**(period of analysis) that were received from the utility companies supplying the Millman Center with electric and #2 fuel oil.

Electricity - The Millman Center buys electricity from Atlantic City Electric at **an average rate of $0.186/kWh** based on 12 months of utility bills from October 2008 to September 2009. The building contains two electric meters; one general building meter and a second for exterior lighting. For purposes of the building analysis, the usage and costs from these meters have been combined. They purchased **approximately 52,237 kWh or $9,737 worth of electricity** in the previous year and are currently charged for demand (kW) which has been factored into each monthly bill. The building has an average monthly demand of **22.6 kW** and an annual peak demand of **30.2 kW**.

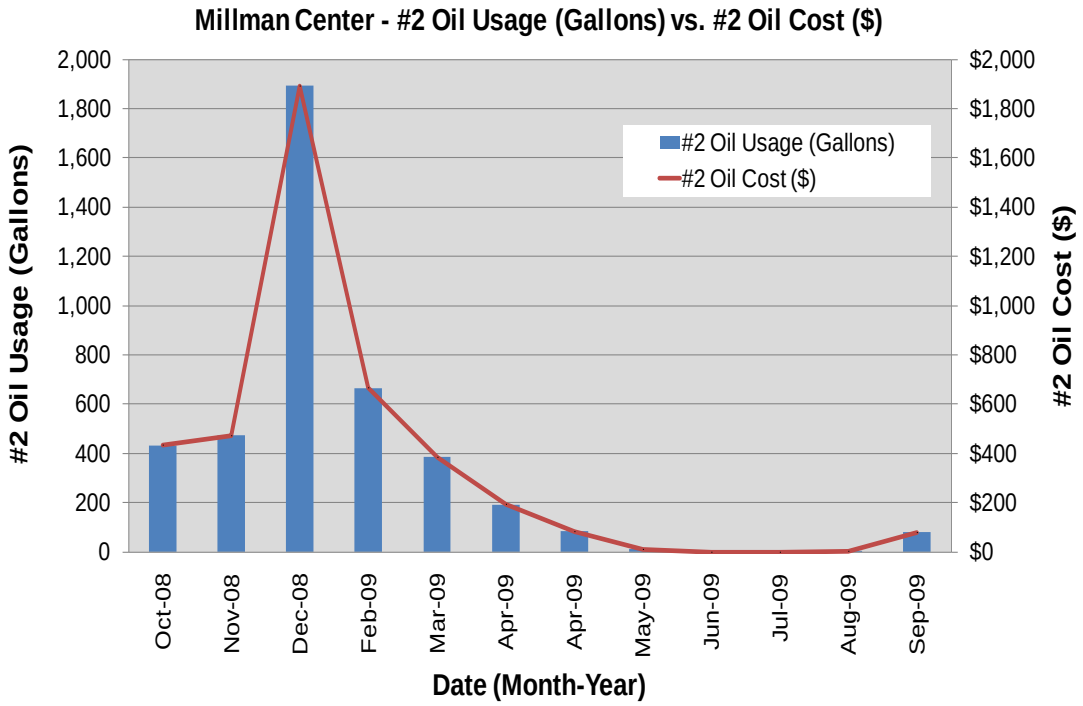
#2 Fuel Oil - The Millman Center is currently served by one fuel delivery company, Pedroni Fuel, which acts as the supply and delivery company at **an average aggregated rate of $1.668/gallon** and purchased **approximately 2,529 gallons or $4,218 worth of #2 fuel oil** in the 12 months from October 2008 to September 2009

The following chart shows electricity use versus cost for The Millman Center based on utility bills for the 12 month period of October 2008 to September 2009.



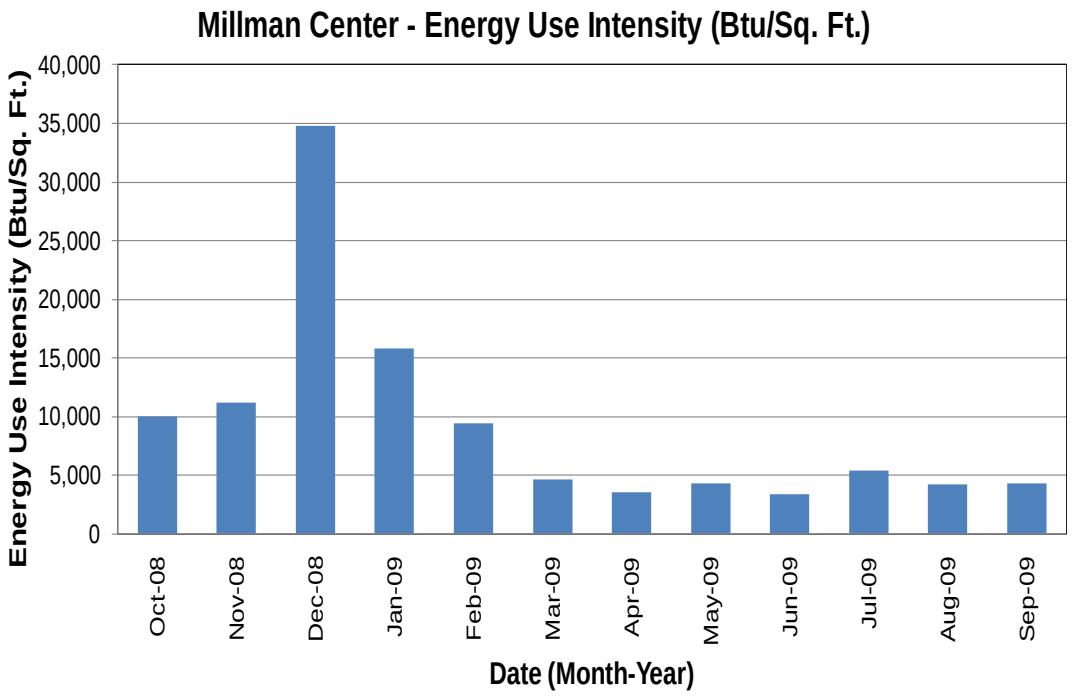
Electricity use follows a trend that is expected for this building due to its existing heating and cooling systems with usage peaking during summer as expected when electrically powered equipment is used for cooling purposes.

The following is a chart of the #2 fuel oil annual load profile for the building versus #2 fuel oil costs, peaking in the coldest months of the year and a chart showing #2 fuel oil consumption following the "heating degree days" curve.



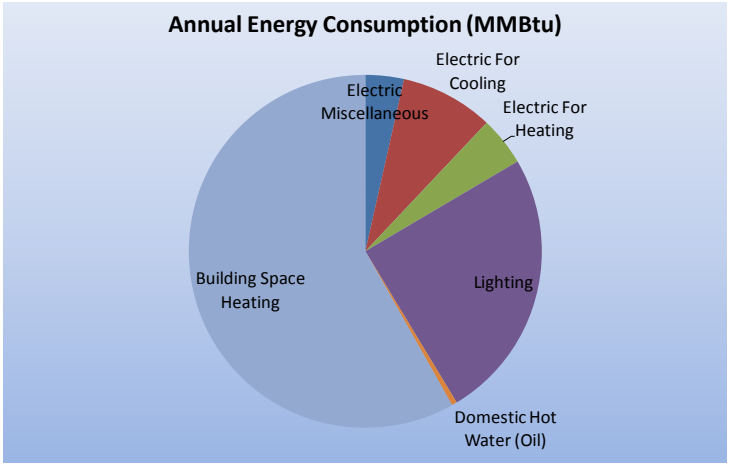
In the above chart, the #2 fuel oil use follows a heating trend as expected. The above chart is based on fuel deliveries, since fuel oil #2 is typically not metered. During the summer it is clear that the #2 fuel oil use is very minimal which reflects that heat is not being used and the domestic hot water (DHW) load is minimal.

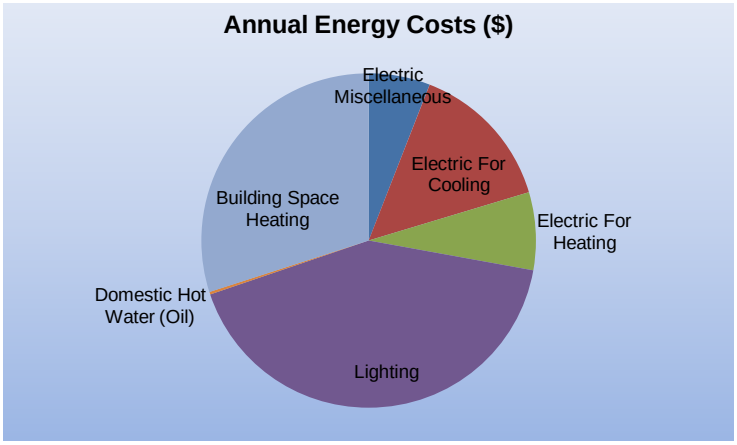
The following chart shows combined #2 fuel oil and electric consumption in Btu/sq ft for The Millman Center based on utility bills for the 12 month period of October 2008 to September 2009.



The following table and chart pies show energy use for The Millman Center based on utility bills for the 12 month period of October 2008 to September 2009. Note electrical cost at 53/MMBtu of energy is almost more than 3 times as expensive to use as #2 fuel oil at $15/MMBtu.

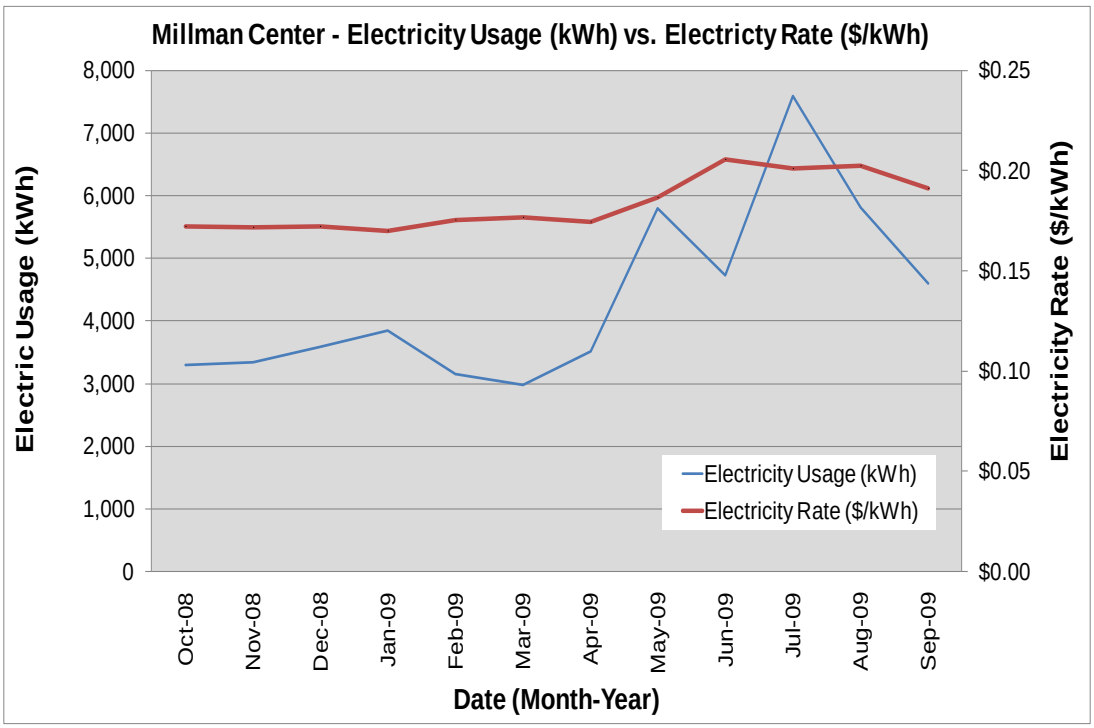
Oct 08 - Sep 09 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	15	4%	$828	6%	55
Electric For Cooling	37	9%	$2,008	14%	55
Electric For Heating	19	4%	$1,052	8%	55
Lighting	107	25%	$5,849	42%	55
Domestic Hot Water (Oil)	2	0%	$35	0%	17
Building Space Heating	251	58%	$4,183	30%	17
Totals	431	100%	$13,955	100%	
Total Electric Usage	178	41%	$9,737	70%	55
Total Oil Usage	253	59%	$4,218	30%	17
Totals	431	100%	$13,955	100%	



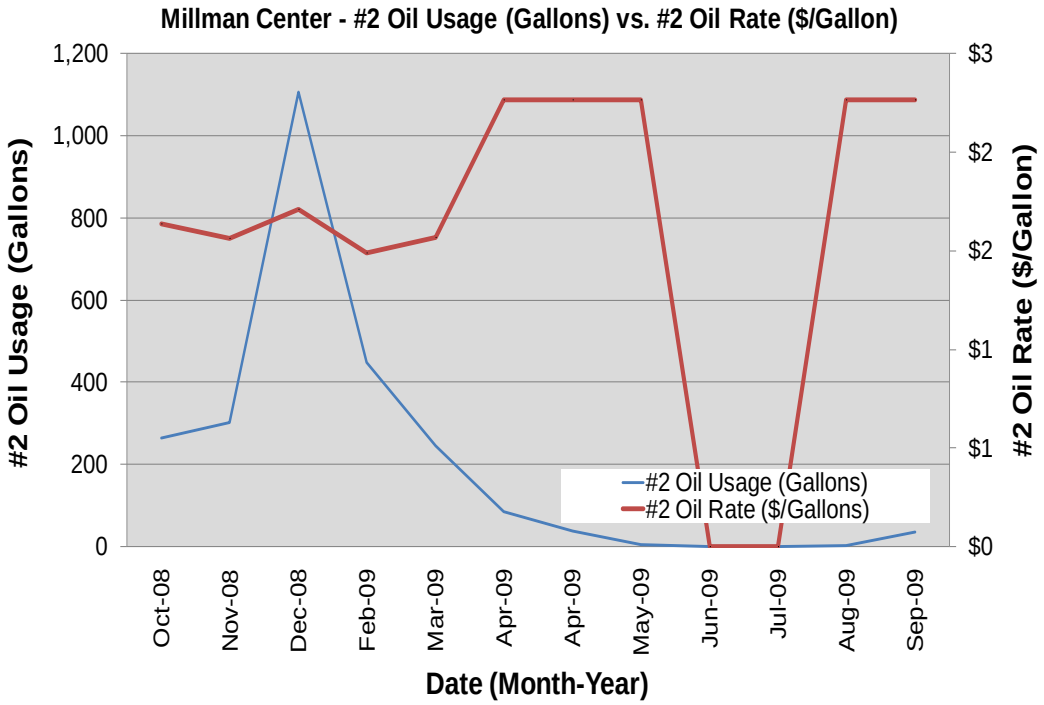


1.2. Utility rate analysis

The Millman Center currently purchases electricity from Atlantic City Electric at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. The Millman Center currently pays an average rate of approximately $0.186/kWh based on the 12 months of utility bills of October 2008 to September 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year except for an anticipated rise in the summer time. Based on these observations this appears to be the appropriate rate for the building.



The Millman Center currently purchases #2 fuel oil from Pedroni Fuel Corp. which acts as the transportation company and energy supplier at a general service market rate for #2 fuel oil (Gallons). The average aggregated rate (supply and transport) for the oil supply is approximately $1.668/Gallon based on 12 months of utility bills for October 2008 to September 2009. The suppliers' general service rates for #2 fuel oil charges a market-rate price. Typically, the #2 fuel oil prices increase during the summer months when #2 fuel oil is used minimally. In general though there is also a price drop in the second half of 2008 due to the overall decline in the price of oil on the commodities exchange.



1.3. Energy benchmarking

SWA has entered energy information about the Millman Center in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building does not receive a performance rating due to its current use as a senior center which means that it is ineligible for Energy Star score. SWA encourages the Township of Lower to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 112.0 kBtu/sq ft yr compared to the national average of a social/meeting building consuming 52.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.8 kBtu/sqft yr, with an additional 7.6 kBtu/sq ft yr from the recommended ECMs.

Per the LGEA program requirements, SWA has assisted the Township of Lower to create an *Energy Star Portfolio Manager* account and has shared the building facility information to allow future data to be added and tracked using the benchmarking tool. SWA is sharing this Portfolio Manager Site information with TRC Energy Services. As per requirements, the account information is provided below:

Username: LowerTownship
Password: LOWER

Also, below is a statement of energy performance generated based on historical energy consumption from the Portfolio Manager Benchmarking tool.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Township of Lower - Millman Center

Building ID: 1933173
For 12-month Period Ending: September 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: March 05, 2010

Facility	Facility Owner	Primary Contact for this Facility
Township of Lower - Millman Center 209 Breakwater Road Villas, NJ 08251	N/A	N/A

Year Built: 1980
Gross Floor Area (ft²): 4,766

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	180,180
Fuel Oil (No. 2) (kBtu)	351,525
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	531,705

Energy Intensity[5]	
Site (kBtu/ft²/yr)	112
Source (kBtu/ft²/yr)	201

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	53

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	-6%
Building Type	Other

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Certifying Professional
N/A

Meets Industry Standards[6] for Indoor Environmental Conditions:	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The free standing single story (slab on grade), 4,766 square feet the Millman Center was originally constructed in 1980 with additions/ alterations done in 2000. It houses a senior center and it contains a public meeting room, offices, pottery room, kitchen, bathrooms and numerous storage rooms, however, sometimes the meeting room is used for non senior center events.

Partial West Façade

Partial East Façade

Partial South Façade

Partial North Façade

2.2. Building occupancy profiles

The Millman Center hosts the Cape May County Nutrition Program for Senior Citizens on weekdays between 8:30 – 12:30. There are approximately 2 full time employees working in the building at any given time. The building hours vary depending upon the scheduled events but the typical operating hours are Monday through Friday from 8:30 AM – 4:30 PM and 6:00 PM – 9:00 PM, Saturday from 9:00 AM – 4:00 PM and Sundays from 9:00 AM – 9:00 PM.

2.3. Building Envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/ outside & no/ low wind) no exterior envelope infrared (IR) images were taken during the field audit. Thermal imaging/ infrared (IR) technology helps to identify energy compromising problem areas in a non-invasive way.

2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of vinyl clapboard siding over 3-1/2" wood stud framing with 3-1/2 inches of (R-13) fiberglass batt cavity insulation. The interior is mostly taped and spackled gypsum wallboard.

Note: Wall insulation levels could not be verified in the field and are based on available construction plans.

During the field audit exterior and interior wall surfaces were inspected. They were found/ reported to be in overall good/ age appropriate condition with some signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:

Damaged exterior wall finishes with missing vinyl siding to be replaced

In light of the exterior wall conditions mentioned above SWA has the following recommendations:

1. Install new vinyl siding at locations where it is missing

2. Biannual maintenance inspections to inspect the exterior walls with a focus on damaged or missing siding, and locating sources of water and air leakage.

2.3.2. Roof

The building's roof is predominantly a medium-pitch gable type over a wood structure with a asphalt shingle finish. A layer of (R-30) of fiberglass batt attic/ ceiling was recorded. This roof is original and has never been replaced.

Note: Roof insulation levels could not be verified in the field and are based on available construction plans.

During the field audit roofs, related flashing, gutters and downspouts were inspected. They were found/ reported to be in overall good/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues detected on all roof areas.

The following specific roof problem spots and areas were identified:


Roof corners and transitions where the shingles have been displaced and do not lay properly on the roof

In light of the exterior wall conditions mentioned above SWA has the following recommendations:

1. Inspect all roof surfaces on a regular basis with a focus on drainage, penetrations, flashing, seams and condition of the shingles of the roof.

2. Repair or replace and reposition all displaced, damaged or missing shingles.

2.3.3. Base

The building's base is composed of a slab-on-grade floor with a perimeter foundation and no detectable slab edge/ perimeter insulation.

The slab is 4" thick and constructed of concrete with a vapor barrier layer to its exterior. Additionally at some locations the slab is supplement with light weight concrete over existing brick pavers for leveling purposes. Slab/ perimeter insulation levels could not be verified in the field and are based on available construction plans.

The building's base and its perimeter were inspected. Judging from signs of uncontrolled moisture or water presence and other energy compromising issues, overall the base was found/ reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

2.3.4. Windows

The building contains several different types of windows.

1. Fixed type windows with a non-insulated aluminum frame, clear double glazing and interior roller blinds and grid patterned grills. The windows are located throughout the building
2. Double-hung type windows with a wood frame, clear single glazing and interior roller blinds . The windows are located throughout the building and are installed with exterior insect screens.
3. Double-hung type windows with a non-insulated aluminum frame, clear double glazing and interior roller blinds . The windows are located throughout the building and are installed with exterior insect screens.
4. Double-hung type windows with a vinyl frame, clear double glazing and interior roller blinds. The windows are located throughout the building
5. Side light windows constructed of tempered glass that are part of some door installations.

Windows, shading devices, sills, related flashing and caulking were inspected from the exterior and interior as far as accessibility allowed. Based on signs of moisture, air-leakage and other energy compromising issues, overall the windows were found and/or reported to be in acceptable/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following typical windows were identified:

Typically installed windows with wooden frame unit showing signs of advanced age and some damage to the frame.

In light of the exterior wall conditions mentioned above SWA has the following recommendations:

1. Replace all original/ single glazed windows with a low-E, double glazed type during the next major building renovations.

2. Regularly inspect and maintain existing windows with a focus on damage frames, cracked glazing, improperly functioning hardware, water damage and leaks, and lack of an airtight seal.

2.3.5. Exterior doors

The building contains several different types of exterior doors..

1. Wood framed wooden type exterior doors. They are located throughout the building and are paneled with some of them containing panels of tempered glass.

2. Metal framed solid metal type exterior doors. They are located throughout the building and are paneled with panes of tempered glass.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected. Based on signs of moisture, air-leakage and other energy compromising issues, overall the doors were found/ reported to be in good/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots and typical installations were identified:

Exterior doors exhibiting worn weather stripping and damaged door frame

In light of the exterior wall conditions mentioned above SWA has the following recommendations:

1. Maintain and replace any missing weather stripping around all exterior doors.

2. Regularly inspect all exterior doors with a focus on the condition of the weather-stripping, physical condition of the exterior door surface, warped door frames, water damage, proper closing of the door, and an airtight seal.

2.3.6. Building air-tightness

Overall the field auditors found the building to be reasonably air-tight with only a few areas of suggested improvements, as described in more detail earlier in this chapter.

In addition to all the above mentioned findings SWA recommends air sealing, caulking and/ or insulating around all structural members, recessed lighting fixtures, electrical boxes and chimney walls that are part of or penetrate the exterior envelope and where air-leakage can occur.

The air tightness of buildings helps maximize all other implemented energy measures and investments and minimizes potentially costly long term maintenance/ repair/ replacement expenses.

2.4. HVAC Systems

The Millman Center is served by four air-handling units located in the ceiling plenum throughout the building. These units are packaged air handlers with oil-fired heating and DX cooling with condensers located outside of the building.

2.4.1. Heating

The building contains four air handling units located in the ceiling plenum throughout the building. These units are oil-fired but contain a DX cooling coil for cooling purposes. These units were observed to each have an 82% nominal efficiency and were observed in good condition and have not yet reached the end of their lifetime.

2.4.2. Cooling

Cooling is provided to the Millman Center via the four air handling units that also provide heating. Each air handler acts as a DX split system with each connected to a condenser located on the ground behind the building. Based on the condition of the equipment and the limited use of the building, the cooling equipment would not be cost-effective to upgrade at this point in time.

2.4.3. Ventilation

As mentioned above, a majority of the building is provided conditioned air from the heating/cooling plant via a large air handler. This air handler receives a mix of outside and return air, tempers it based on set points and provides forced air throughout the building via VAV boxes.

In addition to the air handling unit, there are 10 exhaust fans that help rid the building of stale air and also help induce fresh air into the building. These rooftop exhaust fans were observed to all be working with no major maintenance issues.

2.4.4. Domestic Hot Water

There is one Bradford-White Hydrojet electric water heater with a 40 gallon storage capacity, 4,500W max element and uses 4,990 kWh/year according to the attached Energy Star label. This domestic hot water heater was observed to be appropriately sized and in good condition. This electric hot water heater serves only sinks located within the Millman Center. There have been no reports of domestic hot water problems within the building.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – The Millman Center contains mostly inefficient lighting. There is primarily inefficient lighting such as the existing 4’ T12 fixtures with magnetic ballasts and screw in incandescent fixtures. SWA recommends replacing the T12 lights with T8 electronic ballast

fixtures and incandescent fixtures with CFL's. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

Exit Lights - Exit signs were found to be LED fixtures.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of incandescent, halogen, metal halide and high pressure sodium fixtures. SWA recommends installing CFL's in place of the incandescent and halogens and pulse start metal halides in place of the high pressure sodium and metal halide fixtures.

2.5.2. Appliances

SWA performed a basic survey of appliances installed at the Millman Center and has determined that it would not be cost-effective to replace the existing refrigerators and side by side freezer at this time. Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. refrigerators, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The Millman Center computers are generally programmed for the power save mode, to shut down after a period of time that they have not been used.

2.5.3. Elevators

The Millman Center does not have any installed elevators.

2.5.4. Process and others electrical systems

There are currently no other process or other electrical systems located within the building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Heating/ Cooling	AHU-1; Armstrong air handling unit with oil furnace and cooling coil, assumed 82% efficiency based on similar models	Ceiling plenum above Meeting Room North	Armstrong, Model #L8A14C17-1, Serial #A26782CMA	Oil #2/ Electricity	Meeting Room North	1991	24%
Heating/ Cooling	AHU-2; Armstrong air handling unit with oil furnace and cooling coil, assumed 82% efficiency based on similar models	Ceiling plenum above office bathroom	Armstrong, Model #L8A140C17-1, Serial #A26775CMA	Oil #2/ Electricity	Office Bathroom	1991	24%
Heating/ Cooling	AHU-3; York air handling unit with oil furnace and cooling coil, assumed 82% efficiency based on similar models	Ceiling plenum above Meeting Room South	York, Model #PFMD16F10001, Serial #EACPD00086	Oil #2/ Electricity	Meeting Room South	1994	36%
Heating/ Cooling	AHU-4; Climatrol air handling unit with oil furnace and cooling coil, assumed 82% efficiency based on similar models	Ceiling plenum above Meeting Room South	Climatrol, Model #2532185A06, Serial #155809	Oil #2/ Electricity	Meeting Room South	1999	56%
Cooling	CU-1; York condensing unit, provides R-22 refrigerant cooling to AHU-1	Exterior of building, backside	York, Stellar Series, Model #H5DB048S06A, Serial #WDLM029098	Electricity	Meeting Room North	1991	24%
Cooling	CU-2; York condensing unit, provides R-22 refrigerant cooling to AHU-2	Exterior of building, backside	York, Model #H5DB048S06A, Serial #WCLM 021254	Electricity	Office Bathroom	1991	24%
Cooling	CU-3; Pane condensing unit, provides R-22 refrigerant cooling to AHU-3	Exterior of building, backside	Pane, Model #710AJ060-B, Serial #2296E03585	Electricity	Meeting Room South	1994	36%
Cooling	CU-4; Bryant condensing unit, provides R-22 refrigerant cooling to AHU-4	Exterior of building, backside	Bryant, Model #561CJ060-A, Serial #2100 E21 325	Electricity	Meeting Room South	1999	56%
Domestic Hot Water	Bradford-White electric water heater, 40 gallons storage capacity, 240V, 4,500W upper element, 4,500W lower element, 4,500W max element, Energy Star label says 4,990 kWh/year	Electric/Ceramic kiln room, back of building	Bradford-White, Model #MI4056DS13, Serial #XJ0083566	Electricity	All areas	2003	40%
Lighting	See Appendix A	-	-	-	-	-	-

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of The Millman Center, SWA has separated the investment opportunities into three recommended categories:

1. Capital Improvements - Upgrades not directly associated with energy savings
2. Operations and Maintenance - Low Cost / No Cost Measures
3. Energy Conservation Measures - Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- Replace all original/single-glazed windows – SWA recommends considering an upgrade from all the existing windows to low-E, double-glazed type during the next major building renovation. Replacing the windows would not be cost-effective based on energy savings alone at this point in time.

- Replace oil-fired air handling units with gas-fired units when natural gas service becomes available – The Millman Senior Center building is currently heated using four oil-fired air handling units. Oil #2 is typically more expensive than natural gas and also has a higher carbon footprint. The building is located on the North end of town that does not yet have natural gas lines run from the utility company. Based on conversations with building staff, the utility company is in the process of running district natural gas lines in the area over the next few years. SWA recommends that when natural gas lines become available, these oil-fired air handling units are replaced with natural gas units.

- Replace electric domestic hot water heater with a gas-fired unit when natural gas service becomes available – As mentioned above, natural gas service is currently not available in the area. According to building staff, natural gas service will become available in the next couple of years. SWA recommends that the electric domestic hot water unit is upgraded to a gas-fired unit when natural gas service becomes available.

Category II Recommendations: Operations and Maintenance

- Install new vinyl siding at locations where it is missing – SWA observed several areas of the building that had missing or damaged vinyl siding. This siding should be replaced immediately.

- Bi-annual maintenance inspections of the exterior walls – SWA recommends routine inspections of the exterior walls as part of a preventative maintenance plan. Siding should be replaced at the first sign of damage in order to prevent further water damage or air leakage.

- Bi-annual inspections of roof surfaces – SWA recommends performing roof inspections as part of a preventative maintenance program. Inspections should focus on drainage issues, penetrations, flashing, seams and condition of the shingles of the roof.

- Repair, replace or reposition all displaced shingles – SWA observed some areas of the roof that had missing or displace shingles. These shingles should be repaired or replaced immediately to prevent air or water leakage across the building envelope.

- Regularly inspect and maintain existing windows – The Millman building was observed to contain windows that had frames with minor frame damage, cracked glazing, improperly functioning hardware and water damage. SWA recommends performing routine maintenance

checks as part of a preventative maintenance plan to repair damaged windows immediately and prevent any further water or air leakage.

- Provide weather stripping / air sealing – SWA observed that all windows and doors had proper weather-stripping and air sealing due to their age. As a best practice, SWA recommends that each window and door is inspected twice per year for deficiencies. Any time that a seal has been compromised, building maintenance staff should repair and replace the seal immediately to ensure that thermal barriers are not breached.

- Provide water efficient fixtures and controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and / or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures / appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills.

- Use Energy Star labeled appliances - such as Energy Star refrigerators that should replace older energy inefficient equipment.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Install 15 new CFL lamps
	Description of Recommended 5-10 Year Payback ECMs
2	Install 95 new T8 fluorescent fixtures
3	Install 3 new Pulse Start Metal Halide fixtures
4	Install a 5 kW Solar Photovoltaic system

ECM#1: *Install 15 new CFL lamps*

Description:
The Millman Senior Center building contains 15 light bulbs that are inefficient and should be replaced. Five of these light bulbs are incandescent bulbs used for interior lighting, while 10 of these light bulbs are halogen or incandescent light bulbs used for exterior lighting. SWA recommends replacing the above mentioned bulbs with Compact Fluorescent Lamps (CFLs) that have an equivalent light output. Typically, CFL replacement bulbs will have the same light output while consuming 2/3 less power. See Appendix A for complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $753
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 15 new CFL lamps	RS Means	753	0	753	2,486	0.5	0	1.8	457	919	5	4,187	0.8	456	91	120	3,434	4,451

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
There are currently no incentives for this measure at this time.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#2: *Install 95 new T8 fluorescent fixtures*

Description:
The Millman Center currently contains 95 inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each one of these T12 fixtures with equivalent T8 fluorescent fixtures with electronic ballasts. Typically, T8 fluorescent fixtures with electronic ballasts use 30% less energy than equivalent T12 fixtures with magnetic ballasts. In addition, there will be operating cost savings associated with each bulb since CFLs have a longer rated lifetime than incandescent bulbs. See Appendix A for complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $19,030
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install 95 new T8 fluorescent fixtures	RS Means	20,455	1,425	19,030	3,794	0.8	0	2.7	2,615	3,321	15	39,075	5.7	105	7	15	20,045	6,793

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting – T-5 and T8 lamps with electronic ballast in existing facilities ($15 per fixture)
Maximum incentive amount is $1,425.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#3: *Install 3 new Pulse Start Metal Halide fixtures*

Description:
The Millman Center currently contains 3 exterior Probe Start Metal Halide fixtures. Probe Start Metal Halide fixtures are typically installed at high wattages since they degrade over time. Installing Pulse Start Metal Halide fixtures allows a lower wattage fixture to be used and provide a better quality light since the light does not degrade over time. In addition, Pulse Start Metal Halide lamps last longer, saving money by requiring less lamp changes over time. See Appendix A for complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $2,052
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	Install 3 new Pulse Start Metal Halide fixtures	RS Means	2,127	75	2,052	867	0.2	0	0.6	194	355	15	4,180	5.8	104	7	15	2,128	1,552

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting – Metal Halide with Pulse Start ($25 per fixture)
Maximum incentive amount is $75

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#4: *Install a 5 kW Solar Photovoltaic system*

Description:
Currently, The Millman Center does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, and recommends at this time that Township of Lower further review installing a 5kW PV system to offset electrical demand and reduce the annual net electric consumption for the building, and review guaranteed incentives from NJ rebates to justify the investment. The Millman Center is not eligible for a 30% federal tax credit. Instead, Township of Lower may consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. Atlantic City Electric provides the ability to buy SRECs at $600 / MWh or best market offer.

There are a few locations for a 5kW PV installation on the building roofs and away from shade. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 5kW system needs approximately 41 panels which would take up 435 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:
Estimated installed cost: $30,000
Source of cost estimate: Similar projects

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	gallons, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	Install a 5 kW Solar Photovoltaic system	RS Means	35,000	5,000	30,000	5,902	5.0	0	4.2	0	4,098	25	69,791	7.3	133	5	11	23,998	10,568

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (123 Watts, model #ND-123UJF). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft).

Rebates/financial incentives:
NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application. Incentive amount for this application is $5,000.

http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. $3,000 has been incorporated in the above costs for a period of 15 years; however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

A Wind system is not applicable for this building because the area does not have winds of sufficient velocity to justify installing a wind turbine system.

5.3. Solar Photovoltaic

Pleases see the above recommended ECM#4.

5.4. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this building and would not be recommended due to the insufficient and not constant use of domestic hot water throughout the building to justify the expenditure.

5.5. Combined Heat and Power

CHP is not applicable for this building because of the existing HVAC system and insufficient domestic hot water use.

5.6. Geothermal

Geothermal is not applicable for this building because the current HVAC system does not use hot water.

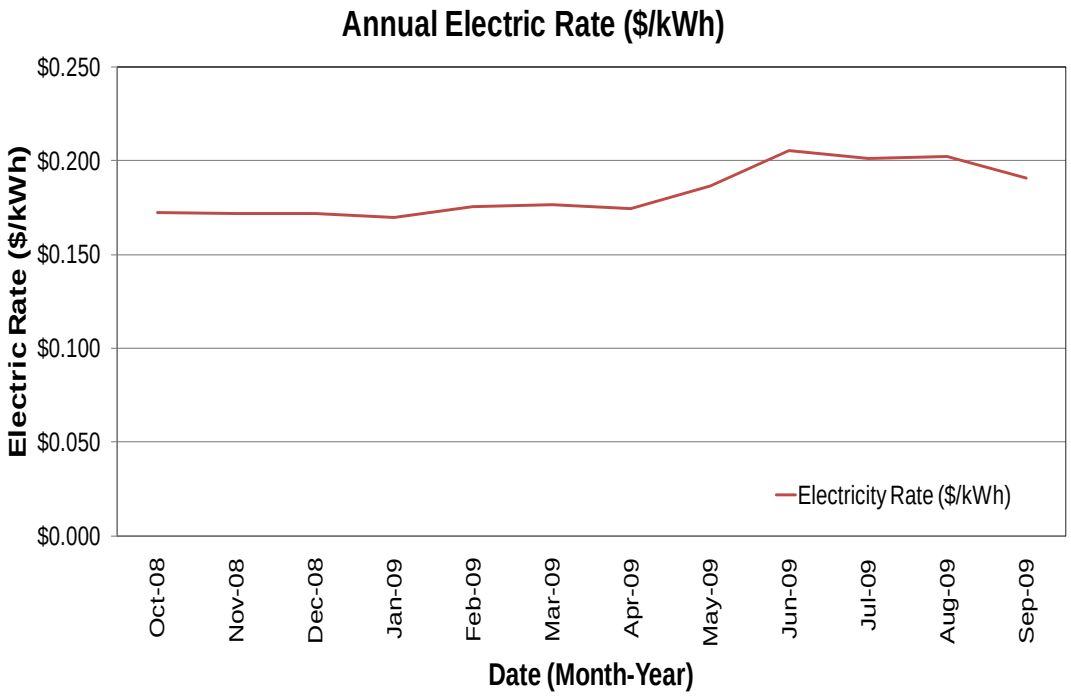
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

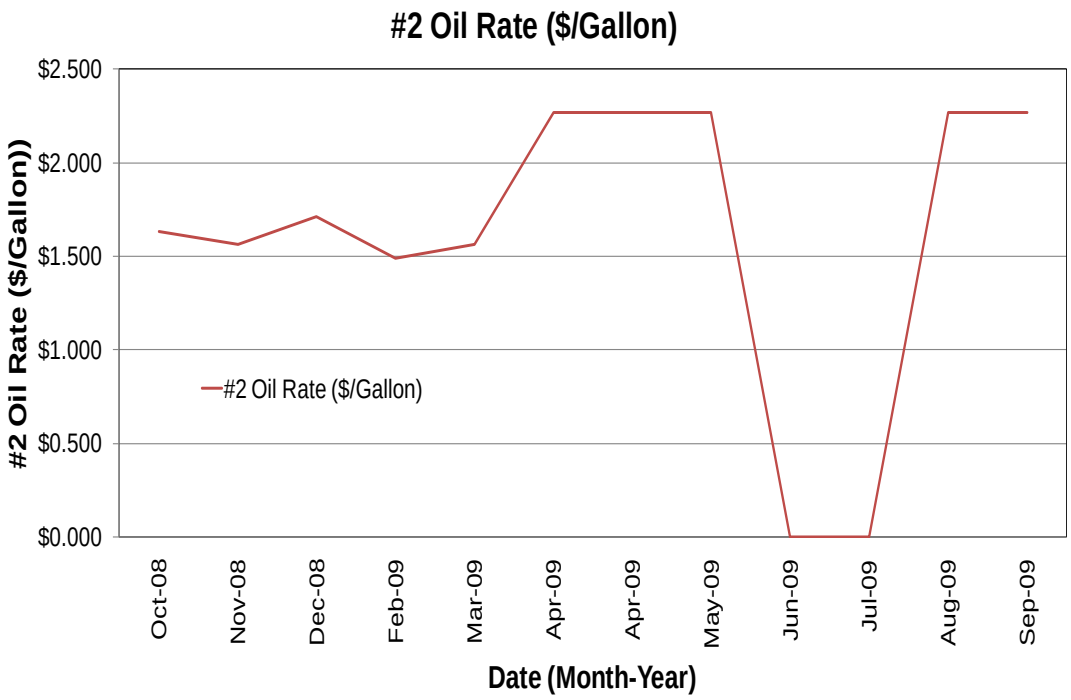
6.1. Energy Purchasing

The Millman Center receives #2 fuel oil via deliveries from Pedroni Fuel Corp., which acts as the transportation company and energy supplier. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is purchased via one incoming meter directly for the Millman Center from Atlantic City Electric without an ESCO. SWA analyzed the utility rate for #2 fuel oil and electricity supply over an extended period. Electric bill analysis shows fluctuations of 11% over the 12 month period between October 2008 and September 2009. #2 fuel oil bill analyses shows fluctuations up to 56% over the 12 month period between October 2008 and September 2009.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity and $2.19/gallon for #2 fuel oil. Currently, the electricity rate for the Millman Center is $0.186/kWh, which means there is a potential cost savings of $ 1,881 per year. The current #2 fuel oil rate

for the Millman Center is $1.67/gallon which means there is no cost savings since they pay below market rate. A cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that the Township of Lower further explore opportunities of purchasing electricity from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for The Millman Center. Appendix B contains a complete list of third party energy suppliers for the Township of Lower service area. The Township of Lower may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and #2 fuel oil use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey.





6.2. Energy Procurement strategies

Also, The Millman Center would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	Established / standard industry assumptions, DOE e-Quest
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

7.2. Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.

Appendix A: Lighting Study of the Millman Center

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Lobby	Parabolic	M	4'T12	3	2	34	S	9	345	15	249	773	T8	Parabolic	4'T8	E	S	3	2	32	9	345	6	210	652	121	0	121
2	1	Lobby	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
3	1	Office	Parabolic	M	4'T12	1	4	34	S	9	345	24	160	497	T8	Parabolic	4'T8	E	S	1	4	32	9	345	13	141	438	59	0	59
4	1	Meeting Room	Parabolic	M	4'T12	8	4	34	S	9	345	24	1,280	3,974	T8	Parabolic	4'T8	E	S	8	4	32	9	345	13	1128	3502	472	0	472
5	1	Meeting Room	Parabolic	M	4'T12	1	2	34	S	9	345	15	83	258	T8	Parabolic	4'T8	E	S	1	2	32	9	345	6	70	217	40	0	40
6	1	Meeting Room	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
7	1	Storage Room	Parabolic	M	4'T12	1	2	34	S	2	345	15	83	57	T8	Parabolic	4'T8	E	S	1	2	32	2	345	6	70	48	9	0	9
8	1	Storage Room	Screw-in	N	Inc	1	1	60	S	2	345	0	60	41	CFL	Screw-in	CFL	N	S	1	1	20	2	345	0	20	14	28	0	28
9	1	Boiler Room	Screw-in	N	Inc	1	1	60	S	2	345	0	60	41	CFL	Screw-in	CFL	N	S	1	1	20	2	345	0	20	14	28	0	28
10	1	Meeting Room	Parabolic	M	4'T12	69	2	34	S	9	345	15	5,727	17,782	T8	Parabolic	4'T8	E	S	69	2	32	9	345	6	4830	14997	2785	0	2785
11	1	Meeting Room	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
12	1	Kitchen	Parabolic	M	4'T12	5	4	34	S	2	345	24	800	552	T8	Parabolic	4'T8	E	S	5	4	32	2	345	13	705	486	66	0	66
13	1	Coat Closet	2'U-shape	M	4'T12	1	2	40	S	2	345	15	95	66	T8	2'U-Shape	4'T8	E	S	1	2	32	2	345	6	70	48	17	0	17
14	1	Hallway	Parabolic	M	4'T12	3	2	34	S	9	345	15	249	773	T8	Parabolic	4'T8	E	S	3	2	32	9	345	6	210	652	121	0	121
15	1	Bathroom	2'U-shape	M	4'T12	1	2	40	S	4	345	15	95	131	T8	2'U-Shape	4'T8	E	S	1	2	32	4	345	6	70	97	35	0	35
16	1	Bathroom Women	2'U-shape	M	4'T12	1	2	40	S	4	345	15	95	131	T8	2'U-Shape	4'T8	E	S	1	2	32	4	345	6	70	97	35	0	35
17	1	Bathroom Men	2'U-shape	M	4'T12	1	2	40	S	4	345	15	95	131	T8	2'U-Shape	4'T8	E	S	1	2	32	4	345	6	70	97	35	0	35
18	1	Janitor's Closet	Screw-in	N	Inc	1	1	60	S	2	345	0	60	41	CFL	Screw-in	CFL	N	S	1	1	20	2	345	0	20	14	28	0	28
19	1	Storage Room	Screw-in	N	Inc	1	1	60	S	2	345	0	60	41	CFL	Screw-in	CFL	N	S	1	1	20	2	345	0	20	14	28	0	28
20	1	Storage Room	Screw-in	N	Inc	1	1	60	S	2	345	0	60	41	CFL	Screw-in	CFL	N	S	1	1	20	2	345	0	20	14	28	0	28
21	Ext	Exterior	Exterior	N	Inc	4	1	65	S	12	365	0	260	1,139	CFL	Exterior	CFL	N	S	4	1	20	12	365	0	80	350	788	0	788
22	Ext	Exterior	Exterior	N	Hal	4	1	75	S	12	365	19	376	1,647	CFL	Exterior	CFL	N	S	4	1	25	12	365	0	100	438	1209	0	1209
23	Ext	Exterior	Exterior	N	Inc	2	1	60	S	12	365	0	120	526	CFL	Exterior	CFL	N	S	2	1	20	12	365	0	40	175	350	0	350
24	Ext	Exterior	Exterior	N	HPS	2	1	150	S	12	365	38	376	1,647	PSMH	Exterior	PSMH	N	S	2	1	100	12	365	22	244	1069	578	0	578
25	Ext	Exterior	Exterior	N	MH	1	1	150	S	12	365	38	188	823	PSMH	Exterior	PSMH	N	S	1	1	100	12	365	22	122	534	289	0	289
Totals:						**118**	**43**	**1,247**				**305**	**10,661**	**31,377**						**118**	**43**	**764**			**140**	**8,360**	**24,230**	**7,147**	**0**	**7,147**

Appendix B: Third Party Energy Suppliers (ESCOs)

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Appendix C: Glossary and Method of Calculations

Glossary of ECM Terms

.

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings
NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

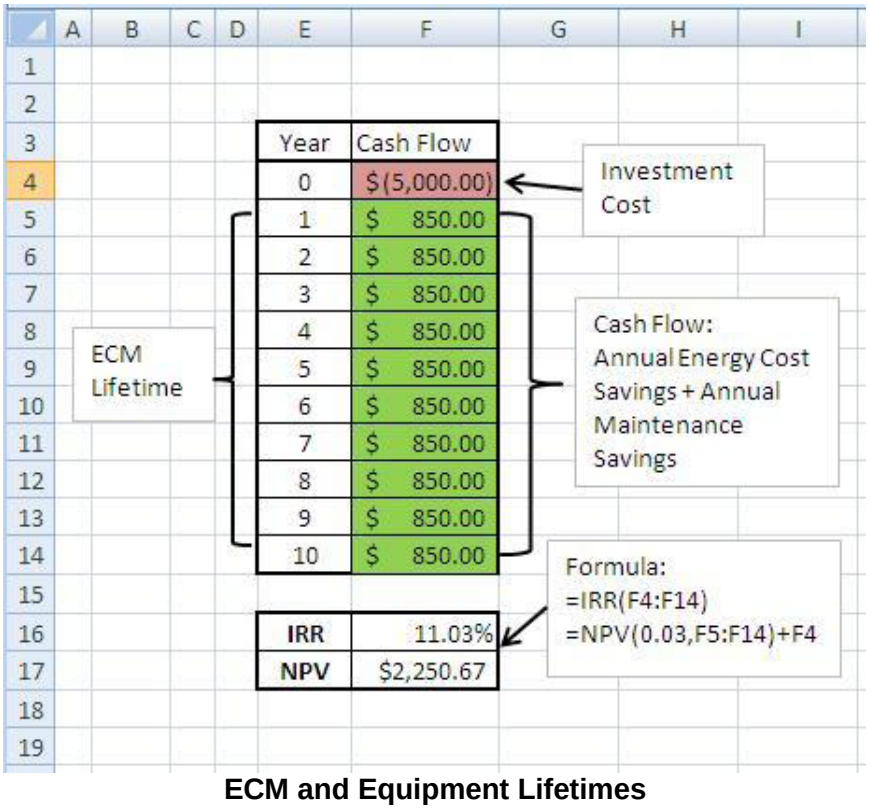
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime

Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Simple Payback = Net ECM Cost / (AECS + AOCS)
Lifetime ROI = (LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI = (Lifetime ROI / Lifetime) = (AECS + OCS) / Net ECM Cost – 1 / Lifetime
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

Excel NPV and IRR Calculation

In Excel, function =IRR(values) and =NPV(rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.
Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

NJCEP C & I Lifetimes

Measure	Measure Life
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8