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*August 25, 2010*

**Local Government Energy Program  
Energy Audit Report**

*For*

***City of New Brunswick  
Fire Headquarters  
93 Joyce Kilmer Ave  
New Brunswick, NJ 08901***

***Project Number: LGEA63***



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## INTRODUCTION

On May 19th, Steven Winter Associates, Inc. (SWA) and BSG-PMK performed an energy audit and assessment of the Fire Headquarters building in The City of New Brunswick, NJ. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The Fire Headquarters Building is a two story building with a basement totaling 16,000 square feet. The lower level of the Fire Headquarters building contains; Engine and Equipment bay, kitchen and pantry rooms, weight room, laundry room, administrative offices, and bedrooms as well as storage space, bathrooms, and showers. The first or main level, houses the engine bay and kitchen. The second floor houses the Captains' office, administrative office space, bedrooms, conference room, bathrooms and showers. The basement contains the weight room, laundry room, and boiler room as well as storage space.

The Fire Headquarters Building is occupied consistently by approximately 12 employees at least for 168 hours a week.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of the building. Using spreadsheet-based calculation methods, SWA and PMK estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

The goal of this energy audit is to provide sufficient information 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.

## EXECUTIVE SUMMARY

This document contains the energy audit report for the Fire Headquarters Building in The City of New Brunswick, NJ 08901.

Based on the field visit performed by Steven Winter Associates (SWA) and PMK staff on May 19<sup>th</sup>, 2010 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

### Current conditions

In the most recent full year of data collected, February, 2009 through January, 2010, the Fire Headquarters building consumed a total of 70,420 kWh of electricity for a total cost of \$11,917. In the most recent full year of natural gas data collected, February, 2009 through January, 2010, 10,040 therms of gas were consumed for a total cost of \$11,350. With electricity and natural gas combined, the building consumed 1,244 MMBtus of energy at a total cost of \$23,267.

SWA/BSG-PMK has entered energy information about the Fire Headquarters Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building was classified as "Other- Police Station/Fire Station" building not allowing it to receive a performance rating because buildings classified as Other are not eligible. Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC).

The Site Energy Use Intensity is 78 kBtu/ft<sup>2</sup>yr compared to the national average of a similar building consuming 78 kBtu/ft<sup>2</sup>yr. Implementing the recommendations included in this report will reduce the building's energy consumption by approximately 14 kBtu/ft<sup>2</sup>yr. There may be energy procurement opportunities for City of New Brunswick to reduce annual utility costs, which are \$1,355/year higher, when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the Fire Headquarters Building, SWA/BSG-PMK has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

### Category I Recommendations: Capital Improvements:

- Replace the water heater, which has passed the end of its useful life. This measure will save up to 72 therms, or \$80, from the facility's annual gas bill, but would not produce a payback that would be considered acceptable for an energy conservation measure.
- Replace roof, because the roofing material has reached the end of its useful life and is beginning to deteriorate.
- Replace concrete floor in the engine bay, it is showing signs of cracking and deterioration.

## Category II: Operations & Maintenance:

- Replace the window air-conditioner in the kitchen. Replacing this unit would save approximately \$30 per year, which would not yield a payback that would be considered acceptable for an ECM.
- Repair damaged skylights
- Reseal window/wall mounted air conditioners
- Monitor and repair structural cracks in the concrete floor in the engine bay
- Repair damaged or clogged roof drains

## Category III: Energy Conservation Measures:

At this time, SWA/BSG-PMK highly recommends a total of **3** Energy Conservation Measures (ECMs) for the Fire Headquarters Building that are summarized in the following table. The total investment cost for these ECMs, with incentives, is **\$61,296** (based on a projected eligibility for New Jersey's Office of Clean Energy current incentive and rebate programs). SWA/BSG-PMK estimates a first year savings of **\$5,709** with an aggregated simple payback of **10.7 years**. SWA/BSG-PMK estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the facility by **50,021 lbs of CO<sub>2</sub>**.

The recommended ECMs and the list below are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the City of New Brunswick. Based on the requirements of the LGEA program, the City of New Brunswick 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 \$1,199.75.

SWA recommends that the City of New Brunswick enroll in the following incentive programs through the NJ Office of Clean Energy in order to reduce the installation costs of most measures:

- Direct Install
- SmartStart

The building would not qualify for the Pay-for-Performance program since the energy audit did not show that source energy consumption could not be reduced by 15+%.

Please refer to Appendix C for further details.

The following table summarizes the proposed Energy Conservation Measures (ECM) and their economic relevance:

ROI Return on Investment (%)

**Assumptions:**

Discount rate: 3.2% per DOE FEMP guidelines Electricity rate \$0.17 \$/kWh  
 Energy price escalation rate: 0% per DOE FEMP guidelines Gas rate \$1.13 \$/therm

Avg. Annual Demand: 0.00551 Area of Building (SF): 16,000

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
1	Lighting Upgrades	Empirical Data	\$3,066	\$555	\$2,511	22,324	10.25	0	4.76	\$0	\$3,795	15	\$44,656	0.66	1678%	112%	151%	\$42,794	30,584
	Occupancy Sensors		\$260	\$35	\$225	175	0.08	0	0.04	\$0	\$30	10	\$251	7.55	12%	1%	5%	\$29	240
2	Vending Miser	Similar Projects	\$250	\$0	\$250	805	0.37	0	0.17	\$0.00	\$137	10	\$1,156	1.83	362%	36%	54%	\$917	1,103
TOTAL			\$3,576	\$590	\$2,986	23,304	10.70	0	4.97	\$0.00	\$3,962	-	\$46,063	0.75	-	-	-	\$43,740	31,926

Table 2 - Recommended Extended-Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
3	Replace Boiler	Similar Projects	\$60,000	\$1,691	\$58,310	0	0.00	1,547	9.67	\$0	\$1,748	30	\$33,385	33.37	-43%	-1%	-1%	-\$24,056	18,095
TOTAL			\$60,000	\$1,691	\$58,310	0	0.00	1,547	9.67	\$0.00	\$1,748	-	\$33,385	33.37	-	-	-	-\$24,056	18,095

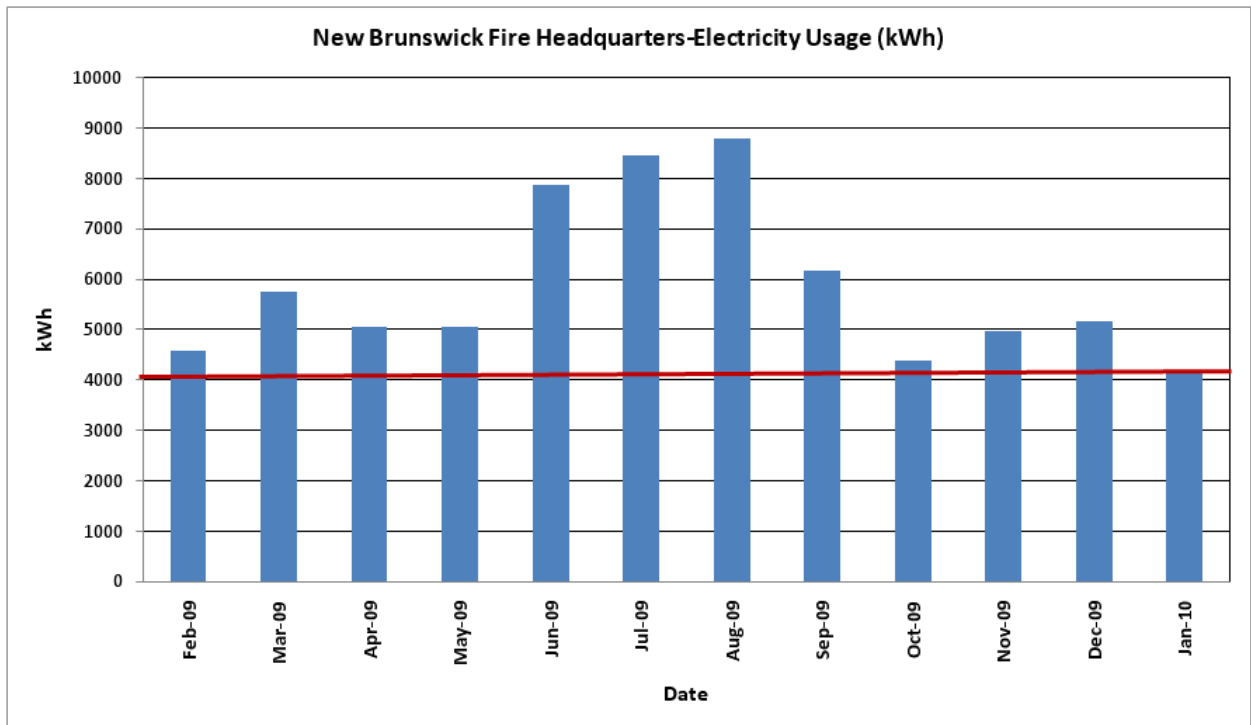
## 1. HISTORIC ENERGY CONSUMPTION

### 1.1. Energy Usage and Cost Analysis

SWA/BSG-PMK analyzed utility bills that were received from the utility company supplying the Fire Headquarters building with electric and natural gas from February, 2009 through January, 2010.

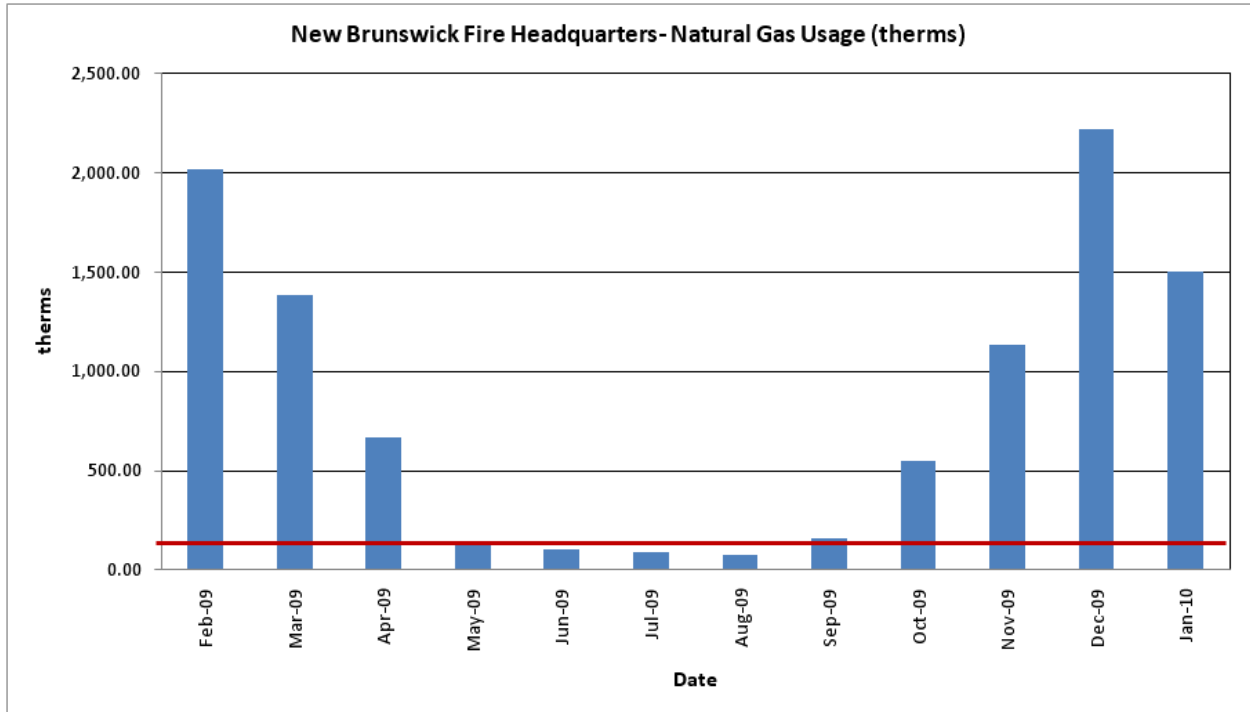
Electricity – The Fire Headquarters is currently served by one electric meter. The facility currently receives electricity from Public Service Electric & Gas at **an average rate of \$0.17kWh** based on 12 months of utility bills from February, 2009 through January, 2010. The facility consumed **approximately 70,420 kWh or \$11,917 worth of electricity** in the previous year with an average monthly demand of 32 kW.

The following charts show electricity usage for the Fire Headquarters based on utility bills for the billing analysis period. The red line indicates the estimated base-load in kWh.



Natural Gas – The Fire Headquarters is currently served by one meter for natural gas. The facility currently receives natural gas from Public Service Electric & Gas at **an average aggregated rate of \$1.13/therm** based on 12 months of utility bills for February, 2009 through January, 2010. The facility consumed **approximately 10,040 therms or \$11,350 worth of natural gas** in the previous year.

The following charts show the natural gas usage for the Fire Headquarters based on utility bills for the analysis period of February, 2009 through January, 2010



The natural gas usage mimics seasonal needs for heating the buildings showing that natural gas is primarily used for heating. The red line indicates the base-load level for the heating, domestic hot water, and cooking needs. The natural gas usage above the red line shows the amount of natural gas used for heating.

## 1.2. Utility Rate

The Fire Headquarters currently receives electricity from Public Service Electric & Gas at a general service market rate for electricity use (kWh) with (kW) demand charge. The facility currently pays an average rate of approximately \$0.17/kWh based on the most recent 12 months of utility bills.

The Fire Headquarters currently receives natural gas supply from Public Service Electric & Gas at a general service market rate for natural gas in (therms). There is one gas meter that provides natural gas service to the facility. The average aggregated rate (supply and transport) for the meter is approximately \$1.13/therm based on the most recent 12 months of utility bills.

## 1.3. Energy Benchmarking

SWA/BSG-PMK has entered energy information about the Fire Headquarters in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The username is *cityofnewbrunswick* and the password is *newbrunswick*. The building was classified as a Fire Station preventing it from earning a performance rating which can be used to achieve an Energy Star building certification.



The Site Energy Use Intensity is 78 kBtu/sq.ft./yr compared to the national average of buildings classified as Fire Stations consuming 78 kBtu/sq.ft./yr. Implementing this report's recommended Energy Conservations Measures (ECMs) will reduce use by approximately 14 kBtu/sq.ft./yr.

SWA/BSG-PMK has created the Portfolio Manager site information for Fire Headquarters. This information can be accessed at: <https://www.energystar.gov/istar/pmpam/>, with the following:

**Username:** *cityofnewbrunswick*

**Password:** *newbrunswick*

# STATEMENT OF ENERGY PERFORMANCE

## New Brunswick Fire Headquarters

Building ID: 2339565  
 For 12-month Period Ending: January 31, 2010<sup>1</sup>  
 Date SEP becomes ineligible: N/A

Date SEP Generated: June 03, 2010

**Facility**  
 New Brunswick Fire Headquarters  
 93 Joyce Kilmer Ave  
 New Brunswick, NJ 08901

**Facility Owner**  
 City of New Brunswick  
 76 Bayard St  
 New Brunswick, NJ 08901

**Primary Contact for this Facility**  
 Chris Butler  
 76 Bayard St  
 New Brunswick, NJ 08901

**Year Built:** 1927  
**Gross Floor Area (ft<sup>2</sup>):** 16,000

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

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

Electricity - Grid Purchase(kBtu)	240,273
Natural Gas (kBtu) <sup>4</sup>	1,003,969
Total Energy (kBtu)	1,244,242

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

Site (kBtu/ft <sup>2</sup> /yr)	78
Source (kBtu/ft <sup>2</sup> /yr)	116

### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	90
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### Electric Distribution Utility

Public Service Elec & Gas Co

### National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	-26%
Building Type	Fire
	Station/Police
	Station

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.

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

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

Based on visits from SWA on Friday, May 07, 2010, the following data was collected and analyzed.

### 2.1. Building Characteristics

The two-story, (including a partial basement) 16,000 square foot Fire Headquarters building was constructed in 1926 with no additions/alterations since. It houses offices, bedrooms, common areas, a work out area, a kitchen and three truck bays.



Front Façade



Right Side Façade



Left Side Façade

### 2.2. Building occupancy profiles

Its occupancy is approximately 7-12 employees 24/7.

### 2.3. Building Envelope

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

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

#### 2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer and some limestone type accents in the front, over structural brick with an unconfirmed level of detectable insulation. The interior is mostly either finished gypsum wall board or exposed brick.

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall acceptable condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

The following specific exterior wall problem spot was identified:



Efflorescence on brick and masonry walls indicate moisture presence within the wall cavity.



Vegetation growing in facade

### 2.3.2. Roof

The building's roof is predominantly a flat and parapet type over steel decking, with a built-up asphalt finish and reflective coating. It is not known when the last roof replacement occurred. Zero inches of assumed roof insulation were recorded.

Note: Roof insulation levels could not be verified in the field, and are based on reports from building management.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall poor, age-appropriate condition, with numerous signs of uncontrolled moisture, air-leakage and other energy-compromising issues detected on all roof areas.

The following specific roof problem spots were identified:



The roofing material has reached the end of its useful lifespan.



Deteriorating roof membrane and patches



Clogged and damaged roof drains



Signs of water damage on interior finishes



Ground vegetation touching/overhanging roof surfaces



Signs of moisture damage on interior finishes

### 2.3.3. Base

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

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

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in acceptable condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific base problem spot was identified:



Structural cracks detected in the slab

### 2.3.4. Windows

The building contains basically three different types of windows.

- Double-hung type windows with a non-insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located throughout the building in the 1980's
- Glass block type windows with no frame, clear single block glazing and no interior or exterior shading devices. The windows are located on the main floor and are original and have never been replaced

- Skylight type windows with a non-insulated metal frame, clear single glazing and no interior or exterior shading devices. The windows are located on the second floor and are original.

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 poor condition with numerous signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spots were identified:



Damaged and aged skylight frame



Air-leakage at sleeved window/wall air-conditioning units



Glass block glazing

### 2.3.5. Exterior Doors

The building contains two different types of exterior doors;

- Metal type exterior doors. They are located throughout the building and were replaced approximately many years ago. Currently they are in the process of being replaced.
- Overhead type truck exterior doors. They are located in the front of the building and were replaced approximately 16 years ago.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in acceptable condition with no significant signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

### 2.3.6. Building Air Tightness

Overall the field auditors found the building to be not adequately air-tight with numerous 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.





## 2.4. HVAC Systems

### 2.4.1. Heating

Heating is provided by a 966 MBH, 81% efficient Burnham natural gas steam boiler, installed in 1985. This unit feeds radiators throughout the building.

Category III Recommendation – ECM #3: Replace the current boiler with a high-efficiency (approximately 86% efficient) unit. This measure would cost approximately \$60,000 and would yield a savings of \$1,686. A second option would be to replace the current steam system with a hot water system, which would allow for a 95% efficient boiler; this option, however, would cost approximately \$120,000 and yield a savings of approximately \$3,000, and carries a 45-year payback.



**Figure 1: Burnham steam boiler**

### 2.4.2. Cooling

Cooling is provided by twenty-three (23) window air-conditioners. Twenty-two (22) of these units have a capacity of about ½-ton and are in good condition, while the other is a 12,600 BTUH, 10.8 EER unit, located in the kitchen, which has reached the end of its useful life. There is also a 1-ton Sanyo split-system condensing unit, which feeds a wall-mounted evaporator in the director's office. Additional cooling is provided by ceiling fans.

Category II Recommendation – Operations & Maintenance: Replace the window air-conditioner in the kitchen. Replacing this unit would save approximately \$30 per year, which would not yield a payback that would be considered acceptable for an ECM.

### 2.4.3. Ventilation

The garage is vented by three (3) wall-mounted ventilation fans, and the shower is ventilated by one (1) wall mounted fan. Additional natural ventilation is provided by doors and windows.

### 2.4.4. Domestic Hot Water



**Figure 2: Ruud water heater**

Domestic hot water is provided by a 76 gallon, 199.9 MBH Ruud water heater, installed in 1991.

Category I Recommendation – Capital Improvements: Replace the water heater, which has passed the end of its useful life. This measure will save up to 72 therms, or \$80, from the facility's annual gas bill, but would not produce a payback that would be considered acceptable for an energy conservation measure.

## **2.5. Electrical Systems**

### **2.5.1. Lighting**

A complete inventory of all interior, exterior, and exit sign light fixtures were examined and documented in Appendix A of this report including an estimated total lighting power consumption. The facility consists primarily of Incandescent Lamps and T12 Fluorescent fixtures with magnetic ballasts.

Category III Recommendation - ECM #1: Recommend upgrading all Incandescent lamps with Compact Fluorescents and all T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts. This and various other lighting upgrades are outlined in Appendix A.

### **2.5.2. Appliances and Process**

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, and copy machines, etc.

More information can be found in the “Products” section of the Energy Star website at: <http://www.energystar.gov>. The building is not currently equipped with energy vending miser devices for conserving energy usage by drinks and snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

In this facility, there are (5) refrigerators, a microwave, (7) computers, (6) TVs, a vending machines, a fax/copy machine, a 4-burner gas stove/oven, an air purification system, a clothes washer, and a clothes dryer. In this facility, many of the appliances found and noted in the attached equipment list were older than the 10 year threshold and should be considered for the Energy Star program.

Category III Recommendations – ECM #2: Install vending machine occupancy sensors on the vending machine, which will shut the power off when the unit is not being used.

### **2.5.3. Elevators**

There are no elevators at this facility.



### 3. Building Systems Equipment List

New Brunswick Fire Department Headquarters							
Building System	Description	Locations	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Steam boiler, 966 MBH, 81% efficient	Basement	Burnham, M# PF-505, S# 7510390	Natural gas	Radiators, entire building	Approx. 1985	17%
Domestic Hot Water	Water heater, 76 gallons, 199.9 MBH, 169.6 GPH	Basement	Ruud, M# RF76-200, S# RUN-1091D04413	Natural gas	Entire building	1991	0%
Ventilation	(4) wall-mounted ventilation fans	Garage	No nameplate	Electricity	Garage	Approx. 1990	20%
Ventilation	Wall-mounted ventilation fan	Shower	No nameplate	Electricity	Shower	Approx. 1990	20%
Air Purification	Air purification system, 5,000 PSIG	Garage	Bauer Compressors, M# P5 w/SECURUS	Electricity	SCBA's	Approx. 2005	70%
Cooling	Window air-conditioner, 12,600 BTUH, 10.8 EER	Kitchen	Samsung, M# AW1291M, S# PAEW300196	Electricity	Kitchen	Approx. 2000	0%
Cooling	(2) ceiling fans	Lounge	No nameplate	Electricity	Lounge	Approx. 2000	50%
Cooling	(2) ceiling fans	Conference room	No nameplate	Electricity	Conference room	Approx. 2000	50%
Cooling	Window air-conditioner, 5,150 BTUH, 9.7 EER (currently not in use)	Storage	Daewoo, M# WM-501	Electricity	Storage	2004	40%
Cooling	(3) window air-conditioners (currently not in use)	Shower room	(2) GE's, (1) Hotpoint	Electricity	Shower room	Approx. 2000	0%
Cooling	Window air-conditioner, 5,950 BTUH, 10.8 EER	Captain's room	GE, M# AGF06LAG1, S# AF 064059	Electricity	Captain's room	2003	30%
Cooling	(17) 1/2 ton window air-conditioners	(17) dorms	Not access	Electricity	(17) dorms	Unknown	Unknown
Cooling	Split-system condensing unit, 1 ton	Outside	Sanyo, M# CL1251	Electricity	Director's office	Approx. 2000	33%
	Split-system evaporator	Wall-mounted	Sanyo				

**Note:** \*The remaining useful life of a system (in %) is the relationship between the system manufactured and / or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

#### 4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA and BSG-PMK have separated the investment opportunities into three categories of recommendations:

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 the water heater, which has passed the end of its useful life. This measure will save up to 72 therms, or \$80, from the facility's annual gas bill, but would not produce a payback that would be considered acceptable for an energy conservation measure.

Replace roof, because the roofing material has reached the end of its useful life and is beginning to deteriorate.

Replace concrete floor in the engine bay, it is showing signs of cracking and deterioration.

##### **Category II: Operations & Maintenance:**

Replace the window air-conditioner in the kitchen. Replacing this unit would save approximately \$30 per year, which would not yield a payback that would be considered acceptable for an ECM.

Repair damaged skylights

Reseal window/wall mounted air conditioners

Monitor and repair structural cracks in the concrete floor in the engine bay

Repair damaged or clogged roof drains

##### **Category III Recommendations: Energy Conservation Measures:**

**Summary Table**

<b>ECM #</b>	<b>Description</b>
1	Lighting and Occupancy Sensors
2	Vending Miser
3	Boiler Replacement

## ECM #1: Lighting Upgrade

### Description:

Lighting at the Fire Headquarters primarily consists of Incandescent Lamps and standard-efficiency fixtures with T12 lamps and magnetic ballasts. SWA/BSG-PMK recommends retrofitting the T12 fixtures with T8 lamps and electronic ballasts and replacing the incandescent fixtures with compact fluorescent lamps. Lighting replacements typically yield a short payback and should because of the low cost to upgrade combined favorable energy savings.

Recommended lighting upgrades are detailed in Appendix A.

### Installation cost:

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
<b>Cost</b>	\$3,066.00	\$260.00	\$3,326.00
<b>Rebate</b>	\$555.00	\$35.00	\$590.00
<b>Net Cost</b>	\$2,511.00	\$225.00	\$2,736.00
<b>Savings (kWh)</b>	22,324	175	22,457
<b>Savings (\$)</b>	\$3,795.04	\$29.78	\$3,817.75
<b>Payback</b>	0.7	7.6	0.7

Source of cost estimate: Empirical Data

### Economics (without incentives):

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
1	Lighting Upgrades	Empirical Data	\$3,066	\$555	\$2,511	22,324	10.25	0	4.76	\$0	\$3,795	15	\$44,656	0.66	1678%	112%	151%	\$42,794	30,584
	Occupancy Sensors		\$260	\$35	\$225	175	0.08	0	0.04	\$0	\$30	10	\$251	7.55	12%	1%	5%	\$29	240

**Assumptions:**

The electric cost used in this ECM was \$0.17/kWh, which was the facilities' average rate for the 12-month period from February, 2009 through January, 2010. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

**Rebates/financial incentives:**

The New Jersey SmartStart offers rebates for upgrading lighting fixtures and installing lighting controls. The total rebate this ECM qualifies for is \$590.

## ECM #2: Vending Miser

### Description:

The average vending machine consumes 4,025 kWh of energy per year, most of which can be attributed to lighting and cooling, which run 24 hours-per-day. Installing occupancy sensors on the Fire Headquarters' one (1) vending machine would activate the power to the unit when in use, and deactivate the power if the unit has not been used for more than 15 minutes. Vending machine lighting would remain off until the adjacent area is occupied again. The refrigeration unit will be shut down for a maximum two hours, in order to maintain a desirable temperature for the product.

**Installation cost:** \$250

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 Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO <sub>2</sub> Reduced, lbs/yr
2	Vending Miser	Similar Projects	\$250	\$0	\$250	805	0.37	0	0.17	\$0.00	\$137	10	\$1,156	1.83	362%	36%	54%	\$917	1,103

### Assumptions:

The electric cost used in this ECM was \$0.17/kWh, which was the Fire Headquarters' average rate for the 12-month period ranging from March, 2009 through February, 2010. The average vending machine consumes 4,025 kWh per year. Energy savings for a vending machine in high-occupancy (more than 100 hours per week) areas is approximately 20%.

### Rebates/financial incentives:

NJ Clean Energy – Direct Install program (60% installed cost)

### ECM #3: Replace Boiler

#### Description:

Heating is provided by a Burnham 966 MBH, natural gas, steam boiler, installed in approximately 1985. The unit is near the end of its 30-year useful life, and should be replaced. Higher-efficiency steam boilers are now available, which are up to 86% efficient. The current unit was 81% efficient at the time of their purchase, but due to their age and condition, their efficiency was estimated to decrease to 70%.

A conversion of the entire heating system from a steam system to a hot water system was also considered. Hot water boilers have efficiencies up to 95%. While this system would save approximately \$3,000 per year in heating costs, installation would cost \$120,000, yielding a payback of 45 years.

#### 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 Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO <sub>2</sub> Reduced, lbs/yr
3	Replace Boiler	Similar Projects	\$60,000	\$1,691	\$58,310	0	0.00	1,547	9.67	\$0	\$1,748	30	\$33,385	33.37	-43%	-1%	-1%	-\$24,056	18,095

#### Assumptions:

The cost per therm of natural gas that was used, taken from the Fire Headquarters' energy bills, was \$1.13. Also taken from the energy bills was the annual heating consumption for all heating units in the facility, 8,600 therms. It should be noted that, due to the fact that only 48.5 weeks' worth of gas bills were provided, the average number of therms consumed in the given 48.5 was assumed to be the gas consumption in the remaining 3.5 weeks of that calendar year. The only two units in the building that consume gas are the boiler and the water heater, and therefore, in order to find the boiler's annual gas consumption, the water heater's gas consumption would have to be calculated and subtracted from the total gas consumption. To calculate the amount of gas consumed by the water heater, a spreadsheet created by Rheem was used. The temperature rise of the heated water was set at 77°F on the spreadsheet, and the energy factor (a unit that specifies the efficiency of water heaters) is specified as 0.62 for gas water heaters. Weight of water was set at 8.33 pounds/gal. Using this data, the therms of natural gas used for heating the water were calculated by the following equation:

$$\text{Therms}_{\text{input}} = \frac{\text{Vol.} \times \text{Wt.}_{\text{water}} \times \Delta \text{Temp.}}{\text{Energy Factor}} \times \frac{1 \text{ Therm}}{100,000.4 \text{ BTU}}$$

The gas consumption by the boiler can now be calculated:

$$\text{Current Gas Input (therms)} = \text{Therms}_{\text{total}} - \text{Therms}_{\text{water heater}}$$

$$\text{Gas Output (therms)} = \text{Current Gas Input} \times \text{Efficiency}_{\text{current}}$$

$$\text{Proposed Gas Input (therms)} = \frac{\text{Gas Output}}{\text{Efficiency}_{\text{proposed}}}$$

$$\text{Savings (therms)} = \text{Current Gas Input} - \text{Proposed Gas Input}$$

#### **Rebates/financial incentives:**

This ECM is calculated based on a projected eligibility for New Jersey's SmartStart Rebate, which pays \$1.75 per MBH for boilers of this heating capacity. The total incentive for this ECM is \$1,691.

## 5. ENERGY CONSERVATION MEASURE FUNDING ALTERNATIVES

BSG-PMK/SWA has reviewed several funding options for the purposes of subsidizing the costs for installing the energy conservation measures noted within this report.

Although funding options are constantly changing and updating this project may benefit from enrolling in a number of alternative programs such as the; The NJ SmartStart program with Technical Assistance, alternate funding by applying for financing and competitive grants through the United States Department of Energy as well as local utility incentive programs in an effort to offset a portion of the cost of ECM implementation.

The Smart Start program offers reimbursement incentives for various equipment purchases, and lighting incentives. The benefits and requirements of this program can be found at:

<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>

The Pay-for-Performance program offers incentives for working with an approved contractor to create a scope of work that will reduce source energy consumption by 15+%. Incentives are achieved during various phases of reporting and implementation. The benefits and requirements of this program can be found at:

<http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance>

Financial assistance is also available through the United States Department of Energy in the form of; Grants, Cooperative Research and development agreements, small business innovation research, and Loan Guarantee Programs. Further information for these programs is available at:

[http://www1.eere.energy.gov/financing/types\\_assistance.html](http://www1.eere.energy.gov/financing/types_assistance.html)

Local Utility incentives such as a Direct Install Program, offer incentives that can provide up to 80% subsidy of the cost to install particular ECM's. As each utility company has different guidelines and incentives it is important to contact your local utility authority for eligibility in these programs.

Additional funding may also be found through the following funding methods:

- Energy Savings Improvement Program (ESIP) – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements.
- Municipal Bonds – Municipal bonds are a bond issued by a city or other local government, or their agencies. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.



- Power Purchase Agreement – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system.

BSG-PMK/SWA recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

## **6. RENEWABLE AND DISTRIBUTED ENERGY MEASURES**

### **6.1. Existing systems**

There are currently no existing renewable energy systems.

### **6.2. Solar Photovoltaic**

Photovoltaic (PV) technology was considered for installation on the roofs of the Fire Headquarters. Based on the shading and the amount of roof area available with unobstructed southern exposure it was determined that PV installations are not cost effective or feasible for this location.

### **6.3. Solar Thermal Collectors**

Solar thermal collectors are not recommended for this location based on the shading and amount of roof area available with unobstructed southern exposure.

### **6.4. Combined Heat and Power**

Combined Heat Power is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

### **6.5. Geothermal**

Geothermal is not applicable to this project. A geothermal system would require the existing heating distribution system to be removed and replaced with a heat pump system. Large underground vertical or horizontal loop systems would need to be installed beneath the existing concrete pad and asphalt. These modifications to the existing heat distribution system would be extremely disruptive to the use of the building and the surrounding neighborhood in addition to the high cost of such an installation and retrofit.

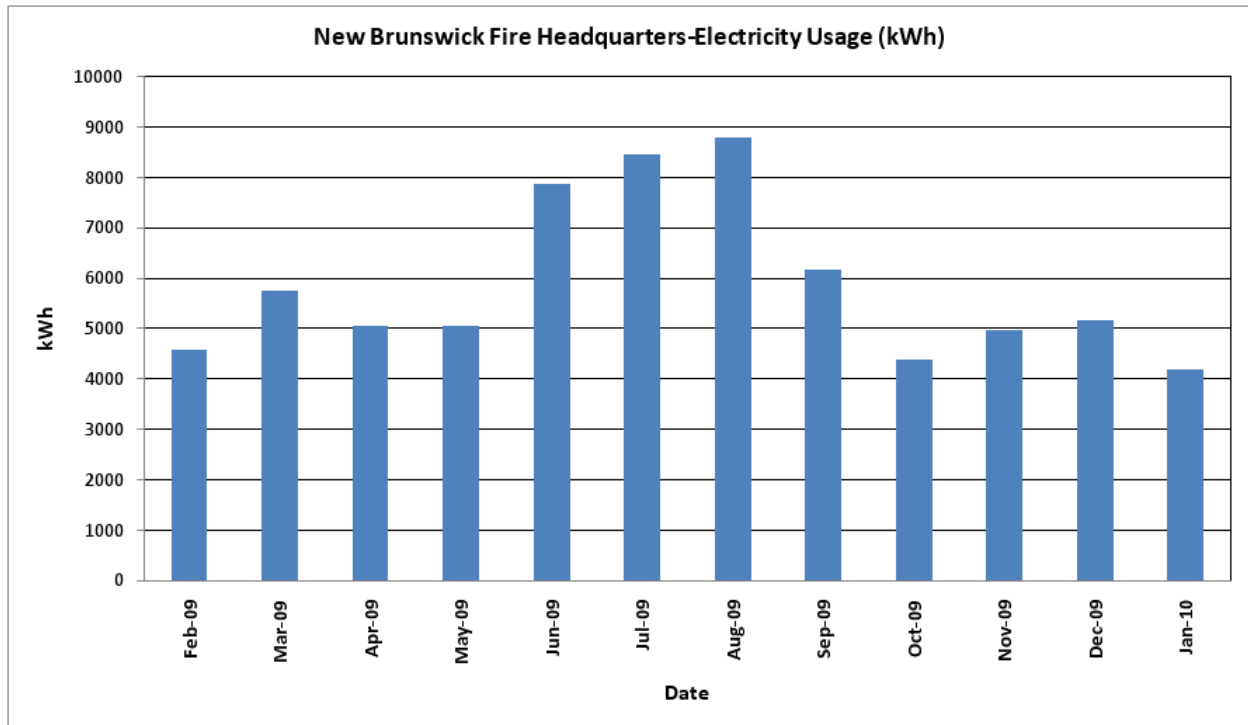
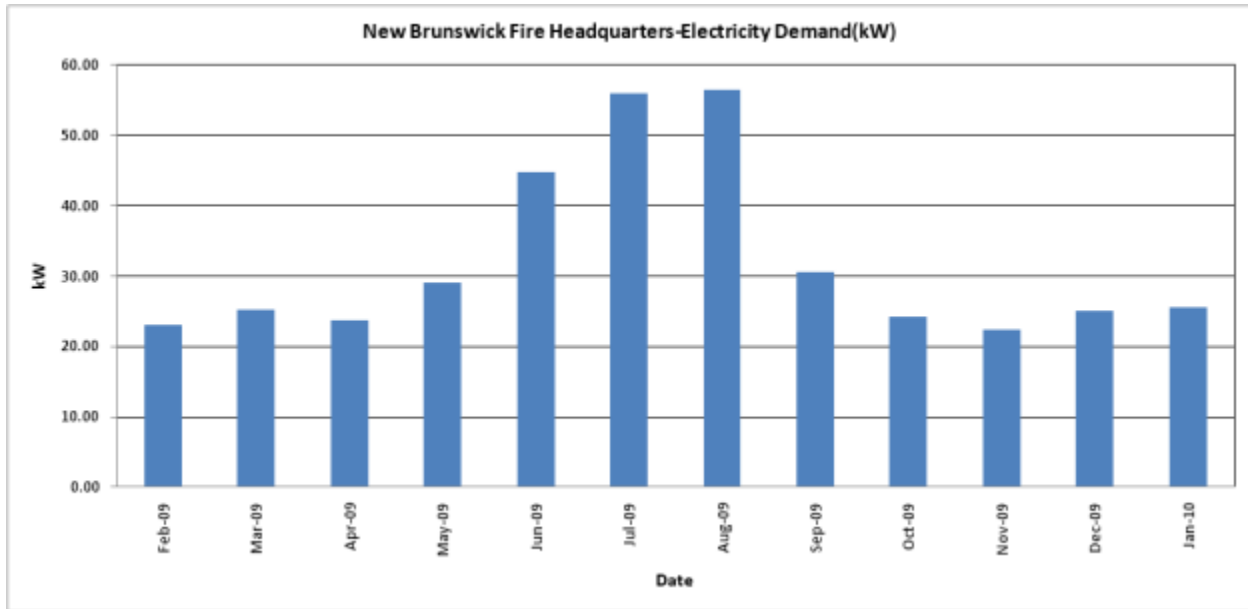
### **6.6. Wind**

Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

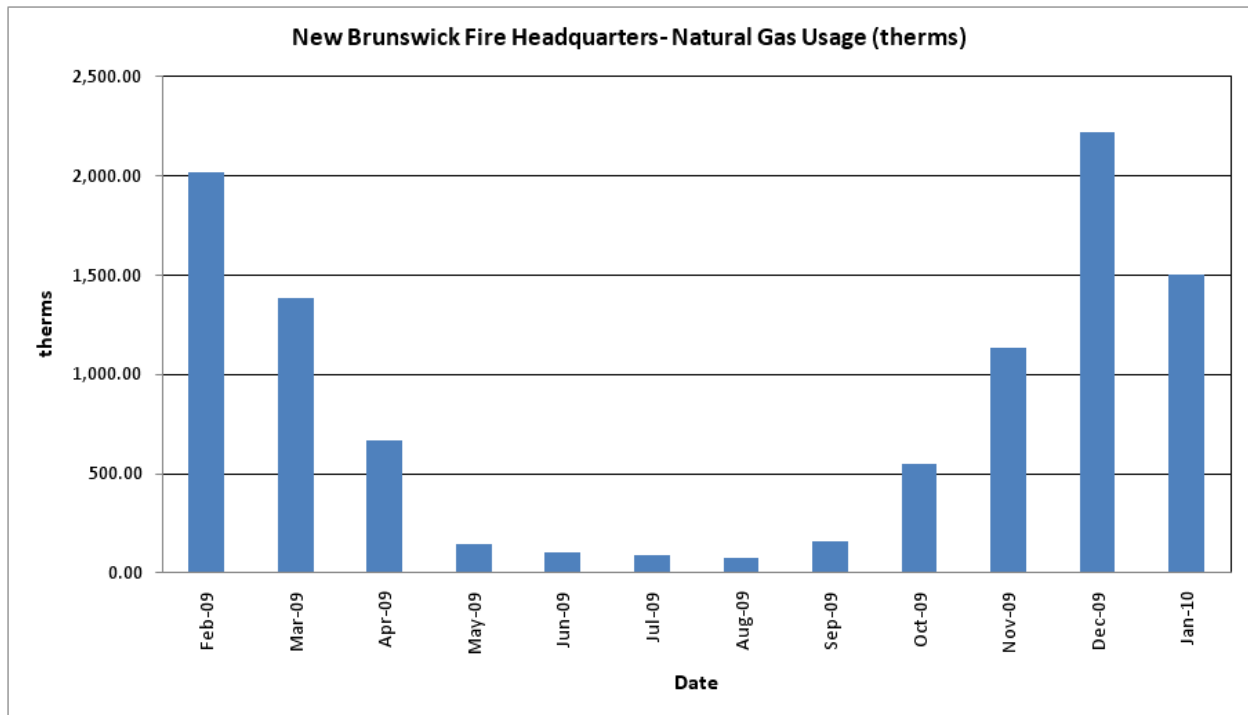
## **7. ENERGY PURCHASING AND PROCUREMENT STRATEGIES**

### **7.1. Energy Purchasing**

The average electrical peak demand for the previous year was 32 kW and the maximum peak demand was 56.44 kW. The electric and gas load profiles for this project are presented in the following charts. The first chart shows electric demand (in kW) for the previous 12 months and the other two charts show electric and gas usage (in kWh), respectively.



The electrical demand peaks (except for a few fluctuations) reflect the electrical consumption peaks.



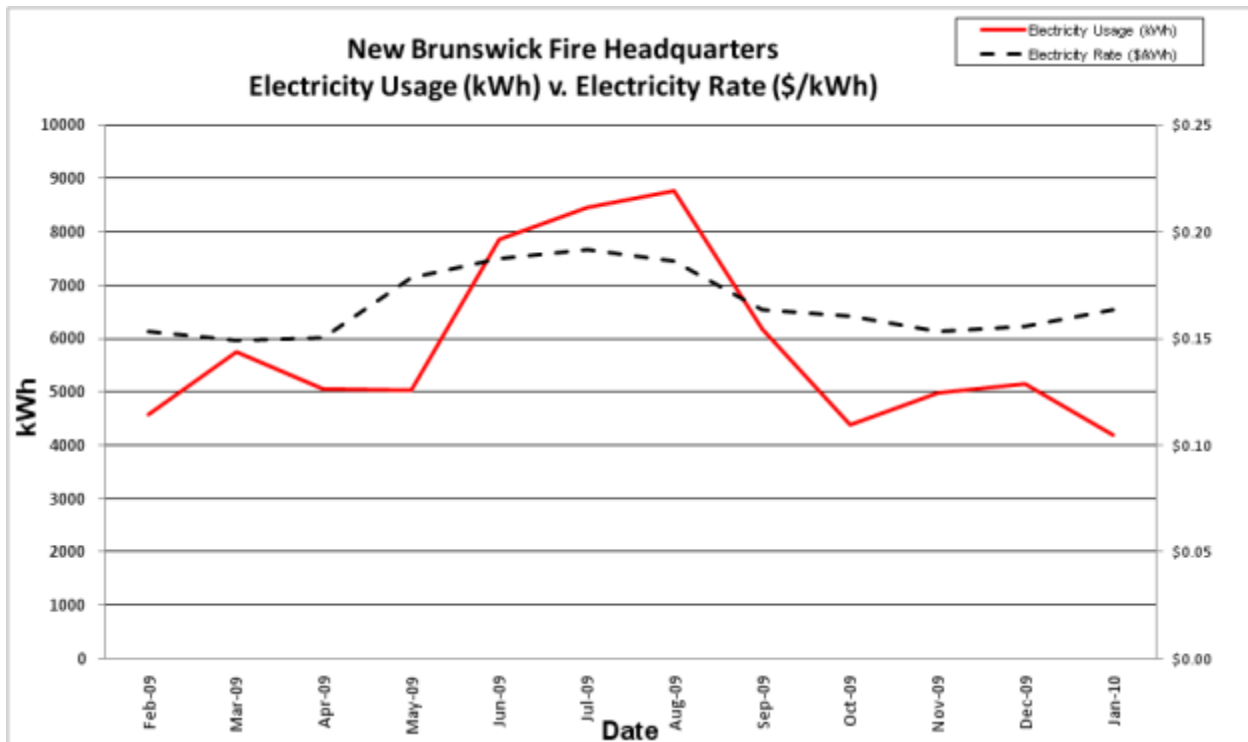
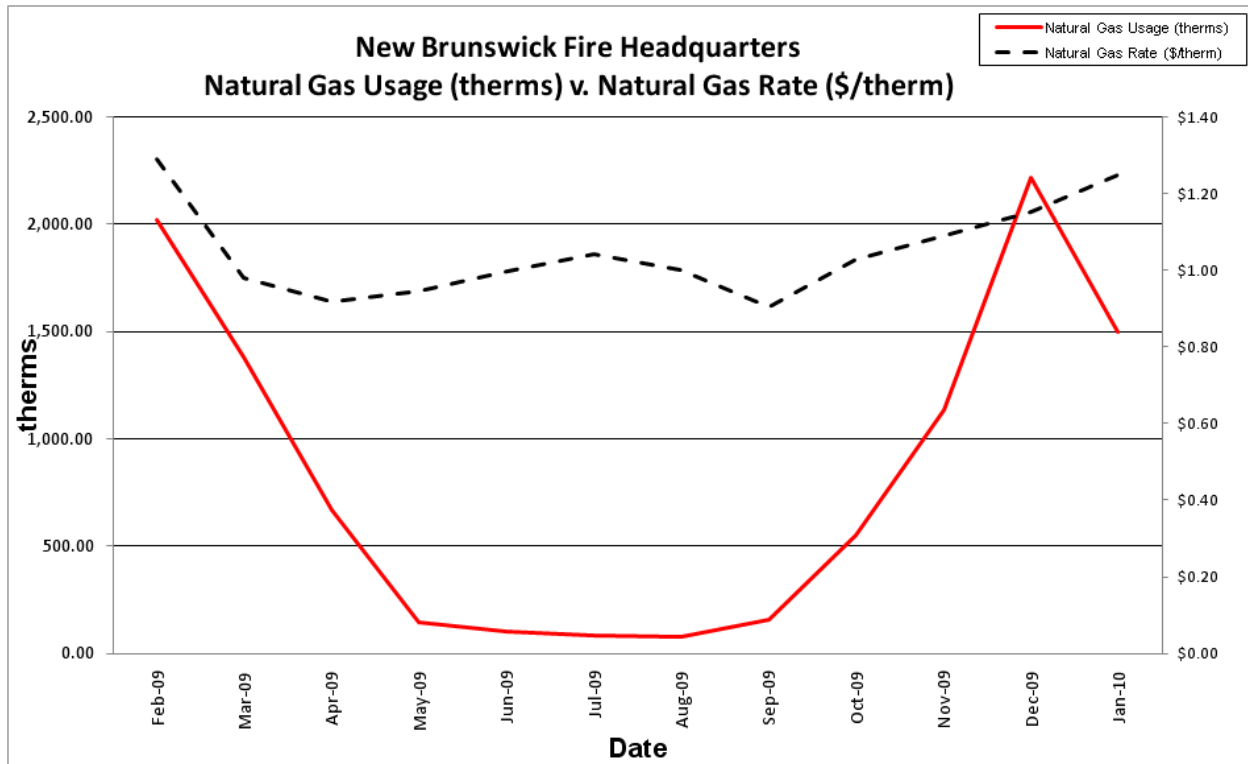
The natural gas usage shows that the most natural gas is consumed in the winter months, meaning the majority of natural gas use in this building is for heating.

## 7.2. Tariff analysis

Currently, natural gas is provided via one gas meter with Public Service Electric & Gas serving as transmission and supply provider. The general service rate for natural gas charges a market-rate price based on use and the Fire Headquarters billing data does not breakdown demand costs for all periods. Typically, the natural gas prices increase during the cooling months when natural gas is less of a demand.

The Fire Headquarters is direct-metered (via one meter) and currently purchases electricity from Public Service Electric & Gas at a general service rate. The general service rate for electric charges are market-rate based on use and the Fire Headquarters billing does show a breakdown of demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by the HVAC condensing units and air handlers.

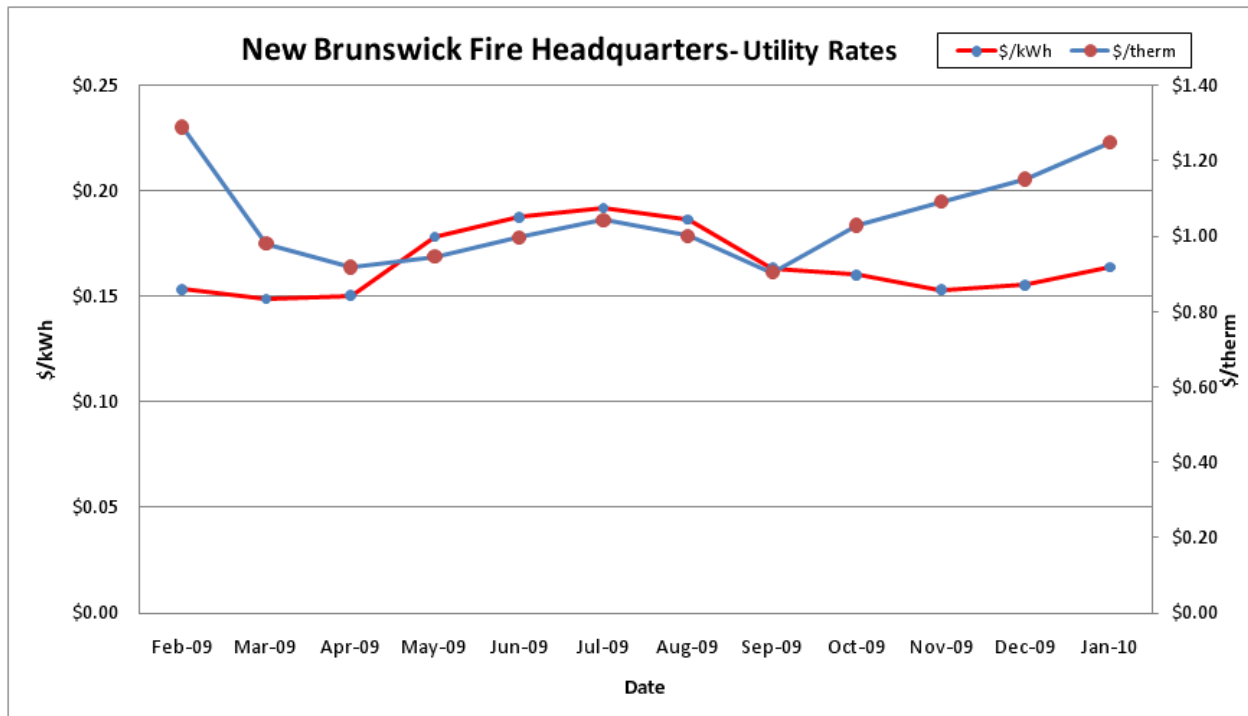
The following charts compare the utility consumption and utility rates for the natural gas and electricity over the previous 12 month period.



### 7.3. Energy Procurement strategies

Billing analysis shows large price fluctuations of over the course of the year for Fire Headquarters natural gas account. Changing third party suppliers could reduce the cost associated with energy procurement. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs) that can act as third party energy suppliers. Appendix B contains a complete list of third party energy suppliers.

SWA/BSG-PMK also recommends that New Brunswick contact 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, which are approximately \$0.15/kWh, it may be possible to save up to \$0.02/kWh, which would have equated to approximately \$1,355 for the past 12 months. New Brunswick already purchases natural gas for lower rate than the average rate of \$1.45/therm.



## 8. METHOD OF ANALYSIS

### 8.1. Assumptions and methods

Energy modeling method: Spreadsheet-based calculation methods

Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)

RS Means 2009 (Building Construction Cost Data)

RS Means 2009 (Mechanical Cost Data)

Note: Cost estimates also based on utility bill analysis and prior experience with similar projects.

### 8.2. 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.***

# LIGHTING ANALYSIS

New Brunswick  
Fire Headquarters  
93 Joyce Kilmer Avenue



Upgrade Code	Upgrade Description	Existing		Proposed		Lighting		
		Fixture	Watts	Fixture	Watts	Total # of Upgrades	Cost per Upgrade (\$)	SmartStart Rebate per Upgrade
1	3 Prong CFL 26W	26W CF/HW	28	No Upgrade	28	4	\$10.00	\$0.00
2	Replace 60W Incandescent Lamp with a 15W Compact Fluorescent	60W INCANDESCENT	60	15W CF/SI	15	38	\$6.00	\$0.00
3	Retrofit the 4' hanging fixture by replacing the (2) T12 Lamps and Magnetic Ballast(s) with (2) T8 Lamps and an Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	1	\$60.00	\$15.00
4	Retrofit the 4' surface mounted fixture by replacing the (2) T12 Lamps and Magnetic Ballast(s) with (2) T8 Lamps and an Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	6	\$60.00	\$15.00
5	Retrofit the 4' surface mounted fixture by replacing the (3) T12 Lamps and Magnetic Ballast(s) with (3) T8 Lamps and an Electronic Ballast	3L4' EE/STD	130	3L4' T8/ELEC	89	20	\$70.00	\$15.00
6	Retrofit the 4' recessed fixture by replacing the (4) T12 Lamps and Magnetic Ballast(s) with (4) T8 Lamps and an Electronic Ballast	4L4' EE/STD	160	4L4' T8/ELEC	110	4	\$80.00	\$15.00
7	Replace the 75W Incandescent Flood with a 26W Compact Fluorescent	75W INCANDESCENT	75	26W CF/SI	28	10	\$10.00	\$0.00
8	Retrofit the 2x2 fixture by replacing the (4) T12 Lamps and Magnetic Ballast(s) with (4) T8 Lamps and an Electronic Ballast	(4) F20T12/HPFMA G	112	(4) FO17T8/ELEC HI	66	4	\$80.00	\$15.00
9	Retrofit the 4' fixture by replacing the (4) T12 Lamps and Magnetic Ballast(s) with (4) T8 Lamps and an Electronic Ballast	4L4' EE/STD	160	4L4' T8/ELEC	110	2	\$80.00	\$15.00
10	Replace the (5) 60W Incandescent Lamps in the ceiling fan with (5) 13W Compact Fluorescents	(5) 60W INCANDESCENT	300	(5) 13W CF	65	2	\$6.00	\$0.00
11	Replace the (3) 60W Incandescent Lamps in the ceiling fan with (3) 13W Compact Fluorescents	(3) 60W INCANDESCENT	180	(3) 13W CF	39	3	\$6.00	\$0.00
12	Replace the 75W Incandescent Flood with a 26W Compact Fluorescent	75W INCANDESCENT	75	26W CF/SI	28	8	\$6.00	\$0.00

## Summary

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$3,066.00	\$260.00	\$3,326.00
Rebate	\$555.00	\$35.00	\$590.00
Net Cost	\$2,511.00	\$225.00	\$2,736.00
Savings (kWh)	22,324	175	22,457
Savings (\$)	\$3,795.04	\$29.78	\$3,817.75
Payback	0.7	7.6	0.7

## Variables:

\$0.17	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
8760	Operating Hours/Year
24	Operating Hours/Work Day

## Assumptions:

25%	Occupancy Sensor Savings (Avg)
40%	Occupancy Sensor Savings(>Avg)

## Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/ Work Day	Hrs/ Year	Existing				Proposed			kW Reduction	Lighting				Controls		Occupancy Sensors (ONLY)				SmartStart Rebate		Lighting & Occupancy Sensors																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.	Watts		Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)			Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)			Energy Savings, kWh	Post-Rebate Cost (\$)	Savings (\$)	Payback (yrs)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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Totals:					9450							4564				4.886		22324				\$3,066.00		\$3,795.04		0.8		175				\$260.00		\$29.78		8.7		\$555.00		\$35.00		22457		\$2,736.00		\$3,817.75		0.7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
1	1	Boiler Room	1	365	26W CF/HW	2	56		No Upgrade	2	56	0	0	\$20.00	\$0.00				0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$20.00	\$0.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</



Seq. #	Upgrade Code	Room/Area	Hrs/ Work Day	Hrs/ Year									Lighting						Occupancy Sensors (ONLY)						Lighting & Occupancy Sensors				
					Existing				Proposed				kW Reduction	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Controls		Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	SmartStart Rebate		Energy Savings, kWh	Post- Rebate Cost (\$)	Savings (\$)	Payback (yrs)
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.	Watts	Type						Qty.	Lighting					Sensors					
22	2	Dorm Room 6	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
23	2	Hallway	24	8760	60W INCANDESC	4	240		15W CF/SL	4	60	0.18	1577	\$24.00	\$268.06	0.1			0	\$0.00	\$0.00		\$0.00	\$0.00	1577	\$24.00	\$268.06	0.1	
24	2	Dorm Room 7	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
25	2	Dorm Room 8	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
26	2	Dorm Room 9	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
27	2	Dorm Room 10	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
28	2	Dorm Room 11	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
29	9	Office	6	2190	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	219	\$160.00	\$37.23	4.3			0	\$0.00	\$0.00		\$30.00	\$0.00	219	\$130.00	\$37.23	3.5	
30	10	Office Area	6	2190	(5) 60W INCANDE	2	600		(5) 13W CF	2	130	0.47	1029	\$12.00	\$174.98	0.1			0	\$0.00	\$0.00		\$0.00	\$0.00	1029	\$12.00	\$174.98	0.1	
31	11	Secretary Office	6	2190	(3) 60W INCANDE	3	540		(3) 13W CF	3	117	0.423	926	\$18.00	\$157.48	0.1			0	\$0.00	\$0.00		\$0.00	\$0.00	926	\$18.00	\$157.48	0.1	
32	7	Office	6	2190	75W INCANDESC	6	450		26W CF/SL	6	168	0.282	618	\$60.00	\$104.99	0.6			0	\$0.00	\$0.00		\$0.00	\$0.00	618	\$60.00	\$104.99	0.6	
33	2	Captain	6	2190	60W INCANDESC	4	240		15W CF/SL	4	60	0.18	394	\$24.00	\$67.01	0.4			0	\$0.00	\$0.00		\$0.00	\$0.00	394	\$24.00	\$67.01	0.4	
34	2	Dorm Room 12	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
35	2	Dorm Room 13	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
36	2	Dorm Room 14	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
37	2	Dorm Room 15	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
38	2	Dorm Room 16	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
39	2	Dorm Room 17	4	1460	60W INCANDESC	1	60		15W CF/SL	1	15	0.045	66	\$6.00	\$11.17	0.5			0	\$0.00	\$0.00		\$0.00	\$0.00	66	\$6.00	\$11.17	0.5	
40	12	Exterior	7	2555	75W INCANDESC	8	600		26W CF/SL	8	224	0.376	961	\$48.00	\$163.32	0.3			0	\$0.00	\$0.00		\$0.00	\$0.00	961	\$48.00	\$163.32	0.3	

## Appendix B: Third Party Energy Suppliers (ESCOs)

### PSE&G SERVICE TERRITORY

Last Updated: 05/19/10

\*CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I –INDUSTRIAL

\*\*\*GREEN POWER MARKETER

Supplier	Telephone & Web Site	*Customer Class
<b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>	C ACTIVE
<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>	C ACTIVE
<b>ConEdison Solutions</b> Cherry Tree Corporate Center 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>	C ACTIVE
<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>	C/I ACTIVE
<b>Credit Suisse, (USA) Inc.</b> 700 College Road East Princeton, NJ 08450	(212) 538-3124 <a href="http://www.creditsuisse.com">www.creditsuisse.com</a>	C ACTIVE
<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>	C/I ACTIVE
<b>FirstEnergy Solutions</b> 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 <a href="http://www.fcs.com">www.fcs.com</a>	C/I ACTIVE
<b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, N.J. 08701	(800) 805-8586 <a href="http://www.gesc.com">www.gesc.com</a>	R/C/I ACTIVE
<b>Green Mountain Energy Company***</b> 3000 Atrium Way	(800) 810-7300	R/C/I

Mount Laurel, NJ 08054	<a href="http://www.greenmountain.com">www.greenmountain.com</a>	ACTIVE
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>	C/I ACTIVE
<b>Integrus Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integrusenergy.com">www.integrusenergy.com</a>	C/I ACTIVE
<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>	C/I ACTIVE
<b>Liberty Power Holdings, 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>	C/I ACTIVE
<b>Linde Energy Services</b> 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 <a href="http://www.linde.com">www.linde.com</a>	C/I ACTIVE
<b>Palmco Power NJ, LLC</b> One Greentree Centre 10000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 <a href="http://www.PalmcoEnergy.com">www.PalmcoEnergy.com</a>	C/I ACTIVE
<b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) <a href="http://www.pepco-services.com">www.pepco-services.com</a>	C/I ACTIVE
<b>Sempra Energy Solutions</b> The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>	C/I ACTIVE
<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>	C/I ACTIVE

<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>	C/I  <b>ACTIVE</b>
<b>Sterling Planet, Inc.***</b> 58 Otto Avenue Beverly, NJ 08010	(877) 457-2306 <a href="http://www.sterlingplanet.com">www.sterlingplanet.com</a>	R/C/I  <b>ACTIVE</b>
<b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 <a href="http://www.sel.com">www.sel.com</a>	C/I  <b>ACTIVE</b>
<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>	C/I  <b>ACTIVE</b>
<b>UGI Energy Services, Inc.</b> 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>	C/I  <b>ACTIVE</b>
<b>Verde Energy USA, Inc.</b> 50 East Palisades Avenue Englewood, NJ 07631	(800) 388-3862 <a href="http://www.lowcostpower.com">www.lowcostpower.com</a>	R/C/I  <b>ACTIVE</b>
<b>Viridian Energy</b> 2001 Route 46, Waterview Plaza Suite 310 Parsippany, NJ 07054	(866) 663-2508 <a href="http://www.viridian.com">www.viridian.com</a>	R/C/I  <b>ACTIVE</b>

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### **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.

### **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/>.

\*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.