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June 28, 2010

Local Government Energy Program
Energy Audit Report

Township of Livingston

Storage Shed
Madison Court
Livingston, NJ 07039

Project Number: LGEA50

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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 Livingston. The audit included a review of the following buildings located in the Township of Livingston for which separate energy audit reports are issued for each of the following referenced buildings:

- Municipal Court
- Main Fire Department
- Northfield Fire Department
- Circle Fire Station
- Township Garage
- Livingston Free Public Library
- Senior & Community Center
- Water Department
- Monmouth Court Community Center
- Well House No. 3, Building 1
- Well House No. 3, Building 2
- Well House No. 4
- Well House No. 9
- Well House No. 11
- Okner Field Concession Building
- Storage Shed
- Northland Pool and Recreation Center
- Sewage Treatment Plant
- Animal Shelter
- Pump House
- Booster Station
- Sewer Station

This report addresses the Storage Shed located on Madison Court, Livingston 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 Storage Shed located on Madison Court was opened in 2005. It is a single story, pre-engineered slab on grade structure with approximately 1,200 square feet of conditioned space. This building is used to store tractor-type lawn cutting equipment and miscellaneous tools.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Township of Livingston 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 storage sheds, 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 existing building condition.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 5 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The Storage Shed located on Madison Court was opened in 2005. It is a single story, pre-engineered slab on grade structure with approximately 1,200 square feet of conditioned space. This building is used to store tractor-type lawn cutting equipment and miscellaneous tools.

Based on the field visit performed by the SWA staff on January 27, 2010 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 March 2008 through February 2009, the period of analysis for this audit, the building consumed 29,240 kWh or $4,449 worth of electricity at an approximate rate of $0.152/kWh. The energy consumption for the building was 99.8 MMBTUs of energy.

SWA has entered energy information about the storage shed in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating because it is classified as an "other" space type which means that it is still ineligible for Energy Star. SWA encourages the Township of Livingston 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 81 kBtu/sq ft yr compared to the national average of a Storage shed consuming 104.0 kBtu/sq ft yr. Implementing this report's recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.1 kBtu/ sq ft yr, which would decrease the building's energy use intensity to 79.9 kBtu/sq ft yr.

Recommendations

The Storage Shed is relatively new and most HVAC equipment has not exceeded their recommended useful life cycle. Additionally lighting is a mix of efficient and inefficient lighting. In Appendix C, SWA has included a mechanical inventory list of equipment for the Storage Shed. 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 Improvements

- Roof insulation repair

Category II Recommendations: - Operations and Maintenance

- Maintain roofs
- Provide weather-stripping and air sealing
- Repair/seal wall cracks and penetrations

Category III Recommendations: Energy Conservation Measures

At this time, SWA recommends a total of **1** Energy Conservation Measures (ECMs) for The Storage Shed as summarized in the following Table # 1. The total investment cost for these ECMs with incentives is **$129**. SWA estimates a first year savings of **378 kWh** or **$65** with a simple payback of **2.0 years**.

SWA estimates that implementing these ECMs will reduce the carbon footprint of The Storage Shed by **518 lbs of CO_2**, which is equivalent to avoiding the need of 2 trees to absorb the annual CO_2 produced. SWA also recommends that Township of Livingston 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 $0.002/kWh, for the past 12 months.

There are various incentives that Township of Livingston could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Township of Livingston 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 up to 80% of the capital investment.

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

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

Table 1 - Highly Recommended 0-5 Year Payback ECMs																		
ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 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	Replace (1) Halogen Fixture With CFL	129	0	129	378	0.1	N/A	3.3	7	65	5	323	2.0	150	30%	41	165	518

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

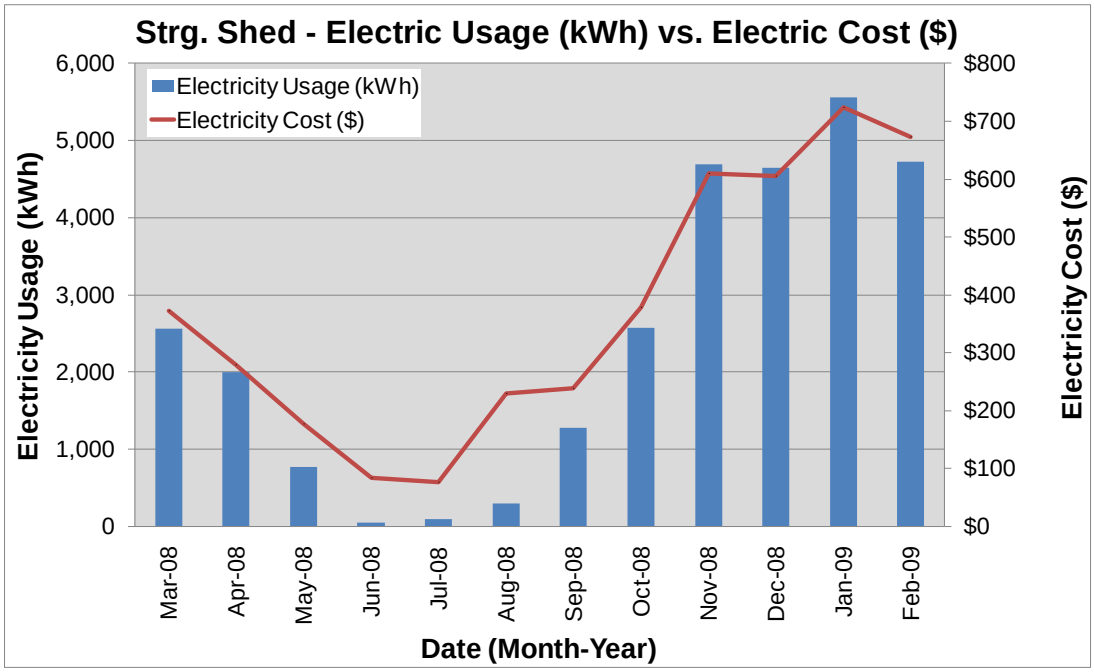
1. HISTORIC ENERGY CONSUMPTION

1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills for the library for the 24 months between March 2007 to February 2009 with an analysis period between **March 2008 and February 2009**.

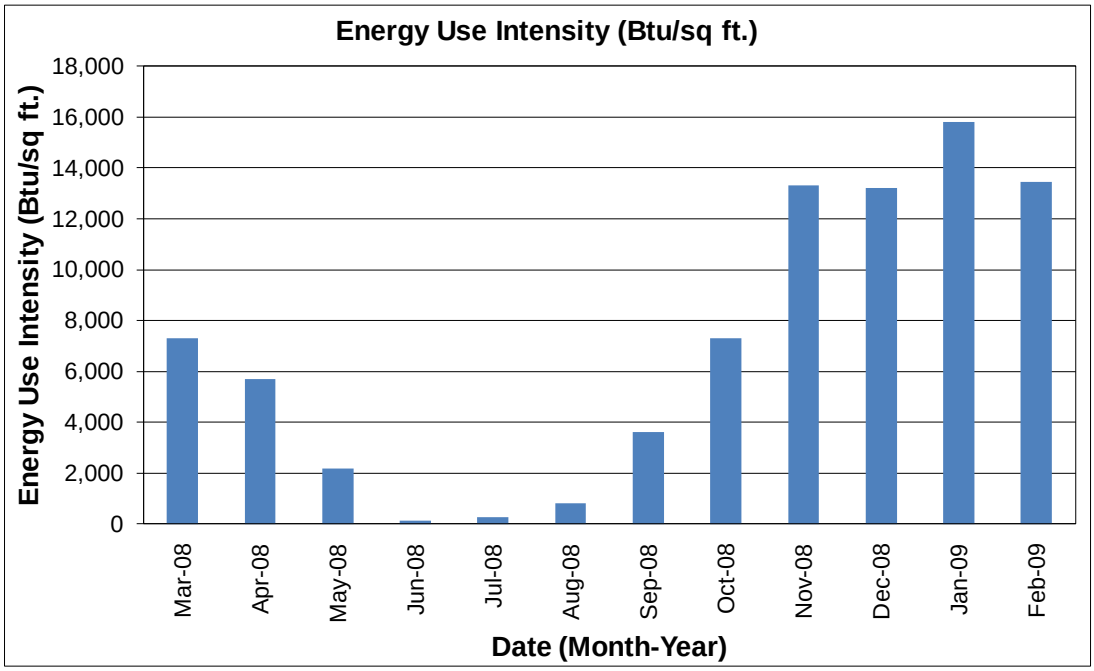
Electricity - The Storage Shed buys electricity from PSE&G at **an average rate of $0.152/kWh** based on 12 months of utility bills from **March 2008 through February 2009**. The building purchased **approximately 29,240 kWh or $4,449 worth of electricity** during the analysis period and is currently charged for demand (kW) which has been factored into each monthly bill. The building had an average monthly demand of **15.2 kW** and an annual peak demand of **28.5 kW**.

The following chart shows electricity use versus cost for the Storage Shed based on utility bills for the 12 month period of March 2008 to February 2009.



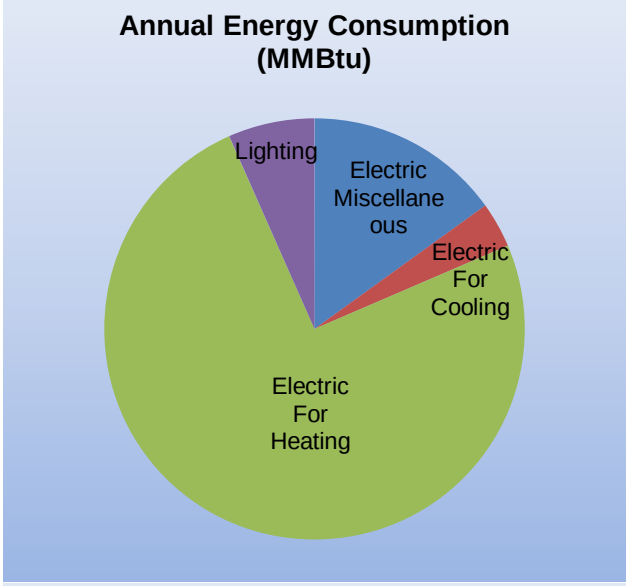
Electricity use follows a trend that is expected for this building with usage peaking during the winter due to heating equipment. The cost of electricity fluctuates as expected with usage peaking in the summer during the electric grids time of highest usage.

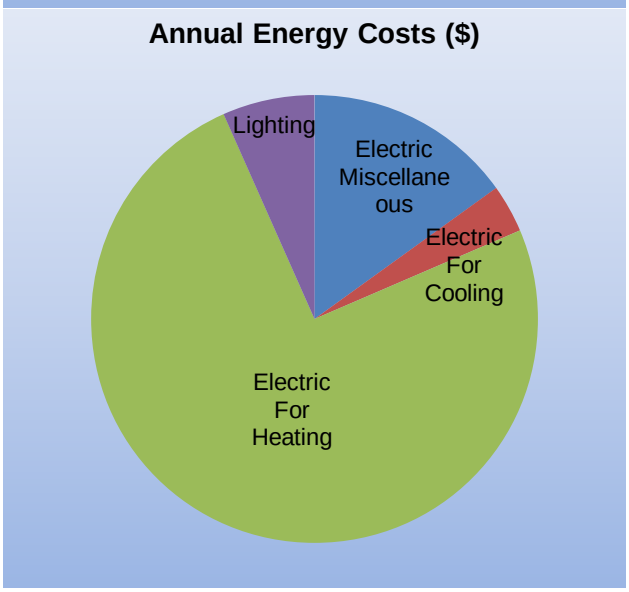
The following chart shows electric consumption in Btu/sq ft for the Storage Shed based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and chart pies show energy use for the Storage Shed based on utility bills for the 12 month period of March 2008 to February 2009.

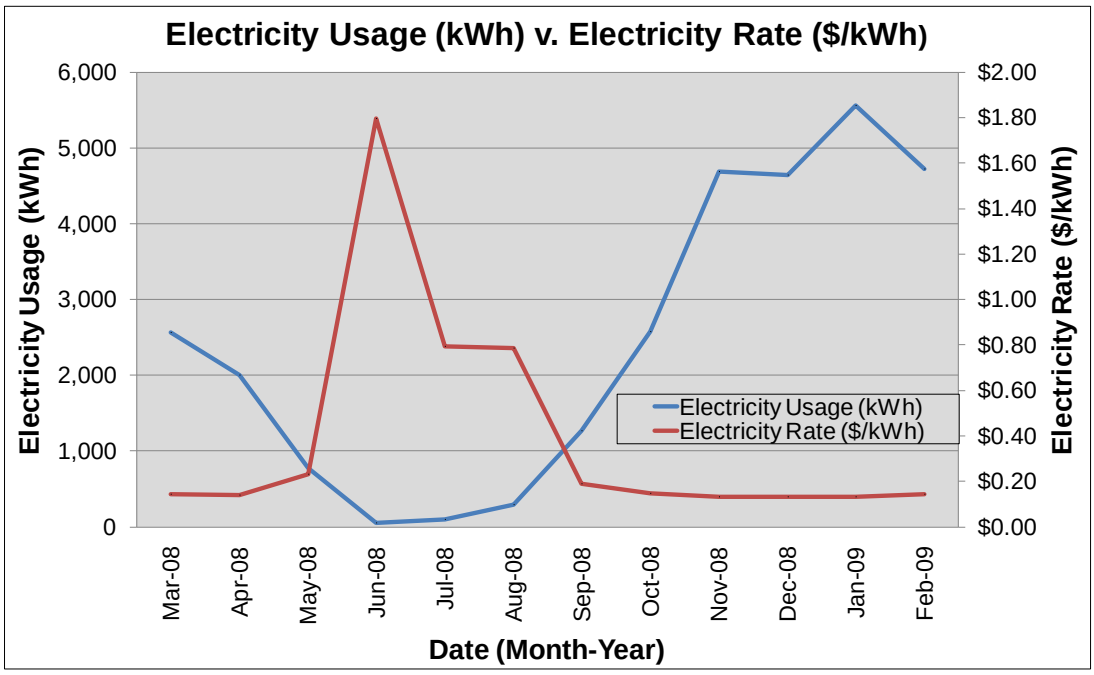
March 2008 - February 2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	15	15%	$670	15%	45
Electric For Cooling	3	3%	$155	3%	45
Electric For Heating	75	75%	$3,328	75%	45
Lighting	7	7%	$296	7%	45
Totals	100	100%	$4,449	100%	





1.2. Utility Rate Analysis

The Storage Shed currently purchases electricity from PSE&G at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. The Storage Shed currently pays an average rate of approximately $0.152/kWh based on the 12 months of utility bills of March 2008 to February 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Based on these observations this appears to be the appropriate rate for the building.



1.3. Energy benchmarking

SWA has entered energy information about the storage shed in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating because it is classified as an "other" space type which means that it is still ineligible for Energy Star. SWA encourages the Township of Livingston 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 81 kBtu/sq ft yr compared to the national average of a Storage shed consuming 104.0 kBtu/sq ft yr. Implementing this report's recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.1 kBtu/ sq ft yr, which would decrease the building's energy use intensity to 79.9 kBtu/sq ft yr.

Per the LGEA program requirements, SWA has assisted the Township of Livingston 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:

[redacted]

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 Livingston - Storage Shed

Building ID: 2050986
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: March 24, 2010

Facility	**Facility Owner**	**Primary Contact for this Facility**
Township of Livingston - Storage Shed Madison Court Livingston, NJ 07039	Township of Livingston 357 South Livingston Avenue Livingston, NJ 07039	Richard Calbi 357 South Livingston Avenue Livingston, NJ 07039

Year Built: 2005
Gross Floor Area (ft²): 1,200

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	97,377
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	97,377
Energy Intensity[5]	
Site (kBtu/ft²/yr)	81
Source (kBtu/ft²/yr)	271
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	15
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	27%
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

This single story 1,200 gross square foot building is a pre-engineered structure built as a slab-on-grade, which is five years old. It is constructed with structural steel framing, girts and metal siding and roof. The exterior walls are insulated panels. The building is used to store tractor-type lawn cutting equipment and miscellaneous tools.

Orientation:	South Elevation – Overhead doors
	North Elevation – Rear opposite overhead doors
	East Elevation – Right side (when facing OH doors)
	West Elevation – Left side (when facing OH doors)

2.2. Building Occupancy Profiles

This building is essentially unoccupied except for approximately 1-2 hours per weekday when a member of the Water Department will access and later return the equipment within.

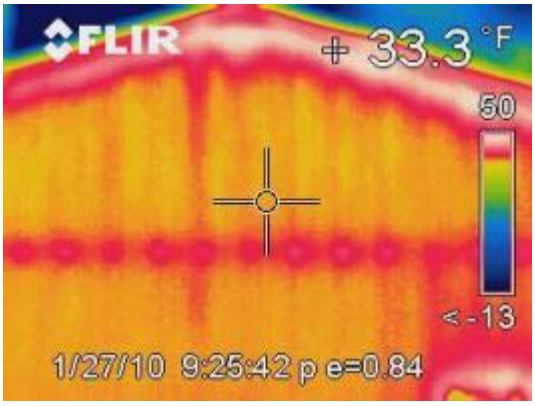
2.3. Building Envelope

Due to favorable weather conditions (min. 18 deg. F delta-T in/ outside & no/ low wind) 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.

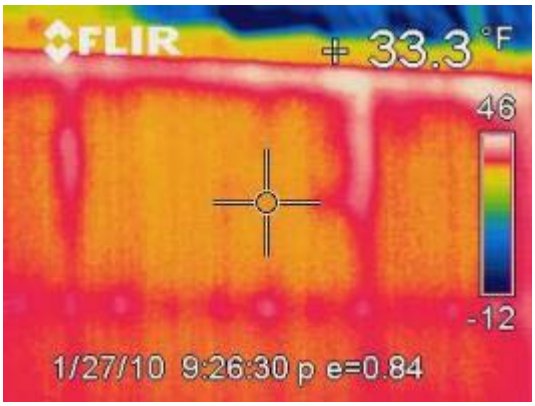
General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews (if available) and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

2.3.1. Exterior Walls

The exterior walls are pre-engineered standing seam vertical insulated panels. There are no significant issues with the exterior walls.



Infrared Image and Digital Photo of North Elevation



Infrared Image and Digital Photo of West Elevation

2.3.2. Roof

The roof consists of pre-engineered standing seam panels with vinyl faced fiberglass batt insulation draped below. Gutters and downspouts are provided to direct rainwater away from the building. There are no significant issues with the roof.

Ceiling Insulation

2.3.3. Base

The base of the building is a poured-in-place concrete slab-on-grade. There are no significant issues with the base.

2.3.4. Windows

The windows are metal framed with thermal break and double glazing. There were no significant issues with the windows.

2.3.5. Exterior doors

The overhead doors and personnel door are insulated metal panel doors. There were no significant issues with the doors.

Overhead Doors on South Elevation

2.3.6. Building air-tightness

The building being only five years old does not have any significant air tightness issues. The building meets the current energy and construction codes for the State of NJ.

2.4. HVAC Systems

2.4.1. General

The Storage Shed is a single, free-standing structure. It is a relatively new building, constructed in 2005, and is used to house large tractor equipment.

2.4.2. Heating

The Storage Shed is heated by four (4) 10 KW electric unit heaters. The heaters have approximately 50% of their useful expected life remaining.

Electric unit heater

2.4.3. Cooling

There is no cooling provided for the Storage Shed.

2.4.4. Ventilation

A single exhaust fan at the peak of the structure provides mechanical ventilation for the space. There are also two (2) motorized louvers in the rear of the space that provide ventilation as required. The exhaust fan is in good condition and has approximately 75% of its useful life remaining.

Exhaust fan in peak of structure, motorized louver in rear of space

2.4.5. Domestic Hot Water

There is no domestic hot water provided for the building.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – The Storage Shed contains eight (8) 8' industrial style fluorescent fixtures. These fixtures each contain two (2) T8 lamps and an electronic ballast.

Interior Fluorescent Light Fixtures

Exit Lights – There is one (1) LED exit light fixture in the facility.

Exterior Lighting – There is one (1) two-lamp halogen fixture on the front wall above the garage doors. This fixture is in very good condition.

Exterior Halogen Fixture Above and Between Garage Doors

2.5.2. Appliances

SWA performed a basic survey of appliances installed at the Storage Shed and there were no appliances present at the time of our survey.

2.5.3. Elevators

The Storage Shed does not have any elevators installed on the premises.

2.5.4. Process and others electrical systems

There is currently no significant process and other electrical systems installed at the storage shed.

3. EQUIPMENT LIST - Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	(4) Electric Unit Heaters	Storage Shed	TPI Corporation 10KW ea.	Electric	Storage Shed	2005	50%
Ventilation	Sidewall Exhaust Fan	Storage Shed	(nameplate inaccessible) Est. fractional horsepower	Electric	Storage Shed	2005	75%
Lighting	See details - Appendix A	building	-	Electric	Building	-	-

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Administration Building, SWA has separated the
Based on the assessment of the Administration Building, 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

- Roof insulation repair – replace all water damaged sections of roof insulation with new insulation.

Category II Recommendations: - Operations and Maintenance

- Maintain roofs – SWA recommends regular maintenance to verify that the rainwater is draining correctly.

- Provide weather-stripping and air sealing – Doors should be observed annually for deficient weather-stripping and replaced as needed. Perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should be sealed with caulk or spray foam.

- Repair/seal wall cracks and penetrations – SWA recommends as part of the maintenance program to seal wall cracks and penetrations in concrete base wherever necessary in order to keep insulation dry and effective.

Category III Recommendations: Energy Conservation Measures

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	**(1) New CFL fixtures to be installed with incentives**

ECM#1: *Lighting Upgrades*

Description:

On the day of the site visit, SWA completed a lighting inventory of the Storage Shed (see Appendix A). The existing interior lighting consists of T8 fluorescent fixtures with electronic ballasts, LED exit signs and halogen exterior lights. SWA recommends replacing the halogen lamps in the exterior light fixtures with CFLs. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Township of Livingston may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor to obtain savings.

Installation cost:

Estimated installed cost: $129 (This includes $79 in Installed labor cost)
Source of cost estimate: *RS Means; Published and established costs, NJ Clean Energy Program*

Economics (with incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 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 energy 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	1 New CFL fixtures to be installed with incentives	RS Means, lit search	129	0	129	378	0.1	N/A	3.3	7	65	5	323	2.0	150	30%	41	165	518

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the site visits and using the billing analysis. SWA also assumed an aggregated 1 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

NJ Clean Energy – None

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 Systems

5.1. Existing Systems

There aren't currently any existing renewable energy systems.

5.2. Wind

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

5.3. Solar Photovoltaic

Solar photovoltaic panels are not recommended due to the small sizes of the building and shadowing from surrounding foliage.

5.4. Solar Thermal Collectors

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

5.5. Combined Heat and Power

CHP is not applicable for this building because of insufficient domestic water use.

5.6. Geothermal

Geothermal is not applicable for this building because it would not be cost effective considering the size of the existing HVAC systems

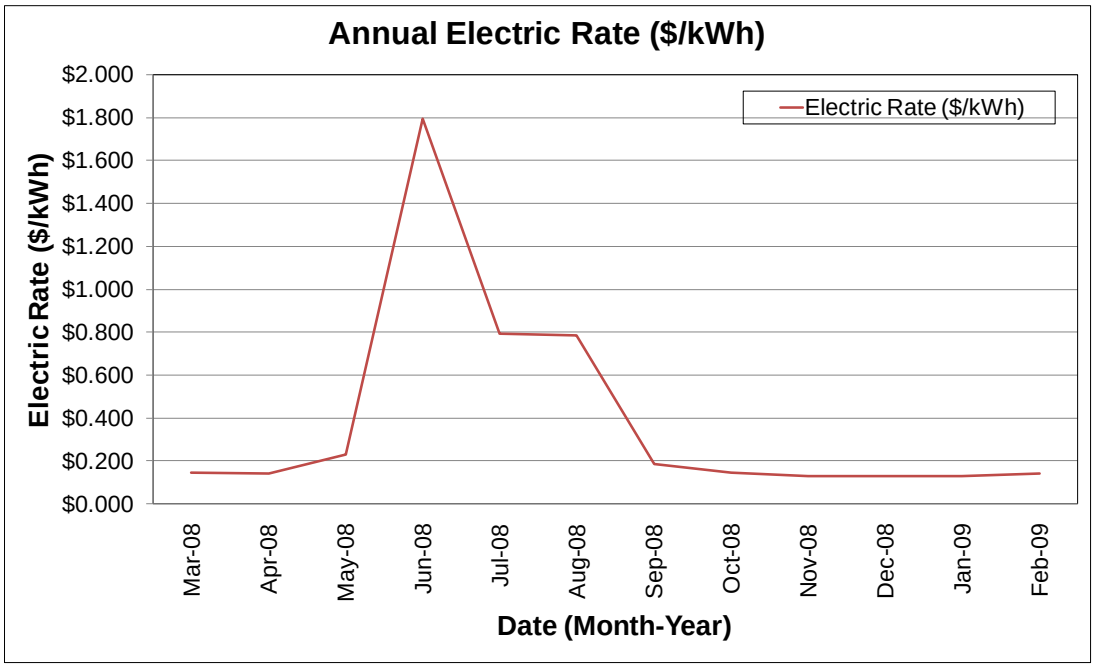
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Energy Purchasing

The Storage Shed receives electricity purchased via one incoming meter directly for the Storage Shed from PSE&G without an ESCO. 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. SWA analyzed the utility rate for electricity supply over an extended period. Electric bill analysis shows fluctuations of 93% over the 12 month period between March 2008 and February 2009.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity. The electricity rate for the concession building is $0.152/kWh, which means there is a almost no potential cost savings even if a lower flat rate can be negotiated. This will involve contacting third party suppliers and negotiating utility rates. SWA recommends that the Township of Livingston 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 Storage Shed. Appendix B contains a complete list of third party energy suppliers for the Township of Livingston service area. The Township of Livingston may want to consider partnering with other school districts, municipalities,

townships and communities to aggregate a substantial electric and natural gas 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 Storage Shed 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 Storage Shed

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	GF	Storage	Ceiling Suspended	E	8T8	8	2	59	Sw	2	365	7	1,000	730	N/A	Ceiling Suspended	8T8	E	Sw	8	2	59	2	365	7	1000	730	0	0	0
2	GF	Storage	Exit sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
3	GF	Exterior	Flood	M	Hal	1	2	120	PC	12	365	28	288	1,167	CFL	Flood	CFL	M	PC	1	2	90	12	365	0	180	788	378	0	378
Totals:						10	5	184				34	1,272	1,945						10	5	154			8	1,186	1,567	378	0	378
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Legend

Fixture Type	Lamp Type	Control Type	Ballast Type	Retrofit Category
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Install new T8)
Pin	1T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2T5	T (Timer)		CFL (Install new CFL)
Recessed	3T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4T5	D (Dimming)		LED (Install new LED)
Circline	2T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3T8	M (Microphonic Sensor)		C (Controls Only)
	4T8			PSMH (Install new Pulse-Start Metal Halide)
	6T8			
	8T8			
	2T12			
	3T12			
	4T12			
	6T12			
	8T12			
	CFL (Compact Fluorescent Lightbulb)			
	Hal (Halogen)			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	FL (Fluorescent)			

Appendix B: Third Party Energy Suppliers (ESCOs)
http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for PSEG 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
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.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
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.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
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.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

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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 measure (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
LCS = Lifetime Cost Savings

NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

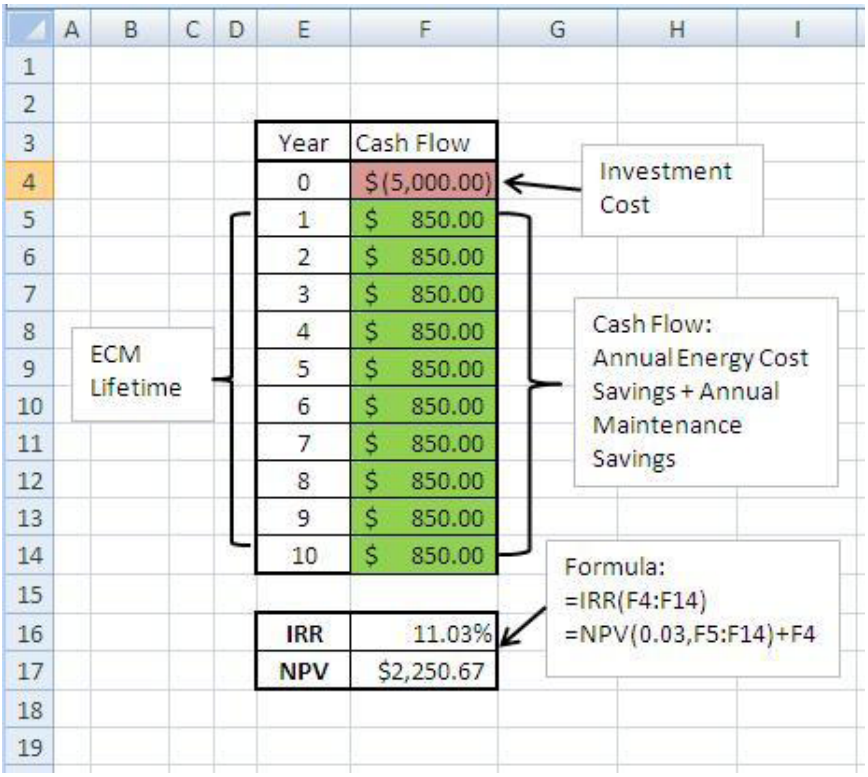
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime
LCS = LOCS+LECS

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