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Local Government Energy Program
Energy Audit Final Report

For
Borough of Metuchen
Senior Center
Metuchen, NJ 08840

Project Number: LGEA18

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INTRODUCTION

On July 29th, 30th and 31st of 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 Metuchen Senior Center at 15 Center Street.

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 Senior Center, located at 15 Center Street, was built in 1994. It is a two story building with an unfinished second floor. The building is a concrete block structure. There are approximately 4,400 square feet of conditioned floor area.

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 Senior Center located at 15 Center Street, Metuchen, NJ 08840. The Senior Center has two above ground levels, the second floor being unfinished. There is an unconditioned attic space.

Based on the inspections performed by Steven Winter Associates (SWA) staff on July 16th 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 25 months for which we have electrical data - from February, 2007 through February 2009 - the Senior Center consumed approximately 120,180 kilowatt hours (kWh) of electricity at a cost of about $21,122. For the 15 month period for which we have natural gas data - from April 2008 until June 2009, the building used 4,796 therms of natural gas at a cost of $7,265.

For the 12-month period for which we have overlapping electrical and gas data, from April, 2008 to March 2009, the building used **77,010** kWh of electricity costing $13,509 at an average price of $0.175 per kWh and **4,185.4** therms of natural gas costing $6,300 at $1.505 per therm. The combined energy use of both sources was 681 MMBtu at a cost of $19,809

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 148 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. Portfolio Manager did not provide a rating score because it does not rate buildings with conditioned floor space of less than 5,000 square feet. The senior citizen center contains 4,400 square feet.

SWA recommends a total of five Energy Conservation Measures (ECMs) for Senior Center. The total investment cost for these ECMs is $**66,640.** The total investment cost for these ECMs if maximum incentives are achieved is about **$55,301.** SWA estimates a first year savings of **$9,126** with a simple payback of **7.3 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. These incentives 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. There are also custom electric and gas incentives based on estimated savings that are calculated on a project by project basis. The total investment cost if all the incentives are attained at their maximum amount is $55,301.

The following table summarizes the proposed Energy Conservation Measures.

SCOPE OF WORK – SUMMARY TABLE

Metuchen Senior Center Energy Conservation Measures Scope of Work

		Installed Cost		1st year energy savings					SPP	LoM		
ECM#	ECM description	Estimated $	Source	usage	unit	demand	unit	$ savings			lifecycle savings	Averaged ROI
1	High Efficiency Lighting	$ 7,840	Contractor	10,386	kWh	1.3	kW	$ 1,662	4.7	12	$16,541	9.2%
2	Lighting Controls w/ Daylight Harvest	$ 2,000	Online	2,330	kWh	0.27	kW	$ 408	4.9	12	$4,061	8.6%
3	New Cooling Condensing Unit	$ 11,000	Online	6,154	kWh	0.73	kW	$ 1,077	10.2	15	$12,857	1.1%
4	Demand Controlled Ventilation	$ 10,800	Estimate	84.7	MMBtu	0.4	kW	$ 2,474	4.4	12	$24,626	10.7%
5	5 KW Solar Photovoltaic System	$ 35,000	Similar	5,915	kWh	5	kW	$ 3,505	10.0	15	$41,842	1.3%
Total		$ 66,640						$ 9,126	7.3	12	$90,838	3.0%

Definitions:
SPP: Simple Payback
LoM: Life of Measure
ROI: Return On Investment

Assumptions:

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

1. HISTORIC ENERGY CONSUMPTION

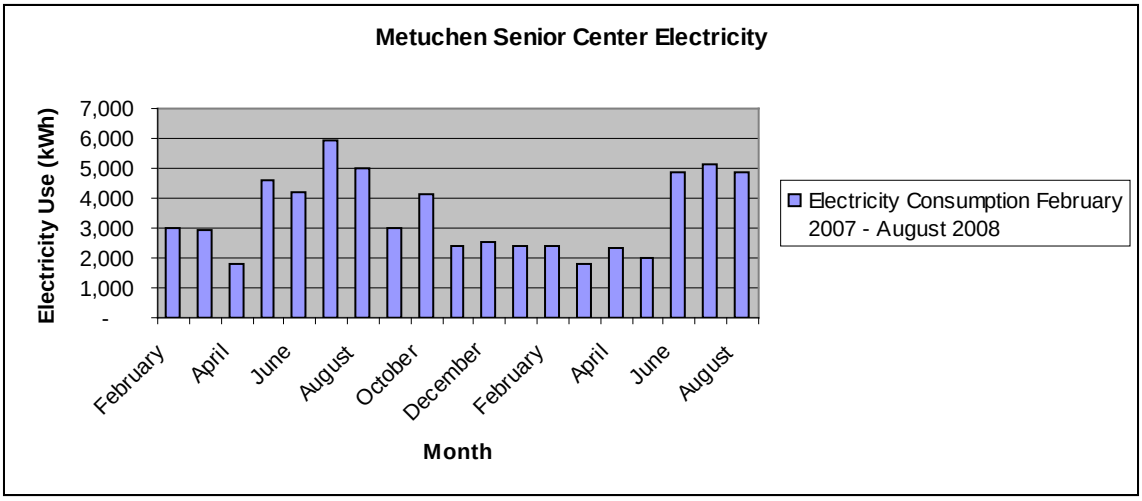
1.1. Energy usage and cost analysis

SWA analyzed utility bills provided by PSE&G and Elizabethtown Gas that showed consumption and cost for a 12-month period for which we have data for both services.

Electricity – The Borough purchases electricity from Public Service Electric and Gas Co. (PSE&G) at **an average aggregated rate of $0.175 per kWh for the Senior Center in 2008-2009.** The Senior Center used **77,010 kWh at a cost of $13,510.** The data also reflected highest peak demand of 26.1 kW and average peak demand of 18.1 kW.

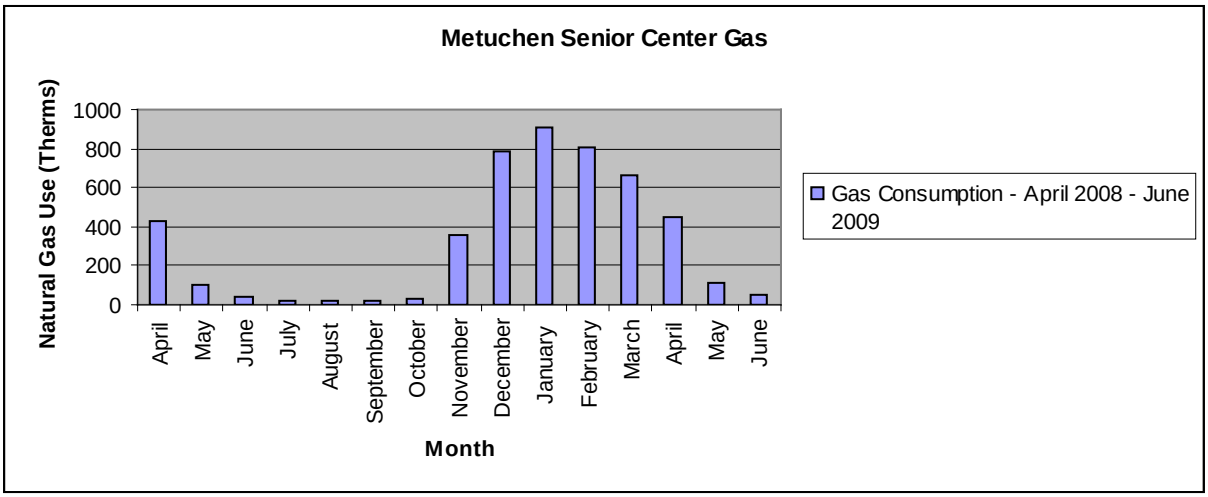
Natural Gas – The Senior Center uses natural gas purchased from Elizabethtown Gas. **The average aggregated rate for natural gas in 2008-2009 was $1.505 per therm**. The building used **4,185.4 therms of gas costing $6,301.**

The following chart shows electricity usage for the Senior Center based on utility bills for April 2007 through February of 2009.



In the above chart, the electricity spikes during the summer months reflect the cooling load as expected.

The following chart shows the natural gas usage for the Senior Center based on utility bills for the April 2008 through June 2009.



In the above chart, the natural gas usage follows a heating trend as expected with almost 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 Senior Center uses Account #51 089 123 15 at service address 15 Center Street, Metuchen, NJ 08840. Natural Gas service is provided by Elizabethtown Gas, account number 1963270681. Electricity was billed at an average aggregated rate of **$0.175/kWh** and natural gas was billed at an average aggregated rate of **$1.51/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. No rating score was given as Portfolio Manager does not rate buildings with less than 5,000 square feet of conditioned floor space.

Per the LGEA program requirements, SWA has assisted the Township of Metuchen to create an *Energy Star Portfolio Manager* account and share the Metuchen Senior Center 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"

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Metuchen - Senior Citizen Center

Building ID: 1810776
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 13, 2009

Facility
Borough of Metuchen - Senior Citizen Center
15 Center Street
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: 1994
Gross Floor Area (ft²): 4,400

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	261,872
Natural Gas (kBtu)[4]	387,780
Total Energy (kBtu)	649,652

Energy Intensity[5]

Site (kBtu/ft²/yr)	148
Source (kBtu/ft²/yr)	291

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	61

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

National Average Comparison

National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	60%
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.

Certifying Professional
Alan Tabachnikov
50 Washington Street
Norwalk, CT 07461

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Metuchen Senior Center was built in 1994. It is a slab-on-grade, two-story building with an unfinished second floor and an unconditioned attic. There is approximately 4,400 square feet of conditioned floor space.

2.2. Building occupancy profiles

There is only 1 full time employee at the Senior Center. As a community gathering center, however, occupancy can grow to upwards of 50 people on some occasions. When the SWA building performance analyst arrived at the building, there were 14 people there. When he left that afternoon, there were only 3 people. As such, it is difficult to estimate an average occupancy.

2.3. Building Envelope

2.3.1. Exterior walls

The exterior walls of the Senior Center are comprised of structural eight-inch concrete block with a decorative design finish. The interior of the perimeter walls are comprised of steel studs, a specified R-13 fiberglass insulation and a painted drywall finish. Although R-19 is currently the standard for exterior walls, adding wall insulation is expensive and is not recommended as a cost-effective option.

2.3.2. Roof

The roof of Senior Center is a pitched modified hip roof comprised of wood trussed rafters / ceiling joists with 5/8 inch sheathing and composite shingles with specified R-30 fiberglass batt insulation. While R-38 ceiling / attic insulation is today's standard, adding insulation is not recommended as it would not be cost-effective.

2.3.3. Base

The building's base is 5-inch concrete slab-on-grade. The slab is tapered at the front entry to provide wheelchair accessibility. There were no reported problems with water penetration or moisture. There are two inches of rigid board insulation extending to two feet below the slab on the interior of the foundation walls and two inches of rigid board insulation under the slab extending to two feet from the foundation wall interior. This is one of the accepted standards for slab / perimeter insulation. SWA is not recommending any improvements.

2.3.4. Windows

The windows are aluminum frame (with thermal isolation); double pane glazing with 3/4-inch argon filled with a butyl tape spacer and a low emissivity coating. The operable parts of the windows are casement type. The windows are for the most part state of the art and SWA has no recommendations other than a best practice procedure of regularly inspecting the window weather-stripping and replacing or repairing any missing or failing portions.

2.3.5. Exterior doors

The exterior doors themselves are high quality doors but the weather-stripping is completely deteriorated on the front entry and vestibule doors. Large spaces between the interior and exterior are allowing unfettered infiltration of unconditioned air and heat transfer to the outside in winter and heat gain to the interior in summer. There is no weather-stripping at all around the insulated steel egress door at the bottom of the back stairs. The exterior door from the kitchen area is in very good condition. Exterior doors can be a major source of heat loss and infiltration and should be inspected regularly and any missing or failed weather-stripping should be repaired or replaced. This should be done as soon as possible. The photographs below show the extent of the problem.

Daylight can be seen between the two main entry doors

2.3.6. Building air tightness

Based upon a visual inspection, the building envelope appears to be fairly well sealed except for the aforementioned exterior doors.

2.4. HVAC systems

2.4.1. Heating

Heat for the Senior Center is provided by one Reznor hot air furnace installed in the air handling unit in the second floor mechanical room. Warm air is distributed through insulated ducts to ceiling registers throughout the first and second floors.

2.4.2. Cooling

The cooling equipment serving the Senior Center is a York Model H1CE180, 15 ton split system air conditioning unit and a York Model L2EU240AA air handler in the attic. The condensing unit has an Energy Efficiency Ratio (EER) of 8.2 (Btus per watt). This is not very efficient for a cooling system of this size. The air handler is an integral part of an air conditioner system. The air handler contains a blower, air filters and directs expansion evaporative cooling (DX) coils.

2.4.3. Ventilation

Fresh air is distributed by the air handling equipment.

ASHRAE Standard 62.1 identifies the outdoor air ventilation required for indoor air quality. Almost all municipal, state and federal jurisdictions use these guidelines as gospel in their building codes and bylaws. The traditional method of accomplishing the ventilation rates was to set the outdoor air quantity to maximum design occupancy. This can result in a tremendous waste of energy when the occupant load is not at maximum –almost always the situation in a type of building use like a senior center - or intermittent use of the space. Carbon dioxide monitoring and control is an acceptable method of reducing ventilation rates when occupancy is below the design load. This ensures ASHRAE standards are being met and only expending the necessary amount of energy.

Demand controlled ventilation can also increase the efficient use of the cooling system as cooling comfort is based not only on the temperature of a space, but the humidity level of that space. With less humid outside air being constantly drawn into the space, the space will be more comfortable at a higher temperature.

SWA recommends installation of CO2 based demand controlled ventilation (DCV). Currently, the air conditioning unit for the senior citizen center provides minimum outside air based on maximum occupancy. The proposed measure recommends addition of CO2 sensors for outside air and return air and demand controlled ventilation logic for the control system. The logic will compare the CO2 of the outside air with the CO2 of the return air and modulate the outside air damper to maintain the set point. This strategy results in energy savings because it reduces the amount of air that needs to be conditioned as well as the fan energy used to move that air.

2.5. Domestic Hot Water

Domestic Hot Water for the Senior Center is provided by one General Electric Model SG40T12AVG00 natural gas-fired combination 40,000 Btuh water heater with 40 gallon storage tank.

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 comprised of older technology T12 fixtures that contain magnetic ballasts, which are far less efficient than the newer electronic ballasts.

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

The Senior Center uses almost exclusively linear fluorescents.

The lighting for the Senior Center is generally operating for approximately the 35 hours a week that the building is open to the public.

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.

SWA recommends retrofitting or replacing the existing magnetic ballast, T12 lamp fixtures with fixtures equipped with electronic ballasts and T8 lamps. The exit lights should be replaced with LED fixtures.

SWA is also recommending installation of sensors to "harvest" daylight – automatically dimming or turning off the lights and allowing natural daylight to maintain the lighting levels to a predetermined set point, and increasing the electric lighting as the daylight wanes.

Refer to Appendix A for a table detailing the survey of the existing lighting and a separate table of the recommended improvement.

2.6.2 Appliances and process

SWA performed a basic survey of appliances installed at the Senior Center and it would not be cost effective to replace any appliances at this time. Look for the Energy Star label when replacing 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.

2.6.3 Elevators

There are no elevators in the Senior Center building.

2.6.4 Other Electrical Systems

While there are no other major electrical systems in use at the senior center, there is an electric kiln used in the pottery classes. It is a Model LT-3K electric kiln from Our Clay House, Inc. If possible, the kiln should not be used on very hot days in the afternoon as this is the time when properties register their highest peak load demand for the month and this kiln with a heavy power draw of 48 amps could cause the monthly peak demand to rise and incur additional demand charges from the power company.

3. EQUIPMENT LIST

Senior Center							
Building System	**Description**	**Physical Location**	**Make / Model / Serial**	**Fuel**	**Space served**	**Date Installed**	**Estimated Remaining useful life %**
Cooling	Condensing unit CU-1;15 HP compressor	Outside South of Bldg	York / M#H1CE180A25B / S#NHCM072265	electric	All Areas	1994	10%
Heating	Reznor Furnace;300,000 BTUH In, 231,000 BTUH Out, 77% Eff.	Attic	Reznor / M#X300-X-C / S#ATTF66J83535254	Natural gas	AHU-1	1994	10%
Heating/ cooling	Air handling unit AHU-1, R-22;	Attic	York / M#L2EU240AA / S#NHCS023258	electric	All Areas	1994	10%
Domestic Hot water heater	One (1) domestic hot water heater;Input capacity: 40,000 BTUH, Storage capacity: 40 gal	Attic	GE / M#SG40T12AVG00 / S#GELN1208531691	Natural gas	Bathrooms/ Kitchen	2008	80%
Domestic Hot water heater	One (1) domestic hot water heater;86 Gallons, 140,000 BTUH	1st Fl. Janitor Closet next to kitchen	AO Smith tank, Honeywell Burner / M#BTP139960	Natural gas	Kitchen	1998	20%

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

N/A

Category II Recommendations: Operations and Maintenance

- Weather Stripping/Air Sealing – As a best practice, exterior/overhead doors and vestibule doors 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 – All heat water, steam and DHW pipes should be inspected and any missing or deteriorated insulation should be replaced with new.
- 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.
- 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
2	Lighting Controls w/Daylight Harvest
3	New High Efficiency Condensing Unit
4	Demand Controlled Ventilation
5	Install 5kW Solar Photovoltaic System

ECM #1: *High Efficiency Lighting Retrofit*

Description:

The lighting at the newer section of the Library is mostly 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.

Installation cost:
Estimated cost: $ 7,840

Source of cost estimate: Lighting Contractors

Economics:

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated $	Source	usage	unit	demand	unit	$ savings				
$ 7,840	Contractor	10,386	kWh			$ 1,662	4.7	12	$16,544	9.3%

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 $1,560 total incentives.

ECM #2: *Lighting Controls with Daylight Harvesting*

Description:

The Senior Center has very good access to daylight and can benefit from controls that "harvest" daylight by automatically dimming or turning electric lights off by means of photocell sensors when there is sufficient daylight to keep lighting levels in a given room at a predetermined set point and increasing the electric lighting as daylight wanes.

Installation cost:

Estimated cost: $ 2,000

Source of cost estimate: Online

Economics:

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated $	Source	usage	unit	demand	unit	$ savings				
$ 2,000	Online	2,330	kWh			$ 408	4.9	12	$4,061	8.6%

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

Assumptions: SWA estimated the cost of implementing the measure based on online cost estimates and standard labor costs. The savings estimates were based on online savings calculators.

Rebates/financial incentives:

Incentives are available through the New Jersey Clean Energy SmartBuilding Program for daylight harvesting controls based on the number of fixtures controlled. If this recommendation is implemented, the measure should qualify for about $1,000.

ECM #3: New High Efficiency Condensing Unit

Description:

The cooling system at the Senior Center has a rated efficiency of only 8.2 (Btus/Watt). New technologies in cooling can deliver efficiencies of upwards of 11 EER. The condensing unit (the outside part of "split-system" cooling systems) should be replaced with a new high efficiency component. If the air handling unit (the inside component) is compatible with the new condensing unit, it can be retained.

Installation cost:
Estimated cost: $ 11,000

Source of cost estimate: Contractor

Economics:

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated $	Source	usage	unit	demand	unit	$ savings				
$ 11,000	RS Means	6,154	Therms			$ 1,077	10.2	15	$12,857	1.1%

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

Assumptions: SWA estimated the cost of implementing the measure based on online cost estimates and standard labor costs. The savings estimates were based on the increased EER for the recommended component.

Rebates/financial incentives:

Incentives are available through the New Jersey Clean Energy SmartBuilding Program for split system cooling. If this recommendation is implemented, the measure should qualify for about $1,380.

ECM #4: *Demand Controlled Ventilation*

Description:

Building codes require that a minimum amount of fresh air be provided to ensure adequate air quality. To comply, ventilation systems often operate at a fixed rate based on an assumed occupancy (e.g., 15 cfm per person multiplied by the maximum design occupancy). The result is there often is much more fresh air coming into buildings than is necessary, especially in buildings with an occupancy that can be well below maximum for extended periods of time, like community centers. That air must be conditioned, resulting in higher energy consumption and costs than is necessary with appropriate ventilation. In humid climates, excess ventilation also can result in uncomfortable humidity and mold and mildew growth, making the indoor air quality (IAQ) worse rather than better.

Demand-controlled ventilation (DCV) using carbon dioxide (CO_2) sensing is a combination of two technologies: CO_2 sensors that monitor CO_2 levels in the air inside a building, and an air-handling system that uses data from the sensors to regulate the amount of ventilation air admitted.

Installation cost:
Estimated cost: $10,800

Source of cost estimate: Federal Energy Management Program "Demand-Controlled Ventilation Using CO_2 Sensors"; AirTest Energy Analysis Program for CO_2 based demand controlled ventilation.

Economics:

Installed Cost		1st year energy savings					SPP	LoM	Lifecycle Savings	ROI
Estimated $	Source	usage	unit	demand	unit	$ savings				
$ 10,800	AirTest	84.7	MMBtu			$ 2,474	4.4	12	$24,626	10.7%

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

Assumptions: SWA estimated the cost and savings of the measure based on the AirTest Energy Analysis Program for CO_2 based demand controlled ventilation. There are certain assumptions made within the program that are detailed in program calculations available as a separate document.

Rebates/financial incentives:

While there are no prescriptive incentives for demand controlled ventilation 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 gas savings available from the SmartStart Commercial Building Incentive Program. Applications for the custom electric and gas incentives are included in the Appendix B of this document.

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

Please 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 #5: ***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 Borough. 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 mount of electrical power that the property requires at any given time to satisfy the building's 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. There may be just enough room on the roof surface at the parking lot side of the building.

Installation cost:

Estimated material cost:	$35,000
Rebate@$1 per watt:	$ 5,000
Total installed cost:	**$30,000**

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:

Solar photovoltaic systems qualify for an incentive of $1,000 per kilowatt. The recommended system should qualify for a $5,000 incentive from NJ Clean Energy Program.

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. Combined Heat and Power

Description:

SWA analyzed the feasibility of installing a combined heat and power system (also know as co-generation) for the Borough of Metuchen Senior Center but believes that the expense of this type of system makes it economically unfeasible at this time.

5.4. Geothermal

Description:

Geothermal is not applicable for the Municipal building because it would not be cost effective to change to a geothermal system.

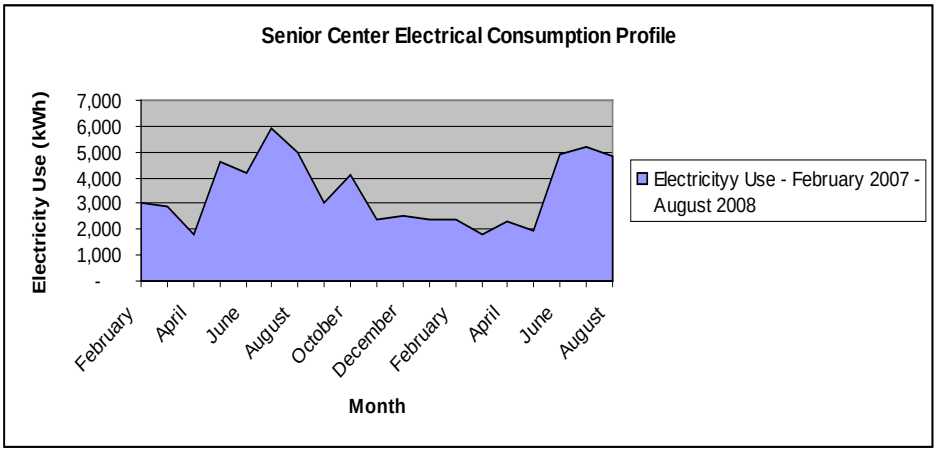
5.5. Wind

Description:

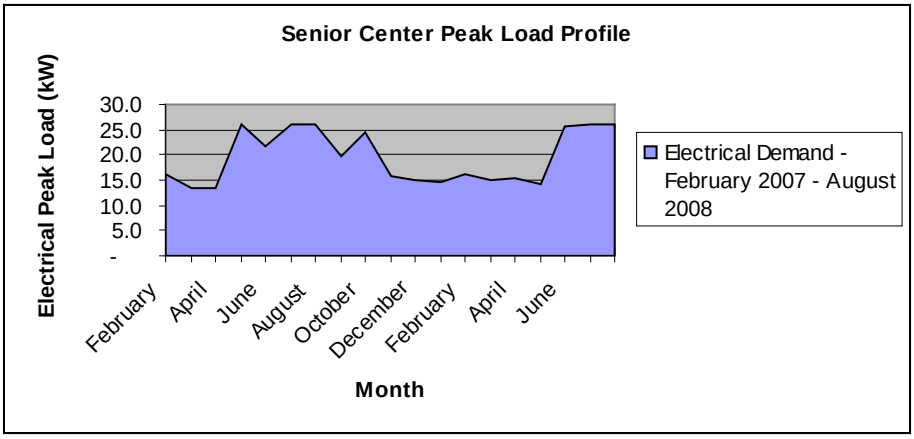
Wind power production is not appropriate for this location, because required land is not available for the wind turbine. Also available wind energy resource is very low.

6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

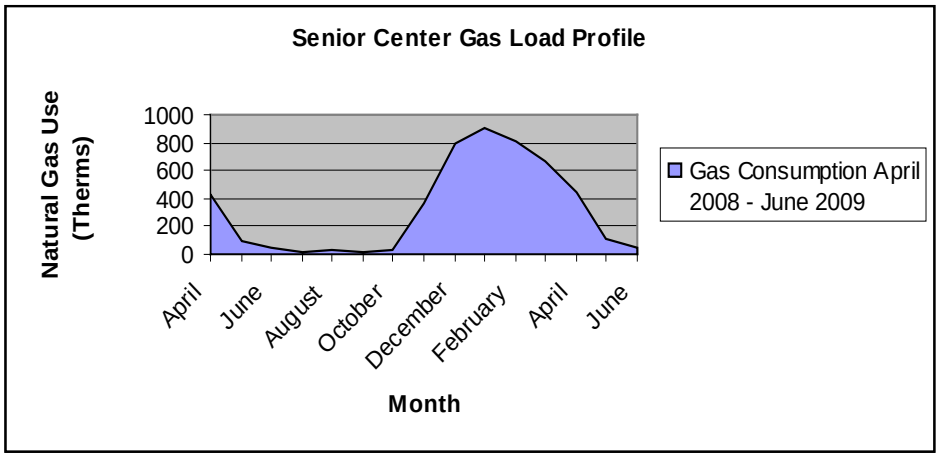
6.1. Load profiles



Electrical Consumption Profile



Electrical Monthly Peak Load Profile



Natural Gas Load Profile

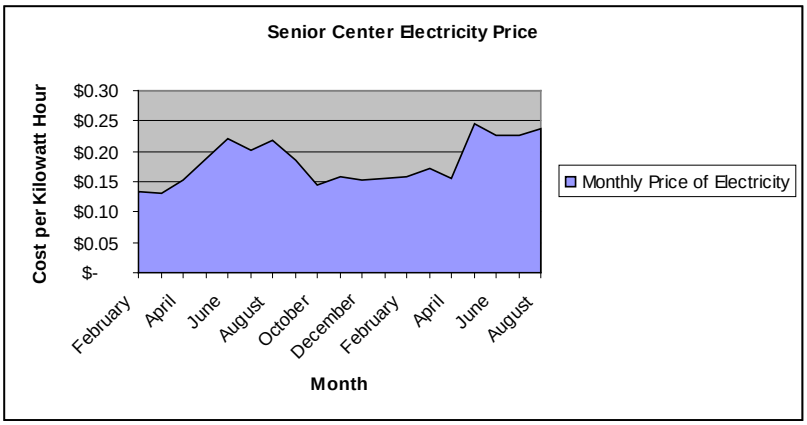
6.2. Tariff analysis

The Borough of Metuchen currently buys electricity and gas from Public Service Gas and Electric 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.

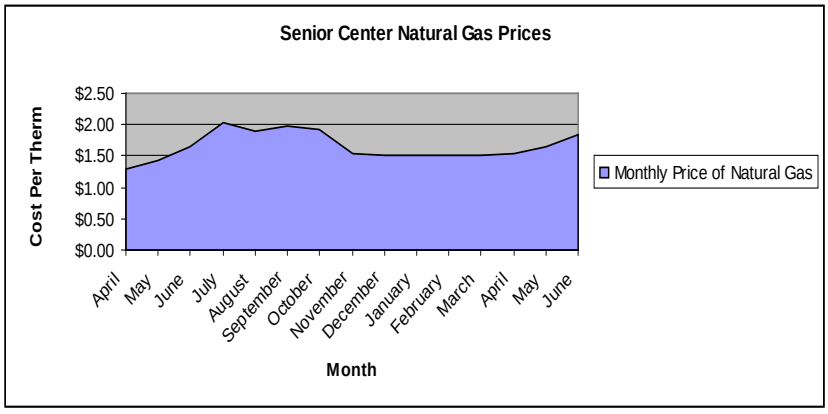
6.3. Energy Procurement Strategies

Bill analysis shows prices fluctuation of over 20% for both electricity and for natural gas over the course of the periods for which data was provided.

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.

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 reduction would 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; Energy Savings Industry Calculators
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 Survey

BOROUGH OF METUCHEN SENIOR CENTER LIGHTING 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	Main Entry Vestibule	18	1CF17		2	1	17	8	272	Manual	Yes
1	Exit		1F7		6	1	7	24	1008	Manual	No
1	Library and Coffee Area	78	4F34T12	M	3	4	34	8	3264	Manual	Yes‼
1	Large Dance w/ Piano	7, no lites;42; 93	4F34T12	M	18	4	34	8	19584	Manual	Yes
1	Kitchen	45; 200 at ext. door	4F34T12	M	4	4	34	6	3264	Manual	Yes
1	Men's Room	8.5; 37 at sink	1CF17		9	1	17	9	1377	Manual	No
1	Women's Room	Rec. Reflector	1CF17		9	1	17	9	1377	Manual	No
1	Pool / Card Room	32-50	4F34T12	M	3	4	34	8	3264	Manual	No
1	Classroom	45, 100 at ext. doors	4F34T12	M	8	4	34	8	8704	Manual	Yes
1	Office 1	71	4F34T12	M	2	4	34	8	2176	Manual	Yes
1	Office 2	182	4F34T12	M					0	Manual	Yes‼
2	Unfinished		1F96T12	M	7	1	80	1	560	Manual	No
1	Mechanical Room		1F96T12	M	3	1	80	1	240	Manual	No
1,2	Stairw ell		2F40 T12	M	4	2	40	12	3840	Manual	No

Lighting Improvement Recommendations

BOROUGH OF METUCHEN SENIOR CENTER LIGHTING LIGHTING SURVEY - RECOMMENDATIONS												
Existing								Retrofit				
Floor	Location in Building	Fixture Type	No. of Fixtures	No. of Lamps	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	New Fixture	No. of Fixtures	Hrs/Day	Watts/Lamp	Energy Use
1	Exit	1F7??	6	1	7	24	1008	LED	6	24	1	144
2	Unfinished	1F96T12	7	1	80	1	560	1F96T8TL835	7	1	59	413
1	Reznor Room	1F96T12	3	1	80	1	240	1F96T8TL835	3	1	59	177
1,2	Stairwell	2F40 T12	4	2	40	12	3840	2F28T8	4	12	28	2688
1	Kitchen	4F34T12	4	4	34	6	3264	4F28T8	4	6	28	2688
1	Library and Coffee Area	4F34T12	3	4	34	8	3264	4F28T8	3	6	28	2016
1	Large Dance w/ Piano	4F34T12	18	4	34	8	19584	4F28T8	18	8	28	16128
1	Pool / Card Room	4F34T12	3	4	34	8	3264	4F28T8	3	8	28	2688
1	Classroom	4F34T12	8	4	34	8	8704	4F28T8	8	8	28	7168
1	Office 1	4F34T12	2	4	34	8	2176	4F28T8	2	8	28	1792
1	Office 2	4F34T12	2	4	34	8	2176	4F28T8	2	8	28	1792

Appendix B: Third Party Suppliers

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

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

704 East Main Street, Suite 1 Moorestown, NJ 08057	www.ugienergyservices.com

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

Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com