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May 5, 2010

Local Government Energy Program
Energy Audit Report

For

Mount Laurel Township

Masonville EMS Building
201 Masonville Road
Mount Laurel, NJ 08054

Project Number: LGEA22

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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 Mount Laurel Township buildings. The audit included a review of the Mount Laurel EMS building (201 Masonville Road), EMS building (1051 S. Church Street), Library, Administrative building, Paws Farm, Paws Farm (Farmhouse) and the Senior Meeting Center. The buildings are located in Mount Laurel, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Mount Laurel – Masonville EMS building located at 201 Masonville Road, Mount Laurel, 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 Masonville EMS building, located at 201 Masonville Road was constructed in 1997 with a minor renovation in 2005 but has not undergone any major renovations. The building consists of approximately 10,051 square feet of conditioned space with occupancy of approximately 30-40 employees at any given time employees. Due to the building being used for Emergency Medical Services as well as an emergency call center, the building is operated 24 hours per day but the occupancy varies.

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

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

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

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Mount Laurel –Masonville EMS building located at 201 Masonville Road, Mount Laurel, NJ. The building is a single story building with a total floor area of 10,051 square feet. The Masonville EMS building was constructed in 1997 with minor renovations in 2005, and since then there has been no major additions or renovations to the building.

Based on the field visit performed by the SWA staff on September 30th and October 1st, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

Existing conditions

From March 2008 through March 2009, the period of analysis for this audit, the building consumed 194,800 kWh or $29,568 worth of electricity at an approximate rate of $0.152/kWh and 10,022 therms or $13,779 worth of natural gas at an approximate rate of $1.375 per therm. The joint energy consumption for the building including both electricity and fossil fuel was 1,667 MMBtus of energy that cost a total of $43,347.

SWA has entered energy information about the Masonville EMS building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible for a performance rating since it is classified as an EMS building. SWA encourages Mount Laurel Township 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 172.3 kBtu/sq ft yr compared to the national average of 104.0 kBtu/sq ft yr. This building has a high Site Energy Use Intensity since it is operated 24 hours per day. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 2.3 kBtu/sqft yr, with an additional 6.2 kBtu/sq ft yr from the recommended ECMs with a 5-10 year payback.

Recommendations

Implementing this report's recommendations will reduce use by approximately 8.3 kBtu/ft^2yr, which would decrease the building's energy use intensity to 164.0 kBtu/ft^2yr.

The Masonville EMS building is used for both Emergency Medical Services as well as a Department of Homeland Security Command/Call center. The building is fairly new since it was built in 1997 and underwent minor renovations in 2005. SWA recommends a package of measures that addresses lighting, electric heating, heating setpoints as well as introduces Solar PV panels to offset electricity usage.

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

Category I Recommendations: Capital Improvement Measures

- Replace baseboard heaters in bunk area bathrooms

Category II Recommendations: Operations and Maintenance

- Bi-annual inspections of exterior wall areas
- Bi-annual inspections of roofs and ceiling cavities

- Adjust timer for exterior lights
- Replace fan belt on garage furnace
- Perform routine maintenance inspections of windows and doors
- Provide weather stripping / air sealing
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **3** Energy Conservation Measure (ECM) for the Masonville EMS building that is summarized in the following Table 1. The total investment cost for these highly recommended ECMs with incentives is **$2,204**. SWA estimates a first year savings of **$872** with a simple payback of **2.3 years**. SWA also recommends **3** ECMs with a 5-10 year payback that is summarized in Table 2 and no End of Life Cycle ECMs.

The implementation of all the recommended ECMs would reduce the building electric usage by 26,899 kWh annually or 14% of the building's current electric consumption and would have a net increase of the building's natural gas usage by 64 therms or less than 1% of the building's current natural gas consumption. The net savings for natural gas usage is negative since one measure recommends replacing an electric fan coil unit with a natural gas fan coil unit. Although this measure increases natural gas usage, it decreases electricity usage and decreases net operating cost. SWA estimates that implementing these ECMs will reduce the carbon footprint of the Masonville EMS building by **47,225 lbs of CO_2**, which is equivalent to removing approximately 2 cars from the roads each year or avoiding the need of 50 trees to absorb the annual CO_2 produced. SWA also recommends that Mount Laurel Township 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, which would have equated to $390 for the past 12 months.

There are various incentives that Mount Laurel Township could apply for that could also help lower the cost of installing the ECMs. SWA recommends that Mount Laurel Township apply for either the NJ SmartStart program or the NJ Clean Power Direct Install program. The NJ SmartStart program provides incentives for prescriptive measures in order to offset the cost of implementation, incentive levels vary by equipment type. The NJ Clean Energy Direct Install program is a new program that provides incentives that could cover up to 80% of the capital investment for prescriptive measures. More information about both programs and how to apply can be found in Appendix D or at the New Jersey Office of Clean Energy's website: http://www.njcleanenergy.com/commercial-industrial/home/home

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

Table 1 - Highly Recommended 0-5 Year Payback ECMs																		
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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	Install 3 new CFL lamps	RS Means	24	0	24	131	0.0	0	0.0	11	31	5	141	0.8	486.5	97.3	126.6	118	235
2	Install 1 programmable thermostat for Garage offices	RS Means	200	0	200	98	0.0	54	0.6	0	89	10	753	2.2	276.4	27.6	43.4	560	771
3	Install 9 new Occupancy Sensors	RS Means	1,980	180	1,800	4,945	1.0	0	1.7	0	752	10	6,347	2.4	252.6	25.3	40.3	4,612	8,854
	TOTALS		**2,204**	**180**	**2,024**	**5,174**	**1.0**	**54**	**2.3**	**11**	**872**	**-**	**7,240**	**2.3**	**-**	**-**	**-**	**5,290**	**9,859**

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

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
4	Replace electric fan coil unit with gas-fired unit	RS Means	2,200	400	1,800	3,456	9.6	-139	-0.2	0	334	20	4,881	5.4	171.2	8.6	17.9	3,172	4,656
5	Install 10 kW Solar Photovoltaic system	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	4.0	0	8,394	25	142,965	7.1	138.3	5.5	11.1	40,210	21,135
6	Install 14 new Pulse Start Metal Halide fixtures	RS Means	11,274	350	10,924	6,465	1.3	0	2.2	517	1,500	15	17,647	7.3	61.5	4.1	10.8	6,979	11,576
	TOTALS		**83,474**	**10,750**	**72,724**	**21,725**	**20.9**	**-139**	**6.0**	**517**	**10,228**	**-**	**165,493**	**7.1**	**-**	**-**	**-**	**50,360**	**37,366**

1. HISTORIC ENERGY CONSUMPTION

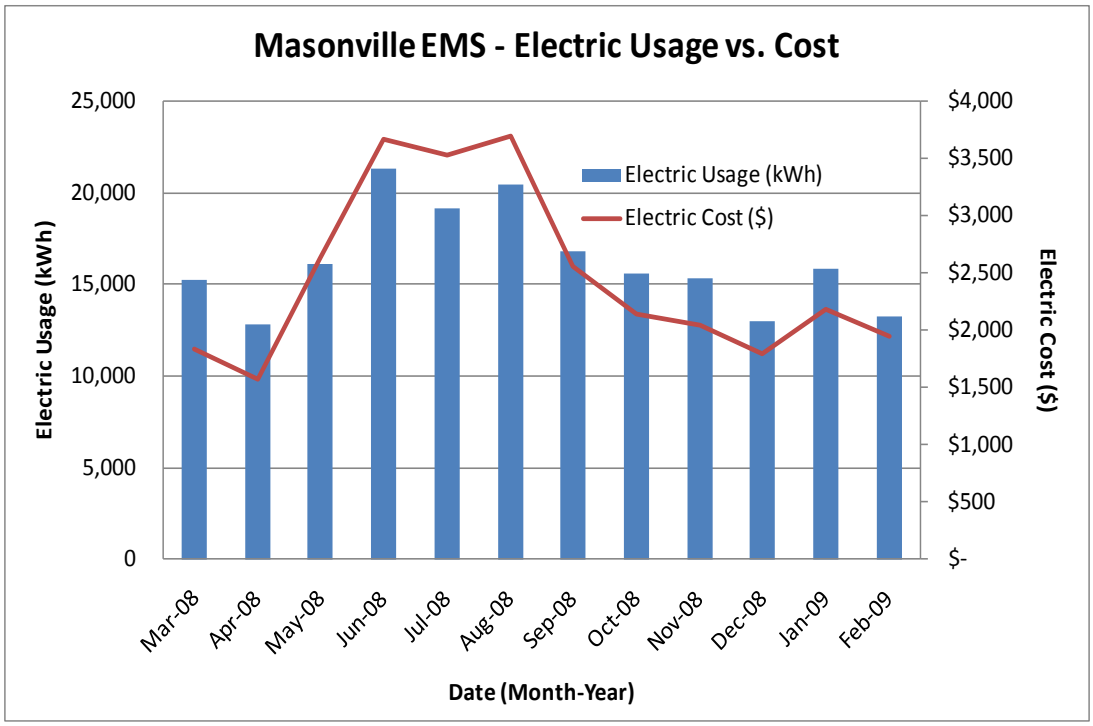
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **March 2008 through March 2009** (period of analysis) that were received from the utility companies supplying the Masonville EMS building with electric and natural gas.

Electricity - The Masonville EMS building buys electricity from PSE&G at **an average rate of $0.152/kWh** based on 12 months of utility bills from March 2008 to March 2009. The building purchased **approximately 194,800 kWh or $29,568 worth of electricity** in the previous year. The building is currently charged for demand (kW) which has been factored into each monthly bill. The building has an average monthly demand of **34.1 kW and a peak demand of 45.6 kW.**

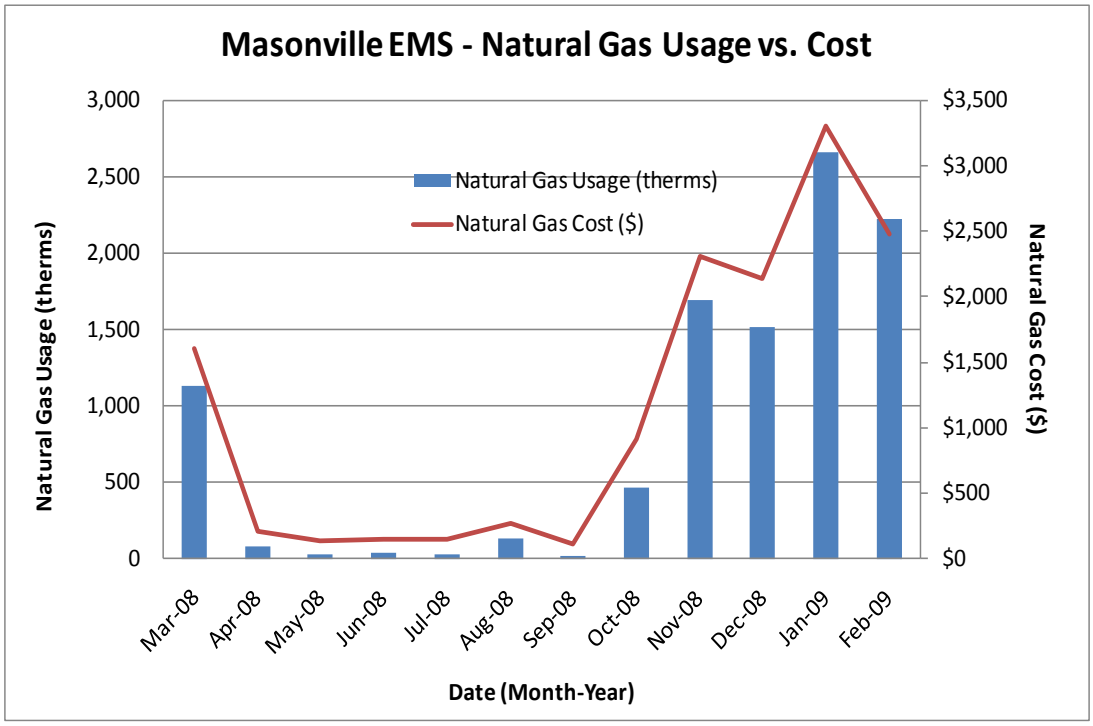
Natural gas - The Masonville EMS building is currently served by one meter for natural gas. The building currently buys natural gas from PSE&G at **an average aggregated rate of $1.375/therm** based on 12 months of utility bills for March 2008 to March 2009. The building purchased **approximately 10,022 therms or $13,779 worth of natural gas** in the previous year.

The following chart shows electricity use versus cost for the Masonville EMS building based on utility bills for the 12 month period of March 2008 to March 2009.



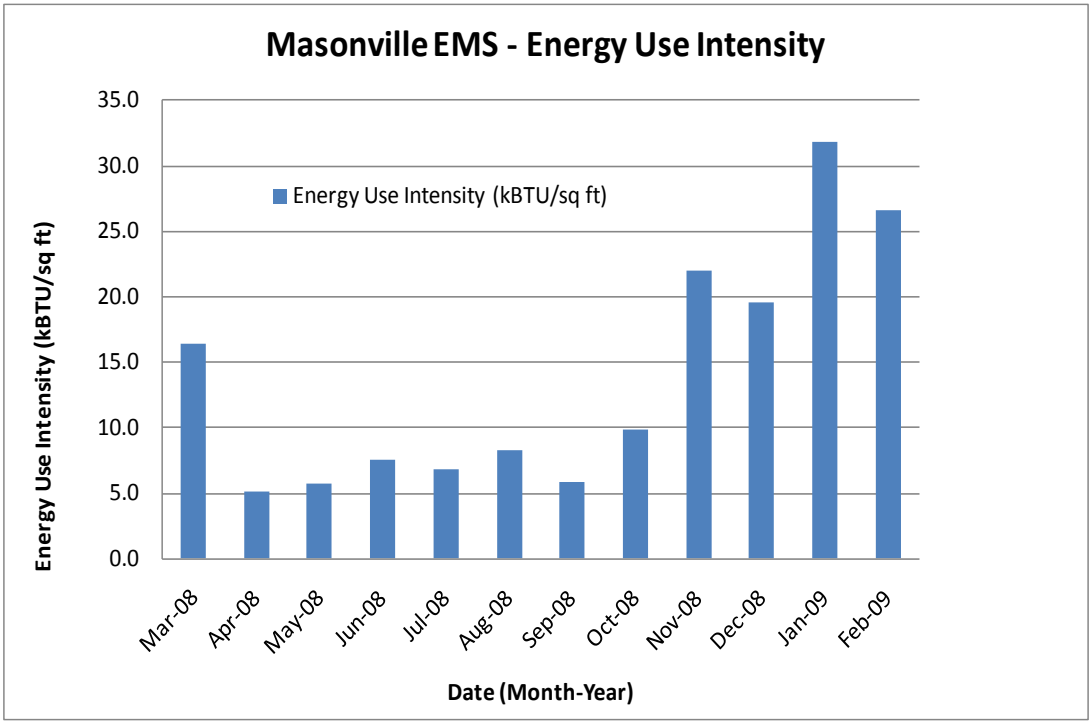
Electricity use follows the expected trend; peaking during the summer months when air conditioning units are used most and decreases during the winter. The cost of electricity fluctuates as expected with usage; however there is a secondary peak around January because of the use of electricity for space heating.

The following is a chart of the natural gas annual load profile for the building versus natural gas costs, peaking in the coldest months of the year.



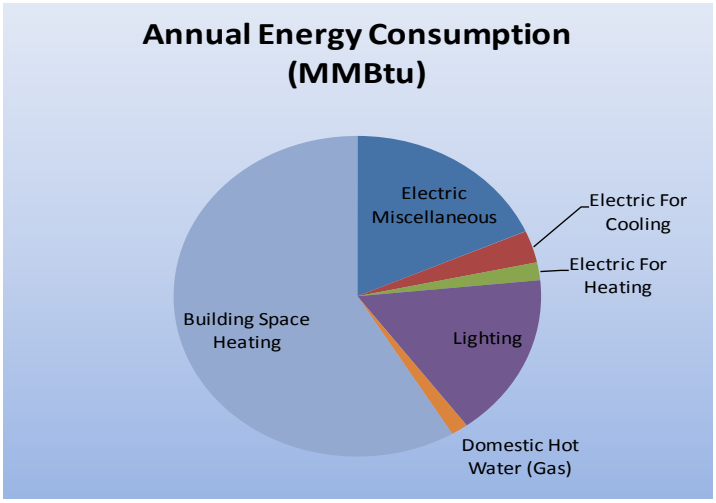
In the above chart, the natural gas use follows a heating trend as expected. During the summer it is clear that the natural gas use is very minimal which reflects that heat is not being used and the domestic hot water (DHW) load is minimal.

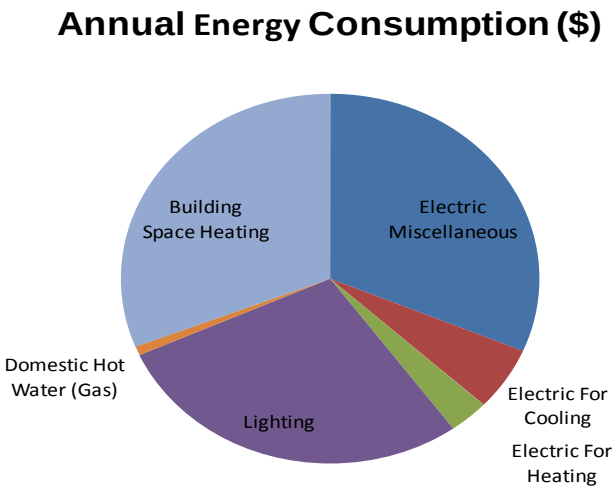
The following chart shows combined natural gas and electric consumption in kBtu/sq ft for the Masonville EMS building based on utility bills for the 12 month period of March 2008 to March 2009.



The following table and chart pies show energy use for the Masonville EMS building based on utility bills for the 12 month period of March 2008 to March 2009. Note electrical cost at $44/MMBtu of energy is more than 3 times as expensive to use as natural gas at $14/MMBtu.

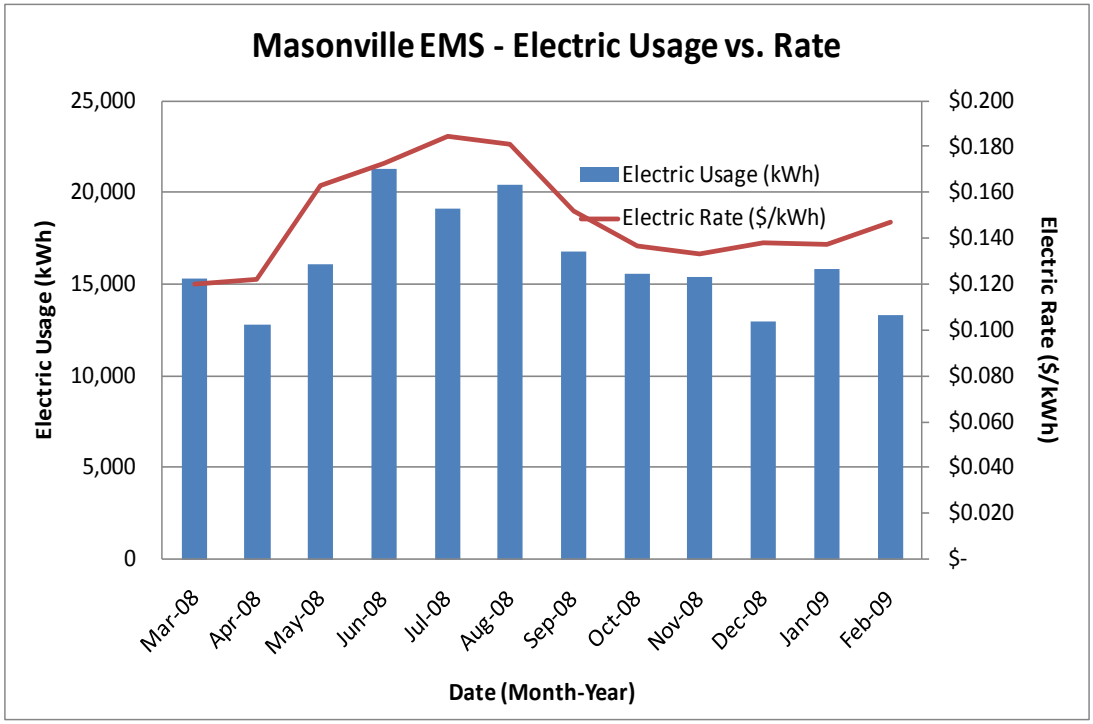
2008 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	306	18%	$13,606	31%	44
Electric For Cooling	54	3%	$2,401	6%	44
Electric For Heating	30	2%	$1,334	3%	44
Lighting	275	16%	$12,227	28%	44
Domestic Hot Water (Gas)	25	1%	$344	1%	14
Building Space Heating	977	59%	$13,435	31%	14
Totals	1,667	100%	$43,347	100%	26
Total Electric Usage	665	40%	$29,568	68%	44
Total Gas Usage	1,002	60%	$13,779	32%	14
Totals	1,667	100%	$43,347	100%	26





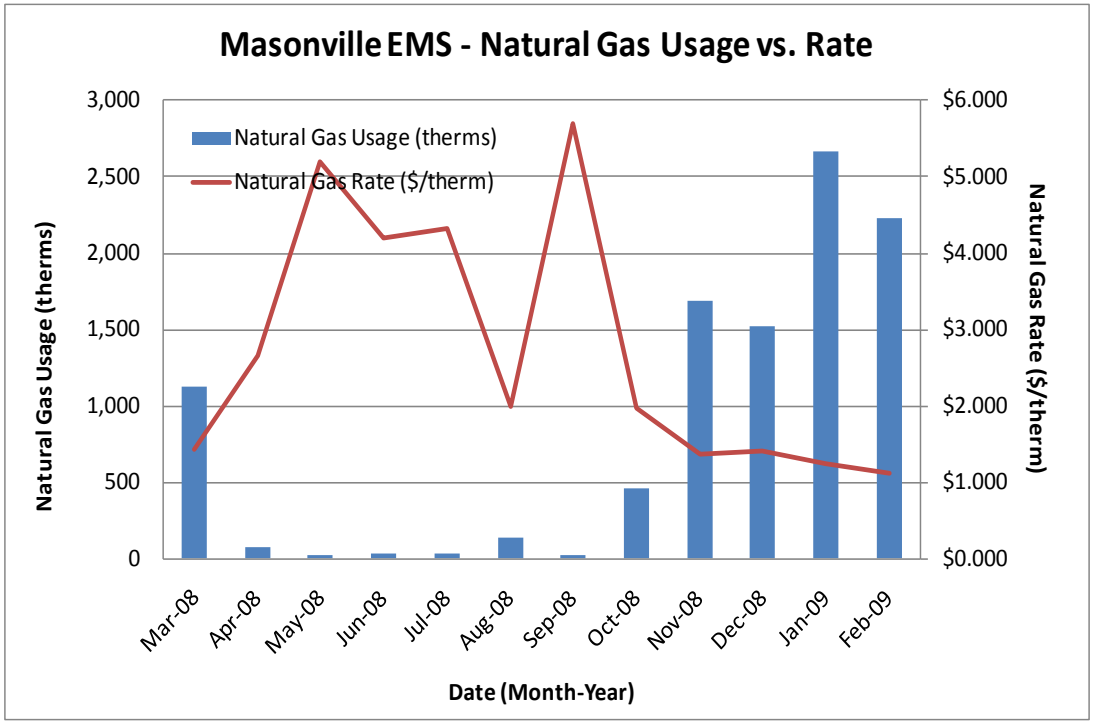
1.2. Utility rate analysis

The Masonville EMS 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 Masonville EMS building currently pays an average rate of approximately $0.152/kWh based on the 12 months of utility bills of March 2008 to March 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year except for the anticipated rate increase during the summer months, and therefore appears to be the appropriate rate for the building.



The Masonville EMS building currently purchases natural gas supply from the PSE&G at a general service market rate for natural gas (therms). There is one gas meter that provides natural gas service to the Masonville EMS building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.375/therm based on 12 months of utility bills for March 2008 to March 2009. The suppliers' general service rate for natural gas charges a market-rate price based on use and the EMS building utility billing does not breakdown demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the summer months when natural gas is used the least. Also contributing to the high gas price per therm fluctuations in the summer may be the low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.



Natural gas rates fluctuate with the amount of gas purchased per therm. In the above chart, it is clear that when consumption is low, natural gas rates (per unit) increase sharply. Every utility bill has a minimum delivery charge as well as taxes, etc factored into the cost, when consumption is low, these charges remain the same therefore increasing the rate (per unit) sharply when usage declines.

1.3. Energy benchmarking

From March 2008 through March 2009, the period of analysis for this audit, the building consumed 194,800 kWh or $29,568 worth of electricity at an approximate rate of $0.152/kWh and 10,022 therms or $13,779 worth of natural gas at an approximate rate of $1.375 per therm. The joint energy consumption for the building, including both electricity and fossil fuel, was 1,667 MMBtus of energy that cost a total of $43,347.

SWA has entered energy information about the Masonville EMS building 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 since it is classified as an EMS building. SWA encourages the Mount Laurel Township 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 172.3 kBtu/sq ft yr compared to the national average of 104.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 2.3 kBtu/sqft yr, with an additional 6.2 kBtu/sq ft yr from the recommended ECMs with a 5-10 year payback.

Per the LGEA program requirements, SWA has assisted Mount Laurel Township 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
Mount Laurel Township - Masonville EMS Building

Building ID: 1923503
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 05, 2010

Facility	**Facility Owner**	**Primary Contact for this Facility**
Mount Laurel Township - Masonville EMS Building 201 Masonville Road Mount Laurel, NJ 08054	N/A	N/A

Year Built: 1997
Gross Floor Area (ft²): 10,051

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	678,989
Natural Gas (kBtu)[4]	1,052,271
Total Energy (kBtu)	1,731,260
Energy Intensity[5]	
Site (kBtu/ft²/yr)	172
Source (kBtu/ft²/yr)	335
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	159
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	57%
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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Masonville EMS building was built in 1997 with minor renovations in 2005. The building has a total area of 10,051 square feet and houses administrative offices, a training center, a call center, a six bay garage, lounge, kitchen and bunk rooms.

2.2. Building occupancy profiles

The building is occupied by up to 30-40 employees at any given time. Due to the building being used for Emergency Medical Services as well as an emergency call center, the building is operated 24 hours per day but the occupancy varies.

2.3. Building envelope

2.3.1.Exterior Walls

The exterior envelope consists of a textured cement block façade with 2x6 metal framing on the interior side of the exterior wall. The exterior wall framing contains approximately 6" of fiberglass batt insulation with a total insulation value of R-19. There were no obvious signs of water or moisture damage noted on the exterior or interior of the wall assemblies. SWA recommends bi-annual inspections as part of a preventative maintenance plan to ensure the integrity of the exterior wall assembly.

Typical Exterior wall of building

Overall, exterior and interior wall finishes of the envelope were found to be in age-appropriate, good condition. SWA recommends biannual maintenance inspections to inspect the exterior walls with a focus on cracks and locating sources of water and air leakage.

2.3.2.Roof

The building has dark grey colored asphalt shingled roof installed in 1997. There were no reported problems with roof leaks or maintenance issues reported at the time of SWA's audit. SWA recommends general maintenance to prevent any damage leading to roof leaks.

SWA auditors were told the water stains on ceiling tiles in areas throughout the building were caused by leaking plumbing and HVAC equipment rather than exterior water penetrations. Damaged and/or missing ceiling tiles should be replaced or repaired as the tiles create an air barrier from unconditioned air.

Attic insulation with bays missing insulation

Fiberglass batt insulation was found between the wood ceiling joists in the attic. SWA recommends maintaining the consistency of this insulation and replacing insulation batts if they become damaged or compressed.

2.3.3.Base

The building's base is 6" concrete slab-on-grade over crushed stone with concrete footers and a vapor barrier. There were not any reported problems with water penetration or moisture.

2.3.4.Windows

The building contains casement and fixed double glazed fiberglass framed windows. The windows appeared to be in good condition. SWA recommends exterior and interior inspections of all windows as part of the building's routine maintenance schedule to ensure air and water tight performance year round. Any gaps, cracks, or damage to weather-stripping or caulking should be repaired or replaced as needed, to minimize energy loss around those openings. All of the windows appear to be in good age-appropriate condition.

2.3.5.Exterior doors

The exterior doors at the Masonville EMS building consisted of either insulated steel doors or aluminum-framed exterior doors with glass panes. The exterior doors are in good condition with some typical wearing of the weather-stripping. If not properly maintained, exterior doors can become major sources of heat loss and infiltration. As a best practice, SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. This will help optimize comfort and energy performance.

Missing weather-stripping on garage door

2.3.6. Building air tightness

Based on a visual inspection and communication with the building staff, the building was observed to be mildly air tight with some minor areas of air infiltration such as worn weather-stripping on exterior doors. As a best practice, weather-stripping on doors and windows should be checked every 6 months for deficiencies and replaced as they fail.

2.4. HVAC Systems

The Masonville EMS building is heated in all areas as well as cooled in all non-garage areas. The majority of the building is heated using gas-fired furnaces with the exception of electric baseboard in bunk area bathrooms and gas-fired infrared heating in the garage bays. The non-garage areas of the building are cooled using separate split AC systems for each area.

2.4.1. Heating

The main section of the Masonville EMS building, which includes the main floor, bunk areas, training centers and first floor offices are heated using gas-fired furnaces in the attic. These furnaces are condensing furnaces with high efficiencies and are operating in good condition. There would be no benefit to upgrade these furnaces at this time. All of the furnaces provide conditioned air to the building via ductwork. The ductwork diffuses air at a constant volume directly into the main floor areas. There is one electric fan coil unit located in the attic that should be replaced with a gas-fired fan coil unit. All of the areas on the main floor that are heated via ductwork are controlled with programmable thermostats. These thermostats are currently set for 70F and set back the temperature at night time.

The bunk area bathrooms located on the main floor are heated using small electric baseboard heaters. These units are controlled via a switch at the unit level and are not controlled by a thermostat. At this time it is not cost-effective to replace these electric baseboard heaters however, SWA recommends that these units are replaced with gas-fired units as a capital improvement measure.

The basement level of the Masonville EMS building contains two separate mechanical rooms that each contains a natural gas-fired, forced air furnace. These furnaces combined provide conditioned air to the entire basement level including the Emergency Call Center. These areas are also controlled with White-Rodgers programmable thermostats that are set to 70F and setback at night time.

The garage bays are heated both with convective heating and radiant heating. There is a mechanical room located above the office space next to the garage that includes a large Reznor unit that provides 6,000 CFM of heated air to the general garage bays. In addition to this unit, there are also 3 separate

Reznor infrared gas heaters installed attached to the ceiling of the garage bays. These units provide infrared heating to the garage. The infrared units are controlled by a thermostat located on the garage wall. This unit is set for 65F and is switched between winter/summer modes. When the thermostat is switched to summer mode, the unit is not able to turn on and heat the garage.

There are a few offices located next to the garage bays and as part of the garage building that are heated via a Reznor gas-fired furnace located in a mechanical room directly above the office space.

2.4.2. Cooling

All of the non-garage areas of the building are cooled using a mix of split type AC systems. These systems consists of cooling coils located within the ductwork that feeds the general space and are connected to condensing units located on the exterior of the building along the side and the back of the building.

2.4.3. Ventilation

The Masonville EMS building uses a forced air system for heating as well as cooling. This system provides ventilation by mixing fresh outside air with return air and then diffusing through the building spaces.

In addition to the HVAC units, toilet exhaust fans helps remove the stale air from the building and also helps induce fresh air into the building. This rooftop exhaust fan was observed to be operating in good condition.

2.4.4. Domestic Hot Water

The Masonville EMS building contains one gas-fired domestic hot water heater that provides hot water to the faucets throughout the building as well as showers located in the bunk areas. According to building drawings, this unit has a 34 gallon storage capacity and an input of 100,000 BTUH. This unit was observed to be in age-appropriate condition and is not recommended to be replaced or upgraded at this point in time.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – Lighting found throughout the Masonville EMS building consists of efficiency T8 fluorescent fixtures with electronic ballasts. There is one bathroom, located next to a bunk room that contains incandescent lamps. There is one occupancy sensor located in the Women's bathroom located in the bunk areas. SWA recommends installing additional occupancy sensors in bathrooms, mechanical rooms, closets and bunk areas that are all specified as having sporadic occupancy. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

Exit Lights - Exit signs were found to be LED types which are the most efficient exit signs available at this time. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

Exterior Lighting – Exterior lighting consisted of approximately 14 Probe Start Metal Halide fixtures that should be upgraded to Pulse Start Metal Halide fixtures. Six of these fixtures were observed to

be on during daylight hours. SWA recommends that the timers that control these lights be adjusted so that they are allowed to shut off during the day when their use is unnecessary. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

2.5.2. Appliances

SWA performed a basic survey of appliances installed at the Masonville EMS building. Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. refrigerators, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off.

2.5.3. Elevators

The Masonville EMS building does not contain an elevator system.

2.5.4. Process and others electrical systems

There are not currently any other electrical or process systems located in the building.

3. EQUIPMENT LIST

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Heating/ Cooling	GF2A; Gas-fired furnace with cooling unit, 92.0% AFUE, R-22 refrigerant	Attic	Bryant, Achiever 90 Plus, Model #CNRHP3617ATAABAA, Serial #0408X31053	Electric/ Natural Gas	All Areas	1997	48%
Heating/ Cooling	GF2B; Gas-fired furnace with cooling unit, 92.0% AFUE, R-22 refrigerant	Attic	Bryant, Achiever 90 Plus, Model #CNRHP3617ATAABAA, Serial #NA	Electric/ Natural Gas	All Areas	1997	48%
Heating/ Cooling	GF3; Gas-fired furnace with cooling unit, 92.0% AFUE, R-22 refrigerant	Attic	Bryant, Achiever 90 Plus, Model #CNRHP3617ATAABAA, Serial #NA	Electric/ Natural Gas	All Areas	1997	48%
Heating/ Cooling	GF4; Gas-fired furnace with cooling unit, 92.0% AFUE, R-22 refrigerant	Attic	Bryant, Achiever 90 Plus, Model #CNRHP3617ATAABAA, Serial #NA	Electric/ Natural Gas	All Areas	1997	48%
Heating	FC1; Ruud, fan coil unit with electric resistance heater kW 7.2/9.6, filters need changing	Attic	Ruud, Model #UBHA-14J10SFAA1, Serial #0408X31053	Electric	All Areas	1997	48%
Thermostats	White-Rodgers thermostats, programmable, setback at night, set for 70F	Various	White-Rodgers	Electric	All Areas	1997	48%
Heating	Rheem natural gas-fired furnace, AFUE 93.5%	Mechanical room by Emergency Command Center	Rheem, Classic 90 Plus premium efficiency series, Model #RCBA-4882GG21XI, Serial #T010501837	Natural Gas	All Areas	2005	80%
Heating	Rheem natural gas-fired furnace, AFUE 93.5%	Mechanical room through Volunteer Lounge	Rheem, Classic 90 Plus premium efficiency series, Model #RCBA-2457GG17XI, Serial #T020501178	Natural Gas	All Areas	2005	80%
Heating	HU1; Large Reznor gas-fired furnace for garage, 6000 CFM design, loose fan belt	Mechanical room attached to Garage	Reznor, Model #RDF1-65, Serial #AWI67T8N54133/VA/MV 7	Natural Gas	Garage	1997	48%
Heating	GF1; Smaller Ruud gas-fired furnace for garage offices	Mechanical room attached to Garage	Ruud, 90Plus, Model #RCBA-2457GG17, Serial #M4697	Natural Gas	Garage Offices	1997	48%
Heating	Reznor, three radiant heating units for garage bays	Ceiling of Garage bays	Reznor, Infra-Rez, Model #NA, Serial #NA	Natural Gas	Garage Bays	1997	48%
Cooling	CU-4; Ruud condensing unit, SEER 10, R22	Exterior, behind building	Ruud, Model #UAKA-060JAZ, Serial #5721 M0398 09375	Electric	All Areas	1998	52%
Cooling	Payne condensing unit, SEER 10, R22	Exterior, behind building	Payne Heating and Cooling, Product #PA13NR036000AEA1, Model #PA13NR036-E, Serial #0308X71175	Electric	All Areas	1997	48%
Cooling	Rheem Heat Pump, R-22	Exterior, behind building	Rheem, Model #RPMD-018JAZ, Serial #7042 M0405 14160	Electric	Basement Server room	2005	80%
Cooling	Meridian condensing unit, R-22	Exterior, behind building	Meridian, High Efficiency Series, Model #2AC12036-2, Serial #NA	Electric	All Areas	1997	80%
Cooling	CU-1; Ruud condensing unit, SEER 10, R-22	Exterior, side of building	Ruud, Model #UAKA-018JAZ, Serial #5460 M3897 09560	Electric	All Areas	1997	48%

Controls	Honeywell Environmental Control (older) thermostat to control smaller HVAC unit for garage offices, non-programmable	Fleet Management Office	Honeywell Environmental control	Electric	Garage office areas	1997	48%
Controls	Reznor Selectra thermostat for garage bay radiant heating (summer/winter controls, on/off), Set at 65F allways	Garage bay	Reznor, Selectra	Electric	Garage Bays	1997	48%
Heating	BB-1; Berko, 1000W/3413 BTUH, nameplate data taken from drawings	Bathroom located in bunk area #1	Berko, OBD series, Model #OBD1000, Serial #NA	Electric	Bunk area #1 bathroom	1997	48%
Heating	BB-2; Berko, 500W/1706 BTUH, nameplate data taken from drawings	Bathroom located in bunk area #2	Berko, OBD series, Model #OBD500, Serial #NA	Electric	Bunk area #2 bathroom	1997	48%
Domestic Hot Water	DHW-1; American Water Heater gas-fired domestic hot water heater, 34 gallon capacity, 100,000 BTUH input, nameplate data taken from drawings	First Floor Mechanical Room	American Water Heater, Model #NA, Serial #NA	Natural Gas	All Areas	1997	20%
Lighting	See Appendix A	-	-	-	-	-	-

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

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Masonville EMS 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

- Replace baseboard heaters in bunk area bathrooms – SWA recommends that existing electric baseboard heaters located in the bunk area bathrooms are replaced as a capital improvement measure. Currently these units are operated via a high/low/off switch located on the unit itself. Based on field conditions and interviews with maintenance staff, it does not appear that these units are used often enough to justify replacing them immediately. Replacing these units with gas-fired units will not be justified by energy savings alone.

Category II Recommendations: Operations and Maintenance

- Bi-annual inspections of exterior wall areas – SWA recommends bi-annual inspections as part of a preventative maintenance plan to ensure the integrity of the exterior wall assembly.

- Bi-annual inspections of roofs and ceiling cavities – SWA recommends bi-annual inspections of all roof surfaces and ceiling cavities as part of a preventative maintenance schedule. Roof surfaces and insulation levels should always remain in tact and in good condition.

- Adjust timer for exterior lights – Timers that control exterior lights should be reset twice per year to account for daylight savings time and to be sure that all exterior lights are not operated during daylight hours.

- Replace fan belt on garage furnace – SWA observed that there was a loose fan belt on the Reznor furnace located in the mechanical room within the garage structure. This forced air furnace provides heat as well as well as ventilation to the garage bays. SWA recommends replacing this fan belt immediately as part of routine HVAC maintenance.

- Perform routine maintenance inspections of windows and doors – SWA recommends that biannual inspections of each window and door are conducted as part of a preventative maintenance schedule.

- Provide weather stripping / air sealing – SWA observed that all windows and doors were in age-appropriate condition, with some exterior doors showing signs of compromised weather-stripping and air sealing. One are of concern observed was the overhead doors located in the garage areas. As a best practice, SWA recommends that each window and door is inspected twice per year for deficiencies. Any time that a seal has been compromised, building maintenance staff should repair and replace the seal immediately to ensure that thermal barriers are not breached.

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

Retrofitting with more efficient water-consumption fixtures / appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills.

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

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Install 3 new CFL lamps
2	Install 1 programmable thermostat for Garage office
3	Install 9 new Occupancy Sensors
	Description of Recommended 5-10 Year Payback ECMs
4	Replace electric fan coil unit with gas-fired unit
5	Install 10 kW Solar Photovoltaic system
6	Install 14 new Pulse Start Metal Halide fixtures

ECM#1: *Install 3 new CFL lamps*

Description:
Currently, the Masonville EMS building contains 3 fixtures located in bunk area bathrooms that contain incandescent lamps that should be upgraded to Compact Fluorescent Lamps (CFLs). CFL bulbs should always be used since they provide a better quality light while using less energy than an incandescent bulb. For a detailed lighting schedule, please see Appendix A.

Installation cost:
Estimated installed cost: $24
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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	Install 3 new CFL lamps	RS Means	24	0	24	131	0.0	0	0.0	11	31	5	141	0.8	486.5	97.3	126.6	118	235

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

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

Options for funding ECM:
This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#2: *Install 1 programmable thermostat for Garage offices*

Description:
The offices located in the Garage area are heated using a single Reznor gas-fired furnace located in a mechanical room directly above the office space. This unit is controlled by a thermostat on the wall of the office that is currently not programmable. SWA recommends upgrading this thermostat to ensure that the heat is turned off when the office is most likely not used such as night time.

Installation cost:
Estimated installed cost: $200
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
2	Install 1 programmable thermostat for Garage offices	RS Means	200	0	200	98	0.0	54	0.6	0	89	10	753	2.2	276.4	27.6	43.4	560	771

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes that the programmable thermostat will be able to lower the heating setpoint at night between 9pm and 6am.

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

Options for funding ECM:
This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#3: *Install 9 new Occupancy Sensors*

Description:
Currently, the Masonville EMS building could benefit from installing occupancy sensors in 9 separate areas. These 9 areas such as the Men's bathroom in the bunk areas as well as the training classrooms are not used consistently and can benefit from having the lights shut off automatically when no motion is detected for a set period of time. For a detailed lighting schedule, please see Appendix A.

Installation cost:
Estimated installed cost: $1,800
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
3	Install 9 new Occupancy Sensors	RS Means	1,980	180	1,800	4,945	1.0	0	1.7	0	752	10	6,347	2.4	252.6	25.3	40.3	4,612	8,854

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operational hours based on building staff interviews and field observations. .

Rebates / financial incentives:
NJ Clean Energy –Occupancy Sensors – Wall-mounted occupancy sensors ($20 per control)
Maximum incentive amount is $180.
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Options for funding ECM:
This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#4: *Replace electric fan coil unit with gas-fired unit*

Description:
The Masonville EMS building contains one electric fan coil unit with a capacity of 9.6kW located in the attic space of the Main floor. This fan coil unit provides electric resistive heat to ductwork that supplies the general areas with heated air. SWA recommends replacing this electric fan coil unit with a natural gas unit to provide cost savings as well as reduce greenhouse gas emissions.

Installation cost:
Estimated installed cost: $1,800
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
4	Replace electric fan coil unit with gas-fired unit	RS Means	2,200	400	1,800	3,456	9.6	-139	-0.2	0	334	20	4,881	5.4	171.2	8.6	17.9	3,172	4,656

Assumptions: Based on field observations, maintenance staff interviews and confirmed with utility bills, this unit is operated for an average of 2 hours per day, 180 days per year. Based on the capacity of 9.6kW, replacing this unit with a natural gas unit will require the same amount of energy from different sources. The original electric unit is assumed to operate at 100% efficiency and uses a total of 3,456 kWh per year or 11.8 MMBtu/year. The gas-fired replacement unit is estimated at 85% efficiency and uses a total of 139 therms per year or 13.9 MMBtu/year. The cost savings for this ECM is based on electricity costing $40/MMBTU compared to natural gas that uses $14/MMBTU.

Rebates / financial incentives:
NJ Clean Energy – Gas heating, Gas-fired furnaces ($300/$400).
Maximum incentive amount is $400.

Options for funding ECM:
This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#5: *Install 10kW Solar Photovoltaic system*

Description:
Currently, the Masonville EMS building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the building roofs and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, and recommends at this time that Mount Laurel Township further review installing a 10kW 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 Masonville EMS building is not eligible for a 30% federal tax credit. Instead, Mount Laurel Township 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 SRECs at $600 / MWh or best market offer.

There are a few locations for a 10kW PV installation on the building roofs and away from shade. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 10kW system needs approximately 82 panels which would take up 869 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:
Estimated installed cost: $60,000
Source of cost estimate: Similar Projects

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
5	Install 10 kW Solar Photovoltaic	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	4.0	0	8,394	25	142,965	7.1	138.3	5.5	11.1	40,210	21,135

	system																		

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

Rebates / financial incentives:
NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application.
Incentive amount for this application is $10,000.

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

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. $6,600 has been incorporated in the above costs for the duration limit of 15 years; however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:
This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#6: *Install 14 new Pulse Start Metal Halide fixtures*

Description:
Currently, the Masonville EMS building uses 14 Probe Start metal halide fixtures for exterior lighting. All of these fixtures are controlled using a timer, shutting them off at night. Probe Start metal halide fixtures have traditionally been used for exterior lighting; however the quality and amount of light that they give off reduces over time. Newer technology such as Pulse Start Metal halides can be installed and give off a better quality light and do not degrade overtime. Pulse Start metal halides save money by allowing customers to install lights at a lower wattage than Probe Start metal halides because degradation does not have to be taken into account. In addition, Probe Start metal halides turn on at full power and off at full power, it is not necessary for them to flicker and warm up like traditional Probe Start metal halides.

Installation cost:
Estimated installed cost: $10,924
Source of cost estimate: Similar Projects

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	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
6	Install 14 new Pulse Start Metal Halide fixtures	RS Means	11,274	350	10,924	6,465	1.3	0	2.2	517	1,500	15	17,647	7.3	61.5	4.1	10.8	6,979	11,576

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

Rebates / financial incentives:
NJ Clean Energy – Prescriptive Lighting, Metal Halide with Pulse Start ($25 per fixture)
Maximum incentive is $350.

Options for funding ECM:

This project may benefit from enrolling in the NJ Direct Install or the NJ SmartStart program to offset a portion of the cost of implementation.

http://www.njcleanenergy.com/commercial-industrial/home/home

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Existing systems

There are not currently any existing renewable energy systems.

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.

Solar Photovoltaic

Please see ECM #5 above.

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.

Combined Heat and Power

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

Geothermal

Geothermal is not applicable for this building because of the current HVAC configuration and would not be cost-effective.

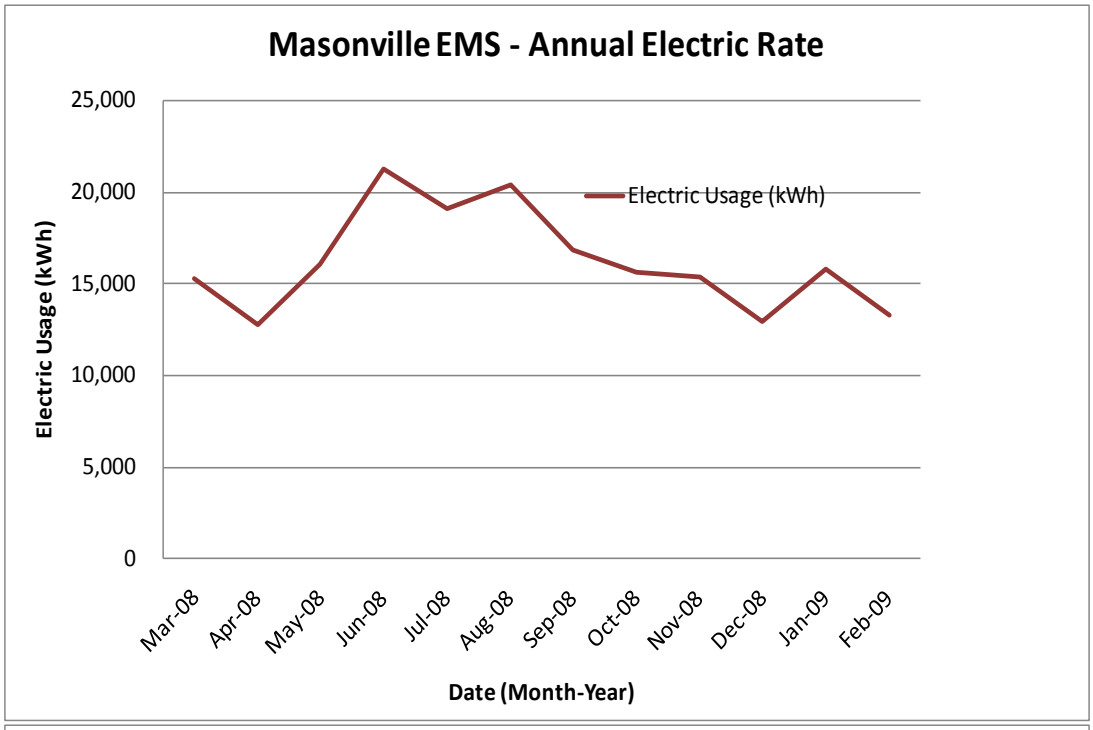
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

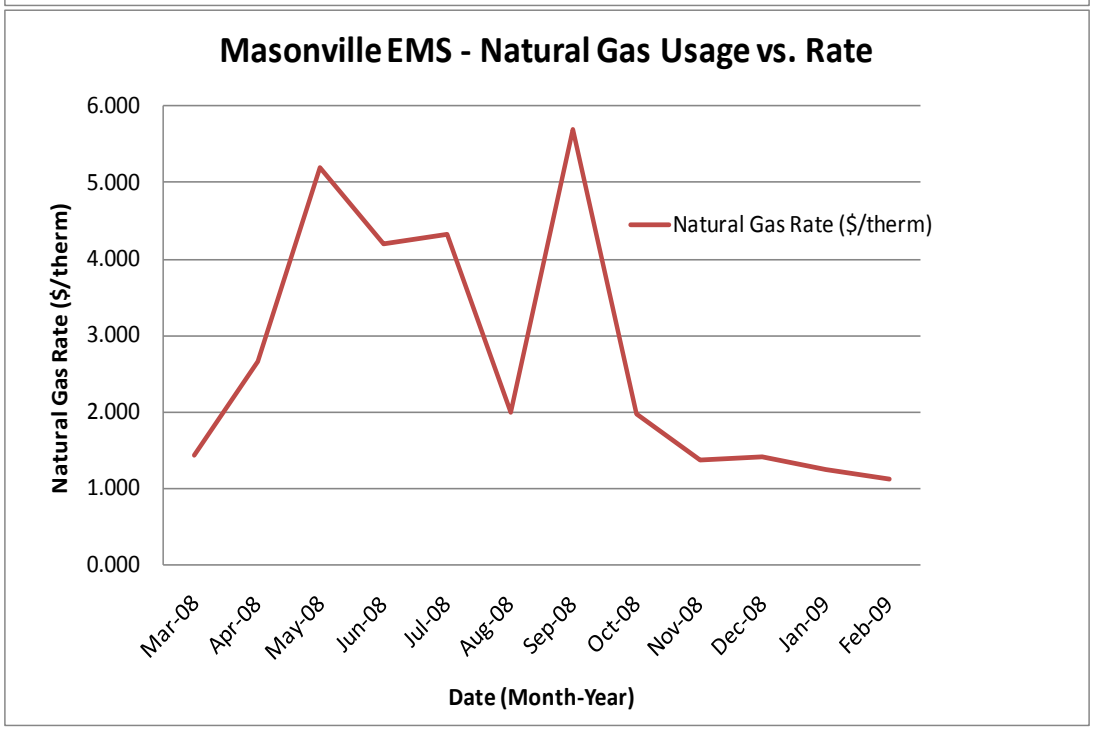
6.1. Energy Purchasing

The Masonville EMS building receives natural gas via one incoming meter. PSE&G supplies gas to the building. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the building from PSE&G without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of up to 35% over the 12 month period. Natural gas bill analysis shows fluctuations up to 43% over the 12 month period. Some of these fluctuations may be due to unusual high and escalating energy costs in 2008.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity and $1.55/therm for natural gas. Currently, the electricity rate for the Masonville EMS building is $.152/kWh, which means there is a potential cost savings of $390 per year. The current natural gas rate for the Masonville EMS building is $1.375/therm which is better than the average natural gas cost. A large cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that Mount Laurel Township 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 Masonville EMS building. Appendix B contains a complete list of third party energy suppliers for the Mount Laurel Township service area. Mount Laurel Township 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 Masonville EMS building 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

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Entrance	2'U-shape	E	2'T8	1	2	18	S	12	365	5	41	180	N/A	2'U-shape	2'T8	E	S	1	2	18	12	365	5	41	180	0	0	0
2	1	Hallway	2'U-shape	E	2'T8	21	2	18	S	10	365	5	761	3,143	N/A	2'U-shape	2'T8	E	S	21	2	18	10	365	5	761	3,143	0	0	0
3	1	Hallway	Exit Sign	N	LED	3	1	5	N	24	365	1	16	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	16	158	0	0	0
4	1	Training center	Parabolic	E	4'T8	14	4	32	N	24	365	13	1,805	17,292	N/A	Parabolic	4'T8	E	N	14	4	32	24	365	13	1,805	17,292	0	0	0
5	**1**	**Training center**	**2'U-shape**	**E**	**2'T8**	**2**	**2**	**18**	**N**	**4**	**365**	**5**	**77**	**120**	**C**	**2'U-shape**	**2'T8**	**E**	**OS**	**2**	**2**	**18**	**3**	**365**	**5**	**77**	**90**	**0**	**30**	**30**
6	**1**	**Administration (101)**	**Parabolic**	**E**	**4'T8**	**4**	**4**	**32**	**N**	**10**	**365**	**13**	**525**	**2,059**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**4**	**4**	**32**	**8**	**365**	**13**	**525**	**1,544**	**0**	**515**	**515**
7	1	Chief of EMS (103)	Parabolic	E	4'T8	2	4	32	N	10	365	13	269	1,029	N/A	Parabolic	4'T8	E	N	2	4	32	10	365	13	269	1,029	0	0	0
8	1	Operations (105)	Parabolic	E	4'T8	4	4	32	S	10	365	13	525	2,059	N/A	Parabolic	4'T8	E	S	4	4	32	10	365	13	525	2,059	0	0	0
9	**1**	**Conference (107)**	**Parabolic**	**E**	**4'T8**	**4**	**4**	**32**	**S**	**10**	**365**	**13**	**525**	**2,059**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**4**	**4**	**32**	**8**	**365**	**13**	**525**	**1,544**	**0**	**515**	**515**
10	1	Bathroom Women	Parabolic	E	4'T8	2	4	32	MS	10	365	13	269	1,029	N/A	Parabolic	4'T8	E	MS	2	4	32	10	365	13	269	1,029	0	0	0
11	1	Bathroom Men	Parabolic	E	2'T8	2	4	17	MS	10	365	5	141	533	N/A	Parabolic	2'T8	E	MS	2	4	17	10	365	5	141	533	0	0	0
12	1	Janitor's Closet (104)	Screw-in	N	CFL	1	1	20	S	2	365	0	20	15	N/A	Screw-in	CFL	N	S	1	1	20	2	365	0	20	15	0	0	0
13	1	Communications (112)	Parabolic	E	4'T8	2	4	32	S	10	365	13	269	1,029	N/A	Parabolic	4'T8	E	S	2	4	32	10	365	13	269	1,029	0	0	0
14	**1**	**Lounge (1060)**	**Parabolic**	**E**	**4'T8**	**6**	**4**	**32**	**S**	**10**	**365**	**13**	**781**	**3,088**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**6**	**4**	**32**	**8**	**365**	**13**	**781**	**2,316**	**0**	**772**	**772**
15	**1**	**sleeping quarters (110)**	**Parabolic**	**E**	**4'T8**	**4**	**4**	**32**	**S**	**10**	**365**	**13**	**525**	**2,059**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**4**	**4**	**32**	**8**	**365**	**13**	**525**	**1,544**	**0**	**515**	**515**
16	1	sleeping quarters bath	Parabolic	E	4'T8	1	4	32	S	4	365	13	141	206	N/A	Parabolic	4'T8	E	S	1	4	32	4	365	13	141	206	0	0	0
17	**1**	**sleeping quarters bath**	**Screw-in**	**N**	**Inc**	**2**	**1**	**40**	**S**	**4**	**365**	**0**	**80**	**117**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**2**	**1**	**15**	**4**	**365**	**0**	**30**	**44**	**73**	**0**	**73**
18	**1**	**sleeping quarters bath**	**Screw-in**	**N**	**Inc**	**1**	**1**	**60**	**S**	**4**	**365**	**0**	**60**	**88**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**1**	**1**	**20**	**4**	**365**	**0**	**20**	**29**	**58**	**0**	**58**
19	**1**	**sleeping quarters (108)**	**Parabolic**	**E**	**4'T8**	**6**	**4**	**32**	**S**	**10**	**365**	**13**	**781**	**3,088**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**6**	**4**	**32**	**8**	**365**	**13**	**781**	**2,316**	**0**	**772**	**772**
20	1	sleeping quarters bath	Screw-in	N	CFL	1	1	15	S	4	365	0	15	22	N/A	Screw-in	CFL	N	S	1	1	15	4	365	0	15	22	0	0	0
21	1	sleeping quarters bath	Screw-in	N	CFL	1	2	9	S	4	365	0	18	26	N/A	Screw-in	CFL	N	S	1	2	9	4	365	0	18	26	0	0	0
22	1	Garage (200)	Parabolic	E	4'T8	4	2	32	S	14	365	6	262	1,431	N/A	Parabolic	4'T8	E	S	4	2	32	14	365	6	262	1,431	0	0	0
23	1	Cascade (205)	Parabolic	E	4'T8	1	4	32	S	2	365	13	141	103	N/A	Parabolic	4'T8	E	S	1	4	32	2	365	13	141	103	0	0	0
24	1	Soiled utility (204)	Parabolic	E	4'T8	1	4	32	S	2	365	13	141	103	N/A	Parabolic	4'T8	E	S	1	4	32	2	365	13	141	103	0	0	0
25	1	Laundry (203)	Parabolic	E	4'T8	1	4	32	S	2	365	13	141	103	N/A	Parabolic	4'T8	E	S	1	4	32	2	365	13	141	103	0	0	0
26	**1**	**Fleet manager (202)**	**Parabolic**	**E**	**4'T8**	**3**	**4**	**32**	**S**	**14**	**365**	**13**	**397**	**2,162**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**3**	**4**	**32**	**11**	**365**	**13**	**397**	**1,621**	**0**	**540**	**540**
27	1	Storage Rm (201)	Parabolic	E	4'T8	2	4	32	S	14	365	13	269	1,441	N/A	Parabolic	4'T8	E	S	2	4	32	14	365	13	269	1,441	0	0	0
28	1	Garage	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
29	1	Staircase (300)	Parabolic	E	4'T8	3	4	32	S	14	365	13	397	2,162	N/A	Parabolic	4'T8	E	S	3	4	32	14	365	13	397	2,162	0	0	0
30	B	Emergency operations (301)	2'U-shape	E	2'T8	8	2	18	S	14	365	5	293	1,676	N/A	2'U-shape	2'T8	E	S	8	2	18	14	365	5	293	1,676	0	0	0
31	B	Emergency operations	Screw-in	E	CFL	29	1	13	S	14	365	0	377	1,926	N/A	Screw-in	CFL	E	S	29	1	13	14	365	0	377	1,926	0	0	0
32	B	Mechanical Rm	Parabolic	E	4'T8	4	4	32	S	2	365	13	525	412	N/A	Parabolic	4'T8	E	S	4	4	32	2	365	13	525	412	0	0	0
33	B	EOC Executive rm (305)	Parabolic	E	4'T8	4	4	32	S	10	365	13	525	2,059	N/A	Parabolic	4'T8	E	S	4	4	32	10	365	13	525	2,059	0	0	0
34	B	Communication rm (307)	Parabolic	E	4'T8	3	4	32	S	10	365	13	397	1,544	N/A	Parabolic	4'T8	E	S	3	4	32	10	365	13	397	1,544	0	0	0
35	**B**	**Volunteer lounge**	**Parabolic**	**E**	**4'T8**	**8**	**4**	**32**	**S**	**10**	**365**	**13**	**1,037**	**4,117**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**8**	**4**	**32**	**8**	**365**	**13**	**1,037**	**3,088**	**0**	**1,029**	**1,029**
36	B	Volunteer lounge	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
37	**B**	**Archive / sprinkler (306)**	**Parabolic**	**E**	**4'T8**	**2**	**4**	**32**	**S**	**10**	**365**	**13**	**269**	**1,029**	**C**	**Parabolic**	**4'T8**	**E**	**OS**	**2**	**4**	**32**	**8**	**365**	**13**	**269**	**772**	**0**	**257**	**257**
38	B	Bathroom	Parabolic	E	4'T8	1	4	32	S	4	365	13	141	206	N/A	Parabolic	4'T8	E	S	1	4	32	4	365	13	141	206	0	0	0
39	**Ext**	**Exterior**	**Exterior**	**N**	**MH**	**6**	**1**	**175**	**N**	**24**	**365**	**44**	**1,094**	**11,511**	**PSMH**	**Exterior**	**PSMH**	**N**	**N**	**6**	**1**	**115**	**12**	**365**	**25**	**715**	**3,679**	**4,152**	**3,679**	**7,831**
40	Ext	Exterior	Exterior	N	CFL	24	1	23	S	12	365	0	552	2,418	N/A	Exterior	CFL	N	S	24	1	23	12	365	0	552	2,418	0	0	0
41	**Ext**	**Exterior**	**Exterior**	**N**	**MH**	**8**	**1**	**150**	**DL**	**12**	**365**	**38**	**1,238**	**6,588**	**PSMH**	**Exterior**	**PSMH**	**N**	**DL**	**8**	**1**	**100**	**12**	**365**	**22**	**822**	**4,275**	**2,313**	**0**	**2,313**
Totals:						**200**	**119**	**1377**				**415**	**15,862**	**80,595**						**200**	**18**	**1,202**				**14,977**	**65,375**	**6,596**	**8,624**	**15,220**

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

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

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

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 measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

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

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

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

Calculation References

ECM = Energy Conservation Measure

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

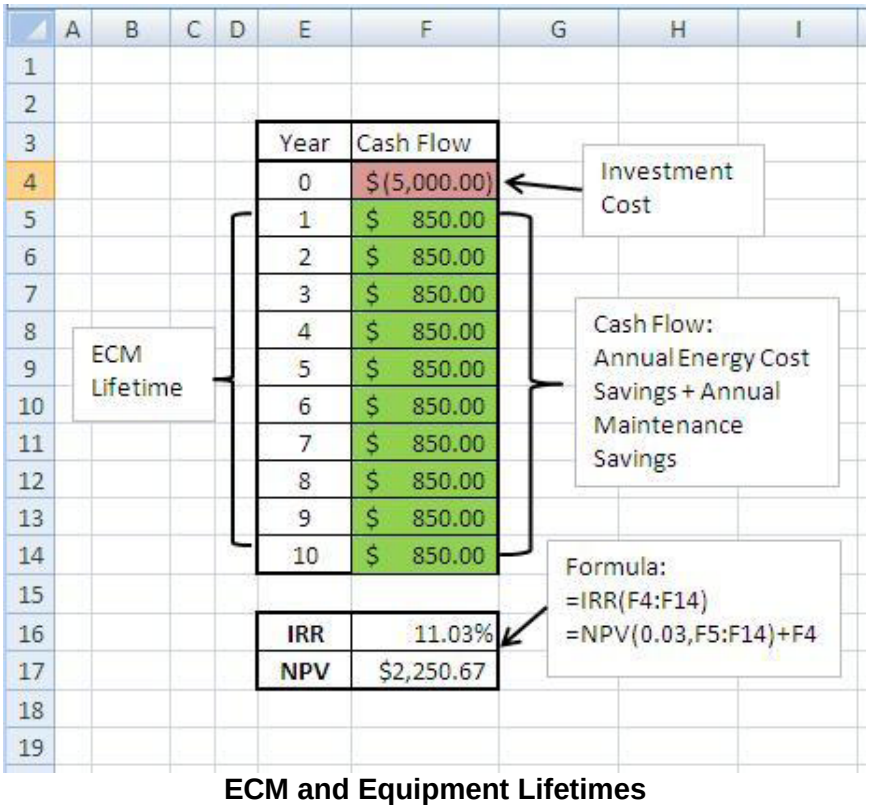
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime

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

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

Excel NPV and IRR Calculation

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



ECM and Equipment Lifetimes

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

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

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

NJCEP C & I Lifetimes

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

APPENDIX D: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. Theincentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 80%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.