ENERGY AUDIT – FINAL REPORT

GLOUCESTER CITY
KING STREET FIRE COMPANY
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GLOUCESTER CITY, NJ 08030
ATTN: MR. JACK LIPSETT

CEG PROPOSAL NO. 9C08131

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Table of Contents

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I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted for:

Gloucester City
King Street Fire House
1 North King Street
Gloucester City, NJ 08030

Municipal Contact Person: Jack Lipsett

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$19,127
Natural Gas	$10,197
Total	$29,324

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Lighting Upgrades	$6,493	$1,813	3.6	44.4%
2	LED Exit Signs	$92	$131	0.7	118.0%
3	Lighting Controls	$1,155	$389	2.9	35.4%
4	High Efficiency Rooftop Unit Replacement	$22,896	$965	23.7	76.6%
5	Programmable Thermostat	$540	$456	1.2	86.6%
6	Infrared Heating Units	$10,300	$1,287	8.0	16.2%

Note A: Includes applicable incentive and maintenance savings.

The estimated demand and energy savings are shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Upgrades	6.54	12,166	-
2	LED Exit Signs	-	876	-
3	Lighting Controls	-	1,636	-
4	High Efficiency Rooftop Unit Replacement	-	5,557	-
5	Programmable Thermostat	-	355	62.6
6	Infrared Heating Units	-	1,959	630

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for Gloucester City's King Street Fire House:

- **ECM #1: Lighting Upgrades**
- **ECM #2: LED Exit Signs**
- **ECM #3: Lighting Controls**
- **ECM #5: Programmable Thermostats**

CEG also has a secondary recommendation that the owner review moving forward with the installation of ECM #6 with a payback of 8.0 years. This ECM replaces the existing heating units in the engine bays that are past their useful life and will greatly increase occupant comfort. CEG recommends the owner review the implementation of this ECM and determine the overall benefit to the facility operation.

II. INTRODUCTION

This comprehensive energy audit covers the 7,200 square foot King Street Fire House that includes administrative offices, dispatch, training room, bunk room, kitchen, restrooms, mechanical rooms, weight room, storage rooms and engine bays.

The first task was to collect and review one year's worth of utility energy data for electricity and natural gas. This information was used to analyze operational characteristics, calculate energy benchmarks for comparison to industry averages, estimate savings potential, and establish a baseline to monitor the effectiveness of implemented measures. A computer spreadsheet was used to enter, sum, and calculate benchmarks and to graph utility information (see Appendix A).

The Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr) and can be used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting annual consumption of all fuels to BTU's then dividing by the area (gross square footage) of the building. EUI is a good indicator of the relative potential for energy savings. A comparatively low EUI indicates less potential for large energy savings. Blueprints (where available) were obtained from the municipal and were utilized to calculate/verify the gross area of the facility.

After gathering the utility data and calculating the EUI, the next step in the audit process is obtaining Architectural and Engineering drawings (where available). By reviewing the Architectural and Engineering drawings, questions regarding the building envelope, lighting systems/controls, HVAC equipment and controls are noted. These questions are then compared to the energy usage profiles developed during the utility data gathering step. Furthermore, through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc. After this information is gathered the next step in the process is the site visit.

The site visit was spent inspecting the actual systems and answering specific questions from the preliminary review. The building manager provided occupancy schedules, O & M practices, the building energy management program, and other information that has an impact on energy consumption.

The post-site work includes evaluation of the information gathered during the site visit, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on mechanical, lighting and building envelope improvements.

III. METHOD OF ANALYSIS

CEG completed the preliminary audit tasks noted in Section II preparing for the site survey. The site survey is a critical input in deciphering where energy opportunities exist within a facility. The auditor walks the entire site to inventory the building envelope (roof, windows, etc.), the heating, ventilation, and air conditioning equipment (HVAC), the lighting equipment, other facility-specific equipment, and to gain an understanding of how each facility is used.

The collected data is then processed using energy engineering calculations to calculate the anticipated energy usage for the proposed energy conservation measures (ECMs). The actual energy usage is entered directly from the utility bills provided by the Owner. The anticipated energy usage is compared to the actual usage to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not duplicative. The savings for each recommendation may actually be higher if the individual recommendations were installed instead of the entire project. For example, the lighting module calculates the change in wattage and multiplies it by the new operating hours instead of the existing operating hours (if there was a change in the hours at all). The lighting controls module calculates the change in hours and multiplies it by the new system wattage instead of the existing wattage. Therefore, if you chose to install the recommended lighting system but not the lighting controls, the savings achieved with the new lighting system would actually be higher because there would have been no reduction in the hours of use.

The same principal follows for heating, cooling, and temperature recommendations – even with fuel switching. If there are recommendations to change the temperature settings to reduce fuel use, then the savings for the heating/cooling equipment recommendations are reduced, as well.

Our thermal module calculates the savings for temperature reductions utilizing automated engineering calculations within Microsoft Excel™ spreadsheets. The savings are calculated in "output" values – meaning energy, not fuel savings. To show fuel savings we multiply the energy values times the fuel conversion factor (these factors are different for electricity, natural gas, fuel oil, etc.) and also take into account the heating/cooling equipment efficiency. The temperature recommendation savings are lower when the heating/cooling equipment is more efficient or is using a cheaper fuel.

Thermal recommendations (insulation, windows, etc.) are evaluated by taking the difference in the thermal load due to reduced heat transfer. Again, the "thermal load" is the thermal load after the other recommendations have been accounted for.

Lastly, installation costs, refer to Appendix B, are then applied to each recommendation and simple paybacks are calculated. Costs are derived from Means Cost Data, other industry publications, and local contractors and suppliers. The NJ SmartStart Building® program incentives (refer to Appendix C) are calculated for the appropriate ECM's and subtracted from the installed cost prior to calculation of the simple payback. In addition, where applicable, maintenance cost savings are estimated and applied to the net savings. Simple return on

investment is calculated using the standard formula of the difference of gains minus investments, divided by the investments. Included within the gains are the annual energy savings, utility incentives and maintenance savings as a total sum. The calculation is completed assuming the project is 100% direct purchased by the Owner with an energy cost escalation of 2.4% for natural gas and 2.2% for electricity.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Natural Gas

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-08 to December-08. Woodruff Energy supplies the natural gas commodity from the wellhead to the PSE&G pipelines. PSE&G charges a rate per therm for delivery of the natural gas via their pipelines to the burners under their General Service Gas (GSG) rate.

Description	Average
Electricity	14.9¢ /kWh
Natural Gas	$1.58 /Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	10,545	22	$1,285
2/08	10,005	22	$1,264
3/08	9,660	23	$1,200
4/08	9,150	27	$1,144
5/08	10,140	26	$1,162
6/08	12,840	30	$2,297
7/08	13,260	28	$2,371
8/08	11,355	28	$2,165
9/08	11,700	25	$2,111
10/08	9,285	30	$1,345
11/08	9,780	28	$1,367
12/08	10,440	26	$1,415
Totals	**128,160**	**30 Max**	**$19,127**

Figure 1
Electricity Usage Profile

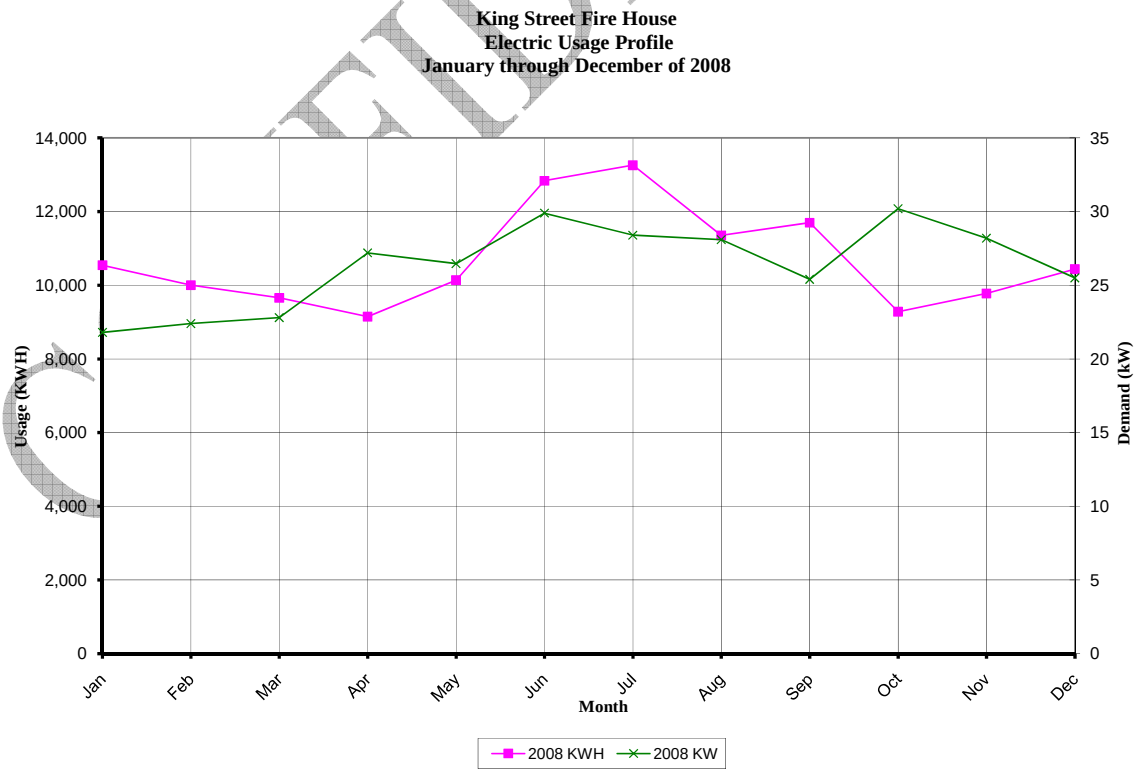
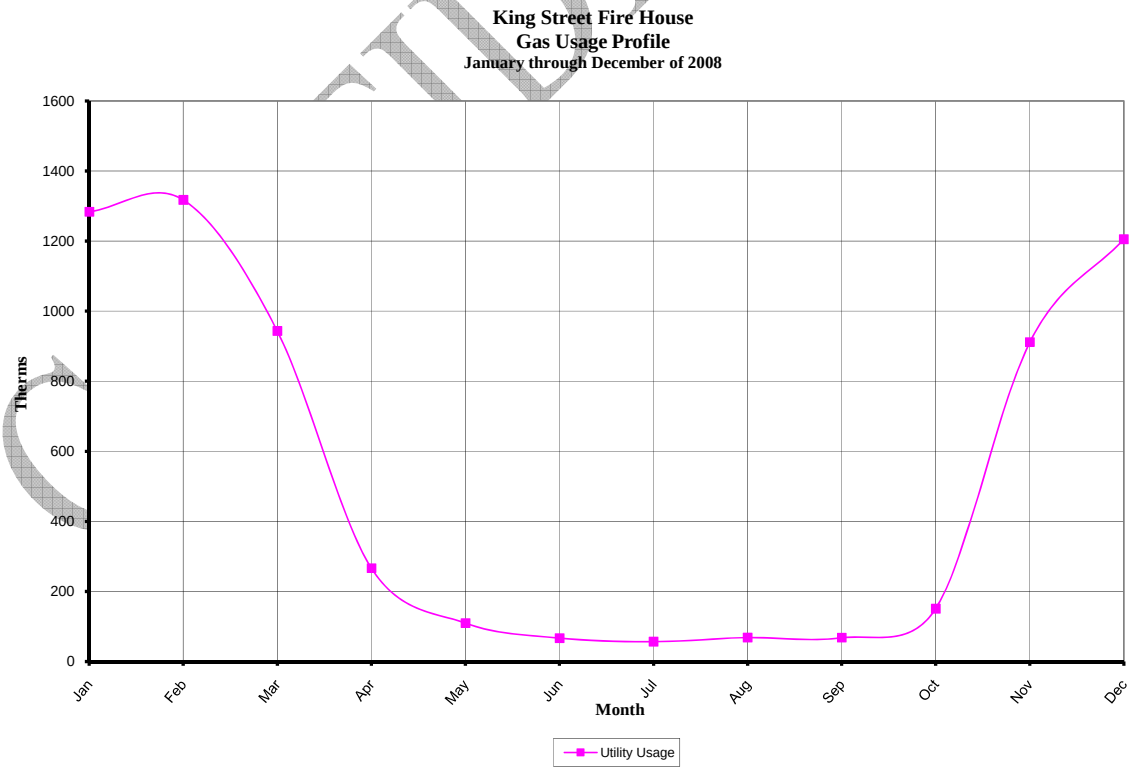


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	1,283	$2,054
2/08	1,318	$2,108
3/08	943	$1,510
4/08	266	$409
5/08	109	$174
6/08	67	$134
7/08	57	$122
8/08	68	$119
9/08	68	$112
10/08	151	$221
11/08	911	$1,279
12/08	1,205	$1,953
Totals	**6,446**	**$10,197**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. Their website allows the user to determine how well the client's building energy use intensity (EUI) compares with similar facilities throughout the U.S. and in your specific region or state.

$$Building\ \ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu\ )}{Building\ \ Square\ \ Footage}$$

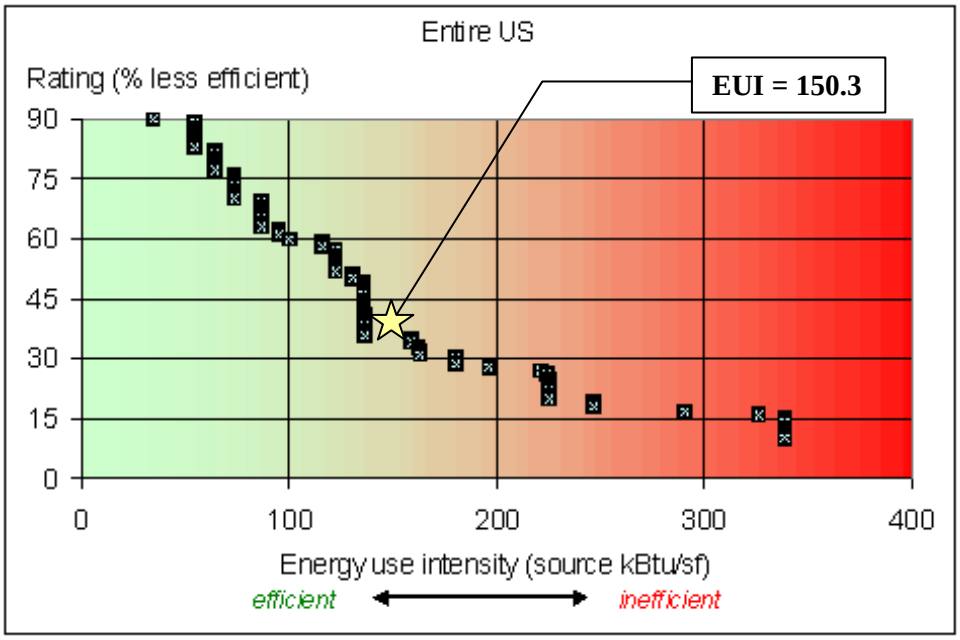
Electric = ((128,160 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 437,538 kBtu

Gas = ((6,446 therms) * (100,000 Btu/h / 1 Therm)) / (1000 Btu/h / 1 kBtu/h) = 644,600 kBtu

$$Building\ \ EUI = \frac{(437{,}538\ kBtu + 644{,}600\ kBtu)}{7{,}200\ SF} = \frac{1{,}082{,}138\ kBtu}{7{,}200\ SF}$$

King Street Fire House EUI = 150.3 kBtu/SF

Figure 3
Energy Use Intensity Distributions: Fire and Police Stations



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows you to track and assess energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and more emphasis is being placed throughout multiple arenas on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these priorities and goals. Saving energy will in-turn save the environment.

In accordance with the Local Government Energy Audit Program, CEG has created an Energy Start account for the municipal in order to allow the municipal access to monitoring their yearly energy usage as it compares to facilities of similar type. This account can be used to calculate the EUI which can be used to monitor the energy performance of the building. The account can be accessed at the following address; the username and password are also listed below:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

Username: gloucestercity
Password: lgeaceg2009

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an “Other” category. The “Other” category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as “Other.” King Street Fire House would be classified as “Other” and therefore cannot be given an Energy Performance Rating. However, Portfolio Manager can still be used to track the buildings energy use index.

Refer to Appendix D for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

V. FACILITY DESCRIPTION

Gloucester City's King Street Fire House consists of offices, training rooms, engine bays, storage rooms, mechanical rooms, locker room, bunk room, etc.; totaling approximately 7,200 SF. The King Street fire house is a one story structure of masonry and block construction. The facility was constructed in 1996.

Heating System

Four (4) Reznor gas-fired unit heaters serve the engine bays. Each heater is rated at 80,000 BTUH and due to their age are approximately 60% efficient. The units are mounted above the ceiling and are controlled by standard non-programmable thermostats.

The storage rooms and laundry room are heated by a York residential gas-fired furnace. The offices, locker room, training room, dispatch office, etc. are heated by three (3) York gas-fired rooftop units.

Domestic Hot Water

Domestic hot water for the restrooms and laundry room is provided by a Bradford White gas-fired hot water heater, with a 50 gallon capacity and an input of 40,000 BTUH.

Cooling System

The offices, locker room, training room, dispatch office, etc. is cooled via three (3) York DX cooling rooftop units.

Controls System

There are local thermostats located throughout the facility that control the various heating and air conditioning systems. The heating and air conditioning set points are manually changed based upon the occupancy of the building.

Lighting

The office areas, training rooms, bunk room, locker room, etc., are lit via 2-foot by 4-foot lay-in fixtures containing 4-foot T12 lamps and magnetic ballasts. Standard switching is utilized and there are no other types of lighting controls present.

The engine bays are lit with 175-Watt Metal Halide fixtures. The lights are switched via standard wall switching. No other lighting controls were being used.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. Additionally, the list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to Appendix E for the Major Equipment List.

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VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrades

Description:

New fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A simple change from the old to the new can provide substantial savings. A typical drop-ceiling lay in fixture with four, 4-foot lamps (40 Watt lamps) has a total wattage of about 154 Watts. By retrofitting with new lamps, reflector and electronic ballasts the total wattage would be reduced to 91 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the Owner on electrical costs due to the better performance of the electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this facility, approximately 1460 hours per year, the Owner will be changing approximately 33% less lamps per year.

This ECM replaces all T12 lighting fixtures with energy efficient T8 lighting, Cooper Metalux or equivalent fixture.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix F that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $25 per fixture; T-5 or T-8 (3-4 lamp) = $30 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$\ 25) + (\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$\ 30)$$
$$\text{Smart Start®}\ Incentive = (18 \times\ \$\ 25) + (\ 58 \times\ \$\ 30) = \$2{,}190$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ \ per\ lamp) + Installation\ Labor$$
$$Maintenance\ Savings = (\ 268 \times 33\%\ reduction \times \$\ 2.00) + (\$20 \times 76\ ) = \$1{,}697$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,380
NJ Smart Start Equipment Incentive ($):	($2,190)
Maintenance Savings ($):	($1,697)
Net Installation Cost ($):	*$6,493*
Total Energy Savings ($ / yr):	*$1,813*
Simple Payback (yrs):	*3.6*
Simple Return on Investment:	*44.4%*

ECM #2: Install LED Exit Signs

Description:

LED is an acronym for light-emitting-diode. LED's are small light sources that are readily associated with electronic equipment. LED exit signs have been manufactured in a variety of shapes and sizes. There are also retrofit kits that allow for simply modification of existing exit signs to accommodate LED technology. The benefits of LED technology are substantial. LED exit signs will last for 20-30 years without maintenance. This results in tremendous maintenance savings considering that incandescent or fluorescent lamps need to be replaced at a rate of 1-5 times per year. Lamp costs ($2-$7 each) and labor costs ($8-$20 per lamp) add up rapidly. Additionally, LED exit lights only uses 5 Watts. In comparison, conventional exit signs use 30 Watts. It is recommended that samples of the products be installed to confirm that they are compatible with the existing electrical system.

This ECM replaces the existing exit signs, four (4) in total, throughout the building with highly energy efficient LED exit signs. A Pegasus Associates Lighting LED exit sign or equivalent was used for the basis of design.

Energy Savings Calculations:

Existing exit sign energy costs: 4 units x 30 watts/unit x 8,760 hrs/yr x $0.149/kWh = $157

New LED exit sign energy costs: 4 units x 5 watts/unit x 8,760 hrs x $0.149/kWh = $26

Net energy savings = $157 - $26 = $131

Installed cost of new LED exit signs = $80 x 4 = $320

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of an incandescent exit sign warrants the following incentive: LED Exit Sign = $20 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ exit\ signs \times\ \$\ 20) = (4 \times \$20) = \$80$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \$\ \ per\ \ lamp) + Installation\ \ Labor$$

$$Maintenance\ Savings = (8 \times \$4.50) + (8 \times \$14) = \$148$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$320
NJ Smart Start Equipment Incentive ($):	($80)
Maintenance Savings ($):	($148)
Net Installation Cost ($):	*$92*
Total Energy Savings ($ / yr):	*$131*
Simple Payback (yrs):	*0.7*
Simple Return on Investment:	*118.0%*

ECM #3: Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all areas of the facility except the engine bays (3,800 SF).

Energy Savings Calculations:

From Appendix E of this report, we calculated the lighting power density (Watts/ft^2) of the existing offices, locker rooms, storage rooms, etc. to be 2.07 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Savings = 10% x 3.3 Watts/SF x 3,800SF x 2,080 hrs/yr. = 2,608 kWh x $0.149/kWh

Savings = $389 / yr

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $75/unit including material and labor. The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of rooms to be retrofitted is 21. Total cost to install sensors is $55/unit x 21 units = $1,155.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,575
NJ Smart Start Equipment Incentive ($):	($420)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$1,155*
Total Energy Savings ($ / yr):	*$389*
Simple Payback (yrs):	*2.9*
Simple Return on Investment:	*35.4%*

ECM #4: High-Efficiency Rooftop Unit Replacement

Description:

The three (3) York gas-fired heating, DX cooling rooftop units located over the offices are excellent candidates for replacement. These units appear to be 1994 vintage units. These rooftop units have reached the end of their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these units should be replaced.

This measure would replace these three units with new energy-efficient heating and cooling roof top units, manufactured by York ZJ Series or equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton \div 1000W/kW]}{[(EER_{NEW} - EER_{OLD})]} \times Avg.LoadFactor \times Hrs.ofCooling$$

Existing York 5-Ton RTU

Rated Capacity = 5 Tons per unit
Condenser Section Efficiency = 7.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.149/kWh

Proposed High-Efficiency 5-Ton Rooftop Unit

Rated Capacity = 5 Tons per Unit
New Cooling Unit Efficiency = 13.0 SEER

$$EnergySavings = \frac{[5CoolingTons \times 12{,}000\,Btu/ton \div 1000W/kW]}{[(13SEER_{NEW} - 7SEER_{OLD})]} \times 0.15 \times 1800 = 2{,}700\,kWh/yr.$$

Existing York 4-Ton RTU

Rated Capacity = 4 Tons per unit
Condenser Section Efficiency = 7.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Proposed High-Efficiency 4-Ton Rooftop Unit

Rated Capacity = 4 Tons per Unit
New Cooling Unit Efficiency = 13.0 SEER

$$EnergySavings = \frac{[4CoolingTons \times 12{,}000\,Btu/ton \div 1000W/kW]}{[(13SEER_{NEW} - 7SEER_{OLD})]} \times 0.15 \times 1800 = 2{,}160kWh/yr.$$

Existing York 3-Ton RTU

Rated Capacity = 3 Tons
Condenser Section Efficiency = 7.0 SEER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Proposed High-Efficiency 3-Ton Rooftop Unit

Rated Capacity = 3 Tons
New Cooling Unit Efficiency = 13.0 SEER

$$EnergySavings = \frac{[3 CoolingTons \times 12{,}000\, Btu/ton \div 1000 W/kW]}{[(13 SEER_{NEW} - 7 SEER_{OLD})]} \times 0.15 \times 1800 = 1{,}620\, kWh/yr.$$

Total Energy Cost Savings = (2,700 + 2,160 + 1,620) kWh x $0.149/kWh = $965 per year

Installation cost for the three (3) rooftop replacements is estimated at $24,000. It is pertinent to note that this estimate includes the demolition of the existing units and curb modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (SEER) at a certain cooling tonnage.

$$\text{Smart Start® } Incentive\ (RTU - 5\ Tons) = (Cooling\ Tons \times\ RTU\ \ Incentive)$$
$$= (5 Tons \times \$92/Ton) = \$460$$

$$\text{Smart Start® } Incentive\ (RTU - 4\ Tons) = (Cooling\ Tons \times\ RTU\ \ Incentive)$$
$$= (4 Tons \times \$92/Ton) = \$368$$

$$\text{Smart Start® } Incentive\ (RTU - 3 Tons) = (Cooling\ Tons \times\ RTU\ \ Incentive)$$
$$= (3\ Tons \times \$92/Ton) = \$276$$

Total Smart Start® Incentive = $460 + $368 + $276 = $1,104

Energy Savings Summary:

ECM #4 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$24,000
NJ Smart Start Equipment Incentive ($):	($1,104)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$22,896*
Total Energy Savings ($ / yr):	*$965*
Simple Payback (yrs):	*23.7*
Simple Return on Investment:	*76.6%*

ECM #5: Programmable Thermostat

Description:

Throughout the building there are standard, manual wall thermostats for various HVAC units that provide local control with adjustable settings for the conditioning equipment. These aged, indoor temperature controls are inaccurate due to temperature drift, age, and not having been re-calibrated. These units also do not have unoccupied setback features.

New programmable thermostats are available that utilize programming schedules for occupied and unoccupied times and can be set to vary space temperature at these respective times. In addition, the programmable thermostats can be used in conjunction with a motion sensor. When the space is not occupied the equipment can operate at the unoccupied setpoint. Once the space becomes occupied the motion sensor sends a signal to the thermostat to raise the temperature of the space to the occupied setpoint. This control system approach is ideal for facilities with low occupancy levels such as a volunteer fire house.

This energy conservation measure would replace the various HVAC unit thermostats with programmable 7-day thermostats with night time setback control. The recommended thermostat setpoints for heating/cooling are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	65° F
Occupied Cooling =	75° F
Unoccupied Cooling =	80° F

CEG recommends replacement of the three (3) existing remote thermostats that control the York rooftop units with Honeywell RTH7500D 7-day programmable thermostat or equivalent.

Energy Savings Calculations:

The energy savings of a 7-day programmable thermostat was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. The referenced calculator can be found at www.energystar.gov. Refer to Appendix G for the detailed calculation.

Calculated energy savings for heating = $99/Unit x 3 units = $297

Calculated energy savings for cooling = $53/Unit x 3 units = $159

Cost of a 7-day programmable thermostat (installed) = $180/unit x 3 units = $540

Simple Payback = $540/($297+$159) = 1.2 Years

A detailed energy savings calculation can be found in Appendix G that outlines the savings from the use of programmable thermostats.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$540
NJ Smart Start Equipment Incentive ($):	-
Maintenance Savings ($):	-
Net Installation Cost ($):	*$540*
Total Energy Savings ($ / yr):	*$456*
Simple Payback (yrs):	*1.2*
Simple Return on Investment:	*86.6%*

ECM #6: Shop Heater Replacement - Infrared Heaters

Description:

The Engine Bays are heated by four (4) Reznor gas-fired unit heaters whenever the large overhead doors are opened. The remote thermostats that control these heating units are set at 60ºF. These units do not provide adequate heating because of the high ceilings and losses through garage doors when open. In addition, these units are beyond their expected service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these units should be replaced.

Our team recommends replacing the existing unit heaters with low intensity infrared (IR) tube heaters. When compared to convective heating systems, IR heaters provide more efficient heating in large areas and warehouses for two reasons: they only heat people and objects (not air); they can be conveniently located and directed to provide heat to only a smaller section occupied by workers.

This ECM replaces the existing unit heaters with Sterling Infrared Heaters or equivalent.

Energy Savings Calculations:

Based on the existing unit heater data, thermostat settings and natural gas bills, the total energy consumed by these heating units is approximately 315 MMBtu/year (3,150 Therms/Year). The total rated heat capacity of the IR tubes is 80% of the current load or 0.8 x 3,150 Therms = 2,520 Therms/Year. The total amount of IR heaters and their size can be estimated based on the current heat load and building layout. In general, a building 200 feet wide or less will require two rows of tubes. Heat output of each 20-foot section is approximately 60,000 Btu/hr.

Estimated Fan Energy Savings:

Each of the Reznor gas-fired unit heaters have a ¼ HP fan that runs each time the unit calls for heating. Assuming that these motors are 80% efficient and the total run hours is 2,800/year, this equates to an electrical savings of:

Existing ¼ HP Motor Operating Cost =

{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency

= [0.746 x 0.25 x 0.75 x 2,800 x 0.149] ÷ 0.80 = $73 / Year

Based on four (4) existing units, this equates to 4 x $73 = $292 /Year Savings

Natural Gas Energy Savings:

20% savings x 3,150 Therms/Yr x $1.58/Therm = $995/Year

Total Energy Savings = Fan Energy Savings + Natural Gas Savings
= $292 + $995 = $1,287 per year

The total implementation cost including material and labor is estimated at approximately $10,300. It is pertinent to note, the labor cost includes installation of the infra-red heaters and required modifications of the existing natural gas piping.

Energy Savings Summary:

ECM #6 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,300
NJ Smart Start Equipment Incentive ($):	($0) [A]
Maintenance Savings ($):	-
Net Installation Cost ($):	*$10,300*
Total Energy Savings ($ / yr):	*$1,287*
Simple Payback (yrs):	*8.0*
Simple Return on Investment:	*16.2%*

Note: A. CEG believes that a NJ Smart Start® Custom Measure incentive could be applied for in order to offset the installation cost. However, further study is required.

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for Gloucester City, and concluded that there is potential for solar energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof is necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 1,950 S.F. can be utilized for a PV system on the Fire House. A depiction of the area utilized is shown in Appendix H. Using this square footage it was determined that a system size of 30.6 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 47,389 KWh annually, reducing the overall utility bill by 37% percent. A detailed financial analysis can be found in Appendix H. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	11.6 Years	8.4%
Direct Purchase	11.6 Years	6.2%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for King Street Fire Company and has determined it is not a viable option. The electrical demand of the King Street Fire House is not large enough to satisfy the need for a wind turbine.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to Section IV, Figures 1 and 2 included within this report to reference the electricity and natural gas usage load profile for January 2008 through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a base load profile, throughout the year. The cooling usage compliments the heating load seen in the natural gas usage. It is evident that there is a slight reduction in the Peak Load from January through May and a slight increase from May through September, with a slight decrease again October through December. The kW demand load appears typical throughout the year. The electric load profile is deemed flat and a very good candidate for Third Party Supply (TPS).

Natural Gas:

Section IV, Figure 2 demonstrates a typical heating load profile with major consumption occurring between December through March 2008.

Tariff Analysis:

Electricity:

Gloucester City receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power) rate. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The rate schedule has a Delivery Charge, Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

Natural Gas:

Gloucester City receives natural gas service through Public Service Electric and Gas Company (PSE&G) on a GSG utility rate class for delivery and received commodity by a Third Party Supplier (TPS); Woodruff Energy. The GSG utility tariff is for delivery service for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. It is pertinent to note, since Gloucester City has elected to utilize a TPS, if the TPS should not deliver, the customer may receive service from PSE&G under

Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

Recommendations:

CEG's recommendation pertains to Gloucester City's electric costs (mainly because Gloucester City does not have a large Natural Gas Critical Mass). CEG recognized the electric cost is competitive with current market prices for a single facility. However, there are opportunities available by aggregation of all facilities and procuring energy from third party suppliers.

CEG advises Gloucester City take a global approach that will be consistent for all facilities within the municipality. Gloucester City's "weighted average price" per kWh (kilowatt hour) for all buildings is approximately $0.1225 per kWh (kWh is the common unit of electric measure). The weighted average price per dekatherm for natural gas is $11.37/dth (Dth is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Gloucester City could realize savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (January through December 2008) and current electric rates, Gloucester City would see savings of over $10,000 per year (Note: Savings were calculated using Gloucester City's Average Annual Consumption of 490,135 kWh and a variance of $.02258 /kWh utilizing a fixed one-year commodity contract). Gloucester City should aggregate its entire electric load to gain the most optimal energy costs. CEG recommends advisory services for alternative sourcing and supply of energy on a "managed approach."

Lastly, CEG recommends that Gloucester City schedule a meeting with their current utility provider to review their utility charges and current tariff structure for electricity. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), Gloucester City will learn more about the competitive supply process. Gloucester City can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, Gloucester City should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the Owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. 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.

iii. *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. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

CEG 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.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

B. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

C. Maintain all weather stripping on windows and doors.

D. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

E. Reduce lighting in specified areas where the foot candle levels are above 70 in private offices and above 30 in corridor, lobbies, etc.

F. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

G. Recalibrate existing temperature sensors within the facility.

H. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.

I. Clean all light fixtures to maximize light output.

J. Confirm that outside air economizers on the rooftop units that serve the Office Areas are functioning properly to take advantage of free cooling.

Electric Cost Summary

PSE&G - Electric - rate- GLP

King Street Fire House **2008**

Account # 61 862 041 03

Meter # 678001858

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	**Total**	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31		
KWH	10,545	10,005	9,660	9,150	10,140	12,840	13,260	11,355	11,700	9,285	9,780	10,440	128,160	
KW	22	22	23	27	26	30	28	28	25	30	28	26	30	Max
Monthly Load Factor	65%	66%	57%	47%	51%	60%	63%	54%	64%	41%	48%	55%	56%	
Electric Delivery, $	$333	$323	$316	$322	$241	$710	$705	$647	$626	$337	$346	$365	$5,269	
Delivery $/kwh	$0.032	$0.032	$0.033	$0.035	$0.024	$0.055	$0.053	$0.057	$0.054	$0.036	$0.035	$0.035	$0.041	
Electric Supply, $	$952	$942	$884	$823	$921	$1,588	$1,666	$1,518	$1,485	$1,008	$1,020	$1,051	$13,857	
Supply $/kwh	$0.090	$0.094	$0.091	$0.090	$0.091	$0.124	$0.126	$0.134	$0.127	$0.109	$0.104	$0.101	$0.108	
Total Cost, $	$1,285	$1,264	$1,200	$1,144	$1,162	$2,297	$2,371	$2,165	$2,111	$1,345	$1,367	$1,415	$19,127	
$/KWH	$0.122	$0.126	$0.124	$0.125	$0.115	$0.179	$0.179	$0.191	$0.180	$0.145	$0.140	$0.136	**$0.149**	

Summary of Natural Gas Cost

PSE&G - Natural Gas-rate - GSGH

King Street Fire House

Account# 507-554 - Woodruff **2008**

Account# 61 862 041 0 3 - PSE&G

Meter# 1757479

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	**Total**
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	
Therms (Burner Tip)	1283.3	1317.5	943.2	266.1	109.4	66.7	56.5	68.1	68.0	150.5	911.4	1205.2	6446.1
Total Distribution Cost	$512	$526	$377	$90	$43	$30	$27	$30	$30	$55	$369	$491	2,581
Cost per Therm	$0.399	$0.399	$37.340	$0.337	$0.391	$0.449	$0.476	$0.446	$0.446	$37.340	$0.405	$0.407	$0.400
Total Commodity Cost	$1,542	$1,583	$1,133	$320	$131	$104	$96	$89	$82	$165	$910	$1,462	7,616
Cost per Therm	$1.20	$1.20	$1.20	$1.20	$1.20	$0.00	$0.00	$1.31	$1.20	$1.10	$1.00	$1.21	$1.18
Total Cost	$2,054	$2,108	$1,510	$409	$174	$134	$122	$119	$112	$221	$1,279	$1,953	$10,197
Cost per Therm	$1.600	$1.600	$1.601	$1.538	$1.592	$2.008	$2.169	$1.752	$1.645	$1.465	$1.404	$1.621	**$1.582**

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

KING STREET FIRE COMPANY

ECM 1 LIGHTING UPGRADE

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$10,380	$0	$0	$10,380
Total Cost			$0	$0	$10,380
Utility Incentive - NJ Smart Start ($30 per 3-4 lamp fixture)					($2,190)
Total Cost Less Incentive					$8,190

ECM 2 LED Exit Signs

	Qty	Unit Cost $	Material $	Labor $	Total $
New LED Exit Signs	4	$80	$50	$30	$320
Total Cost			$50	$30	$320
Utility Incentive - NJ Smart Start ($20 per Exit Sign)					($80)
Total Cost Less Incentive					$240

ECM 3 Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	21	$75	$735	$840	$1,575
Total Cost			$735	$840	$1,575
Utility Incentive - NJ Smart Start ($20 per Sensor)					($420)
Total Cost Less Incentive					$1,155

ECM 4 High Efficiency Rooftop Unit Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
New Roof Top Units	LS	$24,000	$0	$0	$24,000
Total Cost			$0	$0	$24,000
Utility Incentive - NJ Smart Start ($92 per ton)					($1,104)
Total Cost Less Incentive					$22,896

ECM 5 Programmable Thermostat

	Qty	Unit Cost $	Material $	Labor $	Total $
New Programmable Thermostat	3	$180	$120	$60	$540
Total Cost			$120	$60	$540
Utility Incentive - N/A					$0
Total Cost Less Incentive					$540

ECM 6 Infrared Heating Units

	Qty	Unit Cost $	Material $	Labor $	Total $
Infrared Heating Units	LS	$10,300	$0	$0	$10,300
Total Cost			$0	$0	$10,300
Utility Incentive - N/A					$0
Total Cost Less Incentive					$10,300

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	$12 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Gas Cooling

Gas Absorption Chillers	$185 - $400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

	$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

STATEMENT OF ENERGY PERFORMANCE
North King Street Fire Co.

Building ID: 1773112
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 08, 2009

Facility
North King Street Fire Co.
1 North King St.
Gloucester City, NJ 08030

Facility Owner
Gloucester City
512 Monmouth St.
Gloucester City, NJ 08030

Primary Contact for this Facility
Jack Lipsett
512 Monmouth St.
Gloucester City, NJ 08030

Year Built: 1996
Gross Floor Area (ft²): 7,200

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

Site Energy Use Summary[3]

Electricity (kBtu)	437,282
Natural Gas (kBtu)[4]	644,590
Total Energy (kBtu)	1,081,872

Energy Intensity[5]

Site (kBtu/ft²/yr)	150
Source (kBtu/ft²/yr)	297

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	101

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	89%
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[6] **for Indoor Environmental Conditions:**

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

Certifying Professional
Raymond Johnson
520 South Burnt Mill Rd.
Voorhees, NJ 08043

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.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	North King Street Fire Co.	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Fire Station/Police Station	Is this an accurate description of the space in question?		☐
Location	1 North King St., Gloucester City, NJ 08030	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Fire House (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	7,200 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	8 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	168 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	30 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: Electric Meter - 678001858 (kWh)
Space(s): Entire Facility

Start Date	End Date	Energy Use (kWh)
12/01/2008	12/31/2008	10,440.00
11/01/2008	11/30/2008	9,780.00
10/01/2008	10/31/2008	9,285.00
09/01/2008	09/30/2008	11,700.00
08/01/2008	08/31/2008	11,355.00
07/01/2008	07/31/2008	13,260.00
06/01/2008	06/30/2008	12,840.00
05/01/2008	05/31/2008	10,140.00
04/01/2008	04/30/2008	9,150.00
03/01/2008	03/31/2008	9,660.00
02/01/2008	02/29/2008	10,005.00
01/01/2008	01/31/2008	10,545.00
Electric Meter - 678001858 Consumption (kWh)		**128,160.00**
Electric Meter - 678001858 Consumption (kBtu)		**437,281.92**
Total Electricity Consumption (kBtu)		**437,281.92**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	1,205.20
11/01/2008	11/30/2008	911.40
10/01/2008	10/31/2008	150.50
09/01/2008	09/30/2008	68.00
08/01/2008	08/31/2008	68.10
07/01/2008	07/31/2008	56.50
06/01/2008	06/30/2008	66.70
05/01/2008	05/31/2008	109.40
04/01/2008	04/30/2008	266.10

03/01/2008	03/31/2008	943.20
02/01/2008	02/29/2008	1,317.50
01/01/2008	01/31/2008	1,283.30
Natural Gas Consumption (therms)		**6,445.90**
Natural Gas Consumption (kBtu)		**644,590.00**
Total Natural Gas Consumption (kBtu)		**644,590.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

Certifying Professional

(When applying for the ENERGY STAR, this must be the same PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
North King Street Fire Co.
1 North King St.
Gloucester City, NJ 08030

Facility Owner
Gloucester City
512 Monmouth St.
Gloucester City, NJ 08030

Primary Contact for this Facility
Jack Lipsett
512 Monmouth St.
Gloucester City, NJ 08030

General Information

North King Street Fire Co.	
Gross Floor Area Excluding Parking: (ft^2)	7,200
Year Built	1996
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Fire House	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	7,200
Number of PCs[o]	8
Weekly operating hours[o]	168
Workers on Main Shift[o]	30

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	150	150	0	N/A	78
Source (kBtu/ft^2)	297	297	0	N/A	157
Energy Cost					
$/year	$ 29,321.00	$ 29,321.00	N/A	N/A	$ 15,220.54
$/$ft^2$/year	$ 4.07	$ 4.07	N/A	N/A	$ 2.11
Greenhouse Gas Emissions					
$MtCO_2e$/year	101	101	0	N/A	52
$kgCO_2e/ft^2$/year	14	14	0	N/A	7

More than 50% of your building is defined as Fire Station/Police Station. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Fire Station/Police Station. This building uses X% less energy per square foot than the CBECS national average for Fire Station/Police Station.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

MAJOR EQUIPMENT LIST

Concord Engineering Group

"King Street Fire Company"

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Storage Closet	Locker Rm./Kitchen	Bradford White	1	MI5036EN10	-	40	42	50	-	Nat. Gas	2	12	10

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (SEER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	-	York	1	D4CG036N082258	N0CM034561	DX-R22	10.1	3 Ton	Forced Air Furnace	100	82	82%	Nat. Gas	208-230	3	60	15	15	0
Roof	-	York	1	D4CG048N10325B	NCCM022919	DX-R22	10.35	4 Ton	Forced Air Furnace	125	103	82%	Nat. Gas	208-230	3	60	15	15	0
Roof	-	York	1	D4CG060N103258	NFCM049388	DX-R22	10.15	5 Ton	Forced Air Furnace	125	103	82%	Nat. Gas	208-230	3	60	15	15	0

Unit Heaters and Cabinet Unit Heaters

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Heating Type	Input (MBh)	Approx. Age	ASHRAE Service Life	Remaining Life
Engine Bay	Engine Bay	Reznor	4	-	-	Forced Air Furnace	80	15	13	-2

Note: Nameplate data was not available for this equipment.

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C08131
Project: Fire House
Address: 1 North King Street
City: Gloucester City
Building SF: 7,200

King Street Fire House

DATE: 06/16/2009
KWH COST: $0.149

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Fire Prevention office	4	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.75	1564.16	$233.06	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.36	757.12	$112.81	$140.00	$560.00	0.39	807.04	$120.25	4.66
2		Fire Chief Office	4	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.75	1564.16	$233.06	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.36	757.12	$112.81	$140.00	$560.00	0.39	807.04	$120.25	4.66
3		Dispatch Office	2	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.38	782.08	$116.53	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	378.56	$56.41	$140.00	$280.00	0.19	403.52	$60.12	4.66
4		Corridor	6	2'X2' 2-Lamp T-12 Prism Lens Magnetic Ballast	2,080	94	0.56	1173.12	$174.79	6	2'x2' 2-Lamp T-8 Retrofit	34	0.20	424.32	$63.22	$120.00	$720.00	0.36	748.8	$111.57	6.45
5		Ladies Room	1	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.19	75.2	$11.20	1	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	36.4	$5.42	$140.00	$140.00	0.10	38.8	$5.78	24.22
6		Men's Room	1	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.19	75.2	$11.20	1	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	36.4	$5.42	$140.00	$140.00	0.10	38.8	$5.78	24.22
7		Data Room	2	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.38	150.4	$22.41	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	72.8	$10.85	$140.00	$280.00	0.19	77.6	$11.56	24.22
8		Training Room	8	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	1.50	3128.32	$466.12	8	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.73	1514.24	$225.62	$140.00	$1,120.00	0.78	1614.08	$240.50	4.66
9		Training Room	1	2'X2' 2-Lamp T-12 Prism Lens Magnetic Ballast	2,080	94	0.09	195.52	$29.13	1	2'x2' 2-Lamp T-8 Retrofit	34	0.03	70.72	$10.54	$120.00	$120.00	0.06	124.8	$18.60	6.45
10		Shift Supervisor	4	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.75	1564.16	$233.06	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.36	757.12	$112.81	$140.00	$560.00	0.39	807.04	$120.25	4.66
11		Restroom	3	1'X4' 2-Lamp T-12 No Lens Magnetic Ballast	400	88	0.26	105.6	$15.73	3	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	61	0.18	73.2	$10.91	$140.00	$420.00	0.08	32.4	$4.83	87.00

12		Bunk Room	5	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.94	1955.2	$291.32	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.46	946.4	$141.01	$140.00	$700.00	0.49	1008.8	$150.31	4.66
13		Corridor	6	2'X2' 2-Lamp T-12 Prism Lens Magnetic Ballast	2,080	94	0.56	1173.12	$174.79	6	2'x2' 2-Lamp T-8 Retrofit	34	0.20	424.32	$63.22	$120.00	$720.00	0.36	748.8	$111.57	6.45
14		Kitchen	5	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.94	1955.2	$291.32	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.46	946.4	$141.01	$140.00	$700.00	0.49	1008.8	$150.31	4.66
15		Day Room	4	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.75	1564.16	$233.06	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.36	757.12	$112.81	$140.00	$560.00	0.39	807.04	$120.25	4.66
16		Locker Room	5	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.94	1955.2	$291.32	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.46	946.4	$141.01	$140.00	$700.00	0.49	1008.8	$150.31	4.66
17		Locker Room	2	1'X4' 2-Lamp T-12 No Lens Magnetic Ballast	2,080	88	0.18	366.08	$54.55	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	61	0.12	253.76	$37.81	$140.00	$280.00	0.05	112.32	$16.74	16.73
18		Engine Bays	12	175 W MH HID	2,080	195	2.34	4867.2	$725.21	12	No Replacement	195	2.34	4867.2	$725.21	$0.00	$0.00	0.00	0	$0.00	0.00
19		Mechanical Room	2	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.38	150.4	$22.41	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	72.8	$10.85	$140.00	$280.00	0.19	77.6	$11.56	24.22
20		Laundry Room	2	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.38	782.08	$116.53	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	378.56	$56.41	$140.00	$280.00	0.19	403.52	$60.12	4.66
21		Tool Crib	2	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.38	782.08	$116.53	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	378.56	$56.41	$140.00	$280.00	0.19	403.52	$60.12	4.66
22		Weight Room	5	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2,080	188	0.94	1955.2	$291.32	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.46	946.4	$141.01	$140.00	$700.00	0.49	1008.8	$150.31	4.66
23		EMS Storage	1	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.19	75.2	$11.20	1	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	36.4	$5.42	$140.00	$140.00	0.10	38.8	$5.78	24.22
24		Mechanical Room	1	2'X4' 4-Lamp T-12 Prism Lens Magnetic Ballast	400	188	0.19	75.2	$11.20	1	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	36.4	$5.42	$140.00	$140.00	0.10	38.8	$5.78	24.22
25																					
26		**Totals**	88				14.91	28034.2	$4,177.10	88			8.37	15868.7	$2,364.44		$10,380.00	6.54	12165.5	$1,812.66	5.73

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Programmable Thermostat(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of Units	1
Initial Cost per ENERGY STAR Unit (retail price)	$180
Initial Cost per Conventional Unit (retail price)	$73
Unit Fuel Cost (Cooling) ($/kWh)	$0.149
Unit Fuel Cost (Heating) ($/Therm)	$1.58

24 Hour Typical Usage Patterns*

	Weekday	Weekend
Nighttime Set-Back/Set-Up Hours	16	16
Daytime Set-Back/Set-Up Hours	8	8
Hours without Set-Back/Set-Up	0	0

Choose your city from the drop-down menu → **City**: PA-Philadelphia

Heating Season*

Typical Indoor Temperature w/o Set-Back	70
Nighttime Set-Back Temperature (Average)	65
Daytime Set-Back Temperature (Average)	70
Heating System Type	Gas Furnace

Cooling Season*

Typical Indoor Temperature w/o Set-Up	75
Nighttime Set-Up Temperature (Average)	80
Daytime Set-Up Temperature (Average)	75
Cooling System Type	Central AC

**All temperatures are in degrees Fahrenheit. Setpoint is defined as the temperature setting for any given time period. Set-back temperature is defined as the lower setpoint temperature for the energy-savings periods during the heating season, generally nighttime and daytime. Set-up temperature is defined as the higher setpoint temperature for the energy-savings periods during the cooling season, generally nighttime and daytime.*

Annual and Life Cycle Costs and Savings for 1 Programmable Thermostat(s)

	1 ENERGY STAR Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Energy Costs			
Heating Energy Cost	$894	$994	$99
Heating Energy Consumption (MBTU)	*57*	*63*	*6*
Cooling Energy Cost	$258	$310	$53
Cooling Energy Consumption (MBTU)	*5.9*	*7.1*	*1*
Total	**$1,152**	**$1,304**	**$152**
Life Cycle Costs			
Energy Costs	$12,811	$14,501	$1,690
Heating Energy Costs	*$9,944*	*$11,049*	*$1,105*
Heating Energy Consumption (MBTU)	849	943	94
Cooling Energy Costs	$2,867	$3,452	$585
Cooling Energy Consumption (MBTU)	88	106	18
Purchase Price for 1 Unit(s)	*$180*	*$73*	*-$107*
Total	**$12,991**	**$14,574**	**$1,583**
		Simple payback of initial cost (years)	**0.7**

Summary of Benefits for 1 Programmable Thermostat(s)

Initial cost difference	**$107**
Life cycle savings	**$1,690**
Net life cycle savings (life cycle savings - additional cost)	**$1,583**
Life cycle energy saved (MBTU)-includes both Heating and Cooling	**112**
Simple payback of additional cost (years)	**0.7**
Life cycle air pollution reduction (lbs of CO_2)	**16,336**
Air pollution reduction equivalence (number of cars removed from the road for a year)	**1**
Air pollution reduction equivalence (acres of forest)	**2**
Savings as a percent of retail price	**879%**

Assumptions for Programmable Thermostats

Category	Value		Data Source
Heating/Cooling System Efficiencies			
Gas Furnace	84.0		LBNL 2004, Average of ENERGY STAR and Conventional
Gas Boiler	82.5		LBNL 2004, Average of ENERGY STAR and Conventional
Oil Furnace	84.0		LBNL 2004, Average of ENERGY STAR and Conventional
Oil Boiler	82.5		LBNL 2004, Average of ENERGY STAR and Conventional
Baseline Energy Consumption (MBTU)			
Gas Furnace	54.1		DOE 2001
Gas Boiler	56.1		DOE 2001
Oil Furnace	68.7		DOE 2001
Oil Boiler	71.2		DOE 2001
Central Air Conditioner	9.5		DOE 2001
Reference Degree Days (Heating/Cooling)			
Gas Furnace	4,255		DOE 2001
Gas Boiler	4,255		DOE 2001
Oil Furnace	5,339		DOE 2001
Oil Boiler	5,339		DOE 2001
Central Air Conditioner		1701	DOE 2001
Typical Indoor Temperature (Heating Season)	70		ENERGY STAR Programmable Thermostat Eligibility Criteria. Pre-programmed settings for heating include a morning and evening temperature ≤70°F and an adjustment of at least 8 °F (≤62°F) during daytime and nighttime.
Typical Indoor Temperature (Cooling Season)	78		ENERGY STAR Programmable Thermostat Eligibility Criteria. Pre-programmed settings for cooling include a morning and evening temperature ≥78°F and an adjustment of at least 7 °F (≥85°F) during daytime and an adjustment of at least 4°F (≥82°F) at nighttime.
Energy Prices			
Natural Gas ($/Therm)	$1.2700	$/Therm	EIA 2008
Fuel Oil ($/Gallon)	$2.6800	$/gal	EIA 2008
Electric Price (Residential)	$0.1059	$/kWh	EIA 2008
Usage			
Nighttime Hours	8		Default shipped setting, ENERGY STAR specification
Daytime Hours	10		Default shipped setting, ENERGY STAR specification
Carbon Dioxide Emissions Factors			
Oil Carbon Emission Factor	161.27	lbs CO_2/MBtu	EPA 2007
Gas Carbon Emission Factor	116.97	lbs CO_2/MBtu	EPA 2007
Electricity Carbon Emission Factor	1.54	lbs CO_2/kWh	EPA 2008
Thermostat Savings			
Savings per Degree of Setback (Heating Season)	3%		Industry Data 2004
Savings per Degree of Setback (Cooling Season)	6%		Industry Data 2004
Thermostat Lifetime	15	years	LBNL 2007
Initial Cost			
ENERGY STAR Programmable Thermostat	$92		Industry Data 2008
Conventional Thermostat	$73		Industry Data 2008
CO_2 Equivalents			
Annual CO_2 sequestration per forested acre	9,700	lbs CO_2/acre-yr	EPA 2007
Annual CO_2 emissions for "average" passenger car	12,037	lbs CO_2/acre-yr	EPA 2007
Discount Rate			
Commercial and Residential Discount Rate (real)	4%		A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).

Project Name: LGEA Solar PV Project - King Street Fire House
Location: Gloucester City, NJ
Description: Photovoltaic System 95% Financing

Simple Payback Analysis

	Photovoltaic System 95% Financing
Total Construction Cost	$275,310
Annual kWh Production	47,737
Annual Energy Cost Reduction	$7,113
Annual SREC Revenue	$16,708
First Cost Premium	**$275,310**
Simple Payback Calculation:	**11.6** **Years**

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.149**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/kWh) $0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$13,766	0	0	0	$0	0	0	(13,766)	0
1	$0	47,737	$7,113	$0	$16,708	$18,111	$6,222	($512)	($14,278)
2	$0	47,260	$7,326	$0	$16,541	$17,661	$6,672	($466)	($14,744)
3	$0	46,787	$7,546	$0	$16,375	$17,179	$7,154	($412)	($15,155)
4	$0	46,319	$7,772	$0	$16,212	$16,662	$7,671	($349)	($15,504)
5	$0	45,856	$8,006	$236	$16,050	$16,107	$8,226	($514)	($16,018)
6	$0	45,398	$8,246	$234	$15,889	$15,513	$8,820	($432)	($16,450)
7	$0	44,944	$8,493	$231	$15,730	$14,875	$9,458	($341)	($16,791)
8	$0	44,494	$8,748	$229	$15,573	$14,191	$10,142	($241)	($17,033)
9	$0	44,049	$9,010	$227	$15,417	$13,458	$10,875	($132)	($17,165)
10	$0	43,609	$9,281	$225	$15,263	$12,672	$11,661	($14)	($17,179)
11	$0	43,173	$9,559	$222	$15,110	$11,829	$12,504	$114	($17,065)
12	$0	42,741	$9,846	$220	$14,959	$10,925	$13,408	$252	($16,813)
13	$0	42,313	$10,141	$218	$14,810	$9,956	$14,377	$400	($16,413)
14	$0	41,890	$10,445	$216	$14,662	$8,916	$15,417	$558	($15,854)
15	$0	41,471	$10,759	$214	$14,515	$7,802	$16,531	$727	($15,127)
16	$0	41,057	$11,082	$211	$14,370	$6,607	$17,726	$907	($14,220)
17	$0	40,646	$11,414	$209	$14,226	$5,325	$19,008	$1,098	($13,123)
18	$0	40,240	$11,756	$207	$14,084	$3,951	$20,382	$1,300	($11,823)
19	$0	39,837	$12,109	$205	$13,943	$2,478	$21,855	$1,514	($10,309)
20	$0	39,439	$12,472	$203	$13,804	$898	$23,435	$1,740	($8,569)
21	$1	39,045	$12,847	$201	$13,666	$761	$21,544	$4,006	($4,563)
22	$2	38,654	$13,232	$199	$13,529	$521	$17,729	$8,312	$3,749
23	$3	38,268	$13,629	$197	$13,394	$0	$0	$26,825	$30,575
24	$4	37,885	$14,038	$195	$13,260	$0	$0	$27,102	$57,677
25	$5	37,506	$14,459	$193	$13,127	$0	$0	$27,393	$85,070
	Totals:	869,260	$191,124	$3,508	$304,241	$225,116	$261,544	$300,817	$98,835
				Net Present Value (NPV)			**$4,624**		
				Internal Rate of Return (IRR)			**8.4%**		

Project Name: LGEA Solar PV Project - King Street Fire House
Location: Gloucester City, NJ
Description: Photovoltaic System

Simple Payback Analysis

	Photovoltaic System
Total Construction Cost	$275,310
Annual kWh Production	47,737
Annual Energy Cost Reduction	$7,113
Annual SREC Revenue	$16,708
First Cost Premium	**$275,310**
Simple Payback Calculation:	**11.6** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.149**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$275,310	0	0	0	$0	(275,310)	0
1	$0	47,737	$7,113	$0	$16,708	$23,821	($251,489)
2	$0	47,260	$7,326	$0	$16,541	$23,867	($227,622)
3	$0	46,787	$7,546	$0	$16,375	$23,921	($203,701)
4	$0	46,319	$7,772	$0	$16,212	$23,984	($179,716)
5	$0	45,856	$8,006	$236	$16,050	$23,819	($155,897)
6	$0	45,398	$8,246	$234	$15,889	$23,901	($131,996)
7	$0	44,944	$8,493	$231	$15,730	$23,992	($108,005)
8	$0	44,494	$8,748	$229	$15,573	$24,092	($83,913)
9	$0	44,049	$9,010	$227	$15,417	$24,201	($59,712)
10	$0	43,609	$9,281	$225	$15,263	$24,319	($35,393)
11	$0	43,173	$9,559	$222	$15,110	$24,447	($10,946)
12	$0	42,741	$9,846	$220	$14,959	$24,585	$13,639
13	$0	42,313	$10,141	$218	$14,810	$24,733	$38,372
14	$0	41,890	$10,445	$216	$14,662	$24,891	$63,263
15	$0	41,471	$10,759	$214	$14,515	$25,060	$88,324
16	$0	41,057	$11,082	$211	$14,370	$25,240	$113,563
17	$0	40,646	$11,414	$209	$14,226	$25,431	$138,994
18	$0	40,240	$11,756	$207	$14,084	$25,633	$164,627
19	$0	39,837	$12,109	$205	$13,943	$25,847	$190,474
20	$0	39,439	$12,472	$203	$13,804	$26,073	$216,547
21	$1	39,045	$12,847	$201	$13,666	$26,311	$242,858
22	$2	38,654	$13,232	$199	$13,529	$26,562	$269,420
23	$3	38,268	$13,629	$197	$13,394	$26,825	$296,246
24	$4	37,885	$14,038	$195	$13,260	$27,102	$323,348
25	$5	37,506	$14,459	$193	$13,127	$27,393	$350,741
Totals:		869,260	$191,124	$3,508	$304,241	$626,051	$491,857
				Net Present Value (NPV)		**$216,572**	
				Internal Rate of Return (IRR)		**6.2%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
King Street Fire House	1950	Sunpower SPR230	133	14.7	1,956	30.59	47,737	4,389	15.64

.= Proposed PV Layout

Notes:

1. Estimated kWH based on 4.68 hours full output per day per 365 day year. Actual kWH will vary day to day.