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*June 18, 2010*

**Local Government Energy Program  
Energy Audit Report**

***Township of Mount Holly  
Department of Public Works building  
Mount Holly, NJ 08060***

***Project Number: LGEA54***



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## **INTRODUCTION**

On March 10<sup>th</sup>, 2010 Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Department of Public Works building. The building is located at 250 Rancocas Rd, Mount Holly, NJ 08060 in Sussex County. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The single-story 4,400 square feet building was constructed in 2005 and houses truck bays, equipment storage, an office and lunchroom with a small restroom. The occupancy for the building is 12 employees for approximately 40 hours per week year-round.

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

Launched in 2008, the LGEA Program provides subsidized energy audits for DPW 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 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.

## EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the DPW building located at 250 Rancocas Rd, Mount Holly, NJ 08060. The single-story 4,400 square foot building was constructed in 2005 and houses truck bays, equipment storage, an office and lunchroom with a small restroom.

Based on the field visits performed by the SWA staff on March 10<sup>th</sup> 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 and cooling energy use.

From March 2008 to February 2009 the DPW building consumed 16,350 kWh or \$3,148 worth of electricity at an approximate rate of \$0.193/kWh and 2,221 therms or \$3,134 worth of natural gas at an approximate rate of \$1.411/therm. The joint energy consumption for the building, including both electricity and natural gas was 278MMBtu of energy that cost a total of \$6,282.

SWA has entered energy information about the DPW building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building did not receive a performance rating due to its categorization as a mixed use building including an office, garage space, and storage. Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA encourages the Township of Mount Holly 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 69.0 kBtu/ft<sup>2</sup>yr compared to the national average of a similar building consuming 77.0 kBtu/ft<sup>2</sup>yr. Implementing the recommendations included in this report will reduce the building energy consumption by approximately 6.6 kBtu/ft<sup>2</sup>yr. There may be energy procurement opportunities for the DPW building to reduce annual utility costs, which are \$695 higher for electric when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the DPW 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**

- When replacement becomes necessary for the ice machine, purchase an ENERGY STAR<sup>®</sup> rated unit
- Install premium motors when replacements are required

### **Category II Recommendations: Operations and Maintenance**

- Change filters in furnace monthly
- Use ENERGY STAR<sup>®</sup> labeled appliances
- Provide weather stripping / air sealing
- Preventative exterior all maintenance

- Maintain downspouts
- Use smart power electric strips
- Create an energy educational program

### **Category III Recommendations: Energy Conservation Measures - Upgrades with associated energy savings**

At this time, SWA highly recommends a total of **2** Energy Conservation Measures (ECMs) for the DPW building that are summarized in Table 1. The total investment cost for these ECMs is **\$1,599**. SWA estimates a first year savings of **\$670** with a simple payback of **2.2 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the DPW building by **4,757 lbs of CO<sub>2</sub>**. SWA also recommends **3** ECMs with payback greater than 5 years summarized in table 2, which result in a first year savings of **\$846** and 2 Over 10 year Payback and End of Life Cycle ECMs with a total first year savings of **\$310** that are summarized in Table 3.

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

Additionally, a new NJ Clean Power program, Direct Install, could also assist to cover 80% of the capital investment.

The following tables summarize the proposed Energy Conservation Measures (ECMs) and their economic relevance. In order to clearly present the overall energy opportunities for the building and ease the decision and choice of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the summarized ECMs (i.e. lighting change influence on heating/cooling).

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	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 <sub>2</sub> reduced, lbs/yr
1	Install 1 Drinks vending machine miser	www.usatech.com and established costs	279	0	279	2,132	0.8	0	1.7	0	411	12	4,938	0.7	1670	139	147	3,817	2,921
4	6 New occupancy sensors to be installed with incentives	RS Means, lit search	1,320	120	1,200	1,340	0.3	0	1.0	0	259	15	3,880	4.6	223	15	20	1,844	1,836
TOTALS			1,599	120	1,479	3,472	1.1	0	2.7	0	670		8,818	2.2				5,661	4,757

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	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 <sub>2</sub> reduced, lbs/yr
2	25 New T8 fixtures to be installed with incentives	RS Means, lit search	3,494	750	2,744	1,683	0.4	0	1.3	108	403	15	6,047	6.8	120	8	12	2,000	2,306
3	7 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	3,010	175	2,835	245	0.1	0	0.2	327	374	15	5,610	7.6	98	7	10	1,566	336
5	Replace (2) 1 Hp exhaust fan motors with Premium Efficiency	similar projects, DOE International Motor Master selection & savings analysis	554	0	554	358	0.1	0	0.3	0	69	20	1,382	8.0	149	7	11	474	490
TOTALS			7,058	925	6,133	2,286	0.6	0	1.8	435	846		13,039	7.2				4,040	3,132

Table 3 - Recommended Over 10 Year Payback and End of Life Cycle ECMs																			
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 <sub>2</sub> reduced, lbs/yr
6	Replace gas-fired heating / electric cooling split HVAC system with a high efficiency 14 SEER system	similar projects	5,500	484	5,016	685	0.1	30	1.2	0	256	15	3,829	19.6	-24	-2	-4	-1,969	1,284
7	Replace domestic water heater with 95% efficient unit	similar projects	1,500	50	1,450	0	0.0	38	0.9	0	54	15	804	26.9	-45	-3	-8	-810	445
TOTALS			7,000	534	6,466	685	0.1	68	2.1	0	310		4,633	20.9				-2,779	1,729

**Assumptions:** Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines

# 1. HISTORIC ENERGY CONSUMPTION

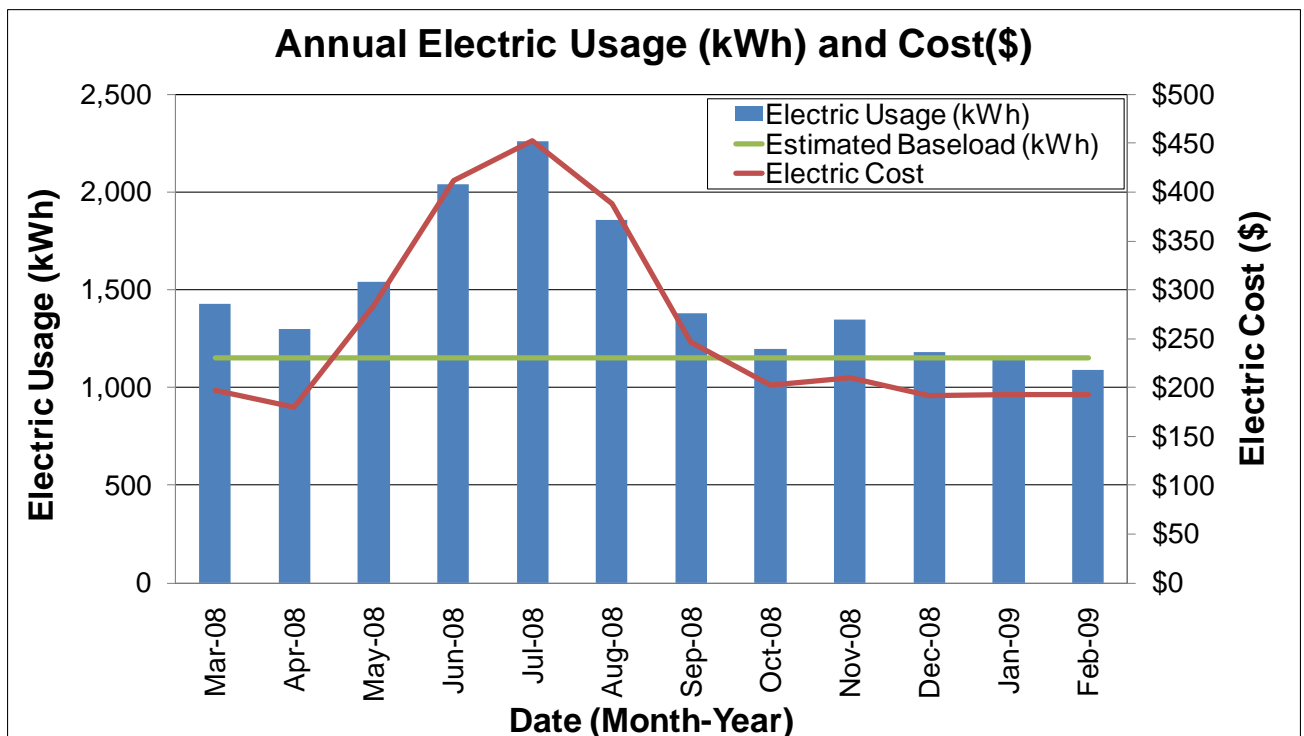
## 1.1. Energy usage and cost analysis

SWA analyzed utility bills from March 2008 through February 2009 that were received from PSE&G for both the electricity and natural gas usage for the DPW building.

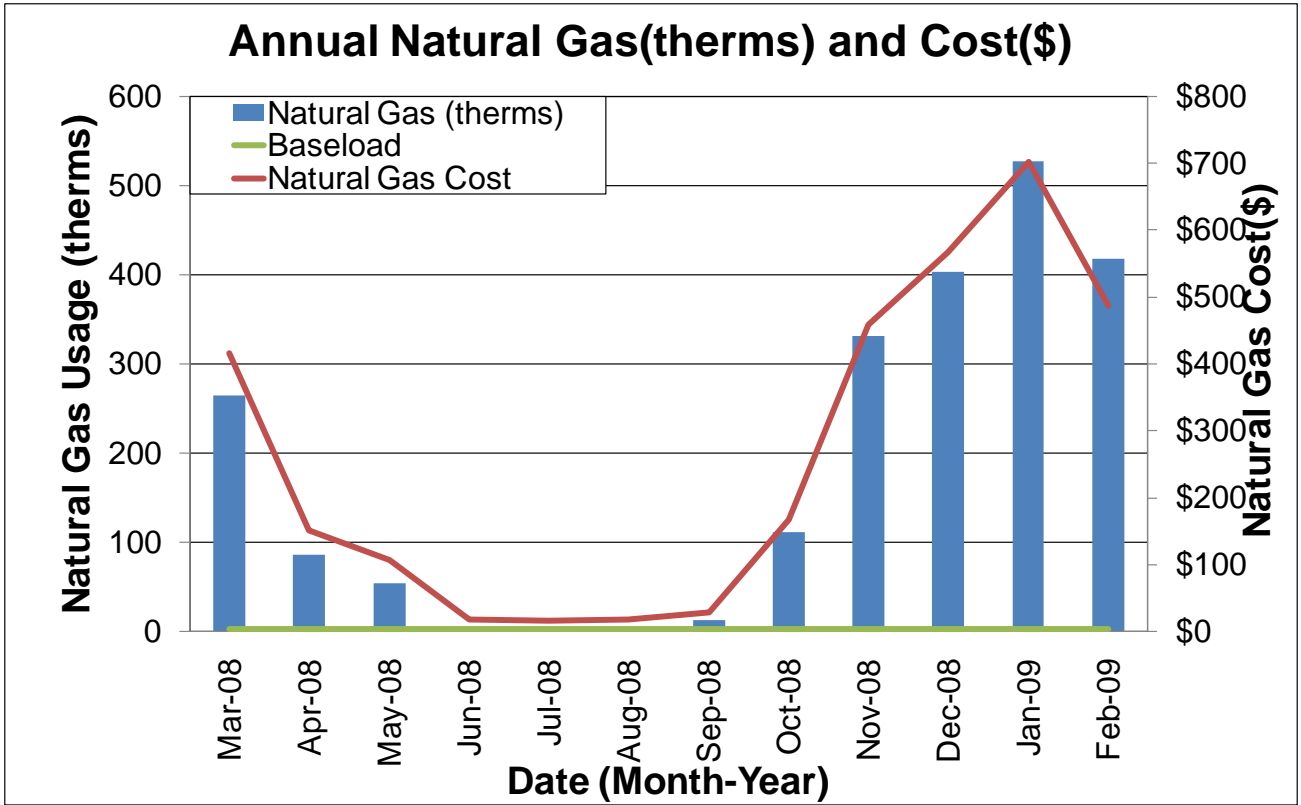
Electricity - The DPW building is currently served by one electric meter. The Township currently buys electricity from PSE&G at **an average rate of \$0.193/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Township purchased **approximately 16,350 kWh or \$3,148 worth of electricity** in the previous year for the DPW building. The average monthly demand was 6 kW.

Natural gas - The DPW building is currently served by one natural gas meter. The Township currently buys natural gas from PSE&G at **an average aggregated rate of \$1.411/therm** based on 12 months of gas bills for March 2008 to February 2009. The Township purchased **approximately 2,221 therms or \$3,134 worth of natural gas** in the previous year for the DPW building.

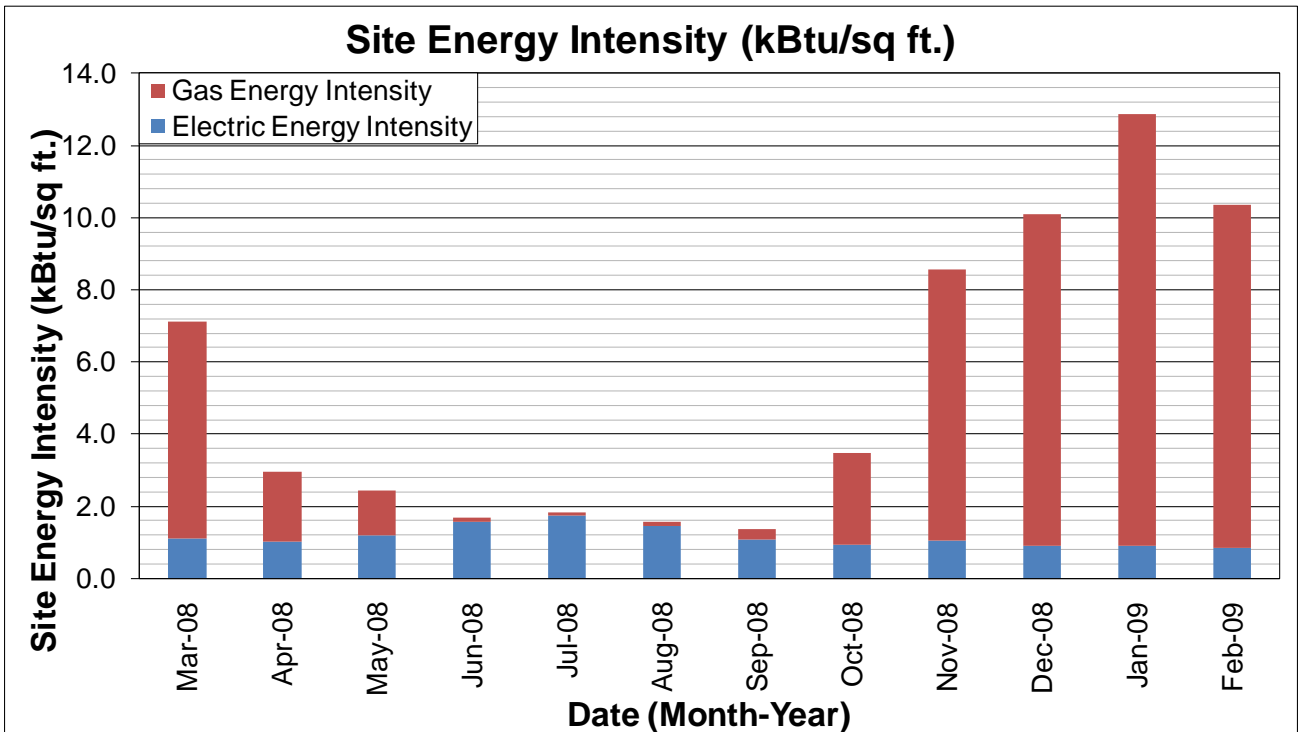
The following chart shows electricity use for the DPW building based on utility bills for the 12 month period of March 2008 to February 2009.



The following chart shows the natural gas estimated energy used for the DPW building based on receipts for the 12 month period of March 2008 to February 2009.

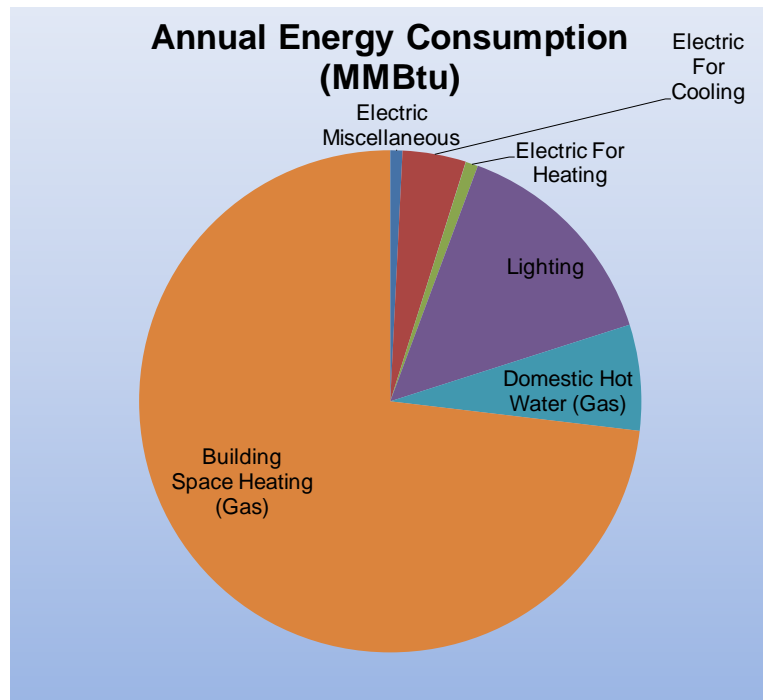


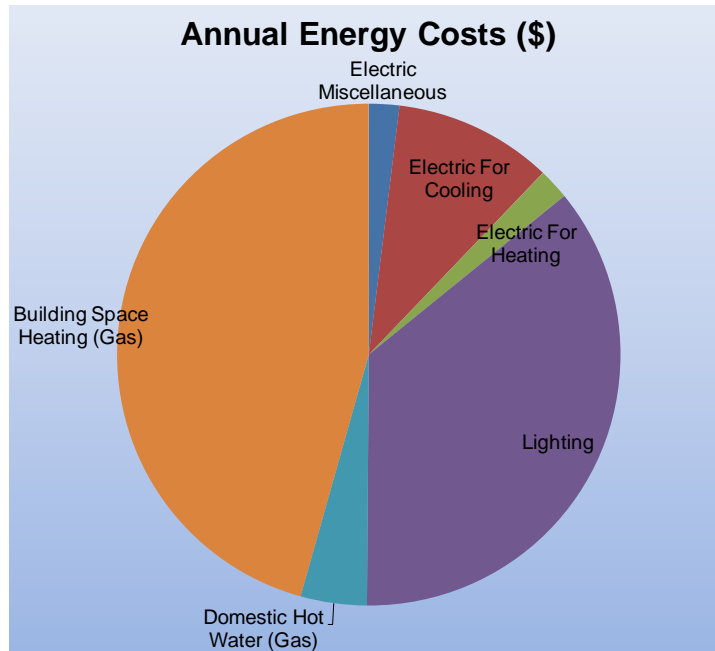
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the DPW building based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and pie charts show energy use for the DPW building based on utility bills (and fuel receipts) for the 12 month period of March 2008 to February 2009. Note electrical cost at \$56/MMBtu of energy is almost 4 times as expensive to use as natural gas at \$14/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Miscellaneous	2	1%	\$122	2%	56
Electric For Cooling	11	4%	\$641	10%	56
Electric For Heating	2	1%	\$125	2%	56
Lighting	40	14%	\$2,259	36%	56
Domestic Hot Water (Gas)	19	7%	\$267	4%	14
Building Space Heating	203	73%	\$2,867	46%	14
<b>Totals</b>	<b>278</b>	<b>100%</b>	<b>\$6,282</b>	<b>100%</b>	
<b>Total Electric Usage</b>	<b>56</b>	<b>20%</b>	<b>\$3,148</b>	<b>50%</b>	<b>56</b>
<b>Total Gas Usage</b>	<b>222</b>	<b>80%</b>	<b>\$3,134</b>	<b>50%</b>	<b>14</b>
<b>Totals</b>	<b>278</b>	<b>100%</b>	<b>\$6,282</b>	<b>100%</b>	





## 1.2. Utility rate

The Township currently purchases electricity from PSE&G at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Township currently pays an average rate of approximately \$0.193/kWh based on the 12 months of utility bills of March 2008 to February 2009.

The Township currently purchases natural gas supplied by PSE&G at the prevailing market rates for natural gas. The average aggregated rate for the natural gas is approximately \$1.411/therm based on 12 months of natural gas bills for March 2008 to February 2009.

## 1.3. Energy benchmarking

SWA has entered energy information about the DPW building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building did not receive a performance rating due to its categorization as a mixed use building including an office, garage space, and storage. Buildings achieving an Energy Star rating of 75 or higher, and professionally verified to meet current indoor environmental standards, are eligible to apply for the Energy Star award and receive the Energy Star plaque that conveys superior energy performance to students, parents, taxpayers, and employees. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification to the United States Green Building Council (USGBC).

The Site Energy Use Intensity is 69.0 kBtu/sqft compared to the national average intensity of similar type buildings consuming 77.0 kBtu/sqft. Implementing this report's highly recommended Energy Conservation Measures (ECMs) will reduce use by approximately 2.7 kBtu/sqft with an additional 3.9 kBtu/sqft from the other recommended measures. These recommendations could

account for at least 6.6 kBtu/sq ft yr reduction, which when implemented would make the building energy consumption even lower.

SWA has created the Portfolio Manager site information for the Township of Mount Holly. Access is also allowed to TRC. This information can be accessed at the following: <https://www.energystar.gov/istar/pmpam/> with the following:

Username: MountHollyTownship

Password: MOUNTHOLLYTOWNSHIP



## STATEMENT OF ENERGY PERFORMANCE

### Mount Holly Township - DPW building

Building ID: 2243928  
 For 12-month Period Ending: January 31, 2009<sup>1</sup>  
 Date SEP becomes ineligible: N/A

Date SEP Generated: April 14, 2010

Facility	Facility Owner	Primary Contact for this Facility
Mount Holly Township - DPW building 250 Rancocas Rd Mount Holly, NJ 08060	N/A	N/A

Year Built: 2005  
 Gross Floor Area (ft<sup>2</sup>): 4,400

Energy Performance Rating<sup>2</sup> (1-100) N/A

#### Site Energy Use Summary<sup>3</sup>

Electricity - Grid Purchase (kBtu)	63,827
Natural Gas (kBtu) <sup>4</sup>	239,045
Total Energy (kBtu)	302,872

#### Energy Intensity<sup>5</sup>

Site (kBtu/ft <sup>2</sup> /yr)	69
Source (kBtu/ft <sup>2</sup> /yr)	105

#### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	22
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#### Electric Distribution Utility

Public Service Elec & Gas Co

#### National Average Comparison

National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	-30%
Building Type	Service (Vehicle Repair/Service, Postal Service)

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.

#### Meets Industry Standards<sup>6</sup> for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

#### Certifying Professional

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 this column 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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, P.E. facility inspection, and notarizing the SEP) and we welcome suggestions for reducing this burden. Send comments (including OMB control number) to the Director, Collection Strategies Division, U.S., EPA, (2022), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

## 2. FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on visits from SWA on March 10<sup>th</sup>, 2010, the following data was collected and analyzed.

### 2.1. Building Characteristics

The single-story (slab on grade), 4,400 square feet DPW Garage Building was constructed in 2005. It houses truck bays, equipment storage, an office and lunchroom with a small restroom.



Front and Left Side Façade



Rear and Right Side Façade

### 2.2. Building occupancy profiles

The building occupancy is approximately 12 employees for approximately 40 hours per week year-round.

### 2.3. Building envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit

*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 wall envelope is constructed of a vertical metal panel system over a steel frame with an assumed 3 inches of fiberglass batt cavity insulation. The interior is mostly finished with the same metal panel system.

*Note:* Wall insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good, age-appropriate condition with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

### **2.3.2. Roof**

The building's roof is predominantly a medium-pitch gable type over a steel structure, with an asphalt shingle finish. The attic was not accessible. Insulation levels in the attic were assumed to be 5" fiberglass batt. The roof is original.

Note: Roof insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good, age-appropriate condition, with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

### **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.

Slab/perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good/ age appropriate condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

### **2.3.4. Windows**

The building contains basically one type of window.

1. Slider type windows with a non-insulated aluminum frame, double glazing and no interior or exterior shading devices. The windows are located and are original/have never been replaced.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in good/ age appropriate condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

### **2.3.5. Exterior doors**

The building contains two different types of exterior doors:

1. Metal type exterior doors. They are located throughout the building and are original/have never been replaced.
2. Insulated overhead type exterior doors. They are located in the front of the building and are original/have never been replaced

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in acceptable condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:



Missing/worn weatherstripping



Damaged/warped/aged door frame

### 2.3.6. Building air tightness

Overall the field auditors found the building to be reasonably air-tight, considering the building's use and occupancy, as described in more detail earlier in this chapter.

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

## 2.4. HVAC Systems

The Township Garage consists of a 3-bay garage with office and storage spaces. The Office and Break Room are cooled by a split system and are the only spaces of the facility that receive cooling. Heating is provided to the offices by a gas-fired furnace. The Sign Room is heated by a gas-fired unit heater and the entire garage is served by a gas-fired infrared heating system.

### 2.4.1 Heating

The Office and Break Room of the garage are heated by a gas-fired furnace that is ducted to ceiling supply diffusers and return registers. The furnace is in good condition and appears to be operating satisfactorily. The adjacent storage room is heated by a gas-fired unit heater. The unit heater is in fair to good condition. Both the furnace and unit heater were installed in 2005, and have about 40% and 25% of their useful lives remaining, respectively.



Gas-fired Furnace in office & Unit Heater in Sign Room.

The garage is heated by a gas-fired, vacuum-operated low intensity infrared heating system which was also installed in 1999. This type of system is a very energy efficient way to heat a space such as this since a garage requires a significant amount of air changes per hour. Infrared heating systems heat people and objects and not the air, so when air is exhausted from the space, the heating is not lost to the outside as it is with a conventional forced-air heating system. This system is in very good condition



Infrared heating system vacuum pump (left) and tube section

## 2.4.2 Cooling

A 2-ton York DX split system provides cooling to the office and Break Room, the only areas to receive cooling in the building. There is a cooling coil in the furnace supply ductwork that is connected to an air-cooled condensing unit located outside on grade and adjacent to the furnace room. This system was installed in 1999 and is in fair condition. According to the 2007 ASHRAE Applications Handbook, this system has 4 years remaining on its estimated service life of 15 years.



Split system condensing unit serving office area

## 2.4.3 Ventilation

The furnace serving the Office and Break Room is ducted to a sidewall louver for ventilation air. The ductwork contains a motor-operated damper to close off the intake air during unoccupied hours.

There are two (2) exhaust fans serving the garage area, one (1) exhaust fan serving the sign room and one (1) exhaust fan serving the toilet room. There are wall-mounted intake louvers in the Sign Room and the Garage to introduce makeup ventilation air for the fans. In addition, the Garage contains a small vehicle exhaust fan with connection hose. All fans were installed in 1999 and are about halfway through their estimated service life of 20 years, according to the 2007 ASHRAE Applications Handbook.

## 2.4.4 Domestic Hot Water

The domestic hot water for the building is provided by a Rheem gas-fired, tank-type water heater, located in the furnace room in the office area. This water heater serves a lavatory in the Toilet Room and a janitor's sink in the Garage. The water heater was installed in 1999 and is approaching the end of its useful life of fifteen (15) years.

## 2.4.5 Commercial Refrigeration

There is a small commercial ice machine and storage bin in the Break Room. The unit was manufactured in 1995 and is in good condition. This type of ice machine is typically not operational until

the ice level in the storage bin falls below a certain point. According to DPW Garage personnel, the ice machine gets minimal use over the course of the year, with little to no use during the winter months. The machine primarily provides ice for the workers' water bottles in the summer months, as well as for a few town recreation activities during the summer. Based on the minimal usage of this equipment, there is very little savings to be achieved by replacement.

## **2.5. Electrical systems**

### **2.5.1. Lighting**

*Interior Lighting* - The DPW building contains mostly T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacement of these fixtures with more high performance T8 fluorescent fixtures with electronic ballasts. There are also fixtures found to contain incandescent bulbs. SWA recommends upgrading these fixtures with compact fluorescent bulbs. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends installing occupancy sensors in closets, offices and areas where payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion or sound is detected within a set time period. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

*Exit Lights* – Most exit signs were found to be LED type.

*Exterior Lighting* - The exterior lighting surveyed during the building audit were wall mounted sconces containing incandescent bulbs. SWA recommends replacing incandescent bulbs with compact fluorescents.

### **2.5.2. Appliances and process**

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>. SWA recommends consulting with the vendor that supplies all vending machines, requesting ENERGY STAR® models when the contract is due for renewal. Also, energy vending miser devices are now available for conserving energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines.

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. SWA recommends all computers and all appliances (i.e. coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off.

### **2.5.3. Elevators**

There is one (1) 15 horsepower elevator located in the building. The elevator is part of the construction of the addition and was installed in 1975. The Township of Mount Holly may wish to consider replacement of this unit as part of a capital improvement project.

### 3. EQUIPMENT LIST

#### Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Cooling	Cooling Coil	Mechanical Room	Unitary Products Model # GU1A024S14B SN (S)EMJS245690	Electric	Office/Break Area	2005	30%
Heating & Ventilation	Furnace	Mechanical Room	Unitary Products Model # P4HUA12N06401A SN (S)EMJS245690	Natural Gas	Office/Break Area	2005	40%
Cooling	Condensing Unit	Mechanical Room	York Model #HIRA024S06D SN (S)EHJM388875	Electric	Office/Break Area	2005	30%
Heating	Unit Heater	Sign Room	Reznor Model FE-25, 1/70 HP Input 25,000 BTU/HR Output 20,000 BTU/HR	Natural Gas	Sign Room	2005	25%
Domestic Water	Domestic Water Heater	Sign Room	Rheem 30 Gallon Model # 21V30-6 SN RHNG-1099A 14926	Natural Gas	Office/Break Area	2005	25%
Refrigeration	Ice Machine	Break Area	Manitowoc Model #BY0454A SN 950863292	Electric	Office/Break Area	2005	0%
Ventilation	Exhaust Fan (EF-1)	Roof over Garage	Penn Ventilator Model FX12BH 1 HP, 110V, 1 PH	Electric	Garage	2005	50%
Ventilation	Exhaust Fan (EF-2)	Roof over Garage	Penn Ventilator Model FX12BH 1 HP, 110V, 1 PH	Electric	Garage	2005	50%
Ventilation	Exhaust Fan (EF-4)	Roof over Sign Room	Penn Ventilator Model FX11R 0.14 HP, 110V, 1 PH	Electric	Sign Room	2005	50%
Ventilation	Exhaust Fan (EF-5)	Roof over Toilet Room	Penn Ventilator Model FX11S 0.14 HP, 110V, 1 PH	Electric	Toilet Room	2005	50%
Heating	Infrared Heating System	Garage	CO-Ray-VAC by Roberts-Gordon Input Cap 270,000 BTUH Output Cap 90,000 BTUH (3) Burner Model # CRV-B9 Vacuum Pump Model # EP-200 3/4 HP	Natural Gas	Garage	2005	50%
Lighting	See details - Appendix A	building	-	Electric	Building		

**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 DPW 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**

- Although the ice machine is beyond its expected useful life, it is rarely used and is in good condition. When replacement becomes necessary, purchase an ENERGY STAR<sup>®</sup> rated unit similar to Manitowoc Model #SY0454A ice machine with #B4001533 ice bin. Estimated replacement cost at this time is \$4,600.
- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.

##### **Category II Recommendations: Operations and Maintenance**

- Based on the environment in the facility, change filters in furnace monthly to ensure efficient operation of the fan, ensure adequate air delivery to the space and avoid overheating of the furnace's heat exchanger, which can cause cracking and require replacement.
- Use ENERGY STAR<sup>®</sup> labeled appliances - such as ENERGY STAR<sup>®</sup> refrigerators that should replace older energy inefficient equipment.
- Provide weather stripping / air sealing - Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The 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 also be sealed with caulk or spray foam.
- Preventative exterior wall maintenance - SWA recommends as part of the maintenance program to install proper flashing, seal wall penetrations wherever necessary in order to keep insulation dry and effective. SWA recommends having any damaged wall sections replaced and sealed with caulk in order to minimize and prevent water and moisture infiltration into the envelope assemblies.
- Maintain downspouts - Repair / install missing downspouts as needed to prevent water / moisture infiltration and insulation damage.
- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.
- Create an energy educational program - that teaches how to minimize their energy use. The US Department of Energy offers free information for hosting energy efficiency educational programs and plans, for more information please visit: <http://www1.eere.energy.gov/education/>

## Category III Recommendations: Energy Conservation Measures

### Summary table

ECM#	Table 1 - Highly Recommended 0-5 Year Payback ECMs
1	Install 1 Drinks vending machine miser
4	6 New occupancy sensors to be installed with incentives
Table 2 - Recommended 5-10 Year Payback ECMs	
2	25 New T8 fixtures to be installed with incentives
3	7 New pulse start metal halide fixtures to be installed with incentives
5	Replace (2) 1 Hp exhaust fan motors with Premium Efficiency
Table 3 - Recommended Over 10 Year Payback ECMs	
6	Replace gas-fired heating / electric cooling split HVAC system with a high efficiency 14 SEER system
7	Replace domestic water heater with 95% efficient unit

## ECM#1: *Install Vending Misers*

### Description:

The Department of Public Works building has one drinks vending machine located in the break room. Energy vending miser devices are now available for conserving energy with these vending machines and coolers. There is not a need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the vending miser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines. Vending miser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: Power down the machine when the surrounding area is vacant; Monitor the room's temperature; Automatically repower the cooling system at one- to three-hour intervals, independent of sales; Ensure the product stays cold.

Snacks vending miser devices can be used on Snacks vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snacks vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

### Installation cost:

Estimated installed cost: \$279 (including \$100 in labor costs)  
 Source of cost estimate: [www.usatech.com](http://www.usatech.com) and established costs

### Economics (without 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 <sub>2</sub> reduced, lbs/yr
1	Install 1 Drinks vending machine miser	<a href="http://www.usatech.com">www.usatech.com</a> and established costs	279	0	279	2,132	0.8	0	1.7	0	411	12	4,938	0.7	1670	139	147	3,817	2,921

**Assumptions:** SWA assumes energy savings based modeling calculator found at [www.usatech.com](http://www.usatech.com) or [http://www.usatech.com/energy\\_management/energy\\_calculator.php](http://www.usatech.com/energy_management/energy_calculator.php)

### Rebates/financial incentives:

*This measure does not qualify for a rebate or other financial incentive 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, 3, & 4: Building Lighting Upgrades

### Description:

On the days of the site visit, SWA completed a lighting inventory of the DPW building (see Appendix A). The existing lighting consists of mostly T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacement with more efficient high performance T8 fluorescent fixtures with electronic ballasts. SWA recommends replacing the few incandescent bulbs found in the building with compact fluorescent bulbs. SWA also recommends the installation of occupancy sensors and motion sensors in order to reduce operating hours of fixtures and kWh. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Township of Mount Holly 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.

**Estimated installed cost:** \$7,824

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 <sub>2</sub> reduced, lbs/yr
2	25 New T8 fixtures to be installed with incentives	RS Means, lit search	3,494	750	2,744	1,683	0.4	0	1.3	108	403	15	6,047	6.8	120	8	12	2,000	2,306
3	7 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	3,010	175	2,835	245	0.1	0	0.2	327	374	15	5,610	7.6	98	7	10	1,566	336
4	6 New occupancy sensors to be installed with incentives	RS Means, lit search	1,320	120	1,200	1,340	0.3	0	1.0	0	259	15	3,880	4.6	223	15	20	1,844	1,836
TOTALS			7,824	1,045	6,779	3,268	0.8	0	2.5	435	1,036		15,537	6.5				5,410	4,478

**Assumptions:** SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 4 hrs/yr to replace aging burnt out lamps vs. newly installed.

### Rebates/financial incentives:

*NJ Clean Energy - Wall Mounted occupancy and motion sensors (\$20 per control)  
Maximum incentive amount is \$120.*

*NJ Clean Energy - T8 lamps with electronic ballast in existing facilities (\$10-30 per fixture, depending on quantity and lamps)  
Maximum incentive amount is \$750.*

*NJ Clean Energy – Pulse Start Metal Halides (\$25 per fixture)  
Maximum incentive amount is \$175.*

**Options for funding the Lighting 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#5: Install Premium Efficiency Motors on Garage Rooftop Exhaust Fans

### Description:

There are two (2) roof-mounted exhaust fans over the Garage that are part of the ventilation system for the Garage. The fans are in relatively good condition and only about halfway through their expected service lives. Each fan motor is rated at 1 Hp. Both fan motors are standard efficiency. The Mount Holly Department of Public Works Garage will realize energy savings by utilizing premium efficiency motors for the fans. There is no NJ Clean Energy rebate since the fans use single phase motors.

### Installation cost:

Estimated installed cost: \$554

Source of cost estimate: Similar projects and DOE Motor Master International selection & savings analysis

### 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 <sub>2</sub> reduced, lbs/yr
5	Replace (2) 1 Hp exhaust fan motors with Premium Efficiency	similar projects, DOE International Motor Master selection & savings analysis	554	0	554	358	0.1	0	0.3	0	69	20	1,382	8	149	7	11	474	490

**Assumptions:** SWA calculated the savings for this measure using as built drawings provided and using the billing analysis. The DOE Motor Master International selection and calculator was used with the assumption that one of each set of heating water pumps operates for the heating season. Based on operating hours for the facility, both fans are considered to operate for approximately 2,000 hours per year.

### Rebates/financial incentives:

*NJ Clean Energy – Premium three-phase motors (\$45-\$700 per motor)  
Maximum incentive amount is \$0.*

### 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#6: *Replace Gas-Fired Heating/DX Cooling Split System Serving Front Office, Lunch and Toilet Room***

### **Description:**

The Front Office, Lunch Room, Mechanical Room and Toilet Room are heated and cooled by a gas-fired furnace with split system DX cooling, with furnace located in the mechanical room and condensing unit located on grade, should be replaced. This equipment was installed in 1999 and is approaching the end of its expected service life of 15 years. SWA recommends replacement of this equipment to gain increase in operating efficiency. This measure cannot be justified by energy savings alone, but should be considered as an end-of-life energy savings opportunity.

The current equipment has a listed cooling Seasonal Energy Efficiency Ratio (SEER) of approximately 10.5. The new equipment should have a minimum 14.0 EER rating. The higher SEER will involve increased cost for the equipment over units with lower SEER. The equipment shall be Energy Star certified and ASHRAE 90.1 compliant. The equipment shall utilize R-410A refrigerant.

### **Installation cost:**

Estimated installed cost: \$5,500

Source of cost estimate: Manufacturer's data and similar projects

### **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 <sub>2</sub> reduced, lbs/yr
6a	Replace gas-fired heating / electric cooling split HVAC system with a 13 SEER system	similar projects	4,500	0	4,500	527	0.1	0	0.4	0	158	15	2,364	28.6	-47	-3	-7	-2,619	722
6b	Incremental cost to replace gas-fired heating / electric cooling split HVAC system with a high efficiency 14 SEER system	similar projects	1,000	484	516	158	0	30	0.8	0	98	15	1,465	5.3	184	12	17	650	562
6	Replace gas-fired heating / electric cooling split HVAC system with a high efficiency 14 SEER system	similar projects	5,500	484	5,016	685	0.1	30	1.2	0	256	15	3,829	19.6	-24	-2	-4	-1,969	1,284

**Assumptions:** SWA calculated the savings for this measure using nameplate data taken on the days of the field visits and using the billing analysis, and by estimating the total of 1,200 cooling hours for one year using weather bin data for Maguire Air Force Base, Trenton, NJ.

**Rebates/financial incentives:**

*NJ Clean Energy – Gas Heating < 300 MBH (\$2.00 per MBH, minimum \$300 per unit)  
Unitary HVAC <5.4 tons and Min. 14.0 SEER (\$92/ton)  
Maximum incentive amount is \$484.*

**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#7: Replace Domestic Water Heater

### Description:

There is one (1) gas-fired domestic water heater that serves toilet rooms and a janitor's sink in the garage and that is utilized for the entire year. This unit typically achieves approximately 75% efficiency in natural gas usage considering its current age. This equipment is approaching the end of its expected service life and should be replaced soon. The Mount Holly Department of Public Works Garage can realize energy savings by installing a direct vent high efficiency water heater. This type of heater can achieve up to 95% efficiency. This measure cannot be justified by energy savings alone, but should be considered as an end-of-life energy savings opportunity.

### Installation cost:

Estimated installed cost: \$1,500

Source of cost estimate: Similar projects

### 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 <sub>2</sub> reduced, lbs/yr
7a	Replace domestic water heater with 80% efficient unit	similar projects	1,000	0	1,000	0	0	11	0.3	0	16	15	233	62.5	-77	-5	N/A	-815	129
7b	Incremental cost to replace domestic water heater with 95% efficient unit	similar projects	500	50	450	0	0	27	0.6	0	38	15	571	11.8	27	2	3	5	316
7	Replace domestic water heater with 95% efficient unit	similar projects	1,500	50	1,450	0	0.0	38	0.9	0	54	15	804	26.9	-45	-3	-8	-810	445

**Assumptions:** SWA calculated the savings for this measure using nameplate data taken the days of the field visits, equipment efficiencies listed above and using the billing analysis.

### Rebates/financial incentives:

*NJ Clean Energy – Gas-fired water heaters <50 gallons (\$50 per heater)*

*Maximum incentive amount is \$50.*

**Options for funding the 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#8: *Install 12.4 kW PV System***

### **Description:**

Currently the Mount Holly Department of Public Works Garage 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's 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. It is recommended at this time that the Mount Holly Department of Public Works Garage further review installing a 12.4 kW 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 Mount Holly Department of Public Works Garage 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. PSE&G provides the ability to buy SREC's at \$600/MWh or best market offer.

The building has a slightly pitched roof with several locations for portions of a 12.4 kW PV installation on the building roof. A commercial crystalline 230 watt panel has 17.5 square feet of surface area (13.1 watts per square foot). A 12.4 kW system needs approximately 54 panels which would take up 945 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Please note that this analysis did not consider the structural capability of the existing building to support the above recommended system. SWA recommends that Mount Holly Township contract with a structural engineer to determine if additional building structure is required to support the recommended system and what costs would be associated with incorporating the additional supports prior to system installation. Should additional costs be identified, the Township should include these costs in the financial analysis of the project.

### **Installation cost:**

Estimated installed cost: \$96,255 (including \$38,500 total labor cost)  
Source of cost estimate: Similar projects

**Economics (with incentives):**

Building	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 <sub>2</sub> reduced, lbs/yr
Mount Holly DPW Garage	install 12.4 kW PV rooftop system with incentives	similar projects	96,255	12,420	83,835	15,282	12	N/A	11.9	0	11,949	25	73,736	7.0	149.0	6.0	12.1	74,965	20,936

**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 (230 Watts, model #ND-U230C1). 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 for systems 50 kW or less. Incentive amount for this application is \$12,420 for the proposed option.*

<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 1,000kWh (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. A total annual SREC credit of \$9,000 has been incorporated in the above costs, 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 are not 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**

*A solar PV system is not recommended due to lack a substantial flat roof for panel installation.*

### **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 small and not constant domestic hot water load.*

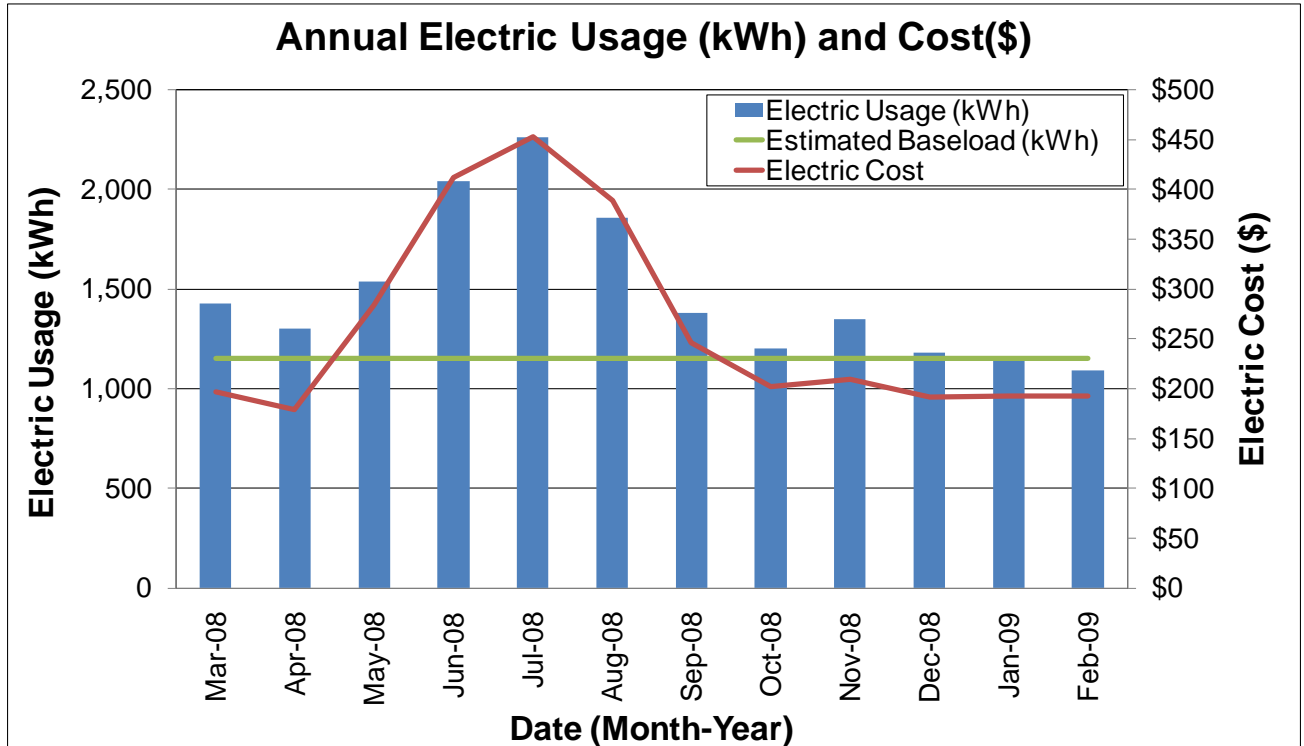
### **5.6. Geothermal**

*Geothermal is not cost effective for this building due to the type of HVAC systems employed and relatively small area of conditioned spaces.*

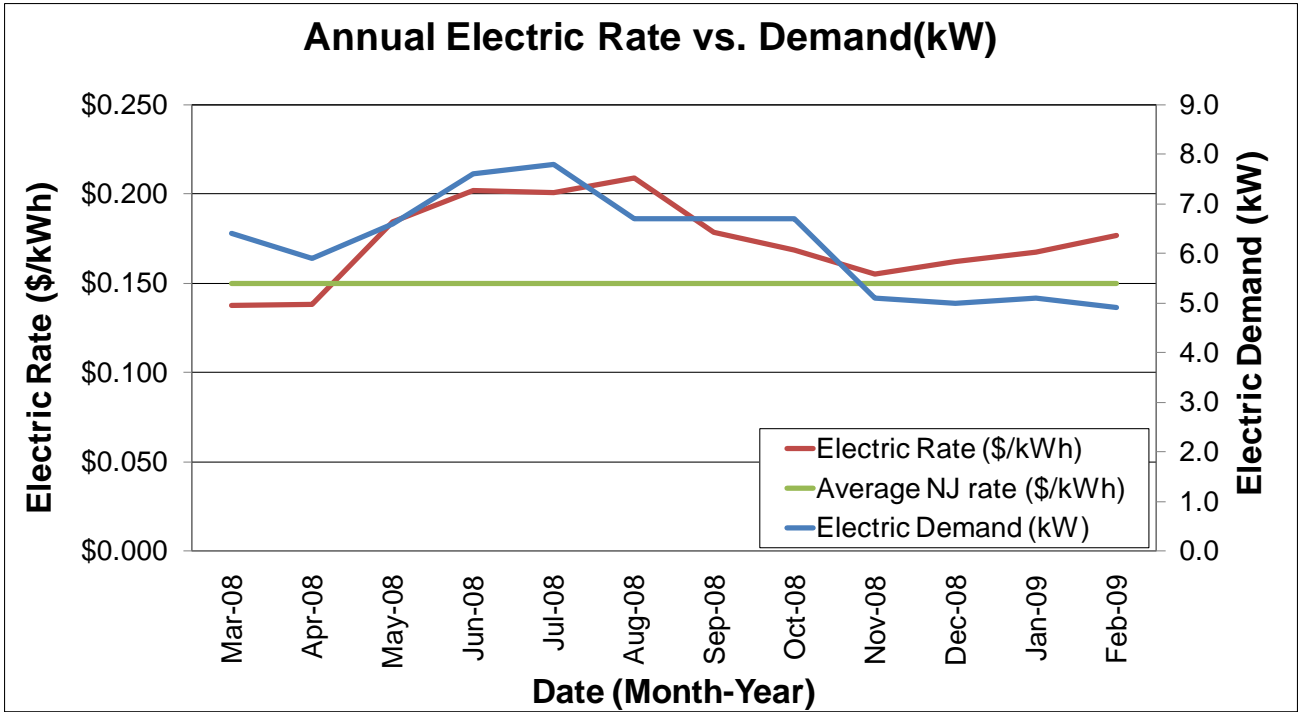
## 6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

### 6.1. Load profiles

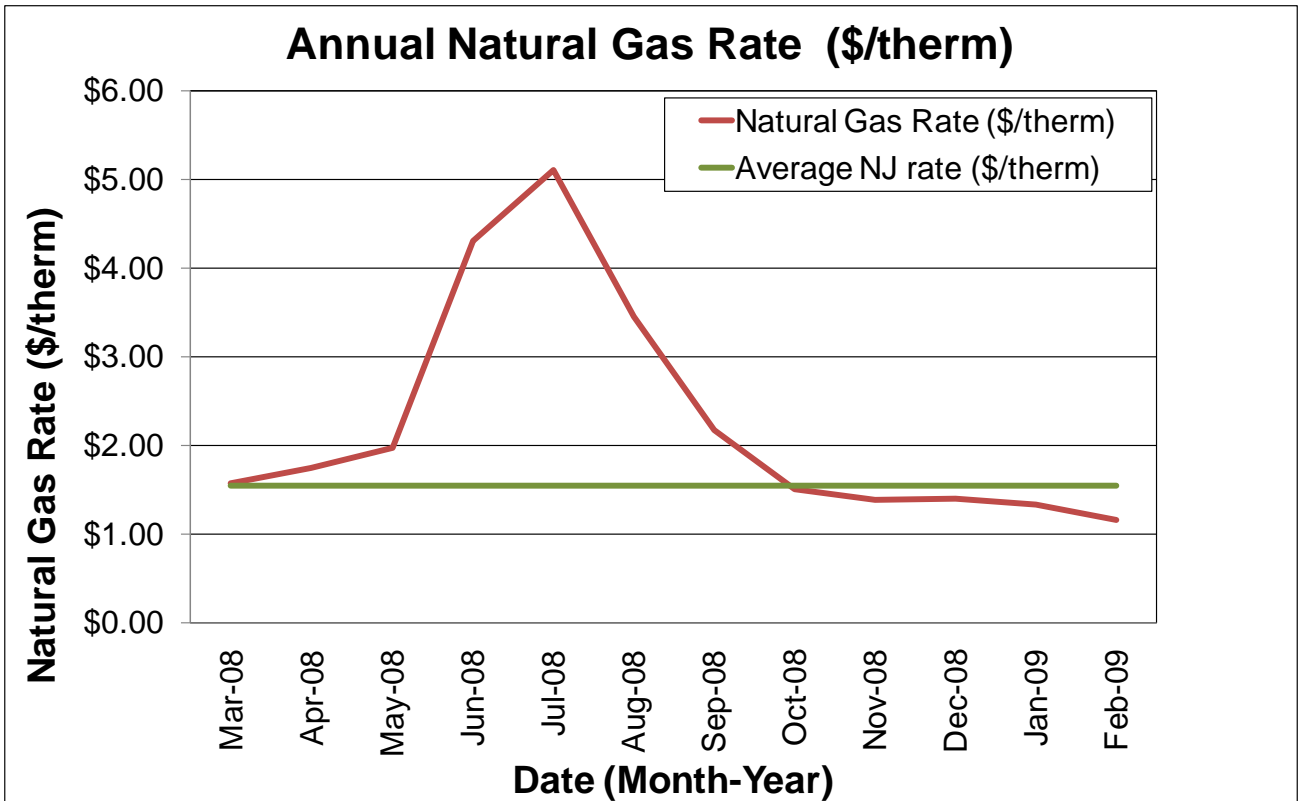
The following charts show annual electric and natural gas load profiles for the DPW Building:

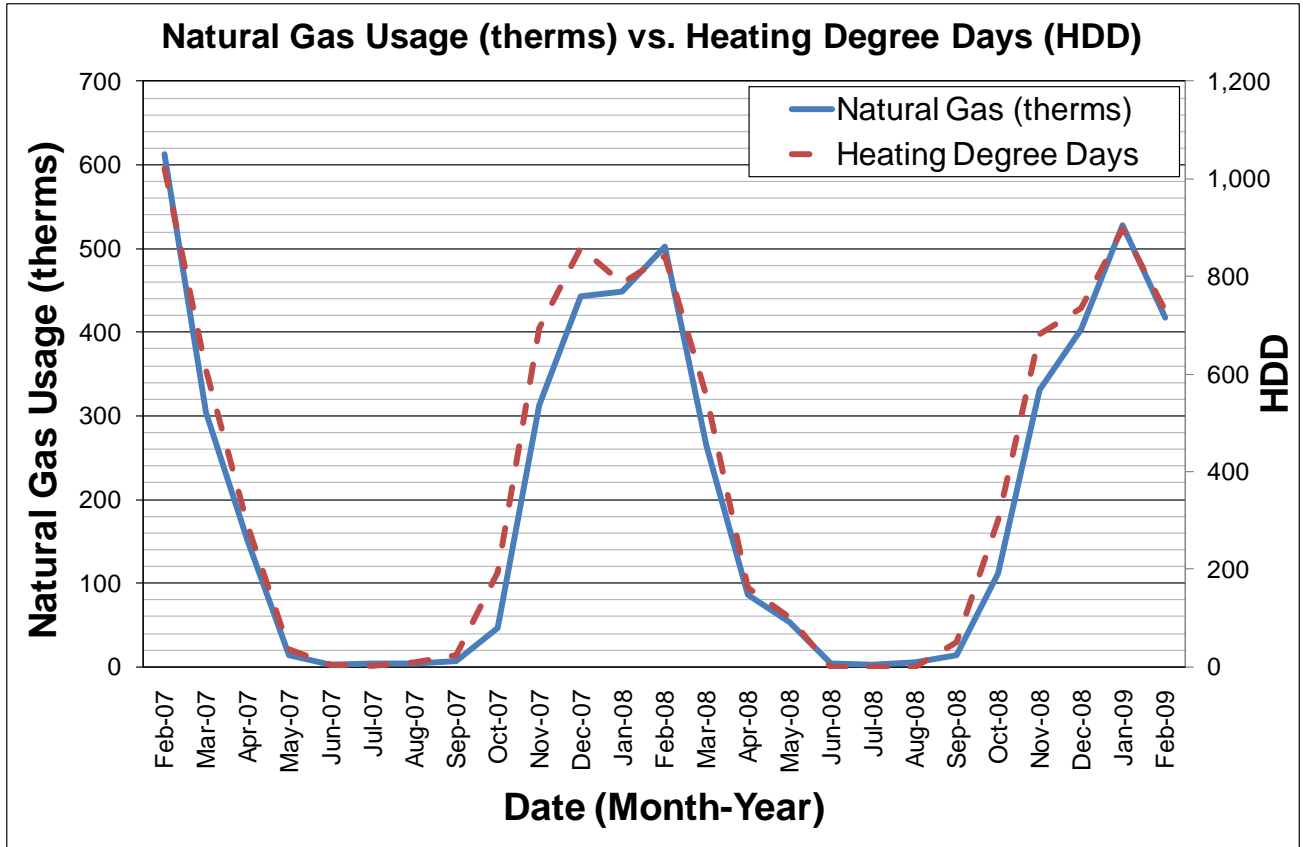


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks.



The following chart shows the estimated use of natural gas annual load for the building, peaking in the coldest months of the year and another chart showing natural gas consumption following the “heating degree days” curve.





### 6.2. Tariff analysis

Currently, natural gas is supplied to the DPW building by PSE&G sold to the Township at the prevailing market rate. Typically, the natural gas prices increase during the heating months when natural is used by the heating equipment. The high natural gas price per therm in the summer may be due to fixed metere costs and low therms usage.

The DPW building is direct-metered (via one main meter) and currently purchases electricity from PSE&G at a general service rate. The general service rate for electric charges are market-rate based on use and the DPW building billing does show a breakdown of demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by air conditioning equipment.

### 6.3. Energy Procurement strategies

The DPW building receives natural gas from PSE&G, who supplies the natural gas and transports it. 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. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 35% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric

and natural gas are \$0.150/kWh and \$1.55/therm respectively. The DPW building annual electric cost is \$695 higher for when compared to the average estimated NJ commercial electric and natural gas rates.

SWA recommends that the Township of Mount Holly further explore opportunities of purchasing electricity from an ESCO in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the DPW building. Appendix B contains a complete list of third party energy suppliers for the DPW building service area. The Township may want to consider partnering with other municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with their local utility and ESCOs. This sort of activity is happening in many parts of the country and in New Jersey. Also, the DPW building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time (without a large capital investment) 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, 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

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	Garage	Recessed	M	4'T12	15	2	40	Sw	10	365	12	1,380	5,037	T8	Recessed	4'T8	E	OS	15	2	32	8	365	5	1035	2833	1259	944	2204
2	GF	Garage	Recessed	S	Inc	5	1	60	Sw	10	365	0	300	1,095	N/A	Recessed	CFL	S	OS	5	1	20	8	365	0	100	274	730	91	821
3	GF	Storage Rm	Recessed	M	4'T12	4	2	40	Sw	8	261	12	368	753	T8	Recessed	4'T8	E	OS	4	2	32	6	261	5	276	424	188	141	329
4	GF	Office	Recessed	M	4'T12	2	2	40	Sw	8	261	12	184	384	T8	Recessed	4'T8	E	OS	2	2	32	6	261	5	138	216	96	72	168
5	GF	Lunch Rm	Recessed	M	4'T12	2	2	40	Sw	8	261	12	184	384	T8	Recessed	4'T8	E	OS	2	2	32	6	261	5	138	216	96	72	168
6	GF	Bathroom	Wall Mounted	M	4'T12	1	1	40	Sw	8	261	12	52	109	T8	Wall Mounted	4'T8	E	OS	1	1	32	6	261	5	37	58	31	19	51
7	GF	Mechanical Rm	Wall Mounted	M	4'T12	1	2	40	Sw	2	261	12	92	48	T8	Wall Mounted	4'T8	E	Sw	1	2	32	2	261	5	69	36	12	0	12
8	Ext	Exterior	Wall Mounted	S	MH	7	1	100	PC	12	365	28	896	3,924	PSMH	Wall Mounted	PSMH	S	PC	7	1	100	12	365	20	840	3679	245	0	245
<b>Totals:</b>						<b>37</b>	<b>13</b>	<b>400</b>				<b>100</b>	<b>3,456</b>	<b>11,734</b>						<b>37</b>	<b>13</b>	<b>312</b>			<b>50</b>	<b>2,633</b>	<b>7,736</b>	<b>2,658</b>	<b>1,340</b>	<b>3,998</b>

Rows Highlighted Yellow Indicate an Energy Conservation Measure is recommended for that space

Total Surface Area (SF)	4,400		
Average Power Cost (\$/kWh)	0.1930		
<b>Exterior Lighting</b>	<b>Existing</b>	<b>Proposed</b>	<b>Savings</b>
Exterior Annual Consumption (kWh)	3,924	3,679	245
Exterior Power (watts)	896	840	56
<b>Total Interior Lighting</b>	<b>Existing</b>	<b>Proposed</b>	<b>Savings</b>
Annual Consumption (kWh)	7,810	4,057	3,753
Lighting Power (watts)	3,456	2,633	823
Lighting Power Density (watts/SF)	0.79	0.60	0.19
Estimated Cost of Fixture Replacement (\$)	5,579		
Estimated Cost of Controls Improvements (\$)	1,200		
<b>Total Consumption Cost Savings (\$)</b>	<b>1,036</b>		

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	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circuline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
	4'T8			PSMH (Install new Pulse-Start Metal Halide)
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium)			
	LPS (Low Pressure Sodium)			

## 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
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>
<b>BOC Energy Services, Inc.</b> 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 <a href="http://www.boc.com">www.boc.com</a>
<b>Commerce Energy, Inc.</b> 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 <a href="http://www.commerceenergy.com">www.commerceenergy.com</a>
<b>ConEdison Solutions</b> 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>
<b>Constellation NewEnergy, Inc.</b> 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 <a href="http://www.newenergy.com">www.newenergy.com</a>
<b>Credit Suisse, (USA) Inc.</b> 700 College Road East Princeton, NJ 08450	(212) 538-3124 <a href="http://www.creditsuisse.com">www.creditsuisse.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>FirstEnergy Solutions</b> 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 <a href="http://www.fes.com">www.fes.com</a>
<b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>
<b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 <a href="http://www.metroenergy.com">www.metroenergy.com</a>
<b>IntegrYS Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integrysenergy.com">www.integrysenergy.com</a>
<b>Liberty Power Delaware, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Liberty Power Holdings, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>Sempra Energy Solutions</b> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 <a href="http://www.sel.com">www.sel.com</a>
<b>Suez Energy Resources NA, Inc.</b> 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 <a href="http://www.suezenergyresources.com">www.suezenergyresources.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
<b>Cooperative Industries</b> 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 <a href="http://www.cooperativenet.com">www.cooperativenet.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>Dominion Retail, Inc.</b> 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 <a href="http://www.retail.dom.com">www.retail.dom.com</a>
<b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 <a href="http://www.gesc.com">www.gesc.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>
<b>Great Eastern Energy</b> 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 <a href="http://www.greateastern.com">www.greateastern.com</a>
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>Hudson Energy Services, LLC</b> 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 <a href="http://www.hudsonenergyservices.com">www.hudsonenergyservices.com</a>
<b>Intelligent Energy</b> 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 <a href="http://www.intelligentenergy.org">www.intelligentenergy.org</a>
<b>Keil &amp; Sons</b> 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 <a href="http://www.systrumenergy.com">www.systrumenergy.com</a>
<b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 <a href="http://www.metroenergy.com">www.metroenergy.com</a>
<b>MxEnergy, Inc.</b> 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 <a href="http://www.mxenergy.com">www.mxenergy.com</a>
<b>NATGASCO (Mitchell Supreme)</b> 532 Freeman Street Orange, NJ 07050	(800) 840-4427 <a href="http://www.natgasco.com">www.natgasco.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>Sempra Energy Solutions</b> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Stuyvesant Energy LLC</b> 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 <a href="http://www.stuyfuel.com">www.stuyfuel.com</a>
<b>Woodruff Energy</b> 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 <a href="http://www.woodruffenergy.com">www.woodruffenergy.com</a>

## 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 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 expressed as 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.

**Gas Rate and Electric Rate (\$/therm and \$/kWh):** The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

### Calculation References

Term	Definition
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
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)]

\* 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).

### 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:

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)		Investment Cost	
6					1	\$ 850.00		Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings	
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%		Formula: =IRR(F4:F14) =NPV(0.03,F5:F14)+F4	
17					NPV	\$2,250.67			

## Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 50kW or less, \$1/Watt incentive subtracted from installation cost
Incentive 2:	Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume \$600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =  
kWh produced by panel \* [\$/kWh cost \* 25 years + \$600/Megawatt hour /1000 \* 15 years]

### 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.

## New Jersey Clean Energy Program Commercial & Industrial Lifetimes

Measure	Life Span
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