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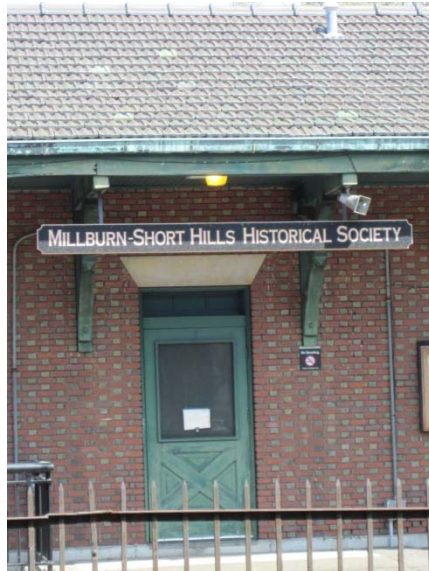
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*August 20, 2010*

**Local Government Energy Program  
Energy Audit Report-FINAL**

***The Township of Millburn  
Station Plaza building  
25 Chatham Rd  
Short Hills, NJ 07078***

***Project Number: LGEA58***



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## EXECUTIVE SUMMARY

The single-story (slab on grade and over a tunnel to the train station), 1,184 square foot Short Hills Station Plaza was originally constructed in 1907. The building was recently renovated for interior finishes. The building houses a museum, which archives the history of Millburn and Short Hills where employees and volunteers for the historical society work. The following chart provides an overview of current energy usage in the building based on the analysis period of February 2009 through January 2010:

**Table 1: State of Building—Energy Usage**

	Electric Usage, kWh/yr	Gas Usage, therms/yr	Other fuel usage, gal/yr	Current Annual Cost of Energy, \$	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	17,181	640	N/A	4,143	120.0	143
Proposed	13,782	640	N/A	3,514	110.2	131
Savings	3,399	0	N/A	629	9.8	12
% Savings	19.8%	0.0%	N/A	15.2%	8.2%	8.1%

There may be energy procurement opportunities for the Station Plaza building to reduce annual utility costs. The Township of Millburn electric costs are \$601 higher than the average estimated NJ commercial utility rate of \$0.15.

SWA has also entered energy information about the Station Plaza 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 "Other" space type. SWA recommends the Township of Millburn continue to insert utility billing information as the building may receive a rating as the (EPA) *ENERGY STAR® Portfolio Manager* database grows. The site energy use intensity is 120.0 kBtu/ft<sup>2</sup>/yr when compared to the national average site energy use intensity of 104.0 kBtu/ft<sup>2</sup>/yr.

Based on the current state of the building and its energy use, SWA recommends implementing various energy conservation measures from the savings detailed in Table 1. The measures are categorized by payback period in Table 2 below:

**Table 2: Energy Conservation Measure Recommendations**

ECMs	First Year Savings (\$)	Simple Payback Period (years)	Initial Investment, \$	CO2 Savings, lbs/yr
0-5 Year	695	1.6	1,112	2,480
5-10 Year	373	6.6	2,460	3,606
Total	1,068	3.4	3,572	6,086

(Please note that first year savings in the table above include both utility costs and maintenance costs savings).

SWA estimates that implementing the recommended ECMs is equivalent to avoiding the need of 6 trees to absorb the annual CO<sub>2</sub> generated.

Other recommendations to increase building efficiency pertaining to capital improvements and operations and maintenance are listed below:

**Further Recommendations:**

SWA recommends that the Township of Millburn further explore the following list for the Station Plaza building:

- Capital Improvements
  - Investigate insulation levels and insulate exterior wall sections.
  - Investigate attic/ceiling insulation and confirm minimum of R30 insulation. Before (additional) insulation is installed SWA recommends air sealing.
  - Consider installing exterior glass vestibule around exterior waiting room doors
  
- Operations and Maintenance
  - Maintain exterior wall assemblies
  - Inspect and maintain all roof surfaces on a regular basis.
  - Maintain weather-stripping around all exterior doors
  - Maintain sealants and caulks at all windows for airtight performance
  - Perform and maintain air-sealing
  - Remove birds’ nestings and regularly maintain rafter netting
  - Purchase the most energy-efficient equipment, including ENERGY STAR<sup>®</sup> labeled appliances, when equipment is installed or replaced
  - Maintain downspouts and cap flashing
  - Use smart power electric strips
  - Create an energy educational program

**Financial Incentives and Other Program Opportunities**

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the Township of Millburn. Based on the requirements of the LGEA program, Township of Millburn must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report’s approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is \$652. The table below summarizes the recommended ECMs that Township of Millburn can undertake for achieving this purpose. It is important to note that the required 25% expenditure is per building and after the other implementation incentive amounts.

**Table 3: Next Steps for the BUILDING**

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Install new CFL fixtures as per ECM#1	NJ Smart Smart and Direct Install

There are various incentive programs that the Township of Millburn could apply for that could help lower the cost of installing the ECMs. For the Station Plaza building, and contingent upon available funding, SWA recommends the following incentive programs:

**Smart Start:** The majority of energy saving equipment and design measures have moderate incentives under this program; however, this is the best choice among the alternatives available.

**Direct Install 2010 Program:** Commercial buildings with peak electric demand below 200kW can receive up to 60% of installed cost of energy saving upgrades.

**Energy Efficiency and Conservation Block Grant Rebate Program:** Provides up to \$20,000 per local government toward energy saving measures.

Please refer to Appendix F for further details.

## **INTRODUCTION**

Launched in 2008, the Local Government Energy Audit (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 up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 38-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Station Plaza building at 25 Chatham Rd, Short Hills, NJ 07078. The process of the audit included facility visit on April 8, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Township of Millburn to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Station Plaza building.

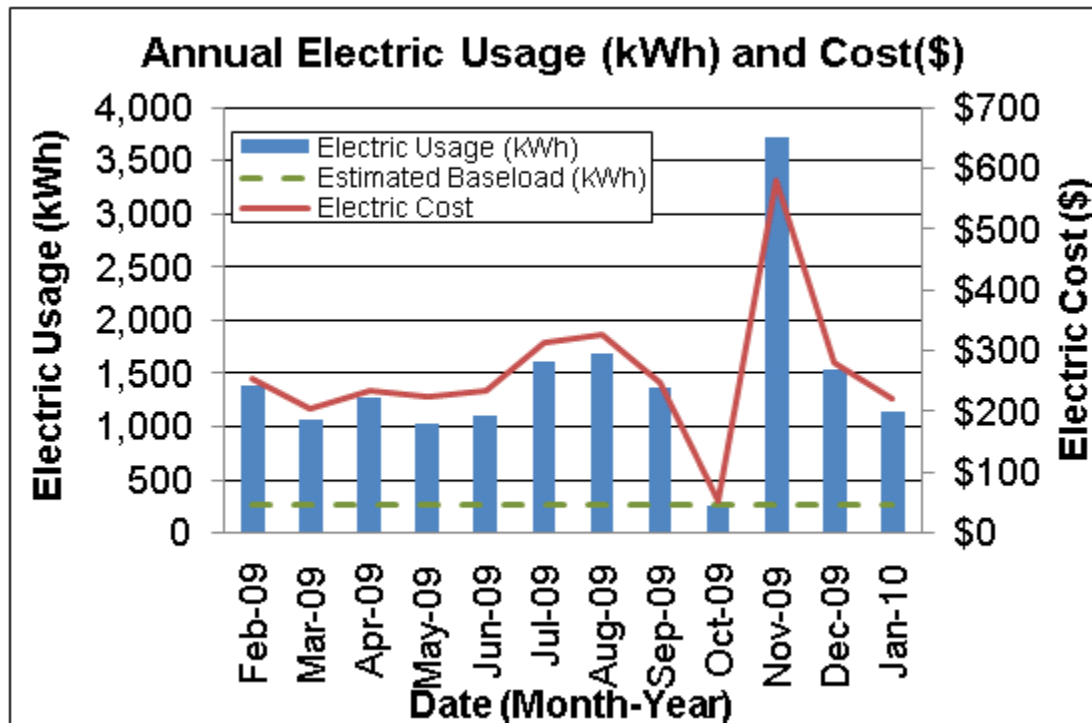
## HISTORICAL ENERGY CONSUMPTION

### Energy usage, load profile and cost analysis

SWA reviewed utility bills from February 2009 through January 2010 that were received from the utility companies supplying the Station Plaza building with electric and natural gas. A 12 month period of analysis from February 2009 through January 2010 was used for all calculations and for purposes of benchmarking the building.

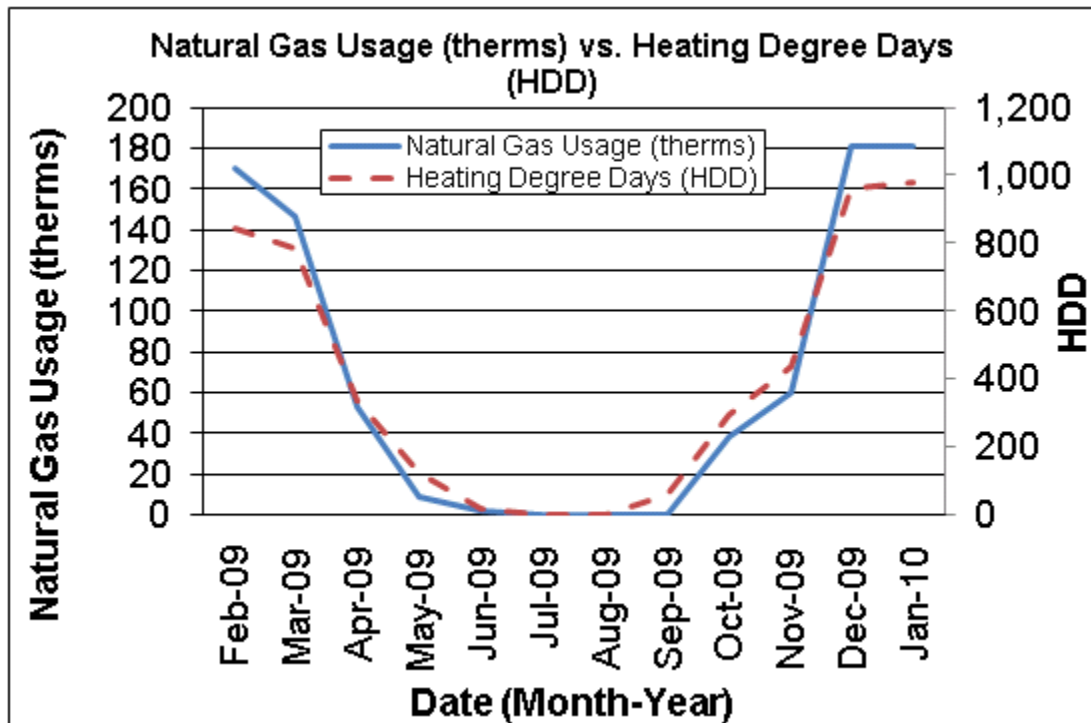
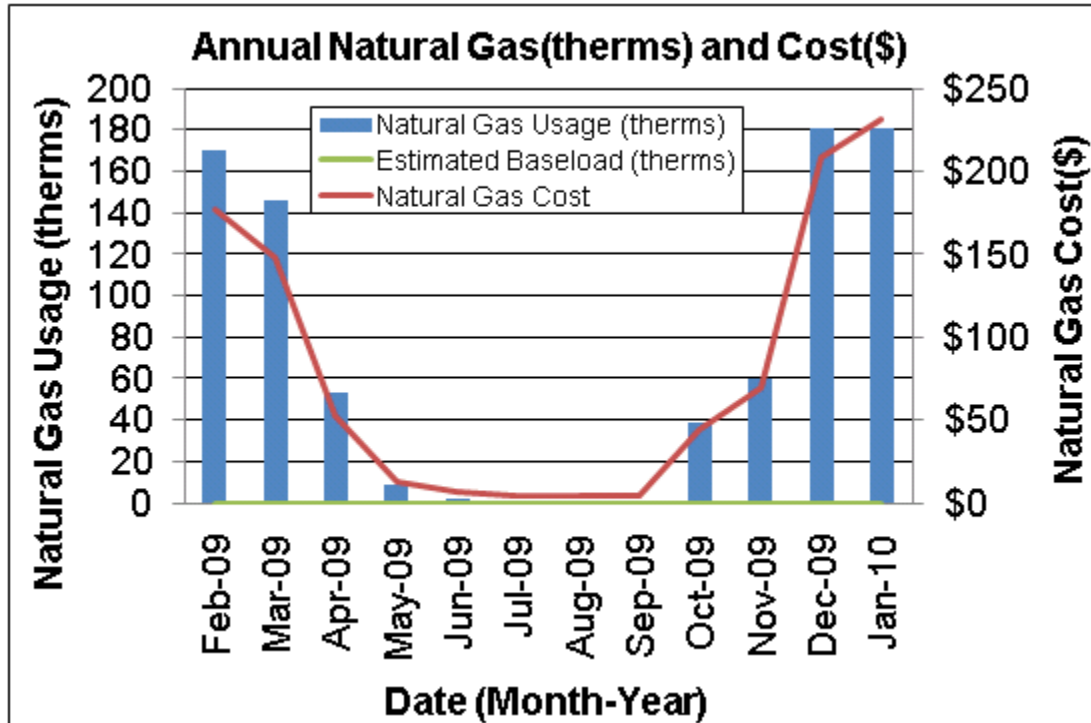
Electricity - The Station Plaza building is currently served by one electric meter. The Township currently buys electricity for the Station Plaza building from JCP&L at **an average aggregated rate of \$0.185/kWh**. The Township purchased **approximately 17,181 kWh, or \$3,178 worth of electricity**, for the Station Plaza building in the previous year. The monthly kW demand was not broken down in the utility bills.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Station Plaza building.



Natural gas - The Station Plaza building is currently served gas from the same meter that serves Short Hill Train Station building located at 15 Chatham Road, Short Hills. SWA did not find any individual gas meters supplying gas to this building. For the purpose of analysis, SWA pro-rated the gas supplied quantity and charges based on the ration of the area of Station Plaza building to that of the Train Station building. The Township currently buys natural gas from PSE&G for the Station Plaza building at **an average aggregated rate of \$1.149/therm**. The Township purchased **approximately 840 therms, or \$965 worth of natural gas**, in the previous year for the Station Plaza building.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Station Plaza building.

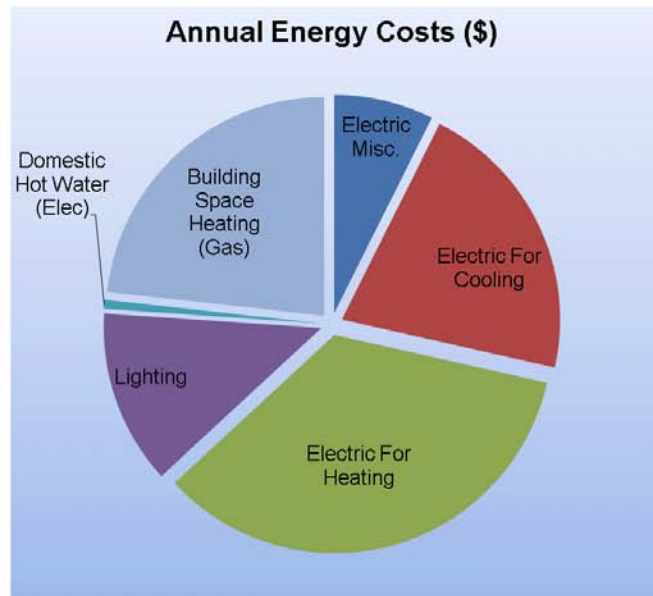
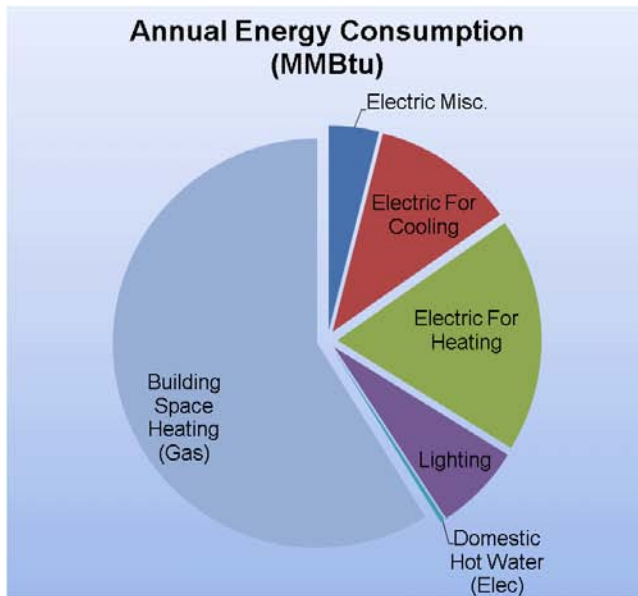


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base

temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

The following table and pie charts show energy use for the Station Plaza building based on utility bills for the 12 month period. Note that electricity cost at \$54/MMBtu of energy is 4.9 times as expensive as the cost of natural gas at \$11/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Misc.	8	4%	\$306	7%	54
Electric For Cooling	16	11%	\$876	21%	54
Electric For Heating	26	19%	\$1,433	35%	54
Lighting	10	7%	\$536	13%	54
Domestic Hot Water (Elec)	0	0%	\$27	1%	54
Building Space Heating	84	59%	\$965	23%	11
<b>Totals</b>	143	100%	\$4,143	100%	
<b>Total Electric Usage</b>	59	41%	\$3,178	77%	54
<b>Total Gas Usage</b>	84	59%	\$965	23%	11
<b>Totals</b>	143	100%	\$4,143	100%	

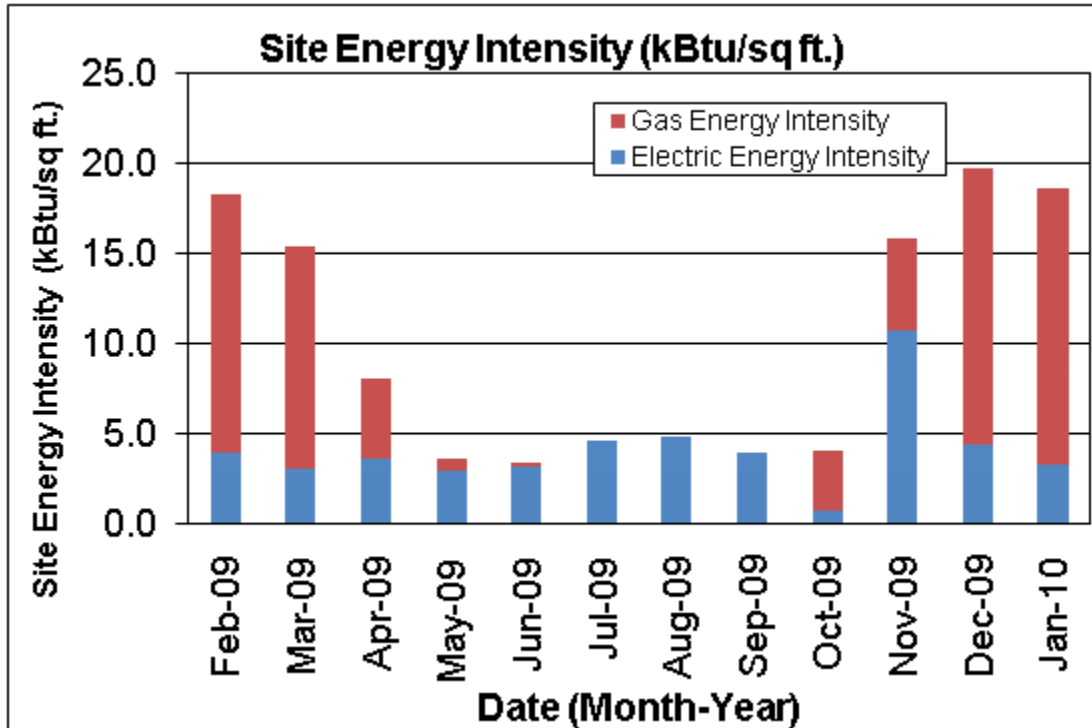


### Energy benchmarking

SWA has entered energy information about the Station Plaza 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 "Other" space

type. SWA recommends the Township of Millburn continue to insert utility billing information as the building may receive a rating as the (EPA) *ENERGY STAR® Portfolio Manager* database grows.

The Site Energy Use Intensity is 120.0 kBtu/ft<sup>2</sup>-yr compared to the national average of a “Other” building consuming 104.0 kBtu/ft<sup>2</sup>-yr. See ECM section for guidance on how to improve the building’s rating.



Per the LGEA program requirements, SWA has assisted the Township to create an *ENERGY STAR® Portfolio Manager* account and share the Station Plaza building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Municipality (user name of “MillburnTownship” with a password of “MILLBURNTOWNSHIP”) and TRC Energy Services (user name of “TRC-LGEA”)

### Tariff analysis

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

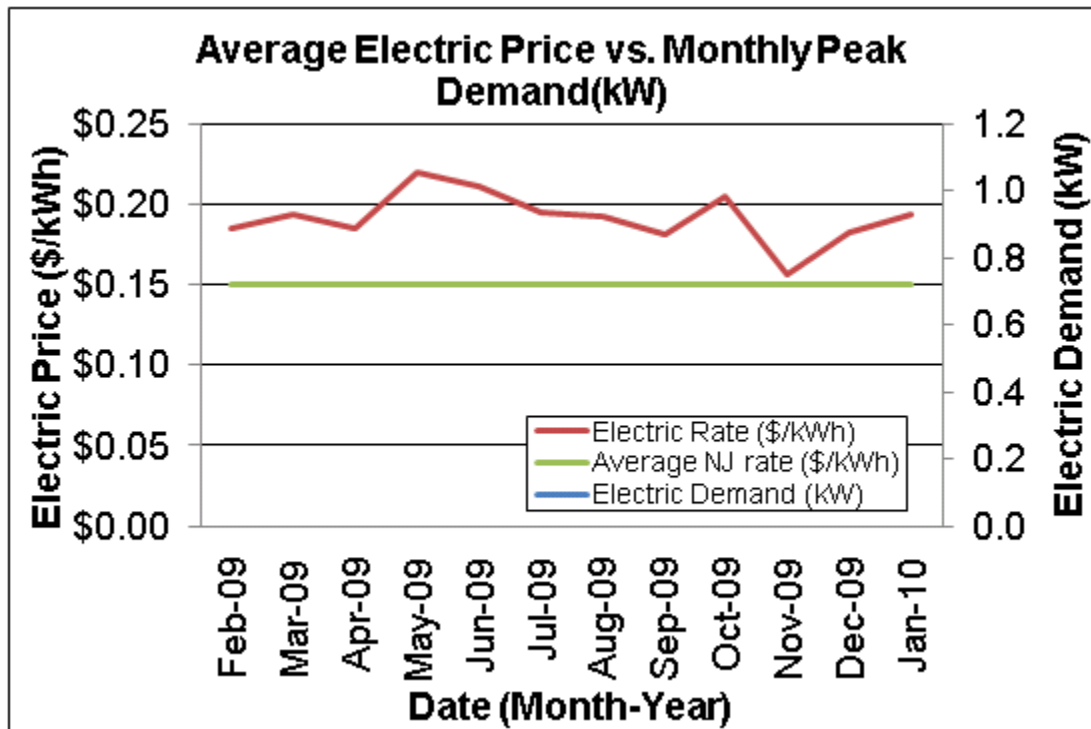
Tariff analysis is performed to determine if the rate that a municipality is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used by the HVAC condensing units and air handlers.

The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the Township is paying a general service rate for natural gas. Demand charges are not broken out in the bill. Thus the building pays for fixed costs such as meter reading charges during the summer months. The building is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. The general service rate for electricity is market-rate based on use.

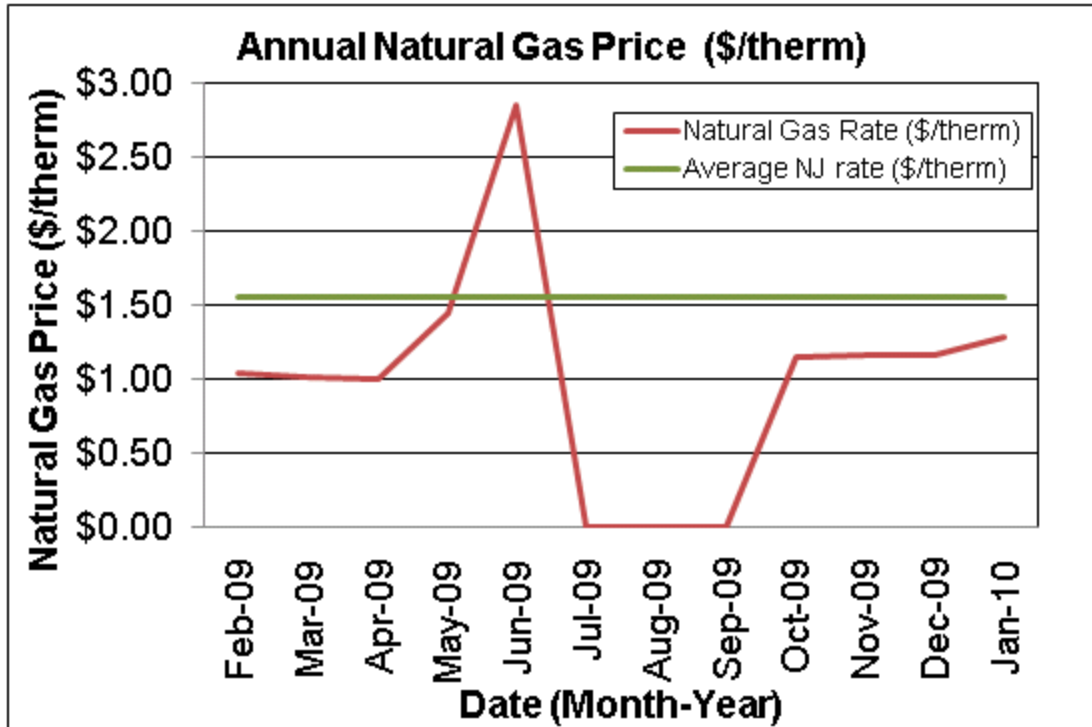
**Energy Procurement strategies**

Billing analysis is conducted using an average aggregated rate that is estimated based on the total cost divided by the total energy usage per utility per 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rates for electric are \$0.150/kWh, while the Township pays a rate of \$0.185/kWh for the Station Plaza building. The Station Plaza building annual electric utility costs are \$601 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 33% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are \$1.550/therm, while the Township pays a competitive rate of \$1.149/therm for the Station Plaza building. Natural gas bill analysis shows fluctuations up to 75% over the most recent 12 month period.



Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs. Summer fluctuations may also have been caused due to fixed meter charges and low gas consumption, resulting in high per therm rates, as for the month of June 2009 in the chart above.

SWA recommends that the Township further explore opportunities of purchasing electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Station Plaza building. Appendix C contains a complete list of third-party energy suppliers for the Millburn service area.

## EXISTING 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 a visit from SWA on April 8, 2010, the following data was collected and analyzed.

### Building Characteristics

The single-story (slab on grade and over a tunnel to the train station), 1,184 square foot Short Hills Station Plaza was originally constructed in 1907 with recently renovated interior finishes. The building houses a museum, which archives the history of Millburn and Short Hills and where employees and volunteers for the historical society work.



Rear Façade

### Building occupancy profiles

The building occupancy is two employees and/or volunteers, approximately two hours, three days per week and a few hours on the occasional Sunday.

### 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.

### Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over 3-1/2" wood stud framing with no detectable insulation. The interior wall surfaces are lath and plaster.

Exterior and interior wall surfaces were inspected during the field audit. There were a number of locations where the brick and mortar joints are missing or have deteriorated due to water damage. These areas warrant attention to prevent water infiltration in the wall assembly. The image below shows damage to a lath and plaster interior wall treatment due to water damage. Areas such as seen in the images below should be investigated and corrected.

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



Deteriorated mortar joints due to water damage at perimeter walls and ineffective site drainage



Damaged lath and plaster on interior wall section



Mortar joints deteriorated



More damaged lath and plaster

### Roof

The building's roof is a medium-pitch gable type over a wood structure, with a ceramic tile finish. The attic area was inaccessible at the time of the audit to inspect insulation levels.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good, age-appropriate condition, with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues.



Ceramic tile roof in good condition



Damaged lath and plaster from water damage



Bird nesting on rafter

## **Base**

The building's base is composed of a below grade slab floor with a perimeter footing with poured concrete foundation walls and no detectable slab edge/perimeter insulation.

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.

## **Windows**

The building contains wood framed, double hung, single glazed windows. Windows are in acceptable condition with no obvious signs of damage.

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.

## **Exterior doors**

The building contains un-insulated wood doors. 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 good/age appropriate condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues.



Exterior door acceptable condition

## **Building air tightness**

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

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.

## **Mechanical Systems**

### **Heating Ventilation Air Conditioning**

Heating for the Station Plaza is provided by a gas fired condensing furnace. There was no comfort complaint; however, it was reported that the building is maintained at a constant temperature throughout the year because it houses rare books and artifacts which are temperature sensitive.

### **Equipment**

The Station Plaza is conditioned by a combined gas fired heating and direct expansion split cooling system. The condensing unit includes a compressor, an outdoor coil, a fan, and a reversing valve, and is located within the attic space itself. The condensing coil is air cooled by attic air, which is forced through the coil and dumped outside through sheet metal ductwork. Refrigerant pipes connect the condensing unit to the air handler, which consists of a fan, an indoor coil, and gas heating equipment. The heating section is condensing and state of the art, with excellent thermal efficiencies expected to be upwards of 90%.

The air handling unit and condensing units were installed reportedly in 2000, and have about 50% of service life remaining. Both units appear to be in good working condition with no signs of rust or deterioration. There is one exhaust fan located above the ceiling, and it serves the bathroom. The building exhaust fan has an estimated 50% useful operating life left. A comprehensive Equipment List can be found in Appendix A.

### **Controls**

There is one heat/cool programmable thermostat in the building, and it is located in the corridor nearest the restroom. SWA does not recommend any improvements because the building is maintained at a constant temperature throughout the year.

### **Domestic Hot Water**

The domestic hot water for the Station Plaza building is provided by an instantaneous electric water heater with one heating element. The unit is located in a closet and serves the restroom with hot water. The water heater was manufactured around 2008 and installed during the time of other interior renovations. It is in good condition with no signs of rust. This heater has 90% estimated useful operating life remaining. SWA does not recommend any improvements with this heater because it is very rarely used.

## **Electrical systems**

### **Lighting**

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

*Interior Lighting* - The interior lighting at the Millburn Station Plaza building consists of mostly incandescent lamps and LED exit signs. SWA also recommends replacing the screw-in incandescent bulbs with compact fluorescent bulbs (CFLs). Based on measurements of day light and artificial lighting levels for each space, there are not any vastly over-illuminated areas.

*Exterior Lighting* - The exterior lighting surveyed during the building audit was found to contain metal halide bulb type fixtures.

### **Appliances and process**

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines, printers, etc. all create an electrical load on the building that is hard to separate out from the rest of the building’s energy usage based on utility analysis.

### **Elevators**

The Station Plaza building does not have an installed elevator.

### **Other electrical systems**

There are not currently any other significant energy-impacting electrical systems installed at the Station Plaza building.

## **RENEWABLE AND DISTRIBUTED ENERGY MEASURES**

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving, and the cost of installation is decreasing, due to both demand and the availability of state and federal government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Technology such as photovoltaic panels or wind turbines, use natural resources to generate electricity on the site. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Solar thermal collectors heat a specified volume of water, reducing the amount of energy required to heat water using building equipment. Cogeneration or CHP allows you to generate electricity locally, while also taking advantage of heat wasted during the generation process.

### **Existing systems**

Currently there are no renewable energy systems installed in the building.

### **Evaluated Systems**

#### **Solar Photovoltaic**

Based on utility analysis and a study of roof conditions, the Short Hills Train Station building is not a good candidate for a Solar Panel installation. There is insufficient roof space for panels to reasonably supplement the power consumption of the building.

#### **Solar Thermal Collectors**

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

#### **Geothermal**

The Station Plaza building is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have around 50% remaining useful life.

#### **Combined Heat and Power**

The Station Plaza building is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a high electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated.

## PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

### Recommendations: Energy Conservation Measures

ECM #	Description	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kBtu/sq ft, 1st yr savings	total 1st yr savings, \$	life of measure, yrs	simple payback, yrs	annual return on investment, %	CO <sub>2</sub> reduced, lbs/yr
1	38 New CFL fixtures to be installed with incentives	1,112	1,385	4.0	695	8	1.6	89	2,480
2	Replace Condensing Unit	2,460	2,014	5.8	373	15	6.6	8	3,606

**Assumptions:** Discount Rate: 3.2%; Energy Price Escalation Rate: 0%

**Notes:**

1. A 0.0 electrical demand reduction/month indicates that it is very low/negligible
2. 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 interaction between retrofits between some of the listed ECMs (i.e. lighting change influence on heating/cooling).

### ECM#1: *Building Lighting Upgrades*

On the days of the site visits, SWA completed a lighting inventory of the Station Plaza building (see Appendix B). The existing lighting at the Millburn Station Plaza building consists of mostly incandescent lamps. SWA highly recommends replacing the screw-in incandescent bulbs with compact fluorescent bulbs (CFLs). Due to low usage of the building, SWA does not have other cost effective lighting recommendations.

The labor in all these installations was evaluated using prevailing electrical contractor wages. The Township of Millburn 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 greater savings.

#### Installation cost:

Estimated installed cost: \$1,112 (includes \$480 of labor)

Source of cost estimate: *RS Means; Published and established costs, NJ Clean Energy Program*

ECM #	ECM description	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO <sub>2</sub> reduced, lbs/yr
1	38 New CFL fixtures to be installed with incentives	1,112	0	1,112	1,385	0	0	4.0	439	695	8	5,562	1.6	716	89	61	3,727	2,480

**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 1.5 hrs/yr to replace aging burnt out lamps vs. newly installed.

#### Rebates/financial incentives:

*There are no incentives available at this time for installing CFL lamps.*  
Please see Appendix F for more information on Incentive Programs.

## ECM#2: Replace Condensing Unit

SWA recommends replacing the existing condensing unit with an ENERGY STAR® rated condensing unit with higher operating efficiency. A split-system central air conditioner consists of an outdoor metal cabinet called the condensing unit which contains the condenser coil and compressor, and an indoor cabinet contains the evaporator coil and supply air fan. Central air conditioners are rated according to their seasonal energy efficiency ratio (SEER - Btu/Watt-hr), which indicates the relative amount of energy needed to provide a specific cooling output. The existing condensing unit has an estimated SEER rating of 10; minimum SEER allowed today is 13. ENERGY STAR® label central air conditioners with SEER ratings of 13 or greater, and up to 16 SEER condensing units are now available in the marketplace. More information can be found in the “Products” section of the ENERGY STAR® website at: <http://www.energystar.gov>. SWA recommends a 15 SEER unit for replacement.

### Installation cost:

Estimated installed cost: \$2,920 (includes \$500 of labor)

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

### Economics:

ECM #	ECM description	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO <sub>2</sub> reduced, lbs/yr
2	Replace Condensing Unit	2,920	460	2,460	2,014	0.1	0	5.8	0	373	15	5,589	6.6	127	8	11	1,924	3,606

**Assumptions:** SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated annual electric savings calculated from EnergyStar online calculator.

### Rebates/financial incentives:

*NJ Clean Energy – Unitary HVAC/Split Systems, 14 SEER minimum, \$73- \$92/ton; maximum incentive available is \$460.*

## **PROPOSED FURTHER RECOMMENDATIONS**

### **Capital Improvements**

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the Station Plaza building:

- Investigate insulation levels and insulate exterior wall sections. SWA suggests applying 2" XPS rigid foam boards to the interior and covering it with gypsum wallboard or other preferred interior finish.
- Investigate attic/ceiling insulation and confirm minimum of R30 insulation. Before (additional) insulation is installed SWA recommends air sealing around all electrical, plumbing, and HVAC penetrations.

### **Operations and Maintenance**

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Maintain exterior wall assemblies - SWA recommends as part of the maintenance program to re-pointing, correct masonry efflorescence and seal wall cracks and penetrations wherever necessary in order to keep insulation dry and effective. SWA recommends having any deteriorated or missing masonry cavities filled or re-pointed with mortar or appropriate caulk to minimize and prevent water and moisture infiltration into the envelope assemblies. Preventative maintenance should be performed on wall assemblies in order to prevent water from entering the walls or further damage. Damaged interior lath and plaster finish on walls should be investigated for water point of entry.
- Inspect and maintain all roof surfaces on a regular basis. SWA recommends investigating the roof for leaks, deteriorating roof finishes and damaged or compromised roof and valley flashing. Inspect and maintain all roof surfaces on a regular basis.
- Maintain weather-stripping around all exterior doors. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed.
- Maintain sealants and caulks at all windows for airtight performance. 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.
- Perform and maintain air-sealing - Penetrations in the thermal envelope should be sealed with caulk or spray foam. Areas to investigate include HVAC, plumbing, and electrical penetrations,

chimney and duct chases and around windows and doors. Air sealing will help to reduce energy loss of expensive conditioned air and prevent rodents or pests from entry into the building.

- Remove bird nests and regularly maintain rafter netting where birds tend to congregate.
- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR<sup>®</sup> labeled appliances, when equipment is installed or replaced. More information can be found in the “Products” section of the ENERGY STAR<sup>®</sup> website at: <http://www.energystar.gov>.
- 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/>

## APPENDIX A: EQUIPMENT LIST

### Inventory

Building System	Description	Model #	Fuel	Location	Space Served	Date Installed	Estimated Remaining Useful Life %
HVAC	Gas fired condensing furnace, 120MBH input, est. 90% thermal efficiency	Carrier, model 58MXA120, S/N 3493A07590	Gas/Electric	Attic	SH Station Plaza	2000 est.	<b>50%</b>
Cooling	Condensing unit, 208/3/60, 5 tons cooling capacity; SEER10	Skil-Aire, model CAA060H3AC, S/N K95028	Electric	Attic	SH Station Plaza	2000 est.	<b>50%</b>
Ventilation	Toilet exhaust fan	no nameplate	Electric	restroom	SH Train Station	2005 est.	<b>50%</b>
Domestic Hot Water	Electric tankless water heater	no nameplate	Electric	Closet	SH Train Station restroom	2008	<b>90%</b>
Lighting	See details - Appendix B	-	Electric	See details - Appendix B	SH Train Station		<b>70%</b>

**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.

## Appendix B: 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 Room	Ceiling Mounted	S	Inc	1	4	75	Sw	2	156	0	300	94	CFL	Ceiling Mounted	CFL	S	Sw	1	4	25	2	156	0	100	31	62	0	62
2	1	Entrance Room	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
3	1	Bathroom	Parabolic Ceiling Mounted	S	Inc	1	1	75	Sw	2	156	0	75	23	CFL	Parabolic Ceiling Mounted	CFL	S	Sw	1	1	25	2	156	0	25	8	16	0	16
4	1	Hallway	Ceiling Mounted	S	Inc	1	3	60	Sw	2	156	0	180	56	CFL	Ceiling Mounted	CFL	S	Sw	1	3	20	2	156	0	60	19	37	0	37
5	1	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
6	1	Main Room	Ceiling Suspended	S	Inc	4	1	100	Sw	2	156	0	400	125	CFL	Ceiling Suspended	CFL	S	Sw	4	1	35	2	156	0	140	44	81	0	81
7	1	Main Room	Track	S	Inc	25	1	60	Sw	2	156	0	1,500	488	CFL	Track	CFL	S	Sw	25	1	20	2	156	0	500	156	312	0	312
8	1	Main Room	Exit Sign	S	LED	1	1	5	Sw	24	365	1	6	48	N/A	Exit Sign	LED	S	Sw	1	1	5	24	365	1	6	48	0	0	0
9	1	Utility Closet	Wall Mounted	M	2T12	1	1	20	Sw	2	156	6	26	8	T12	Wall Mounted	2T12	M	Sw	1	1	20	2	156	6	26	8	0	0	0
10	Ext	Exterior	Recessed	S	Inc	6	1	75	PC	8	365	0	450	1,314	CFL	Recessed	CFL	S	PC	6	1	25	8	365	0	150	438	876	0	876
11	Ext	Exterior	Spotlight	S	MH	1	1	150	PC	8	365	42	192	561	MH	Spotlight	MH	S	PC	1	1	150	8	365	42	192	561	0	0	0
12	Ext	Platform	Pole Mounted Off Building	S	CFL	2	1	23	T	8	156	0	46	57	N/A	Pole Mounted Off Building	CFL	S	T	2	1	23	8	156	0	46	57	0	0	0
<b>Totals:</b>						<b>46</b>	<b>17</b>	<b>653</b>				<b>50</b>	<b>3,191</b>	<b>2,899</b>						<b>46</b>	<b>17</b>	<b>358</b>			<b>50</b>	<b>1,261</b>	<b>1,514</b>	<b>1,385</b>	<b>0</b>	<b>1,385</b>

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

### Legend

Fixture Type		Lamp Type			Control Type		Ballast Type	Retrofit Category
Ceiling Suspended	Recessed	CFL	3T12	8T5	Autom. Timer (T)	S (Self)	N/A (None)	
Exit Sign	Sconce	Inc	3T12 U-Shaped	8T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)	
High Bay	Spotlight	LED	3T5	8T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)	
Parabolic Ceiling Mounted	Track	HPS	3T5 U-Shaped	8T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)	
Parabolic Ceiling Suspended	Vanity	MH	3T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)	
Pendant	Wall Mounted	MV	3T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)	
Recessed Parabolic	Wall Suspended	1T12	4T5	Circline - T12	Delay Switch (DSw)		D (Delamping)	
Ceiling Mounted	Wallpack	1T12 U-Shaped	4T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)	
Chandelier		1T5	6T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)	
Equipment / Furne Hood		1T5 U-Shaped	6T12 U-Shaped	Induction	Motion & Switch (MSw)			
Flood		1T8	6T5	Infrared	None (N)			
Landscape		1T8 U-Shaped	6T5 U-Shaped	LPS	Occupancy Sensor (OS)			
Low Bay		2T12 U-Shaped	6T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)			
Parabolic Wall Mounted		2T5	6T8 U-Shaped	Neon	Photocell (PC)			
Pole Mounted		2T5 U-Shaped	8T12	Quartz Halogen	Switch (Sw)			
Pole Mounted Off Building		2T8 U-Shaped	8T12 U-Shaped					

**APPENDIX C: THIRD PARTY ENERGY SUPPLIERS**

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

Third Party Electric Suppliers for JCPL 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>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>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>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>Integritys Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integritysenergy.com">www.integritysenergy.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>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 Thomall 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 D: GLOSSARY AND METHOD OF CALCULATIONS

**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 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.

**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					Year	Cash Flow			
4					0	\$ (5,000.00)	← Investment Cost		
5					1	\$ 850.00			
6					2	\$ 850.00			
7					3	\$ 850.00			
8					4	\$ 850.00			
9					5	\$ 850.00			
10					6	\$ 850.00			
11					7	\$ 850.00			
12					8	\$ 850.00			
13					9	\$ 850.00			
14					10	\$ 850.00			
15									
16					IRR	11.03%	← Formula: =IRR(F4:F14)		
17					NPV	\$2,250.67	← Formula: =NPV(0.03,F5:F14)+F4		

## 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

**APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®**

OMB No. 2060-0347



**STATEMENT OF ENERGY PERFORMANCE  
Township of Millburn - Station Plaza**

Building ID: 2246042  
For 12-month Period Ending: January 31, 2010<sup>1</sup>  
Date SEP becomes ineligible: N/A

Date SEP Generated: June 24, 2010

**Facility**  
Township of Millburn - Station Plaza  
25 Chatham Road  
Short Hills, NJ 07041

**Facility Owner**  
N/A

**Primary Contact for this Facility**  
N/A

**Year Built:** 1907  
**Gross Floor Area (ft<sup>2</sup>):** 1,184

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

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

Electricity - Grid Purchase(kBtu)	58,067
Natural Gas (kBtu) <sup>4</sup>	83,842
Total Energy (kBtu)	141,909

**Energy Intensity<sup>5</sup>**

Site (kBtu/ft <sup>2</sup> /yr)	120
Source (kBtu/ft <sup>2</sup> /yr)	238

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

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	13
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**Electric Distribution Utility**

FirstEnergy - Jersey Central Power & Lt Co

**National Average Comparison**

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	12%
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.

**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 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.

## APPENDIX F: 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. The incentives 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 60%** 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.

### **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/>.

**APPENDIX G: ENERGY CONSERVATION MEASURES**

ECM Counter		ECM description	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st year cost 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, \$	CO2 reduced, lbs/yr
1	0 to 5 Year Payback	38 New CFL fixtures to be installed with incentives	1,112	0	1,112	1,385	0.0	0	4.0	439	695	8	5,562	1.6	716	89	61	3,727	2,480
		<b>TOTALS</b>	<b>1,112</b>		<b>1,112</b>	<b>1,385</b>	<b>0.0</b>	<b>0</b>	<b>4.0</b>	<b>439</b>	<b>695</b>		<b>5,562</b>	<b>1.6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,480</b>
2	5 to 10 Year Payback	Replace Condensing Unit	2,920	460	2,460	2,014	0.1		5.8	0	373	15	5,589	6.6	127	8	11	1,924	3,606
		<b>TOTALS</b>	<b>2,920</b>	<b>460</b>	<b>2,460</b>	<b>2,014</b>	<b>0.1</b>	<b>0</b>	<b>5.8</b>	<b>0</b>	<b>373</b>		<b>5,589</b>	<b>6.6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3,606</b>

## APPENDIX H: METHOD OF ANALYSIS

### Assumptions and tools

Energy modeling tool: Established/standard industry assumptions  
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

### 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.***