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**Local Government Energy Program  
Energy Audit Final Report**

*For  
Borough of Metuchen  
Department of Public Works  
44 Jersey Avenue  
Metuchen, NJ 08840*

*Project Number: LGEA18*



## TABLE OF CONTENTS

INTRODUCTION .....	3
EXECUTIVE SUMMARY.....	4
1. HISTORIC ENERGY CONSUMPTION.....	6
1.1. ENERGY USAGE AND COST ANALYSIS.....	6
1.2. UTILITY RATE.....	7
1.3. ENERGY BENCHMARKING .....	7
2. FACILITY AND SYSTEMS DESCRIPTION .....	9
2.1. BUILDING CHARACTERISTICS .....	9
2.2. BUILDING OCCUPANCY PROFILES .....	9
2.3. BUILDING ENVELOPE .....	9
2.3.1. EXTERIOR WALLS.....	9
2.3.2. ROOF .....	9
2.3.3. BASE .....	9
2.3.4. WINDOWS .....	10
EXISTING WINDOWS.....	10
2.3.5. EXTERIOR DOORS.....	11
2.3.6. BUILDING AIR TIGHTNESS.....	11
2.4. HVAC SYSTEMS.....	12
2.4.1. HEATING .....	12
2.4.2. COOLING.....	12
2.4.3. VENTILATION.....	13
2.4.4. DOMESTIC HOT WATER .....	13
2.5. ELECTRICAL SYSTEMS .....	14
2.5.1. LIGHTING.....	14
2.5.2. APPLIANCES AND PROCESS .....	15
2.5.3. ELEVATORS.....	15
3. EQUIPMENT LIST .....	15
4. ENERGY CONSERVATION MEASURES.....	16
5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES.....	20
5.1. EXISTING SYSTEMS .....	20
5.2. SOLAR PHOTOVOLTAICS .....	20
5.3. COMBINED HEAT AND POWER.....	22
5.4. GEOTHERMAL.....	22
5.5. WIND .....	22
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES .....	23
6.1. LOAD PROFILES .....	23
6.2. TARIFF ANALYSIS.....	23
6.3. ENERGY PROCUREMENT STRATEGIES.....	24
7. METHOD OF ANALYSIS.....	25
7.1. ASSUMPTIONS AND TOOLS.....	25
7.2. DISCLAIMER .....	25
APPENDIX A: LIGHTING STUDY .....	26
LIGHTING IMPROVEMENTS .....	ERROR! BOOKMARK NOT DEFINED.

## **INTRODUCTION**

On July 16<sup>th</sup> and from July 29-31, 2009, Steven Winter Associates, Inc. (SWA) performed an energy audit and conditions assessment of the Borough of Metuchen Borough Hall, Public Library, Senior Center and Department of Public Works buildings located in Metuchen, NJ in Middlesex County. This assessment was conducted under the New Jersey Clean Energy Local Government Energy Audit Program. A separate report has been submitted for each of the buildings that were assessed. This document applies only to the Department of Public Works buildings located at 44 Jersey Avenue.

Existing conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building. Energy data collected in the field was imported into the eQUEST energy conservation software to generate a baseline model of the building. SWA simulated the installation of energy improvement measures on the baseline model of the building. Energy saving calculations and projected economics are automated and served as the basis for our conclusions.

The Metuchen Department of Public Works (DPW), located at 44 Jersey Avenue, was built around 1955. The section housing the offices was renovated sometime within the past 10 years. The DPW consists of 9,472 square feet of conditioned space. The garage section is a two-story concrete block building. The office section is a one-story concrete block building. There are 25 full time DPW employees including the office staff, but many of the employees work outside the building for most of the day. The DPW is open for business approximately 45 hours a week.

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.

## EXECUTIVE SUMMARY

The document contains the Energy Audit Final Report and conditions assessment report for the Borough of Metuchen Department of Public Works located at 44 Jersey Avenue, Metuchen, NJ 08840. The DPW main building has two sections: the garage area that is a two-story structure with a loft at the second floor and is built slab on grade and an office space, recently renovated, that is a one-story slab on grade. The building contains approximately 9,472 square feet of conditioned space.

Based on the inspections performed by Steven Winter Associates (SWA) staff on July 16<sup>th</sup> and between July 29-31, 2009, and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy and 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.

For the 12 months from January, 2008 through December 2008, the Metuchen Public Works Building consumed approximately 325,920 kilowatt hours (kWh) of electricity at a cost of \$46,919. Between April 2008 and March of 2009 the DPW used 6,387 therms of natural gas at a cost of \$9,554. Combined energy consumption (electricity and gas) for a one year period was 1,751 million Btu (MMBtu) at a total 12-month cost of \$56,473..

SWA benchmarked the energy performance of the Municipal building using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Using 2008 as a baseline year, Portfolio Manager was used to evaluate the site energy use intensity of the building. The site energy use intensity for the Municipal building is 186 kBtu/sq.ft/year. Future utility bills can be added to the Portfolio Manager and the site energy use intensity for different time periods can be compared to the year 2008 baseline to track changes in energy consumption over time. After energy efficiency improvements are made, Portfolio Manager can be used to evaluate the impact over time. No rating score was provided as the building type is not supported by Portfolio Manager for rating at this time.

SWA recommends a total of four Energy Conservation Measures (ECMs) for the DPW. The total investment cost for these ECMs is **\$80,500**. The total investment cost for these ECMs if maximum incentives are achieved is about **\$67,423**. SWA estimates a first year savings of **\$11,639** with a simple payback of **6.9 years**.

There are various incentives for which the Borough of Metuchen could apply that could also help lower the cost of installing the ECMs. SWA recommends that the Township applies for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. Currently, the New Jersey Office of Clean Energy offers a Renewable Energy Incentive program that would pay \$5,000 for the installation of a 5 kW photovoltaic system. There is also an incentive that issues a Solar Renewable Energy Certificate for every 1000kWh (1MWh) of electricity generated that can be sold or traded for the current market rate of electricity. The total investment cost if all the incentives are attained at their maximum amount is \$67,423.

The following table summarizes the proposed Energy Conservation Measures.

**SCOPE OF WORK – SUMMARY TABLE**

ECM#	ECM description	Installed Cost		1st year energy savings					SPP	LoM	lifecycle savings	Averaged ROI
		Estimated \$	Source	usage	unit	demand	unit	\$ savings				
1	High Efficiency Lighting	\$ 13,000	Estimate	17,236	kWh	4.83	kW	\$ 2,732	4.8	12	\$27,194	9.1%
2	New Furnaces	\$ 8,500	Estimate	1,874	Therms			\$ 2,811	3.0	12	\$27,981	19.1%
3	5 KW Solar Photovoltaic System	\$ 35,000	Similar	5,915	kWh	5	kW	\$ 3,505	10.0	15	\$41,842	1.3%
4	Solar Thermal	\$ 24,000	Similar	17,116	kWh	4	kW	\$ 2,591	9.3	15	\$30,931	1.9%
<b>Total</b>		\$ 80,500						\$ 11,639	6.9	11	\$109,343	3.2%

Discount rate: 3.0% per DOE FEMP guidelines  
 Energy price escalation rate: 0% per DOE FEMP guidelines

# 1. HISTORIC ENERGY CONSUMPTION

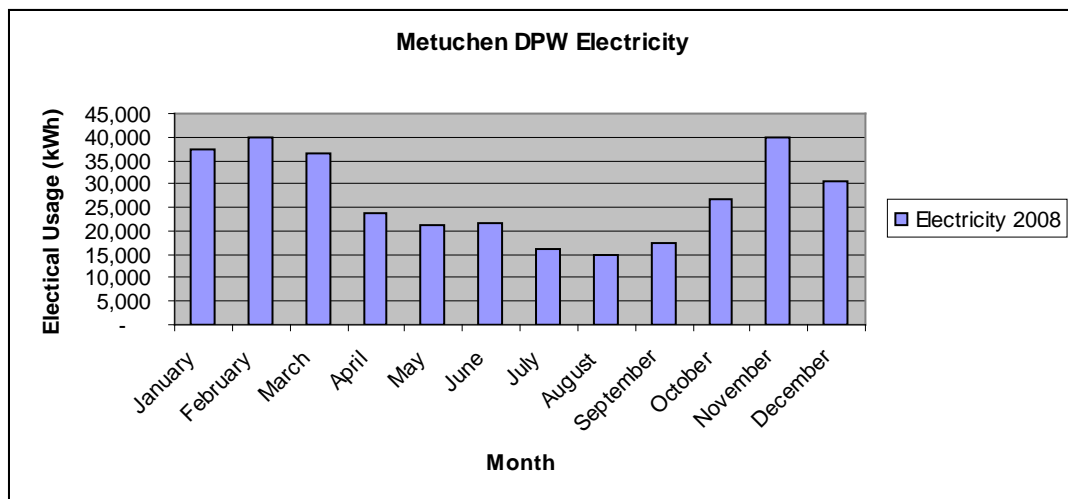
## 1.1. Energy usage and cost analysis

SWA analyzed utility bills provided by PSE&G and Elizabethtown Gas that showed consumption and cost for a fairly recent 12 month period.

**Electricity** – The Borough purchases electricity from Public Service Electric and Gas Co. (PSE&G) at an average aggregated rate of **\$0.143 per kWh for the DPW between February of 2007 and February of 2009**. The DPW used **686,880 kWh at a cost of \$95,254.44**. The data also reflected that demand charges averaged approximately \$328.35 monthly. **Peak demand in 2008 was 98.4 kW with an average monthly demand of 77 kW**

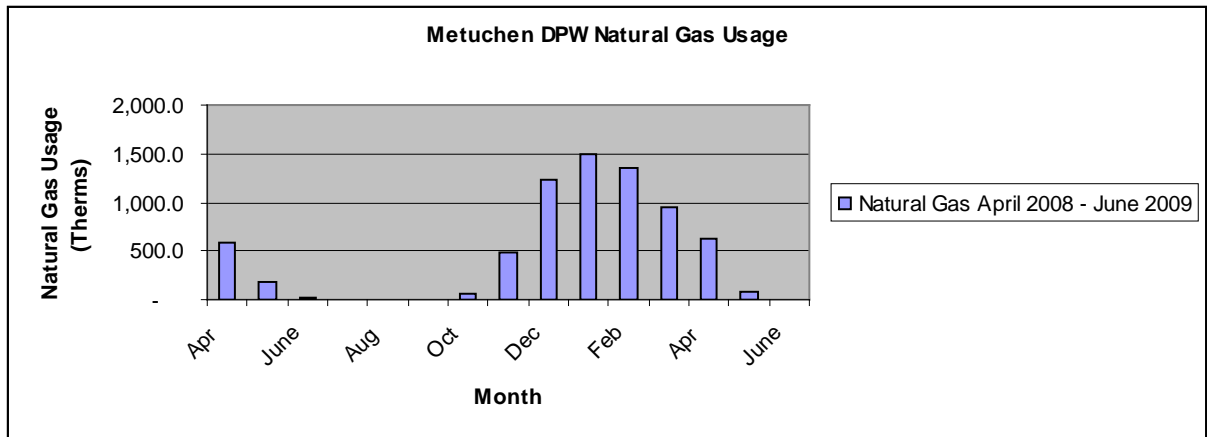
**Natural Gas** – The building uses natural gas purchased from Elizabethtown Gas. **The average aggregated rate for natural gas between March of 2008 and May of 2009 was \$1.50 per therm**. The building used **7,106 therms of gas costing \$10,681.44**.

The following chart shows electricity usage for the DPW based on utility bills for January 2008 through December 2008.



In the above chart, the electricity spikes during the winter months. This is unusual in that the building uses natural gas for heat and electricity for cooling. The intuitive curve would show the spikes in the summer months.

The following chart shows the natural gas usage for the Municipal complex based on utility bills for the year starting September 2007 through August 2008. The months have been arranged to reflect a calendar year.



In the above chart, the natural gas usage follows a heating trend as expected with little or no gas used through the late spring, summer and early fall.

### 1.2. Utility rate

The building purchases electricity from PSE&G at the MD rate. The DPW uses Account #02 51 090 463 28 at service address 44 Jersey Avenue, Metuchen, NJ 08840. Natural Gas service is provided by Elizabethtown Gas, account number 1068774551. Electricity was billed at an average aggregated rate of **\$0.144/kWh** and natural gas was billed at an average aggregated rate of **\$1.50/therm**.

### 1.3. Energy benchmarking

The building information and utility data were entered into the U.S. Environmental Protection Agency’s (EPA) *Energy Star Portfolio Manager* energy benchmarking system. A summary report of the Portfolio Manager results is provided on the following page. A rating score cannot be calculated as Portfolio Manager cannot provide a rating for this type of building use and occupancy at this time.

Per the LGEA program requirements, SWA has assisted the Township of Metuchen to create an *Energy Star Portfolio Manager* account and share the Metuchen DPW facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager site information with TRC Energy Services, user name TRC-LGEA, as well as the Township of Metuchen with the following user name and password:

User name: “WEBoerth”  
 Password: “Metuchen”



## STATEMENT OF ENERGY PERFORMANCE Metuchen DPW

Building ID: 1849975  
For 12-month Period Ending: January 31, 2009<sup>1</sup>  
Date SEP becomes ineligible: N/A

Date SEP Generated: September 23, 2009

**Facility**  
Metuchen DPW  
44 Jersey Avenue  
Metuchen, NJ 08840

**Facility Owner**  
Borough of Metuchen  
500 Main Street  
Metuchen, NJ 08840

**Primary Contact for this Facility**  
Alan Tabachnikov  
50 Washington Street  
Norwalk, CT 07461

Year Built: 1955  
Gross Floor Area (ft<sup>2</sup>): 9,472

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

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

Electricity - Grid Purchase (kBtu)	1,138,307
Natural Gas (kBtu) <sup>4</sup>	627,264
Total Energy (kBtu)	1,765,571

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

Site (kBtu/ft <sup>2</sup> /yr)	186
Source (kBtu/ft <sup>2</sup> /yr)	471

### Emissions (based on site energy use)

Greenhouse Gas Emissions (MTCO <sub>2</sub> e/year)	207
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### Electric Distribution Utility

PSE&G - Public Service Elec & Gas Co

### National Average Comparison

National Average Site EUI	48
National Average Source EUI	122
% Difference from National Average Source EUI	286%
Building Type	Office

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

Alan Tabachnikov  
50 Washington Street  
Norwalk, CT 07461

#### 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 entering the SEP) and we have suggestions for reducing this time for the future. Send comments (including OMB control number) to the Director, Collection Strategies Division, U.S. EPA, (202) 219-1300 Pennsylvania Ave., NW, Washington, DC 20460.

EPA Form 5900-16



## **2. FACILITY AND SYSTEMS DESCRIPTION**

### **2.1. Building Characteristics**

The Metuchen Department of Public Works was built in the mid 1950's. There is a staff of about 25 full time employees at the Department of Public Works but many of them do not work in the DPW building much of the time. The building houses the DPW professional offices as well as a large open space for parking and mechanical repairs to the department vehicles. There are also a number of other rooms with uses ranging from tire storage to sign painting.

### **2.2. Building occupancy profiles**

There are 25 full time employees at the DPW but most of them work outside of the building at any given time. Due to the nature of the building's use and occupancy, the amount of people using the building at any given time will fluctuate.

### **2.3. Building Envelope**

#### **2.3.1. Exterior walls**

The exterior walls consist of eight inch concrete block. There is no evidence of any insulation in the garage walls and building maintenance staff confirmed that they had not seen any insulation. The office walls are eight inch concrete block and the office section has been upgraded recently and some insulation has been added to the walls, bringing them up to approximately R-11. Adding additional insulation to exterior walls will not be a cost-effective option.

#### **2.3.2. Roof**

The roof of the both the garage and the office section have been well maintained and the built up roofing is in good condition. The roofs are flat and there is ceiling insulation in both the garage area and the offices. DPW staff thinks that there is rigid board insulation under the roof surface but there was no non-invasive way to determine if that is so. There is about R-19 in the garage roof and approximately R-30 in the office section. Existence of any roof or ceiling insulation is generally more significant than adding additional insulation would be, so installing more insulation would be expensive, disruptive and, in general, is not a cost-effective option at present time.

#### **2.3.3. Base**

The building's base is a five inch concrete slab on grade in the office section, and eight inch slab on grade in the garage area. There were no reported problems with water penetration or moisture. The building code in effect at the time of construction would not have required insulation either at the perimeter of the foundation walls or under the slab, and the building staff has not ever seen evidence of any insulation. SWA did not have access to any building plans for the DPW buildings. Excavation to install perimeter insulation is not a cost effective option.

### 2.3.4. Windows

The existing windows throughout both sections of the DPW building are single glazed with very little insulating qualities. Due to seasonal conditions at the time of the site visit, SWA could not review the actual performance of the windows during cold weather but single glazed windows are a poor performance energy option. Some attempts have been made to improve performance by securing Plexiglas over the interior of the windows. This has not been effective as the heat buildup between the window and the Plexiglas has not only broken the seal where the Plexiglas was attached to the window frames, but in several areas has actually broken the window glass. The SWA energy auditor noted a small infestation of flying insects inside two separate offices. The operable windows, because of the ineffective Plexiglas covering, are no longer operable and therefore cannot be used at all for ventilation. New windows are needed throughout the office section. The garage area has very little window area but these windows are also in poor condition and should be replaced. As the employees who work in the garage also work outdoors much of the time and are dressed for outdoor work, replacement of the garage windows is not as imperative at this time.



**Office Section - Existing Windows**



### 2.3.5. Exterior doors

Some of the exterior doors are in satisfactory condition although there was no weather-stripping on the glass entry doors and none on some of the metal clad exterior doors. If not properly maintained, exterior doors can become major sources of heat loss and infiltration. As a best practice, SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. This will help optimize comfort and energy performance.

The overhead door to the garage area should be inspected regularly as well. Overhead doors are often responsible for an increased amount of infiltration and heat loss.



The glass is new on the entry and doors but there is no weather-stripping at all.

### 2.3.6. Building air tightness

Based upon a visual inspection, neither the office section nor the garage appears to be well sealed. In the office section, that is mostly due to the existing single pane aluminum frame windows. The deficiencies in the garage area are in many ways a function of the space's use and occupancy. Replacing the windows would greatly improve the building's air tightness as well as improve heating, cooling and ventilation efficiencies.

As noted previously, the overhead door should be regularly inspected and all missing or failing weather-stripping should be repaired or replaced.

## 2.4. HVAC systems

### 2.4.1. Heating

The heating plant consists of two very old inefficient furnaces both burning natural gas. They are both at the end of their estimated useful lives and the technology upon which they depend is several generations out of date.

The existing furnaces were estimated to have an operating efficiency of approximately 60% to 65%. There are newer furnace technologies, known as condensing furnaces that provide efficiencies above 90%. SWA is recommending replacing both furnaces with maximum 95.5 % efficient condensing furnaces. This will be a very cost-effective improvement.



### 2.4.2. Cooling

The cooling equipment serving the DPW offices is located outside and in the mechanical room. Cooling is provided by a York H1RA048S25A outdoor condensing unit that uses the furnaces in the mechanical room as an air handler for moving the cooled air to the offices. The York condensing unit has a seasonal energy efficiency ratio (SEER) of about 10, not particularly efficient by today's standards. Newer York and other manufacturer's two to four ton cooling systems can reach efficiencies of SEER 14 or more. As the condensing unit is in relatively good condition, SWA is not recommending replacing it at this time. At such time a the cooling system needs to be replaced, the replacement unit should have an energy efficiency ratio of at least 14.

### **2.4.3. Ventilation**

There are some exhaust fans in the garage area. There is no mechanical fresh air supply to the offices or the garage areas.

The blower motors in the furnaces are used to circulate both heated and cooled air to other parts of the building. There is no capability to introduce outside air or exhaust air from the building. It can only condition and recirculate indoor air. Therefore the only source of fresh air is through open door and windows or leaks through or around them or other areas where there are protrusions to the outside. There are exhaust fans in the garage area but no mechanically supplied fresh air.

With a lack of mechanical fresh air supply (and no stale air exhaust in the office areas), normally occurring pollutants that exist in the building interior can build up to uncomfortable or even dangerous levels. Furthermore, the carbon monoxide and other combustion engine byproducts produced during motor vehicle operation inside the garage area can be drawn into the offices and other areas of the building through the return air ducts and other avenues of cross-contamination. Providing adequate ventilation through open windows or doors while maintaining a comfortable temperature range inside the building during very cold or very warm weather is impractical. While carbon dioxide (CO<sub>2</sub>) is not a problem in and of itself, it is used as an indicator of the adequacy of fresh air. As CO<sub>2</sub> levels rise, it is an indication that there is not proper ventilation or the building is exceeding its' design occupancy. When this happens, buildup of common indoor air pollutants can occur, leading to discomfort or health complaints.

The Occupational Safety and Health Administration (OSHA) standard for interior CO<sub>2</sub> is 5,000 parts per million (PPM) of air. The borough should arrange to have the interior air tested for CO<sub>2</sub> levels during various operational and climatic conditions. The building may need to address the need for more mechanical ventilation by using a CO<sub>2</sub> based or contaminants based demand controlled ventilation system.

## **2.5. Domestic Hot Water**

Domestic Hot Water for the building is provided by one electric A.O. Smith Model KEN80 combination water heater/storage system with two 4.5 kW heating elements and an 80 gallon storage capacity.

SWA recommends the domestic hot water pipe runs be inspected to ensure that they are properly insulated. Repairing insulation and/or providing increased insulation levels, particularly where piping passes through semi- or un-conditioned spaces, will decrease the piping heat losses.

More efficient hot water fixtures and equipment will save energy through reduced energy consumption for water heating and additional money, through reducing water and sewer bills. Automatic water shut-off controls for the faucets should be considered to further decrease water consumption. SWA did not see any dishwashers or clothes washers. As a best practice, at such time as the Borough deems it necessary to replace fixtures, energy saving fixtures bearing the ENERGY STAR label should be selected to ensure efficient performance.

## 2.6. Electrical systems

### 2.6.1. Lighting

*Interior Lighting* – Most of the lighting in the building is fluorescent and consists of fixtures with magnetic ballasts and T12 (inch and a half diameter) lamps.



There are several types of lighting that are used in the building, the most prevalent being fluorescent.

There are several basic types of fluorescent lights:

Compact fluorescent lamps (CFLs)

Fluorescent linear tubes, U-tubes and circline (round) lamps

The building uses predominantly linear fluorescents but there are some incandescent lights and several screw-in type compact fluorescents.

The lighting for the DPW is generally operating for approximately the 45 hours a week (average) that the building is occupied.

In accordance with requirements of the Local Government Energy Audit program, SWA, Inc. performed an investment grade lighting audit, which provides a comprehensive survey of existing lighting, and an extensive technical and financial analysis. It provides a dynamic simulation of the base building, calibrated against actual energy bills, as well as the proposed energy conservation measures.

Almost all the magnetic ballasted fixtures lighting in the building should be retrofitted for electronic ballasts and T8 lamps with a reflective backing. The exterior lighting should be turned on and off by photocell controls that operate based on the amount of outdoor light and are more effective than timer controls in this application.



Refer to Appendix A for a table detailing the survey the existing lighting and a separate table indicating which specific fixtures in which areas of the building should be retrofitted or replaced.

### Appliances and process

SWA performed a basic survey of appliances installed at the DPW and does not think that it would be cost effective to replace any appliances at this time. Generally, management should select Energy Star label appliances when replacing outdated appliances and equipment, including: refrigerators, printers, computers, copy machines, etc. More information can be found in the “Products” section of the Energy Star website at: <http://www.energystar.gov>.

### 2.6.2. Elevators

There are no elevators at the DPW buildings.

## 3. EQUIPMENT LIST

DPW							
Building System	Description	Physical Location	Make / Model / Serial	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Cooling	Condensing unit CU-1 ;46 MBH Cooling	Outside, near Air Compressor Rm	York / M#H1RA048S25A / S#WFMM064687	electric	Offices	2004	65%
Heating	Direct heat furnace;No Namplate	Furnace Rm, Outside of garage	Sterling QV2 / M#NAMB-FO29AC / S#EFAS171694	Natural gas	Garage	1975	0%
Heating	Direct heat furnace;No Namplate	Furnace Rm, Outside of garage	Sterling QV2 / M#No Namplate / S#No Namplate	Natural gas	Garage	1970	0%
Domestic Heating	One (1) domestic hot water heater, ;Heating element: (2)x4.5 kw, Storage capacity: 80 gal	Air Compressor Rm	A.O. Smith / M#KEN80910 / S#MH82-06599-910	electric	All areas	1991	10%
Air compressor	Air compressor;5HP Motor	Air Compressor Rm	Westinghouse / M#FA100-145	electric	Garage	1972	0%
Heating/ cooling	Direct fire air handler, works with CU-1;140,000 Btu/hr In, 112,000 Btu/hr Out, 80% Eff.	Air Compressor Rm	Goodman / M#GMP150-5REVB / S#9910607683	Natural gas	Offices	1991	20%
Cooling	Window AC unit, rarely used;1 ton	Admin Office	Fredrick / M#NA	electric	Admin Office	1999	30%

**Note:**

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

#### 4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA has 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**

- Ventilation –SWA recommends installation of a contaminant based demand controlled ventilation system for the DPW buildings. Presently there are only some exhaust fans in the garage and mechanic's work area with no mechanical supplied ventilation in either section of the main building.
- Windows - The windows in both sections of the building are old metal framed, single pane windows that offer very little in the way of insulating or air sealing qualities. Attempts to improve the window's performance by installing Plexiglas at the interior of the window frames have only succeeded in assuring that the windows are no longer operable and cannot be used to supply any fresh air. Aside from the front entry, there is no other form of supply or exhaust ventilation in the office section and only doors and exhaust fans in the garage section. SWA recommends replacing the windows with vinyl frame, dual pane windows with an argon gas filling and a low emissivity coating.

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

- Weather Stripping/Air Sealing – As a best practice, exterior/overhead doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frame. Building staff should also verify that windows open and close properly and repair, as needed. Any other accessible gaps or penetrations in the thermal envelope should also be sealed with caulk or spray foam. Particular attention should be paid to penetrations and doors connecting the main building to the garage to prevent transfer of combustion product.
- Pipe Insulation - Insure that there is sufficient insulation and that it is intact throughout. Replace all deteriorated or missing insulation.
- Plug-In Timer Controls – For locally controlled equipment that the staff are currently responsible for turning off equipment when not in use. Plug-in timer controls can be utilized to ensure electrical equipment does not operate during unoccupied periods.
- Lighting Controls - Occupancy sensors and/or photocells, should also be considered. In applications where occupants tend to leave the lights running inadvertently, such as during fire response or other extended periods of absence, the occupancy sensors automatically shut-off the lights. Since operating hours vary, a survey of the building occupants can provide the most accurate feedback on lighting usage patterns within the facility to help determine the appropriateness of lighting controls.
- Daylighting Controls – Most of the offices have sufficient window area that artificial lighting need not be used for a good part of the day. Controls that increase or reduce the level of artificial light based on the useable amount of daylight available (known as daylight harvesting) should be installed.
- Energy Star Appliances - Consider Energy Star labeled equipment and appliances when replacement is necessary, including: refrigerators, printers, computers, copy machines, etc.



- Water Efficient Fixtures & Controls - Adding controlled on/off timers on all lavatory faucets is a cost-effect way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consuming fixtures and appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water and sewer bills.

**Category III Recommendations: Energy Conservation Measures**

**Summary table**

ECM#	Description
1	High Efficiency Lighting Retrofit
2	Two New Furnaces
3	5 kW Solar Photovoltaic System
4	Solar Thermal System (DHW)

**ECM #1: High Efficiency Lighting Retrofit**

**Description:**

Most of the lighting throughout the building is comprised of older technologies. There are some incandescent lighting and some compact fluorescent lighting. The bulk of the lighting is provided by linear fluorescents using magnetic ballasts and T12 diameter lamps. Almost all of the linear fluorescent lighting should be replaced, or retrofitted where possible, with electronic ballasts and T8 diameter lamps. The few incandescent lights should be replaced with compact fluorescents.

**Installation cost:**

Estimated cost: \$ 13,000

source of cost estimate: Estimates; Similar Projects; Contractors

**Economics:**

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated \$	Source	usage	unit	demand	unit	\$ savings				
\$ 13,000	Contractor	17,236	kWh	4.83	kW	\$ 2,732	4.8	12	\$27,190	9.1%

3.0% per DOE FEMP guidelines

0% per DOE FEMP guidelines

**Assumptions:** SWA used estimates from contractors for other similar projects and derived unit costs for various types of lighting replacements and retrofits.

**Rebates/financial incentives:**

High efficiency lighting qualifies for incentives under the New Jersey Clean Energy SmartStart Commercial Building Incentive Program prescriptive measures. Incentives are available for

retrofits and/or new fixtures with T8 and T5 lamps and electronic ballasts, hard-wired compact fluorescent lights, pulse start metal halide fixtures or retrofits and certain other types of lighting. SWA estimates that if our lighting recommendations are implemented, the measures would qualify for about \$1,920 total incentives.

## ECM #2: *Install new furnaces*

**Description:**

The existing furnaces at the DPW are old, inefficient and have outlived their expected useful life. The rated efficiencies on this type of heating plant is approximately 60% to 65%. Condensing furnaces currently have rated efficiencies above 90%.

The most efficient type of furnace is the High Efficiency Condensing Furnace. In condensing furnaces there is a second heat exchanger where hot flue gasses are captured until the point at which the water vapor will condense. This process allows the condensing furnace to extract much more heat from the normal combustion process. The resultant flue gases are not very hot and can be vented outside horizontally directly with PVC pipe.

**Installation cost:**

Estimated cost: \$8,500

Source of cost estimate: Similar projects

**Economics:**

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated \$	Source	usage	unit	demand	unit	\$ savings				
\$ 8,500	Contractor	1,874	Therms			\$ 2,811	3.0	12	\$27,981	19.1%

- 3.0% per DOE FEMP guidelines
- 0% per DOE FEMP guidelines

**Rebates/financial incentives:**

Financial incentives of \$300 - \$400 per unit are available through the New Jersey SmartStart Buildings Program. Incentives for this measure would be between six and eight hundred dollars.

**Options for funding ECM:**

*This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

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

**ECM #3: *Install Solar Photovoltaic System***

*See section 5: RENEWABLE AND DISTRIBUTED ENERGY MEASURE*

**ECM #4: *Install Solar Thermal Domestic Hot Water System***

*See section 5: RENEWABLE AND DISTRIBUTED ENERGY MEASURE*

**5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES**

**5.1. Existing systems**

There are currently no existing renewable energy systems.

**5.2. Solar Photovoltaics**

**ECM #3: *Install 5 Kilowatt Solar Photovoltaic System***

**Description:**

Currently, the complex does not utilize any renewable energy systems. Renewable energy systems such as solar photovoltaics can offset a certain amount of the electricity purchased by the Township. In addition, utility companies general bill for electricity in two ways – for usage and for demand. Usage is the actual amount of electricity consumed by the property in a given period (usually each month, measured in kilowatt hours). Demand is the amount of electrical power that the property requires at any given time to satisfy the building electrical load. Peak demand is billed based on the largest amount of power required by the building at any given time during the billing period (measured in kilowatts). During the summer when demand is at its’ highest due to the addition of air conditioning loads, the utility demand charges often rise to help the utility cover its’ need for increased power capabilities. A photovoltaic system will not only offset the amount of electricity consumed, but will actually lower the peak demand, resulting in additional cost savings. SWA recommends installation of a small sized (5 kilowatt) solar system. As part of a concept known as net metering, when solar electricity production from the system is high and the building load is low, any excess power can be sold back to the utility. A solar photovoltaic system of this size will need approximately 1,200 square feet of roof area with a clear southern exposure.

**Installation cost:**

Estimated material cost:	\$35,000
Rebate@\$1 per watt:	\$ 5,000
<b>Total installed cost:</b>	<b>\$30,000</b>

Source of cost estimate: Similar Projects

**Economics :**

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated \$	Source	usage	unit	demand	unit	\$ savings				
\$ 35,000	RS Means	5,915	kWh	5	kW	\$ 3,505	10.0	15	\$41,842	1.3%

- 3.0% Per DOE FEMP guidelines
- 0% Per DOE FEMP guidelines

**Assumptions:** SWA estimated the cost and savings of the system based on past solar photovoltaic projects, the NREL online solar savings calculator and included the projected Solar Renewable Energy Credits in the savings estimate.

**Rebates/financial incentives:**

*PSE&G Solar Loan Program, 15 year payback, paid with SRECs (Solar Renewable Energy Certificates) with a floor value of >\$475.*

**Options for funding ECM:**

*This project may benefit from enrolling in the New Jersey SmartStart program to obtain Technical Assistance and offset a portion of the cost of implementation.*

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

**5.3. Solar Thermal**

**ECM #4: Install Solar Thermal DHW System**

**Description:**

Currently, the complex does not utilize any renewable energy systems. Solar thermal is a technology that harnesses the sun’s energy to heat water for domestic use or space heating. Most solar thermal systems used for domestic hot water utilize medium heat flat plate collectors that indirectly heat the water using a freeze protected transfer fluid and heat exchangers. The building presently has an electric water heater, storage tank combination. Water is introduced into the existing system from the Borough water system at approximately 55 degrees (F) and heated to about 125 degrees (F). The solar system would offset a portion of the cost of the electricity by pre-heating the water before it enters the tank.

**Installation cost:**

Estimated material cost: \$24,000

Source of cost estimate: Estimated based on similar projects.

**Economics:**

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated \$	Source	usage	unit	demand	unit	\$ savings				
\$ 24,000	Similar	17,116	kWh	4	kW	\$ 2,591	9.3	15	\$30,928	1.9%

3.0% per DOE FEMP guidelines

0% per DOE FEMP guidelines

**Assumptions:** SWA assumes thermal savings based on domestic hot water base loads calculated using the eQuest building simulation software model and by conducting a billing analysis.

**Rebates/financial incentives:**

While there are no prescriptive incentives for solar thermal renewable energy available from the New Jersey Clean Energy Program, an argument could be made that the energy savings deriving from this measure should qualify for the custom electric and custom electric savings available from the SmartStart Commercial Building Incentive Program. An application for the custom electric incentive is available on request or from the NJ Clean Energy website.

**5.4. Combined Heat and Power**

**Description:**

*A CHP system is not compatible with a forced air system supplied by furnaces and distributed electric domestic hot water makers.*

**5.5. Geothermal**

**Description:**

*Geothermal is not applicable in this building because of the heating and cooling system in place..*

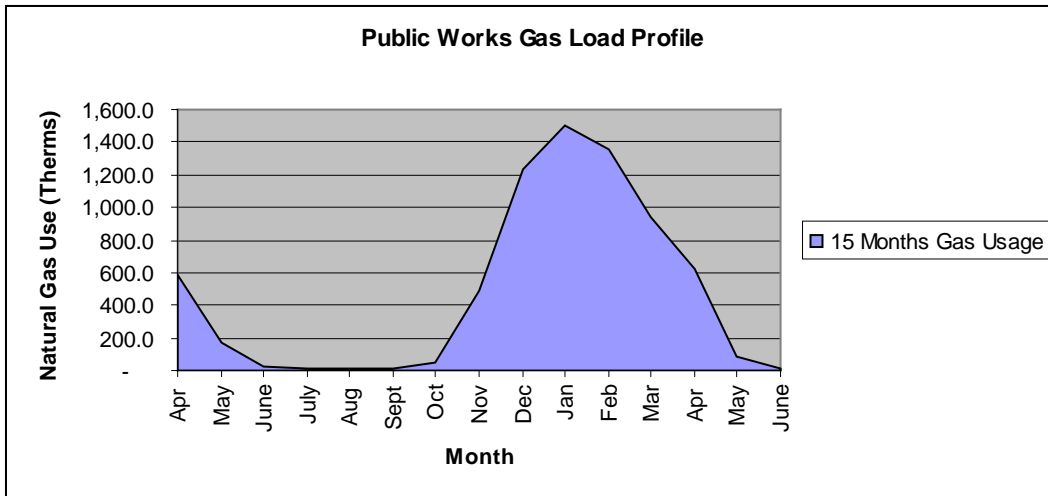
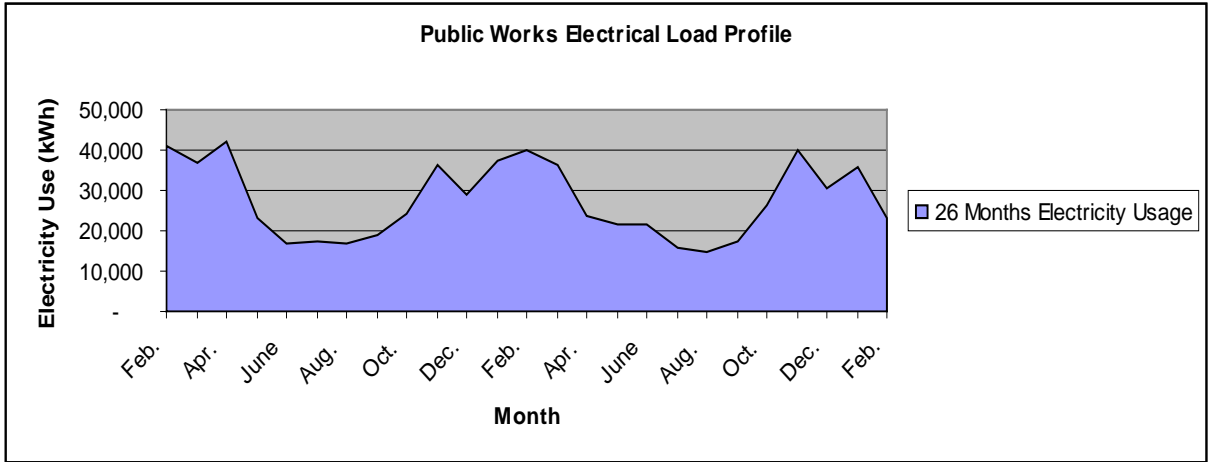
**5.6. Wind**

**Description:**

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

## 6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

### 6.1. Load profiles



### 6.2. Tariff analysis

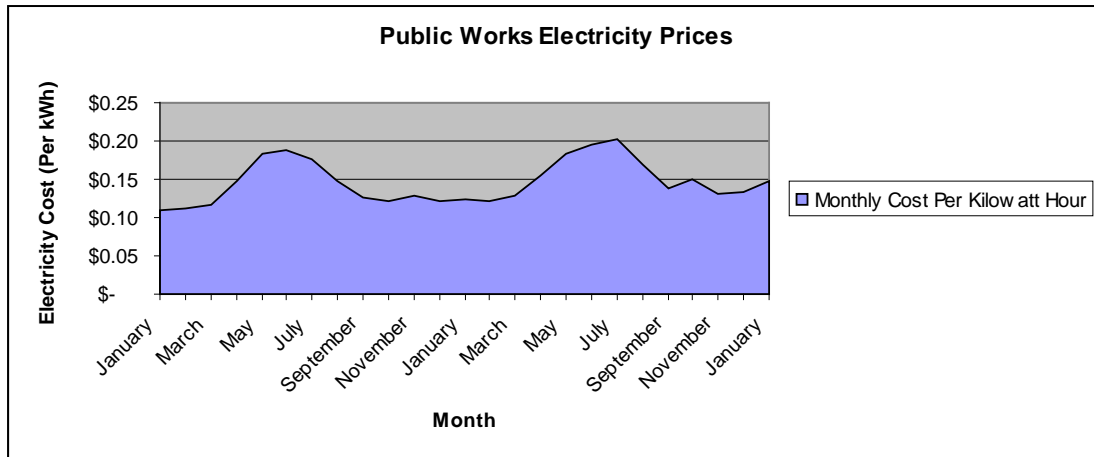
The Borough of Metuchen currently buys electricity and gas from PSE&G and Elizabethtown Gas respectively, on general service rates. The general service is a typical rate where customers pay for natural gas based on usage and for electricity based on consumption as well as peak electrical demand. The general service rate is the best option at this time.

### 6.3. Energy Procurement Strategies

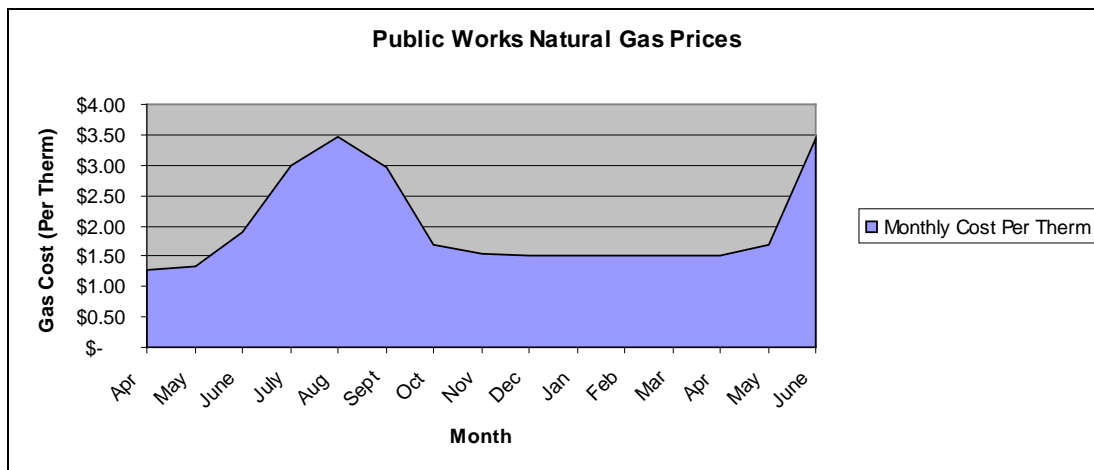
Bill analysis shows prices fluctuation of over 20% for both electricity and for natural gas over the course of September 2007 through April 2009.

The large spike in gas prices on the chart below is only reflecting the fixed service charge, which skews the price per therm when actual usage is very low.

Electric account



Natural Gas account



We recommend contacting the NJ Energy Choice program and deciding if a third party energy supplier for both the gas and the electricity would benefit the Borough. There is a list of area third party providers in Appendix C.

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



The building would not be eligible for enrolling in a Demand Response Program because electric demand does not exceed 50kW, which is a typical threshold for considering this option.

## 7. METHOD OF ANALYSIS

### 7.1. Assumptions and tools

Energy modeling tool: eQUEST V3.6

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

RS Means 2009 (Building Construction Cost Data)

RS Means 2009 (Mechanical Cost Data)

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

### 7.2. Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

***THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.***

***THIS DOCUMENT IS MEANT TO BE USED TO ANALYZE HOW THE BUILDING USES ENERGY AND HOW VARIOUS ENERGY CONSERVATION MEASURES MIGHT AFFECT FUTURE ENERGY AND OPERATING COSTS. IT IS NOT MEANT TO BE USED AS A DESIGN TOOL OR FOR EQUIPMENT SPECIFICATIONS.***

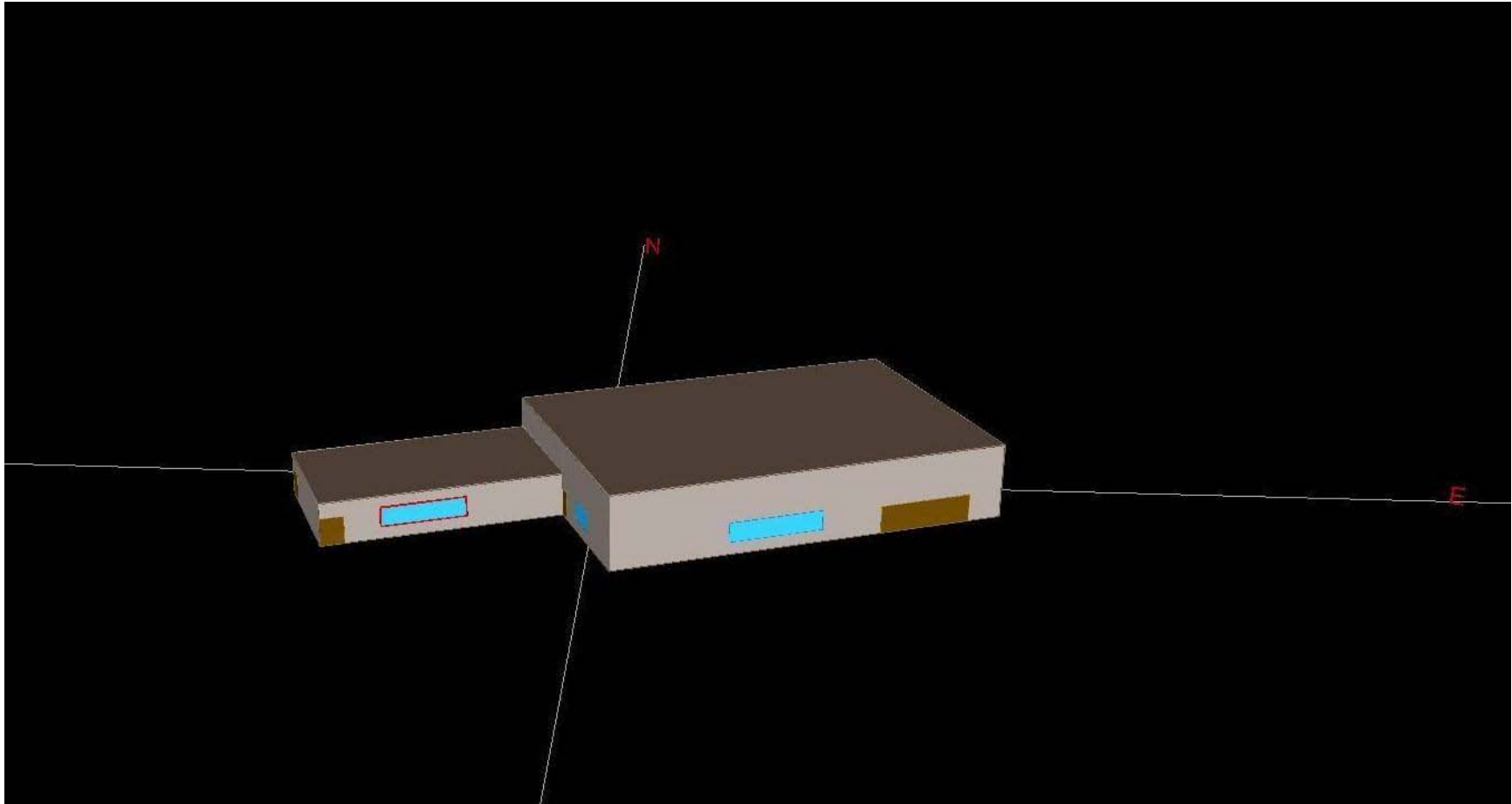
**Appendix A: Lighting study**

BOROUGH OF METUCHEN DEPARTMENT OF PUBLIC WORKS LIGHTING SURVEY											
Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?
1	Fred Office	25.5, 28.8, 30.5	2F96T12	M	2	2	80	9.5	3040	Manual	Yes
1	Fred Office		2F40T12	M	1	2	40	9.5	760	Manual	Yes
1	Fred Office		1CF17		2	1	17	9.5	323	Manual	No
1	Archive-Closet		4INC60	NA	1	4	60	3	720	Manual	No
1	Coat Closet		2CF13		1	2	13	1	26	3-Way	No
1	Bathroom		1F20T12	M	1	1	20	1	20	Manual	Yes
1	Main Entry Vestibule		3INC60	NA	1	3	60	9.5	1710	Manual	Yes
1	Main Entry Vestibule		1CF20		2	1	20	9.5	380	Manual	Yes
1	Admin Office	72	6F20T12	M	4	6	20	9.5	4560	Dimmer	Yes
1	Ladies Room	Off Scale	1F20T12	M	1	1	20	6	120	Manual	Yes
1	Hall		1INC65PR	NA	1	1	65	9.5	617.5	Manual	No
1	Office 2	56.2	2F34T12	M	2	2	34	9.5	1292	Manual	Yes
1	Office 2		6F20T12	M	1	6	20	9.5	1140	Manual	Yes
1	Office 3	27	2F96T12	M	2	2	80	9.5	3040	Manual	Yes
1	Super Office	50.8	2F96T12	M	2	2	80	9.5	3040	Manual	Yes
1	Bathroom		3INC60	NA	1	3	60	9.5	1710	Manual	No
1	Garage	14.9, 15.2, 16.8	2F96T12	M	10	2	80	9.5	15200	Manual	No
1	Garage	11.7	1MH150	NA	1	1	150	9.5	1425	Manual	No
1	Loft		2F40T12	M	4	2	40	6	1920	Manual	No
1	Room 2 (No Overhead)		2F96T12	M	8	2	80	9.5	12160	Manual	No
1	Room 2 (No Overhead)		2F40T12	M	3	2	40	9.5	2280	Manual	No
1	Room 2 (No Overhead)	12.3	1MH70	M	1	1	70	9.5	665	Manual	No
1	Tire Room	20.6	2F40T12	M	2	2	40	6	960	Manual	No
1	Lounge	4.3	2F96T12	M	1	2	80	9.5	1520	Manual	No
1	Lounge		2F40T12	M	2	2	40	9.5	1520	Manual	No
1	Bathroom		2F40T12	M	3	2	40	9.5	2280	Manual	No
2	Upper Bath		2F96T12	M	1	2	80	6	960	Manual	No

Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?
2	Upper Bath		2F32T8	E	2	2	32	6	768	Manual	No
2	Upper Bath		2F32T8	E	1	2	32	9.5	608	Ckt. Brkr.	No
2	Sign Room		2F96T12	M	4	2	80	6	3840	Manual	No
1	Mechanics		2F20T12	M	1	2	20	9.5	380	Ckt. Brkr.	No
1	Mechanics		2F40T12	M	2	2	40	9.5	1520	Ckt. Brkr.	No
1	Sign Making		2F40T12	M	3	2	40	9.5	2280	Ckt. Brkr.	No
1	Sign Making		2F96T12	M	1	2	80	9.5	1520	Ckt. Brkr.	No
1	John's Supply		2F32T8	E	1	2	32	9.5	608	Ckt. Brkr.	No
1	John's Supply		1CF17		2	1	17	9.5	323	Ckt. Brkr.	No
Exterior	Main Entry		1CF22		1	1	22	24	528	??	No
Exterior	Sides		1CF22		2	1	22	12	528	??	No
Exterior	Front Garage		1MH70	M	1	1	70	12	840	??	No

BOROUGH OF METUCHEN DEPARTMENT OF PUBLIC WORKS LIGHTING SURVEY														
Existing										Retrofit				
Floor	Location	Fixture Type	No. of Fixtures	No. of Lamps	Watts/Lamps	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	New Fixture	No. of Fixtures	Hrs/Day	Watts/Lamps	Energy Use
1	Bathroom Ladies Room	1F20T12	1	1	20	1	20	Manual	Yes	1F17T8	1	1	17	17
1	Hall	1F20T12	1	1	20	6	120	Manual	Yes	1F17T8	1	2	17	34
1	Hall	1INC65PR	1	1	65	9.5	617.5	Manual	No	1FC12T6	1	9.5	26	247
1	Garage	1MH150	1	1	150	9.5	1425	Manual	No	1MH90	1	9.5	90	855
1	Mechanics	2F20T12	1	2	20	9.5	380	Ckt. Brkr.	No	2F17T8	1	9.5	17	323
1	Office 2	2F34T12	2	2	34	9.5	1292	Manual	Yes	2F32T8	2	9.5	32	1216
1	Loft	2F40T12	4	2	40	6	1920	Manual	No	2F32T8	4	6	32	1536
1	Tire Room	2F40T12	2	2	40	6	960	Manual	No	2F32T8	2	6	32	768
1	Fred Office	2F40T12	1	2	40	9.5	760	Manual	Yes	2F32T8	1	9.5	32	608
1	Room 2	2F40T12	3	2	40	9.5	2280	Manual	No	2F32T8	3	9.5	32	1824
1	Lounge	2F40T12	2	2	40	9.5	1520	Manual	No	2F32T8	2	9.5	32	1216
1	Bathroom	2F40T12	3	2	40	9.5	2280	Manual	No	2F32T8	3	9.5	32	1824
1	Mechanics	2F40T12	2	2	40	9.5	1520	Ckt. Brkr.	No	2F32T8	2	9.5	32	1216
1	Signs	2F40T12	3	2	40	9.5	2280	Ckt. Brkr.	No	2F32T8	3	9.5	32	1824
2	Upper Bath	2F96T12	1	2	80	6	960	Manual	No	2F32T8	2	6	32	768
2	Sign Room	2F96T12	4	2	80	6	3840	Manual	No	2F32T8	8	6	32	3072
1	Fred Office	2F96T12	2	2	80	9.5	3040	Manual	Yes	2F32T8	4	9.5	32	2432
1	Office 3	2F96T12	2	2	80	9.5	3040	Manual	Yes	2F32T8	4	9.5	32	2432
1	Super	2F96T12	2	2	80	9.5	3040	Manual	Yes	2F32T8	4	9.5	32	2432
1	Garage	2F96T12	10	2	80	9.5	15200	Manual	No	2F32T8	20	9.5	32	12160
1	Room 2	2F96T12	8	2	80	9.5	12160	Manual	No	2F32T8	16	9.5	32	9728
1	Lounge	2F96T12	1	2	80	9.5	1520	Manual	No	2F32T8	2	9.5	32	1216
1	Signs	2F96T12	1	2	80	9.5	1520	Ckt. Brkr.	No	2F32T8	2	9.5	32	1216
1	Vestibule	3INC60	1	3	60	9.5	1710	Manual	Yes	3CF14	1	9.5	14	399
1	Bathroom	3INC60	1	3	60	9.5	1710	Manual	No	3CF14	1	9.5	14	399
1	Archive-	4INC60	1	4	60	3	720	Manual	No	4CF14	1	9.5	14	532
1	Admin	6F20T12	4	6	20	9.5	4560	Dimmer	Yes	6F17T8	4	9.5	17	3876
1	Office 2	6F20T12	1	6	20	9.5	1140	Manual	Yes	6F17T8	1	9.5	17	969

Appendix B: eQUEST model



**Annual Energy and Demand (pg 1 of 2)**

	Ann. Source Energy		Annual Site Energy		Lighting	HVAC Energy			Peak	
	Total Mbtu	EUI kBtu/sf/yr	Elect kWh	Nat Gas Therms	Electric kWh	Electric kWh	Nat Gas Therms	Total Mbtu	Elect kW	Cooling Tons
<b>Annual Energy USE or DEMAND</b>										
0 Base Design	4,048	427.36	325,859	7,113	38,187	103,297	7,113	1,064	108	23
1 0+High Efficiency Lighting	4,008	423.19	321,318	7,182	33,921	103,020	7,182	1,070	106	23
2 0+New Window on Office Section	4,041	426.67	325,089	7,126	38,187	102,526	7,126	1,062	108	23
3 0+New Furnaces 90% Efficiency	3,973	419.51	325,859	6,369	38,187	103,297	6,369	989	108	23

**Incremental SAVINGS** (values are relative to previous measure (% savings are relative to base case use), negative entries indicate increased use)

1 0+High Efficiency Lighting	40	4.17 (1%)	4,541 (1%)	-70 (-1%)	4,266 (11%)	276 (0%)	-70 (-1%)	-6 (-1%)	2 (2%)	0 (1%)
2 0+New Window on Office Section	7	0.70 (0%)	770 (0%)	-13 (-0%)	0 (0%)	770 (1%)	-13 (-0%)	1 (0%)	0 (0%)	0 (2%)
3 0+New Furnaces 90% Efficiency	74	7.85 (2%)	0 (0%)	744 (10%)	0 (0%)	0 (0%)	744 (10%)	74 (7%)	0 (0%)	0 (0%)

**Cumulative SAVINGS** (values (and % savings) are relative to the Base Case, negative entries indicate increased use)

1 0+High Efficiency Lighting	40	4.17 (1%)	4,541 (1%)	-70 (-1%)	4,266 (11%)	276 (0%)	-70 (-1%)	-6 (-1%)	2 (2%)	0 (1%)
2 0+New Window on Office Section	7	0.70 (0%)	770 (0%)	-13 (-0%)	0 (0%)	770 (1%)	-13 (-0%)	1 (0%)	0 (0%)	0 (2%)
3 0+New Furnaces 90% Efficiency	74	7.85 (2%)	0 (0%)	744 (10%)	0 (0%)	0 (0%)	744 (10%)	74 (7%)	0 (0%)	0 (0%)

**Annual Costs (pg 2 of 2)**

		Annual Utility Cost				Incentives		LCC	
		Electric kWh(\$)	Electric kW(\$)	Electric Total(\$)	Nat Gas Total(\$)	Total (\$)	Owner (\$)	Design Team (\$)	Total (PV\$)
<b>Annual COST</b>									
0	Base Design	\$ 46,891	--	\$ 46,891	\$ 10,690	\$ 57,581			\$ 375,192
1	0+High Efficiency Lighting	\$ 46,238	--	\$ 46,238	\$ 10,795	\$ 57,033			\$ 371,649
2	0+New Window on Office Section	\$ 46,780	--	\$ 46,780	\$ 10,710	\$ 57,490			\$ 374,604
3	0+New Furnaces 90% Efficiency	\$ 46,891	--	\$ 46,891	\$ 9,573	\$ 56,464			\$ 367,792
<b>Incremental SAVINGS (values are relative to previous measure (% savings are relative to base case cost), negative entries indicate increased cost)</b>									
1	0+High Efficiency Lighting	\$ 653	--	\$ 653	\$ -105	\$ 548			\$ 3,543
2	0+New Window on Office Section	\$ 111	--	\$ 111	\$ -20	\$ 91			\$ -2,955
3	0+New Furnaces 90% Efficiency	\$ 0	--	\$ 0	\$ 1,117	\$ 1,117			\$ 6,812
<b>Cumulative SAVINGS (values (and % savings) are relative to the Base Case, negative entries indicate increased cost)</b>									
1	0+High Efficiency Lighting	\$ 653	--	\$ 653	\$ -105	\$ 548			\$ 3,543
2	0+New Window on Office Section	\$ 111	--	\$ 111	\$ -20	\$ 91			\$ 588
3	0+New Furnaces 90% Efficiency	\$ 0	--	\$ 0	\$ 1,117	\$ 1,117			\$ 7,400

## Appendix C: Third Party Suppliers

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>
<b>BOC Energy Services, Inc.</b> 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 <a href="http://www.boc.com">www.boc.com</a>
<b>Commerce Energy, Inc.</b> 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 <a href="http://www.commerceenergy.com">www.commerceenergy.com</a>
<b>ConEdison Solutions</b> 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>
<b>Constellation NewEnergy, Inc.</b> 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 <a href="http://www.newenergy.com">www.newenergy.com</a>
<b>Credit Suisse, (USA) Inc.</b> 700 College Road East Princeton, NJ 08450	(212) 538-3124 <a href="http://www.creditsuisse.com">www.creditsuisse.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>FirstEnergy Solutions</b> 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 <a href="http://www.fes.com">www.fes.com</a>
<b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>



<b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 <a href="http://www.metroenergy.com">www.metroenergy.com</a>
<b>IntegrYS Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integrYSenergy.com">www.integrYSenergy.com</a>
<b>Liberty Power Delaware, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Liberty Power Holdings, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>Sempra Energy Solutions</b> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 <a href="http://www.sel.com">www.sel.com</a>
<b>Suez Energy Resources NA, Inc.</b> 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 <a href="http://www.suezenergyresources.com">www.suezenergyresources.com</a>
<b>UGI Energy Services, Inc.</b>	(856) 273-9995

704 East Main Street, Suite 1  
Moorestown, NJ 08057

[www.ugienergyservices.com](http://www.ugienergyservices.com)

<b>Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory</b>	<b>Telephone &amp; Web Site</b>
<b>Cooperative Industries</b> 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 <a href="http://www.cooperativenet.com">www.cooperativenet.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 <a href="http://www.gesc.com">www.gesc.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>
<b>Great Eastern Energy</b> 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 <a href="http://www.greateastern.com">www.greateastern.com</a>
<b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>Intelligent Energy</b> 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 <a href="http://www.intelligentenergy.org">www.intelligentenergy.org</a>
<b>Metromedia Energy, Inc.</b>	(877) 750-7046

6 Industrial Way Eatontown, NJ 07724	<a href="http://www.metromediaenergy.com">www.metromediaenergy.com</a>
<b>MxEnergy, Inc.</b> 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 <a href="http://www.mxenergy.com">www.mxenergy.com</a>
<b>NATGASCO (Mitchell Supreme)</b> 532 Freeman Street Orange, NJ 07050	(800) 840-4427 <a href="http://www.natgasco.com">www.natgasco.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Woodruff Energy</b> 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 <a href="http://www.woodruffenergy.com">www.woodruffenergy.com</a>