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April 16, 2009

Local Government Energy Program
Energy Audit Report
FINAL

City of Rahway
Recreation Center
Rahway, NJ 07065

Project Number: LGEA10

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INTRODUCTION

On August 11th, 12th and 13th of 2009, Steven Winter Associates, Inc. (SWA) performed an energy audit and conditions assessment of the City of Rahway buildings. The audit included a review of the:

- City Hall
- Recreation Center
- Arts Guild
- Senior Center
- Senior Center Annex
- Main Street Firehouse
- Auxiliary (Maple Avenue) Firehouse
- Department of Public Works

The buildings are located in Union County, NJ. This assessment was conducted under the New Jersey Clean Energy Local Government Energy Audit Program. A separate report will be prepared and submitted for each of the buildings assessed. This document applies only to the Rahway Recreation Center at 275 East Milton Avenue.

The Recreation Center is a one story slab on grade concrete and brick structure with approximately 34,000 square feet of conditioned floor space built in 1999. Existing conditions and energy-related information, in addition to copies of past utility bills, were collected in order to analyze the building.

Existing conditions and energy-related information, in addition to copies of past utility bills, were collected in order to analyze and facilitate the implementation of energy conservation measures for the building. The goal of this energy audit is to provide sufficient information to the City of Rahway to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building. SWA also completed the Carbon Footprint Assessment for the Arts Guild building which is presented in Appendix D. SWA provides a separate addendum to this report to the City of Rahway called "Guidelines for Operating Existing Buildings "according to the Leadership in Energy and Environmental Design (LEED) program instituted by USGBC.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program subsidizes 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be subsidized by the program. The Board of Public Utilities (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

The document contains the energy audit report and conditions assessment report for the City of Rahway Recreation Center located at 275 East Milton Avenue, Rahway, NJ 07065. The Recreation Center was built in 1999 and contains approximately 34,000 square feet of conditioned space.

Based on the inspections performed by Steven Winter Associates (SWA) staff from August 11th through August 13th, 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 recommendations. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling and electric usage.

From March 2008 to February 2009, the Recreation Center building consumed 404,320 kilowatt hours (kWh) of electricity at a cost of $64,966 and 11,908 therms of natural gas at a total cost of approximately $18,626. Combined energy consumption (electricity and gas) for that period was 2,570 million Btu (MMBtu) at a total 12-month cost of $83,591.

SWA has entered energy information about the Recreation Center in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The building was ineligible to receive an Energy Star performance rating since the building is a multi-use building and the tool does not provide a rating for multi-use buildings. SWA encourages the City of Rahway to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time to review the building performance. SWA also completed the Carbon Footprint Assessment for the Arts Guild building which is presented in Appendix D.

The Site Energy Use Intensity is 76 kBtu/ft^{2}yr compared to the national average of recreation centers consuming 65 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 27.0 kBtu/ft^{2}yr, which when implemented would make the building energy consumption better than the national average consumption for recreation type buildings.

Based on the assessment of the Recreation Center building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Install Air Conditioning in the Gymnasium

Category II Recommendations: Operations and Maintenance

- Insulate boiler room and basement level piping
- Maintain roofs
- Maintain downspouts
- Provide weather stripping / air sealing
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances
- Use smart power electric strips

Category III Recommendations: Energy Conservation Measures - Upgrades with associated energy savings

At this time, SWA highly recommends a total of 5 Energy Conservation Measures (ECMs) for the Recreation Center building that are summarized in Table 1. The total investment cost for these ECMs with incentives is **$57,099**. SWA estimates a first year savings of **$38,495** with a simple payback of 1.4 **years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Recreation Center building by **192,498 lbs of CO_2**, which is equivalent to removing approximately 16 cars from the roads each year or avoiding the need of 469 trees to absorb the annual CO_2 generated. SWA also recommends 2 ECMs with a total first year savings of **$44,083** that is summarized in Table 2. Because the building and equipment is relatively new, SWA did not find any End of Life Cycle Energy Conservation Measures that could be applicable.

The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Recreation Center building annual utility costs are $4,317 higher for electric and $169 higher for natural gas for a total of $4,486 higher, when compared to the average estimated NJ commercial utility rates; potential savings from smart energy procurement could yield even better results.

There are various incentives the City of Rahway could apply for that would help lower the cost of installing the ECMs; these incentives are built in the savings shown in the tables that follow. More details can be found in Appendix C. SWA recommends that the City of Rahway apply 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. SWA also recommends that the City of Rahway apply for the NJ Direct Install program for measures recommended in Section four by contacting the following contractor in Union County:

Tri-State Light & Energy, Inc.
Direct Install Administrator
Phone: 610-789-1900
Email: NJDirectInstall@TSLE.com

Currently, the New Jersey Office of Clean Energy offers a Renewable Energy Incentive that would pay $50,000 for the installation of a 50kW 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. Renewable energy measures require application approval and negotiations with the utility and proof of performance. There is also a utility-sponsored loan program through PSE&G that would allow the building to pay for the installation of a PV system through a loan issued by PSE&G. The City of Rahway should check with PSE&G if they offer similar rebates and help for renewable energy measures.

The following tables summarize the proposed Energy Conservation Measures (ECMs) and their economic relevance. In order to clearly present the overall energy opportunities for the building and ease the decision and choice of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight or potential overlaps between some of the summarized ECMs (i.e. lighting change influence on heating / cooling.

The following three tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2.1	95 New T5 fixtures to be installed with incentives	RS Means, lit search	20,455	1,520	18,935	102,220	21.3	N/A	10.3	11,409	27,866	15	327,904	0.7	2535	169	147	258,445	140,041
1	install 3 vending machine and 1 snacks machine energy misers	www.usatech.com and established costs	1,016	none at this time	1,016	5,223	0.1	0	0.5	0	841	12	10,091	1.2	893	74	83	7,354	7,156
2.3	occupancy sensors to be installed with incentives	RS Means, lit search	5,060	460	4,600	9,294	1.9	N/A	0.9	0	1,496	15	17,608	3.1	283	19	31	10,295	12,733
3	retro commission-ing	LBL (see note below)	11,560	none at this time	11,560	7,928	0.2	595	2.5	910	3,118	15	33,114	3.7	305	20	25	19,473	10,861
4	demand controlled ventilation	similar projects	19,008	none at this time	19,008	15,844	0.3	1,677	6.5	0	5,174	15	77,606	3.7	308	21	12	12,025	21,706
	TOTALS		**57,099**	**1,980**	**55,119**	**140,510**	**23.9**	**2,272**	**20.8**	**12,319**	**38,495**	**-**	**466,323**	**1.4**	**-**	**-**	**-**	**307,592**	**192,498**

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5	install 50 kW PV rooftop system (with $1/W INCENTIVE and $600/1MWh SREC)	similar projects	375,000	50,000	325,000	56,721	50.0	0	5.7	0	43,165	25	751,633	7.5	288	12	11	240,297	77,708
2.2	28 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	13,475	700	12,775	4,560	0.9	0	0.5	617	1,351	15	15,897	9.5	97	6	4	673	6,247
	TOTALS		**388,475**	**50,700**	**337,775**	**61,281**	**50.9**	**0**	**6.2**	**617**	**44,516**	**-**	**767,530**	**7.6**	**-**	**-**	**-**	**240,970**	**83,954**

Assumptions: Discount Rate: 3% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines

Note:
1. A 0.0 electrical demand reduction / month indicates that it is very low / negligible
2. Source of cost estimate for ECM3: Estimate based on Lawrence Berkeley National Laboratory

1. HISTORIC ENERGY CONSUMPTION

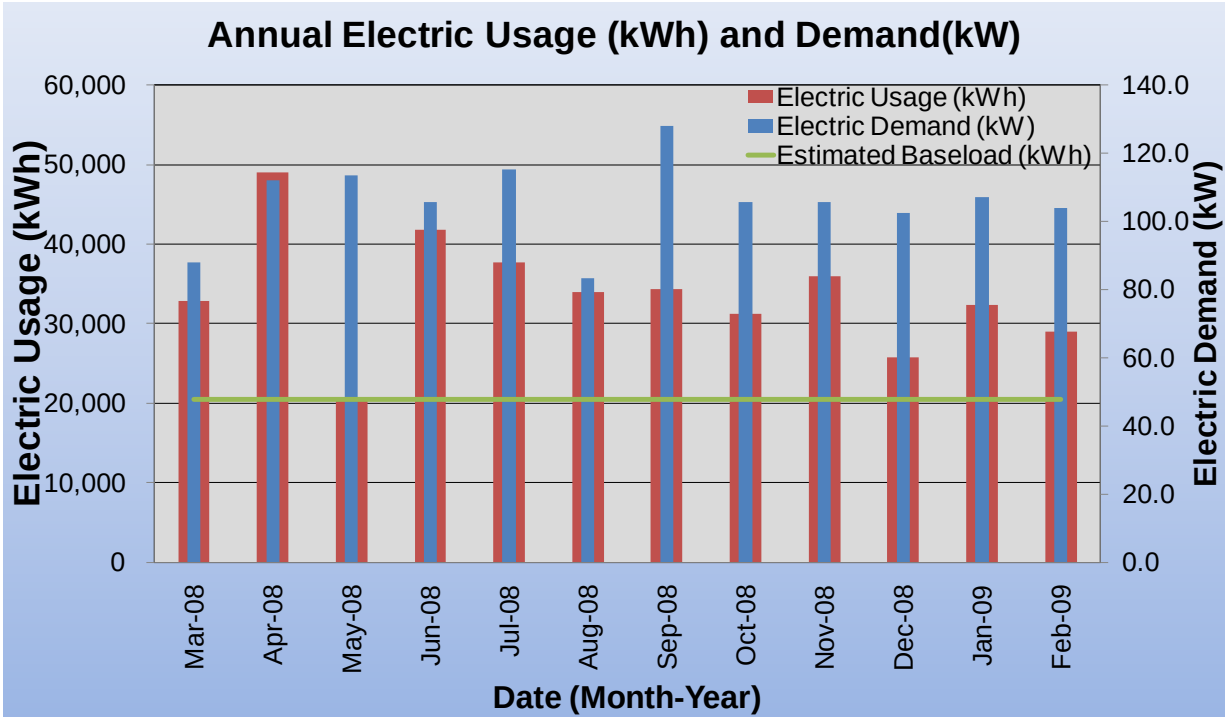
1.1. Energy usage and cost analysis

SWA analyzed utility bills from March 2008 through February 2009 that were received from the utility companies supplying the Recreation Center with electric and natural gas.

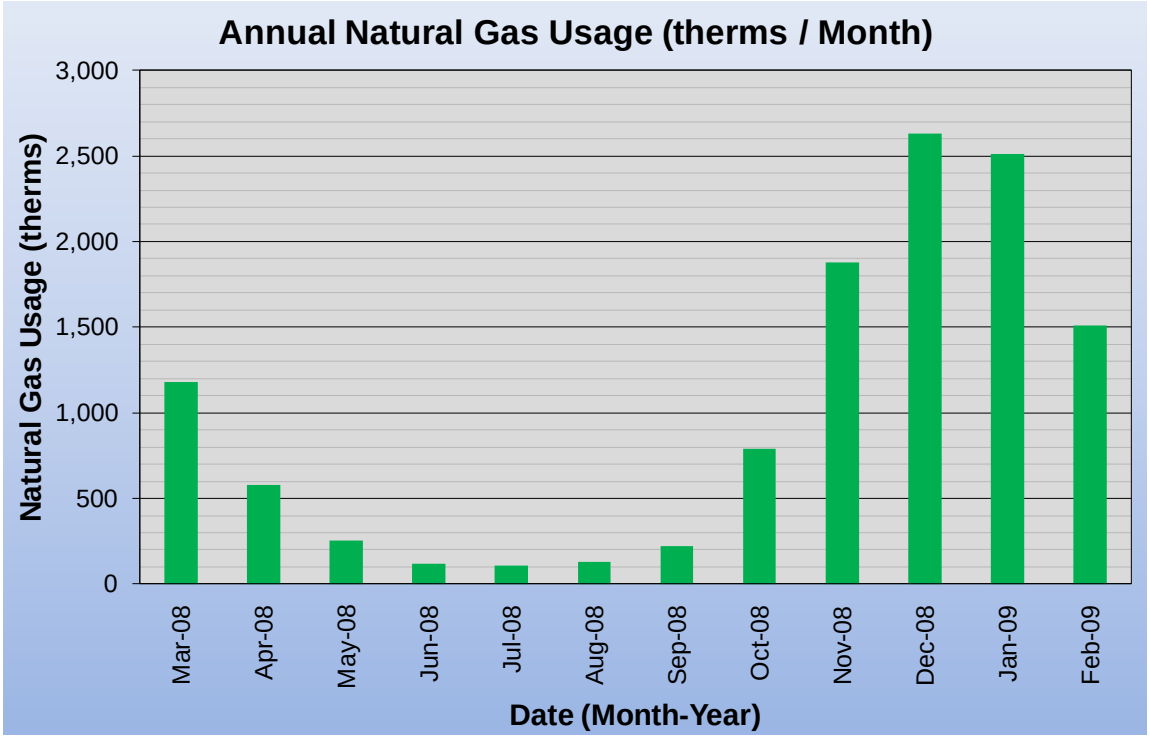
Electricity – The City of Rahway purchases electricity from PSE&G at **an average rate of $0.161 per kWh** based on the 12 months of utility bills from March 2008 through February 2009**.** The Recreation Center used approximately **404,320 kWh or $64,966 worth of electricity.** The data also reflected that demand averaged 106 kilowatts with a peak demand of 128.

Natural Gas – The Recreation Center uses natural gas purchased from AMG, a division of Pepco Energy Services Co. and purchase the transport of the gas from Elizabethtown Gas. **The average rate for natural gas was $1.56/therm** based on the 12 months of utility bills from March 2008 through February 2009. The building used **11,908 therms or $18,626 worth of natural gas** in the previous year**.**

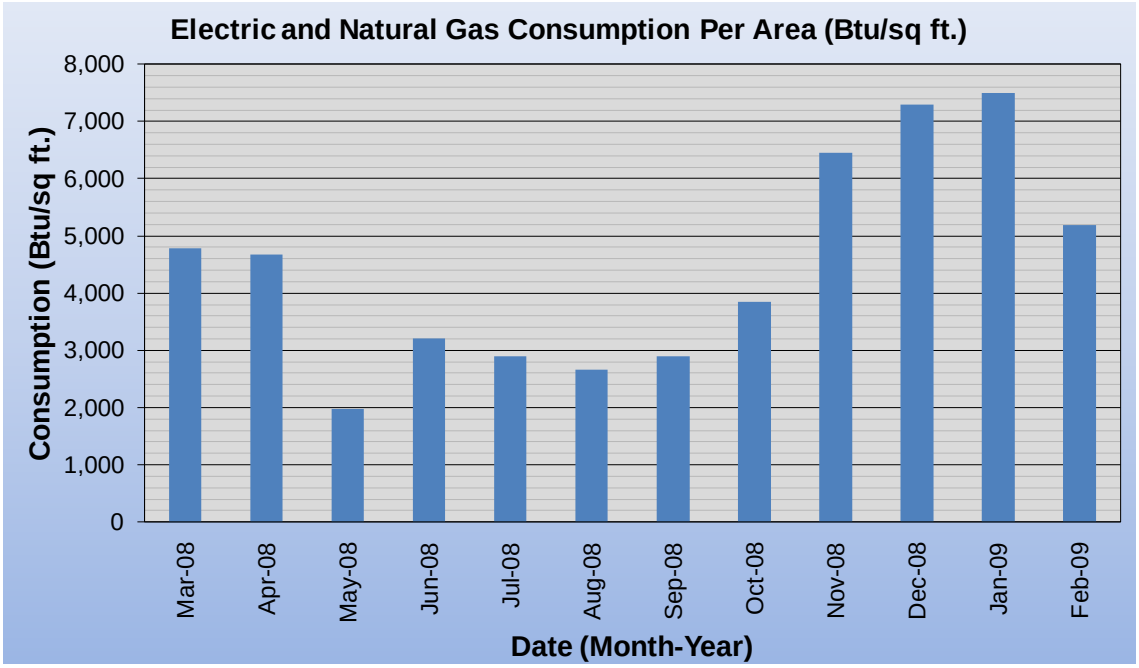
The following chart shows electricity use for the Recreation Center building based on utility bills for the 12 month period of March 2008 to February 2009.



The following chart shows the natural gas usage for the Recreation Center based on utility bills for the period starting March 2008 and ending in February 2009.

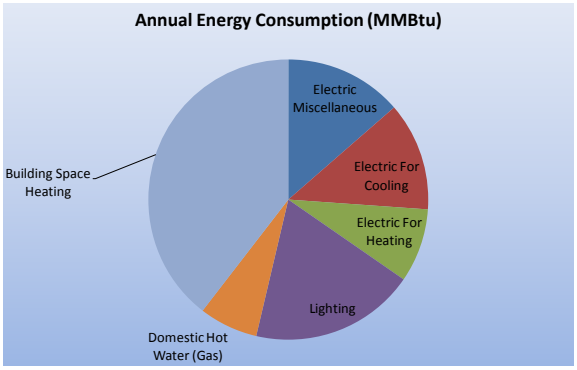


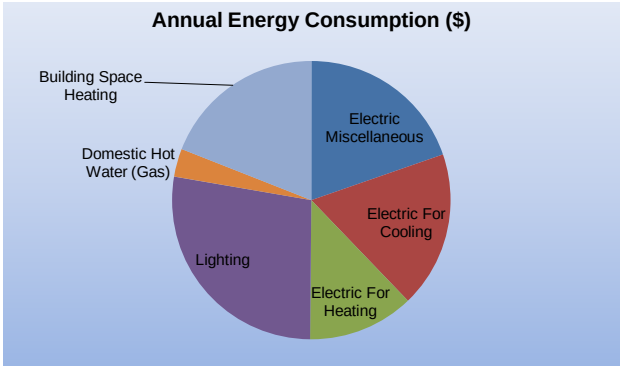
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Recreation Center based on utility bills for the 12 month period of March 2008 through February 2009.



The following table and pie charts show energy use for the Recreation Center based on utility bills for the 12 month period of March 2008 to February 2009. Note that the electrical cost at $47/MMBtu of energy is 3 times as expensive to use as natural gas at $16/MMBtu.

2008 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	97	4%	$4,554	5%	47
Electric For Cooling	322	13%	$15,168	18%	47
Electric For Heating	219	9%	$10,309	12%	47
Lighting	742	29%	$34,935	42%	47
Domestic Hot Water (Gas)	175	7%	$2,730	3%	16
Building Space Heating	1,016	40%	$15,896	19%	16
Totals	2,570		$83,591	100%	33
Total Electric Usage	1,380	54%	$64,966	78%	47
Total Gas Usage	1,191	46%	$18,626	22%	16
Totals	2,570	100%	$83,591	100%	33





1.2. Utility rate

The building purchases electricity from PSE&G. The Recreation Center uses Account #08 51 367 203 01 with service address 225 East Milton Avenue, Rahway, NJ 07065. Natural Gas service is provided by Elizabethtown Gas, account number 8186659681. The gas itself is purchased from AMG, a division of Pepco Energy Services Co. Electricity was billed at an average aggregated rate of **$0.161/kWh** and natural gas was billed at an average aggregated rate of **$1.56/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. SWA has created a Portfolio Manager account for Rahway at the link below. SWA has shared the City of Rahway benchmarking profile that was developed for this report and it can utilize the benchmarking tool to add future data and track energy performance. A summary report of the Portfolio Manager results is provided on the following page. A rating score cannot be calculated at this time as Portfolio Manager cannot create a rating score for this type of building.

The Site Energy Use Intensity is 76 kBtu/ft^{2}yr compared to the national average of recreation type buildings consuming 65 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 27.0 kBtu/ft^{2}yr, which when implemented would make the building energy consumption better than the national average consumption for recreation type buildings.

SWA has created the Portfolio Manager site information for the City of Rahway. This information can be accessed at: https://www.energystar.gov/istar/pmpam/, with the following:

Username: RahwayTownship
Password: RAHWAYNJ

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Rahway Recreation Center

Building ID: 1899829
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 20, 2009

Facility
Rahway Recreation Center
275 East Milton Avenue
Rahway, NJ 07065

Facility Owner
City of Rahway
1 City Hall Plaza
Rahway, NJ 07065

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

Year Built: 2001
Gross Floor Area (ft²): 34,000

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,413,177
Natural Gas (kBtu)[4]	1,154,013
Total Energy (kBtu)	2,567,190

Energy Intensity[5]

Site (kBtu/ft²/yr)	76
Source (kBtu/ft²/yr)	174

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	277

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

National Average Comparison

National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	28%
Building Type	Recreation

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

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

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

Certifying Professional
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.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Rahway Recreation Center building was originally built in the 1999. The original structure remains with no additions. The recreation center consists of 34,000 square feet of conditioned space. The building houses a gymnasium, concession stand, exercise rooms, multi-purpose meeting rooms and offices. It consists of two levels, a ground floor and an upper mezzanine level.

2.2. Building occupancy profiles

Occupancy for the office areas is Monday through Friday from 8:30 AM to 4:30 PM and additional hours on Thursday between 6:00 PM - 8:00 PM. The exercise room and gymnasium are open Monday through Friday from 7:00 AM – 9:00 PM and Saturday from 8:00 AM to 1:00 PM. The building is not typically scheduled for use on Sunday however it is rented out for various sporting events, large gatherings, fairs and trade shows on occasional Sundays and other typically unscheduled hours of the day. Typical occupancy for the office and building staff is eight persons and thirty for the exercise, gymnasium and meeting room areas. The actual occupancy rarely approaches the building maximum.

2.3. Building envelope

2.3.1. Exterior Walls

There are two typical exterior envelopes. The first consists of a 4” red brick veneer façade with a 1.5” rigid board insulation layer and 8” CMU layer to the interior. Cosmetically the veneer wall is in excellent age appropriate condition except for some cracked caulk. This is the primary envelope for most of the building; however, there is a second envelope with an EIFS (Exterior Insulation and Finish System) exterior wall system. It is located in two instances. The first is adjacent to the ground floor ceiling and above the window system of the ground floor walls. The second is as the only envelope for all exterior walls that extrude past the roofs of the ground floor. This envelope consists of a 1.5” thick EIFS with 5/8” Dens-Glass sheathing layer, 6” metal stud wall spaced at 16” OC and 6” layer of thermal BATT insulation with vapor barrier on the interior face. This insulation exceeds the usual quality standards of industry best practices and is worth noting.

Exterior wall insulation levels could not be visually verified because of the brick veneer envelope, but the thermal BATT insulation layer was verified. IR (Infrared) images were not taken in the field due to the warm weather and rain at the time of the inspection.

2.3.2. Roof

There are two roofing systems at the recreation center - a flat EPDM (ethylene propylene diene monomer) roof and a metal roof panel system above the arched truss structure of the gymnasium. The EPDM roof is a dark gray color and consists of the EPDM roofing layer, a tapered ISO board, 1.5” layer of rigid board insulation, and metal decking layer above a structural steel member. The metal roof is composed of ribbed metal panels, 2” thick layer of rigid board insulation, and 6 mil poly vapor barrier over a layer of 6” metal decking. The

EPDM roof was found to be in age appropriate condition with small occurrences of pooling throughout the roof and large occurrences of pooling near mechanical equipment. The metal roofing was in good condition with no visible openings or damaged panels.

Image of roof membrane in age appropriate condition

2.3.3.Base

The building's base is 5" concrete slab on grade. There were no reported problems with water penetration or moisture. There are 2 inches of rigid board insulation at the interior of the foundation walls and extending two feet in from the foundation walls under the slab. This is standard for this type of structure. SWA does not recommend any additional insulation as it would not be cost effective.

2.3.4.Windows

All of the building windows are original, aluminum framed, and double glazed. The majority of the windows are non-operable and either fixed or part of a curtain wall system. The few operable windows at the location were observed to be in good working condition and seal tightly. According to specifications from Kawneer, the manufacturer, all of the windows are installed with thermal breaks. There was no visible damage to the window frames or to the caulking of the units installed in the brick wall.

2.3.5.Exterior doors

There are two primary types of exterior doors installed at the recreation center, aluminum frame with glass panels and reinforced fiberglass. The aluminum and fiberglass exterior doors were inspected and observed to be in good condition except for some weather-stripping that was starting to show wear and tear at the time of the inspection.

Doors showing need for higher threshold, door sweep or weather-stripping – main door and gym doors

SWA recommends that the exterior doors of the building be weather-stripped in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals. Tight seals around doors will help ensure the building to be kept continuously insulated.

2.3.6. Building air tightness

In addition to the above mentioned recommendations SWA suggests air sealing, caulking and/ or insulating around all plumbing, electrical, HVAC and structural envelope penetrations. This should include bottom and top plates, recessed light fixtures, electrical boxes, chimney walls and window, or sleeve air conditioner units. The air tightness of buildings helps to maximize other implemented energy measures and investments and minimizes long term maintenance and repair cost.

2.4. HVAC systems

2.4.1. Heating

All space heating is provided by Trane Duct heater furnaces installed in the air handlers in the attic mechanical room. The heat for the gymnasiums are provided by three Trane model GLND040AD-M furnaces with 2 burners with a capacity of 320,000 Btuh output. The kitchen heat is provided by a smaller 280,000 Btuh output furnace. Single burner 400,000 Btuh duct heaters provide the space heating for the offices, halls, classrooms and exercise rooms.

Building staff has indicated that at least two of the air handler heating systems and combination heating / cooling systems “have never worked properly” and are going to be replaced. SWA recommends retro-commissioning of all the mechanical equipment before any replacements are made so that the City of Rahway can completely understand exactly what problems affect the entire system before working on the separate component parts.

2.4.2. Cooling

The cooling equipment serving the Recreation Center is located on the roof and in the mechanical spaces in the attic. Split system cooling is characterized by physically separating the hot and cold side of the system.

The cold side, consisting of the expansion valve and the cold coil, is located in the Air handling units located in the mechanical room. The condensing units are located out on roof at the same level as the mechanical room. These units serve the hallways, classrooms, back offices, workout room, reception area and front office. Please see equipment information for more details.

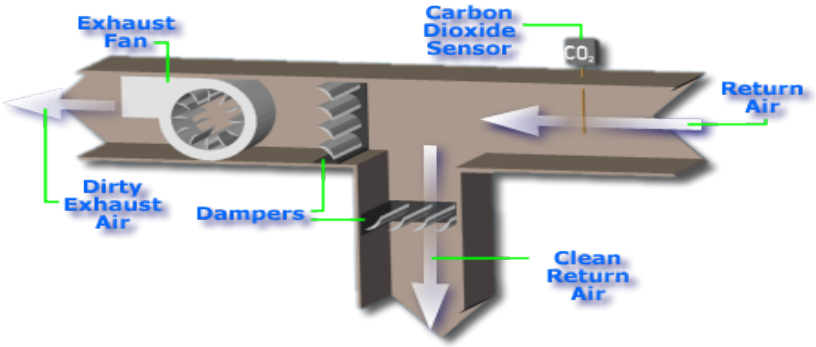
The gymnasium and exercise room have no cooling and are used for only heating and ventilation. As such, neither area is used for three or four months out of the year. It seems that they would be used more often if there were cooling available. Although more energy would be used to conditioned these spaces, SWA recommends the installation of cooling equipment in these areas as a capital improvement.

2.4.3.Ventilation

Ventilation is provided by the air handling equipment that distributes the heated or cooled air to the different parts of the building. There are also rooftop exhaust fans serving the kitchen and rest rooms.

ASHRAE Standard 62-99 identifies the outdoor air ventilation required for indoor air quality. Many municipal, state and federal jurisdictions use these as guidelines a for 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 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.

SWA recommends installation of CO2 based demand controlled ventilation (DCV). Instead of continuously ventilating the space at a constant rate designed to accommodate the maximum occupancy of the Recreation Center, which is rarely if ever the case, demand-controlled ventilation (DCV) will see that the amount of outside air drawn in for ventilation depends on the building's actual occupancy at any given time. 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. DCV primarily refers to when actual occupancies are approximated by measuring carbon dioxide (CO2) levels within a building with sensors. There are several ways to design a CO2- based demand controlled ventilation system. The following figure is just one very simple example of the ways that CO2 sensors can be used in some systems:



2.4.4.Domestic Hot Water

Domestic Hot Water for the Recreation Center is provided by one natural gas system that combines the burner for heating the water and the storage tank that maintains a set amount of heated water. The Recreation Center has a Rheem Guardian, Model #22V50 with a 50 gallon storage system. This water heater was installed within the past year or so to replace an oversized system. There is no further recommendation for replacing this unit at this time; however, SWA recommends the domestic hot water pipe runs be closely inspected to insure they are properly insulated.

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.

2.5. Electrical systems

2.5.1. Lighting

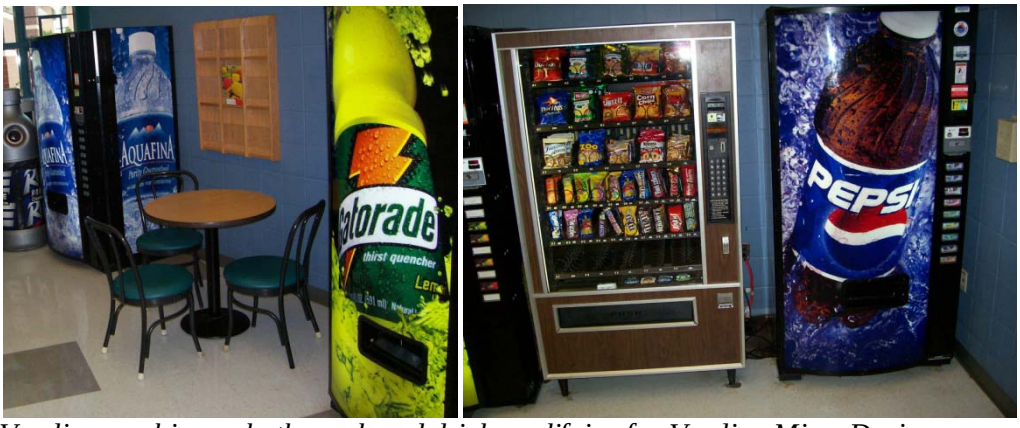
In accordance with requirements of the Local Government Energy Audit program, SWA, Inc. performed an investment grade lighting audit, which provides a comprehensive survey of existing lighting, and an extensive technical and financial analysis.

Because the building was built relatively recently, most of the lighting is comprised mostly of T8 fixtures that contain electronic ballasts, which are far more efficient than the older T12 lamps and magnetic.

In the gymnasium, there are some high wattage metal halide and halogen lights that should be replaced with high efficiency T5 high bay fixtures. SWA recommends replacing the 400 watt and 250 watt metal halide lighting in the gymnasium with new T5, electronic ballast fluorescent fixtures. Refer to Appendix A for a table detailing the survey of the existing lighting and a separate table indicating which specific fixtures in which areas of the building should be retrofitted or replaced.

2.5.2. Appliances and process

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov. Also, energy vending miser devices are now available for conserving energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.



Vending machines – both snack and drink qualifying for Vending Miser Devices

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends

all computers and all appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off.

2.5.3.Elevators

There are no elevators in the one story Recreation Center building.

2.5.4. Other electrical systems

There are not currently any other significant energy impacting electrical systems installed at the Recreation Center building.

3. EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
H/V	Direct Fired AHU AHU3: 11,000CFM, 400MBH/320MBH, double burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46071	Elec./ Nat. Gas	Gymnasium	2001	50%
H/V	Direct Fired AHU AHU4: 11,000CFM, 400MBH/320MBH, double burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46072	Elec./ Nat. Gas	Gymnasium	2001	50%
H/V	Direct Fired AHU AHU5: 11,000CFM, 400MBH/320MBH, double burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46073	Elec./ Nat. Gas	Gymnasium	2001	50%
HVAC	Direct Fired AHU c/w DX cooling coils AHU1: 5200CFM, 400MBH/320MBH, single burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46075	Elec./ Nat. Gas	Building North side - offices, exercise room	2001	50%
HVAC	Direct Fired AHU c/w DX cooling coils AHU2: 9700CFM, 400MBH/320MBH, single burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46074	Elec./ Nat. Gas	Building Center and South side - halls, etc.	2001	50%
HVAC	Direct Fired AHU c/w DX cooling coils AHU6: 2300CFM, 150MBH/120MBH, single burner	Mechanical Room	Trane, Model: GLND040AD, S/N A98K46076	Elec./ Nat. Gas	Building North side; back offices	2001	50%

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Cooling	Condensing Unit, 460V, 60 Hz, MCA56, 25 ton RTU	On Roof	Trane, Model RAUCC254B213, S/N C09D14120	Elec.	Building Center and South side - halls, etc.	2001	50%
Cooling	Condensing Unit, 460V, 60 Hz, MCA27.4, 12.5 ton RTU	On Roof	Trane, Model TTA150B400BC, S/N N32249HAH	Elec.	Building North side - offices, exercise room	2001	50%
Cooling	Condensing Unit, 460V, 60 Hz, 6 ton RTU (estimated)	On Roof	Model, make, S/N not available; name plate missing	Elec.	Building North side; back offices	2001	50%
H/V	Direct Fired roof top package unit, 350MBH/280MBH, 4500-8500 CFM	On Roof	Trane, Model GRAA35PFGB0N6CN305, S/N A98H43251	Elec./ Nat. Gas	Kitchen	1998	25%
Ventilation	KEF-1, Kitchen exhaust fan - belt driven	On Roof	Greenheck, Model CUBE-180-15, S/N 98K17743	Elec.	Kitchen	2001	50%
Ventilation	Toilet exhaust fan - estimated	On Roof	Greenheck, Model GB-90-4, S/N 98K15263	Elec.	Restrooms	2001	50%
DHW	50 Gallon domestic hot water heater; I/P 38,000 Btu/hr, 258 therms	Mechanical Room	Rheem, Guardian, model 22V50, S/N RHLN12085310.16	Gas	Whole building	2008	90%

Note:
The remaining useful life of a system (in %) is an estimate based on the system date 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

- Install Air Conditioning for Gymnasium: Building personnel advised that having cooling in gymnasium would make it more useful during the summer months. SWA recommends installing three condensing units on the roof outside, each of a 30 ton capacity, and connecting each individually to a new DX cooling coil fitted into the existing direct fired AHU serving the gymnasium. Estimated cost for this upgrade is approximately $70,000 for each gymnasium unit, a total of $210,000.
- Building personnel also advised us that they are unhappy with the performance of the gymnasium heating units and are considering replacing at least two of these. SWA recommends that retro-commissioning recommended in ECM#3 below be performed first; it is possible a satisfactory performance could be achieved as a result of retro-commissioning -furthermore, if cooling is desired, it can be incorporated in the existing units as outlined in the previous point.

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.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly.

- Maintain downspouts - Repair / install missing downspouts as needed to prevent water / moisture infiltration and insulation damage.

- Pipe Insulation – All hot water, steam and DHW pipes should be inspected and any missing or deteriorated insulation should be replaced with new.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- 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.

- The existing building management system was found to be outdated and not very user-friendly. SWA recommends upgrading the software to the satisfaction of building personnel and connecting to a central web based platform for easy access for all buildings.

Category III Recommendations: Energy Conservation Measures

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
2.1	Install new T5 fixtures with incentives
1	Install 3 new vending machine and 1 snack machine energy misers
2.3	Install occupancy sensors with incentives
3	Building retro-commissioning
4	Demand controlled ventilation
	Description of Recommended 5-10 Year Payback ECMs
5	Install 50kW PV system
2.2	Install new Pulse start metal halide fixtures with incentives

ECM#1: *Install Vending Misers*

Description:

The Recreation Center building has three drinks vending machines (in both Meeting Room 104 and Concession Room 103). Energy vending miser devices are now available for conserving energy with these coolers. There is no need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the vending miser devices, refrigerated beverage vending machines or coolers use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. Vending miser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: power down the machine when the surrounding area is vacant, monitor the room's temperature, automatically repower the cooling system at one- to three-hour intervals, independent of sales, and ensure the product stays cold.

The building also contains one snack vending machine. Snack vending miser devices can be used on Snack vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snack vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

Installation cost:

Estimated installed cost: $1016 (estimated labor cost of $400)
Source of cost estimate: www.usatech.com *and established costs*

Economics (without incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	install 3 vending machine and 1 snacks machine energy misers	www.usatech.com and established costs	1,016	none at this time	1,016	5,223	0.1	0	0.5	0	841	12	10,091	1.2	893	74	83	7,354	7,156

Assumptions: SWA assumes energy savings based modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php

Rebates / financial incentives: *There are no direct incentives for this measure.*

Options for funding ECM (Please see Appendix C also):

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

This project may benefit from enrolling in NJ Direct Install program by contacting the following contractor in Union County:

Tri-State Light & Energy, Inc.
Direct Install Administrator
Phone: 610-789-1900
Email: NJDirectInstall@TSLE.com

http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

ECM#2: *Building Lighting Upgrades*

Description:
On the days of the site visits, SWA completed a lighting inventory of the Recreation Center (see Appendix A). The existing lighting consists of mostly T8 fluorescent fixtures with electronic ballasts. SWA has performed an evaluation of installing occupancy sensors in large spaces, offices and bathrooms that may be left unoccupied a considerable amount of time throughout the day and installing T5 fixtures in place of Metal Halide gymnasium lighting. The labor in all these installations was evaluated using prevailing electrical contractor wages. The City of Rahway may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor to obtain savings.

Installation cost:
Estimated installed cost: $38,990 (estimated labor cost of $25,340)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics (with incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO2 reduced, lbs/yr
2.1	95 New T5 fixtures to be installed with incentives	RS Means, lit search	20,455	1,520	18,935	102,220	21.3	N/A	10.3	11,409	27,866	15	327,904	0.7	2535	169	147	258,445	140,041
2.2	28 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	13,475	700	12,775	4,560	0.9	N/A	0.5	617	1,351	15	15,897	9.5	97	6	4	673	6,247
2.3	occupancy sensors to be installed with incentives	RS Means, lit search	5,060	460	4,600	9,294	1.9	N/A	0.9	0	1,496	15	17,608	3.1	283	19	31	10,295	12,733
	TOTALS		**38,990**	**2,680**	**36,310**	**116,074**	**24.2**	**0**	**11.6**	**12,026**	30,714	**15**	361,409	**1.2**	**1392**	**93**	**85**	**269,414**	**159,021**

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 4 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

NJ Clean Energy - Wall Mounted occupancy sensors ($20 per control)
Maximum incentive amount is $460.

NJ Clean Energy - T5 lamps with electronic ballast in existing facilities ($10-30 per fixture, depending on quantity and lamps) Maximum incentive amount is $1520.

NJ Clean Energy – Pulse Start Metal Halide lamps in existing facility ($10-14 per fixture, depending on quantity and lamps). Maximum incentive amount is $700.

Options for funding the Lighting ECM (Please see Appendix C also):

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

This project may benefit from enrolling in the NJ Direct Install program by contacting the following contractor in Union County:

Tri-State Light & Energy, Inc.
Direct Install Administrator
Phone: 610-789-1900
Email: NJDirectInstall@TSLE.com

http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

ECM #3: *Retro-Commissioning of All HVAC Equipment*

Description:

Commissioning is the systematic and documented process of ensuring that a new building's systems are designed, installed, tested for full functionality, and capable of being operated and maintained according to the owner's operational needs. Retro-commissioning refers to that process being performed on an existing building as an after-market measure.

Installation cost:
Estimated cost: $11,560 (estimated labor cost of $10,404)

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	retro commission-ing	LBL (see note below)	11,560	none at this time	11,560	7,928	0.2	595	2.5	910	3,118	15	33,114	3.7	305	20	25	19,473	10,861

Source of cost estimate: Estimate based on Lawrence Berkeley National Laboratory studies[1]

Assumptions: SWA estimated the cost and savings of the measure based on studies done by Lawrence Berkley National Laboratory (LBL), a U.S. Department of Energy laboratory operated by the University of California. Because the building is relatively new, SWA estimated a 5% savings on electrical and gas heating systems after the measure is implemented. Also, Operation and Maintenance savings of about ½ hour per week is estimated.

[1] Mills E et al. 2004. The cost-effectiveness of commercial buildings commissioning. Lawrence Berkeley National Laboratory. LBNL report #56637 (PDF 3.5 MB).

Rebates / financial incentives: *There are no direct incentives for this measure.*

Options for funding ECM (Please see Appendix C also):

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

This project may benefit from enrolling in NJ Direct Install program by contacting the following contractor in Union County:

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http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

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 long operating hours and occupancy that can be well below maximum for extended periods of time, like libraries and gymnasiums. That air must be conditioned, resulting in higher energy consumption and costs than is necessary with appropriate ventilation.
Demand-controlled ventilation (DCV) using carbon dioxide (CO_2) sensors 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: $19,008
Source of cost estimate: Federal Energy management Program "Demand-Controlled Ventilation Using CO2 Sensors"
Air-Test Energy Analysis Program for CO2 based demand controlled ventilation.

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	demand controlled ventilation	similar projects	19,008	none at this time	19,008	15,844	0.3	1,677	6.5	0	5,174	15	77,606	3.7	308	21	12	12,025	21,706

Assumptions: SWA estimated the cost and savings of the measure based on the AirTest Energy Analysis Program for CO2 based demand controlled ventilation. A total of 9000 cfm fresh air (20% of peak supply air) was assumed for calculating savings - at the time the site visit was done, the BMS system showed 50% fresh air being drawing into the gymnasium unit. The fresh air schedule is reportedly set into the BMS program; however, there is no demand controlled ventilation at present. Our estimate should be taken as an average savings occurring through the year.

Rebates / financial incentives: *There are no direct incentives for this measure.*

Options for funding ECM (Please see Appendix C also):

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

This project may benefit from enrolling in NJ Direct Install program by contacting the following contractor in Union County:

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Direct Install Administrator
Phone: 610-789-1900
Email: NJDirectInstall@TSLE.com

http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

ECM #5: *Install 50 Kilowatt Solar Photovoltaic System*

Description:

Currently, the building 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 generally 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'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 50 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 4,000 square feet of roof area with a clear southern exposure on the flat roof portions.

Installation cost:
Estimated installed cost: $325,000 (estimated labor cost of $150,000)
Source of cost estimate: Similar Projects

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5	install 50 kW PV rooftop system (with $1/W INCENTIVE and $600/1MWh SREC)	similar projects	375,000	50,000	325,000	56,721	50.0	0	5.7	0	43,165	25	751,633	7.5	288	12	11	240,297	77,708

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. SWA projected physical dimensions based on a

typical Polycrystalline Solar Panel (230 Watts, model #ND-U230C1). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft).

Rebates/financial incentives (Please see Appendix C also):

NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application for systems 50kW or less. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. A total of $33,600 has been incorporated in the above costs; however it requires proof of performance, application approval and negotiations with the utility.

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. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are currently no existing renewable energy systems.

5.2. 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.

5.3. Solar Photovoltaic

Please see the above recommended ECM#5.

5.4. Solar Thermal Collectors

Description:

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

5.5. Combined Heat and Power

Description:

SWA considered the installation of a combined heat and power system for the Recreation Center but does not recommend its installation because of the HVAC equipment type and insufficient year-round thermal loads.

5.6. Geothermal

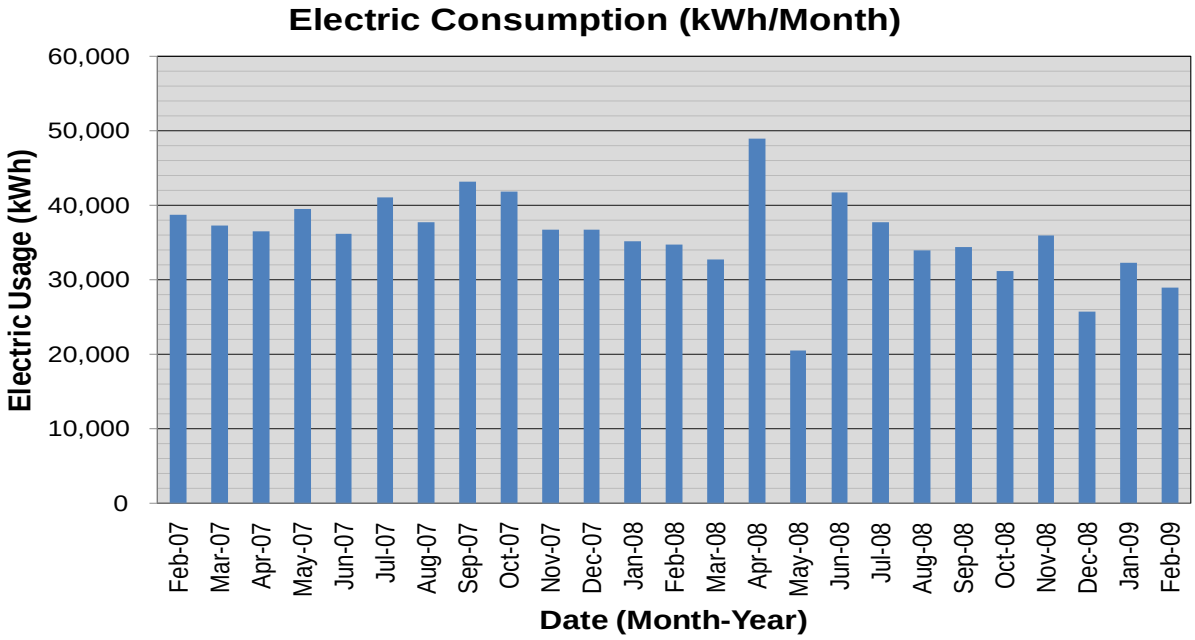
Description:

Geothermal is not applicable for the Recreation Center because the existing HVAC systems have at least 50% remaining life.

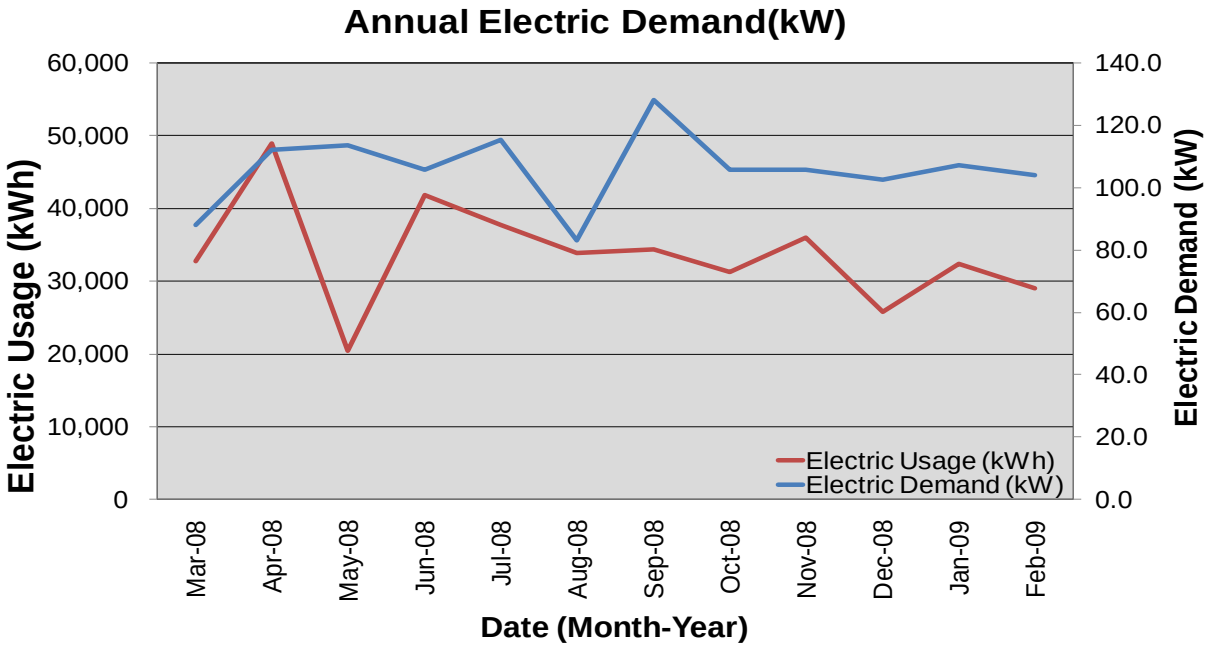
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

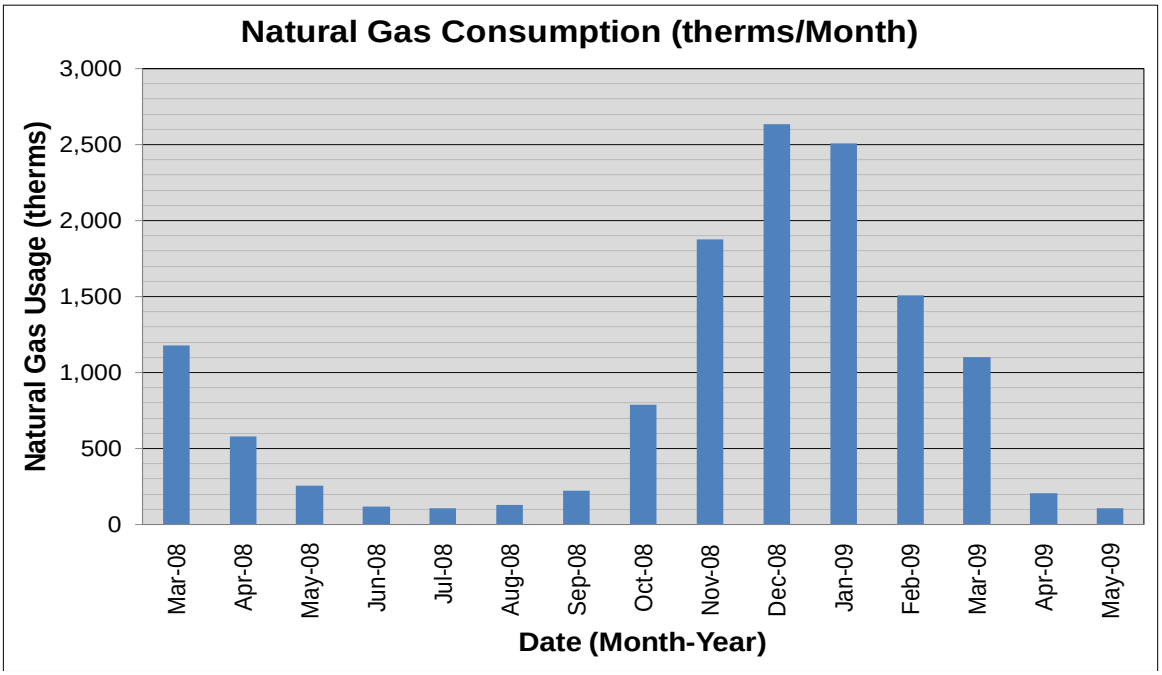
The following are charts that show the annual electric and natural gas load profiles for the Recreation Center.

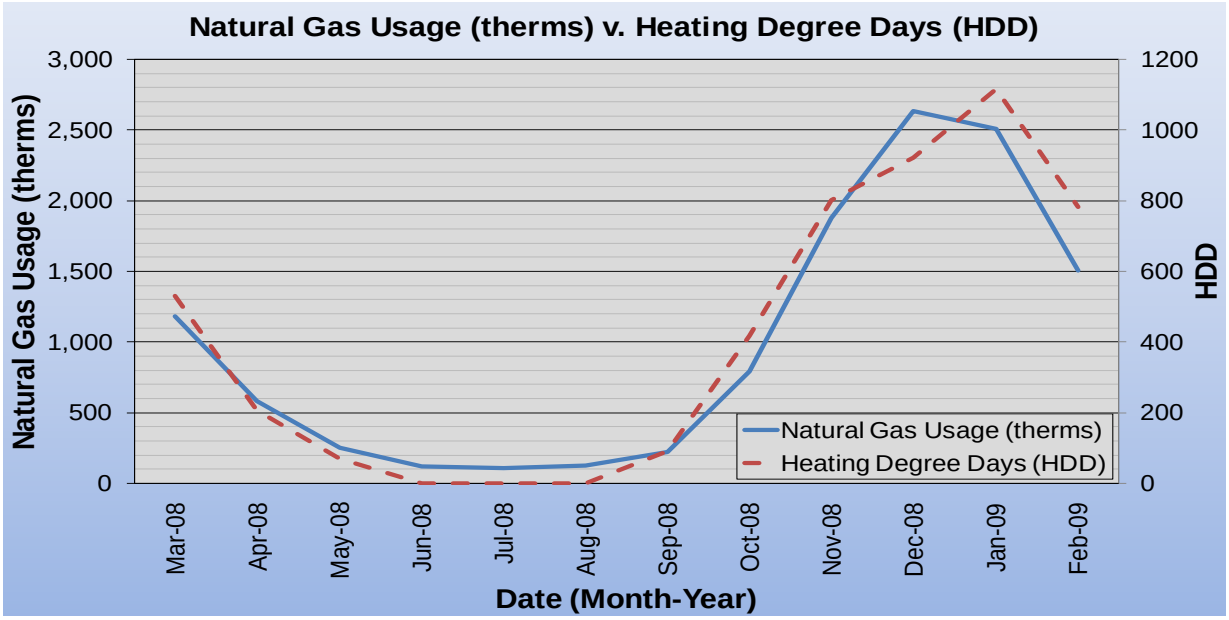


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks.



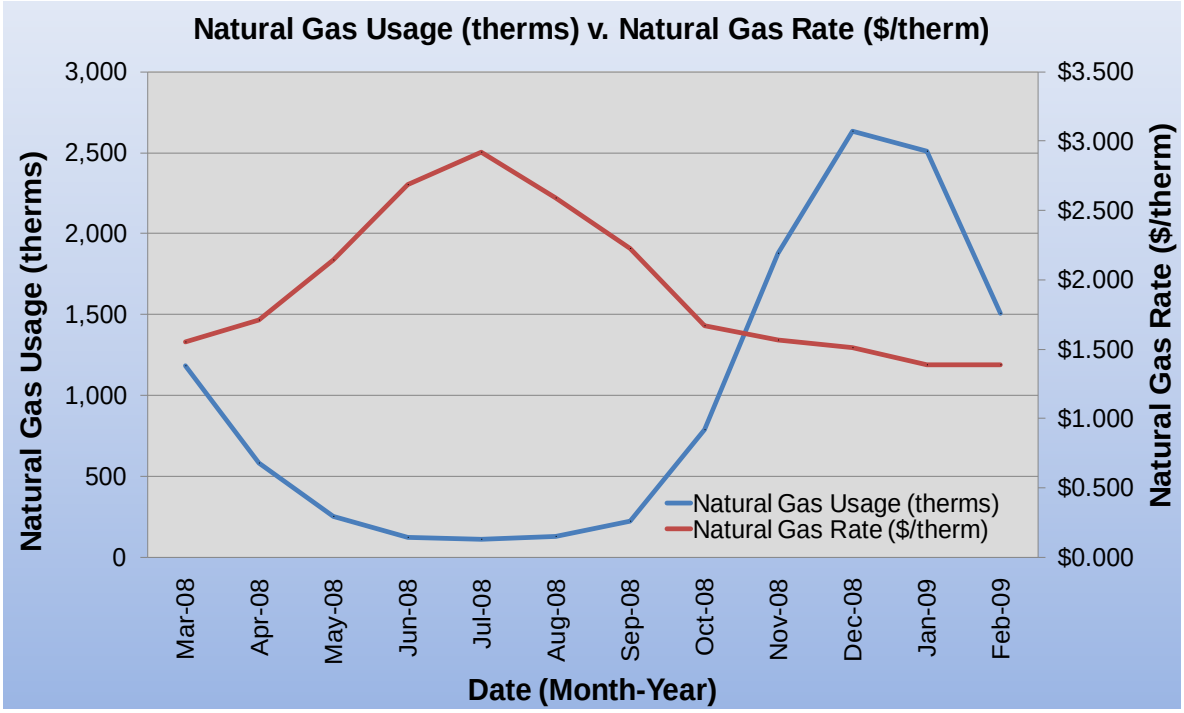
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the "heating degree days" curve. Some utility bills have more than one month estimated and combined.





6.2. Tariff analysis

The City of Rahway 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.



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

6.3. Energy Procurement Strategies

The Recreation Center building receives natural gas via one incoming meter. Pepco supplies the gas and Elizabeth Town transports it. There is no ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance-based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner.

SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 36% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 53% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Recreation Center building annual utility costs are $4,317 higher for electric and $169 higher for natural gas for a total of $4,486 higher, when compared to the average estimated NJ commercial

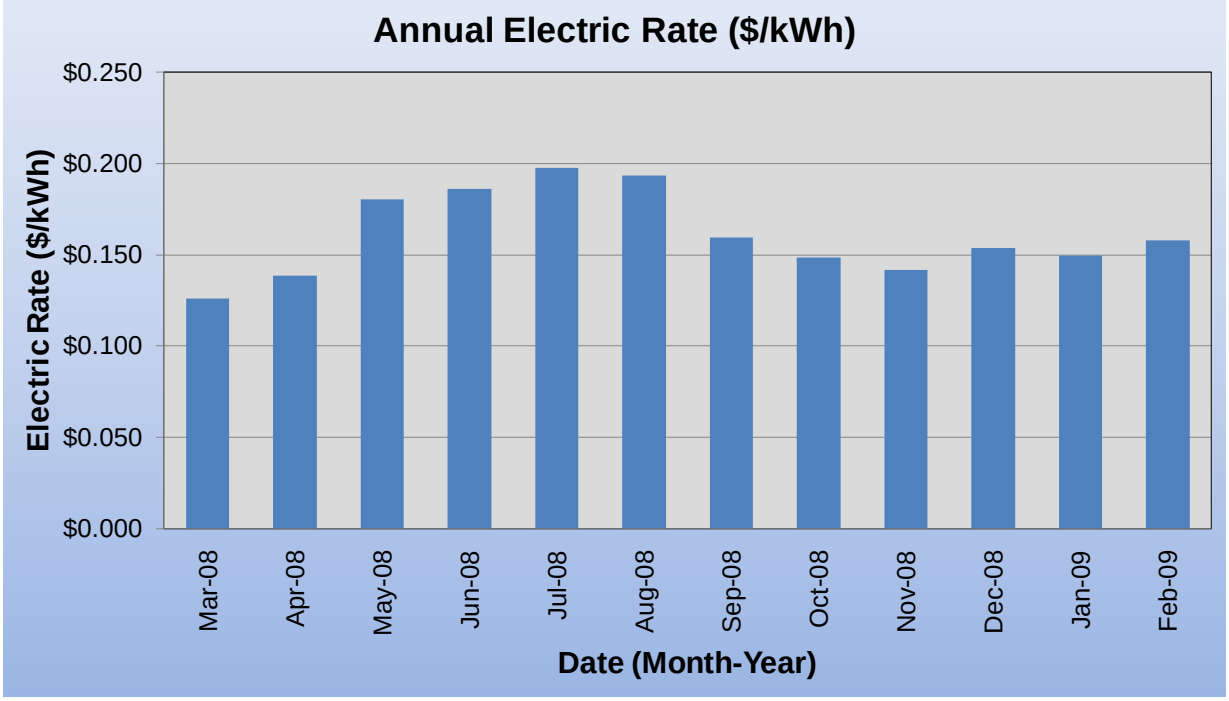
utility rates.

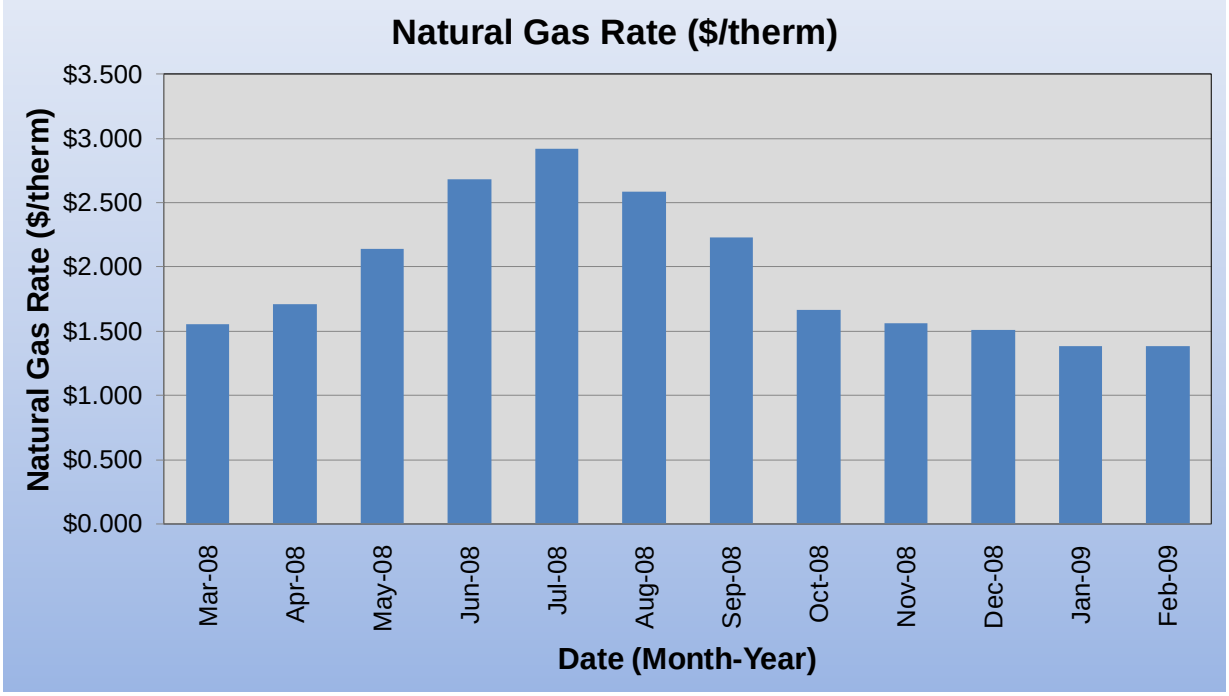
SWA recommends that the City of Rahway further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Recreation Center building. Appendix B contains a complete list of third party energy suppliers for the Rahway service area.

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

The Recreation center building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

The following charts show the building monthly spending per unit of energy in 2008.




Natural Gas Rate ($/therm)
Natural Gas Rate ($/therm)
$3.500
$3.000
$2.500
$2.000
$1.500
$1.000
$0.500
$0.000
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Date (Month-Year)

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	Established / standard industry assumptions, DOE e-Quest
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

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.

Appendix A: Lighting Survey

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Exercise Rm 118	Parabolic	E	4'T8	21	3	32	S	12	295	10	2,026	7,880	C	Parabolic	4'T8	E	OS	21	3	32	9	295	10	2026	5910	0	1970	1970
2	1	Boxing Room 123	Recessed	E	4'T8	9	4	32	S	12	295	13	1,165	4,492	N/A	Recessed	4'T8	E	S	9	4	32	12	295	13	1165	4492	0	0	0
3	1	Ceramics Room 115	Parabolic	E	4'T8	12	3	32	S	8	243	10	1,162	2,473	C	Parabolic	4'T8	E	OS	12	3	32	6	243	10	1162	1855	0	618	618
4	1	Ceramics Room 115	Screw -in	N	MH	1	1	175	S	8	243	44	219	426	T5	Parabolic	4'T5	E	OS	1	1	28	6	243	3	31	45	365	15	381
5	1	Kiln Room 148	Parabolic	E	4'T8	1	2	32	S	8	243	6	70	136	C	Parabolic	4'T8	E	OS	1	2	32	6	243	6	70	102	0	34	34
6	1	Director's Office 124	Parabolic	E	4'T8	3	3	32	S	8	243	10	298	618	N/A	Parabolic	4'T8	E	S	3	3	32	8	243	10	298	618	0	0	0
7	1	Staff offices 123	Recessed	E	4'T8	8	4	32	S	8	243	13	1,037	2,193	C	Recessed	4'T8	E	OS	8	4	32	6	243	13	1037	1645	0	548	548
8	1	Kitchen 126	Parabolic	E	4'T8	1	2	32	S	12	295	6	70	248	N/A	Parabolic	4'T8	E	S	1	2	32	12	295	6	70	248	0	0	0
9	1	Kitchen 127	Recessed	E	4'T8	1	4	32	S	12	295	13	141	499	N/A	Recessed	4'T8	E	S	1	4	32	12	295	13	141	499	0	0	0
10	1	Kitchen 127	Recessed	E	CFL	1	1	26	S	12	295	0	26	92	N/A	Recessed	CFL	E	S	1	1	26	12	295	0	26	92	0	0	0
11	1	Mechanical Rm 121	Parabolic	E	4'T8	1	2	32	S	2	295	6	70	41	N/A	Parabolic	4'T8	E	S	1	2	32	2	295	6	70	41	0	0	0
12	1	Bathroom 125	Parabolic	E	4'T8	1	2	32	S	12	295	6	70	248	N/A	Parabolic	4'T8	E	S	1	2	32	12	295	6	70	248	0	0	0
13	1	Electrical Rm 145	Parabolic	E	4'T8	3	2	32	S	2	295	6	198	124	N/A	Parabolic	4'T8	E	S	3	2	32	2	295	6	198	124	0	0	0
14	1	Janitor's Closet 120	Parabolic	E	4'T8	1	2	32	S	2	295	6	70	41	N/A	Parabolic	4'T8	E	S	1	2	32	2	295	6	70	41	0	0	0
15	1	Classroom 114	Parabolic	E	4'T8	5	3	32	S	8	243	10	490	1,030	C	Parabolic	4'T8	E	OS	5	3	32	6	243	10	490	773	0	258	258
16	1	Classroom 114	HID	E	MH	1	1	175	S	8	243	44	219	426	T5	Parabolic	4'T5	E	OS	1	1	28	6	243	3	31	45	365	15	381
17	1	Classroom 113	Screw -in	N	MH	1	1	175	S	8	243	44	219	426	T5	Parabolic	4'T5	E	OS	1	1	28	6	243	3	31	45	365	15	381
18	1	Classroom 113	Parabolic	E	4'T8	10	3	32	S	8	243	10	970	2,061	C	Parabolic	4'T8	E	OS	10	3	32	6	243	10	970	1545	0	515	515
19	1	Classroom 112	Parabolic	E	4'T8	6	3	32	S	8	243	10	586	1,236	C	Parabolic	4'T8	E	OS	6	3	32	6	243	10	586	927	0	309	309
20	1	Classroom 112	Screw -in	N	MH	1	1	175	S	12	295	44	219	775	C	Parabolic	4'T5	N	OS	1	1	28	9	295	3	31	82	666	27	693
21	1	Lobby 102	Parabolic	M	4'T8	14	2	32	S	12	295	6	902	3,469	N/A	Parabolic	4'T8	N	S	14	2	32	12	295	6	902	3469	0	0	0
22	1	Lobby 102	Recessed	N	CFL	9	1	26	S	12	295	0	234	828	N/A	Recessed	CFL	N	S	9	1	26	12	295	0	234	828	0	0	0
23	1	Vestibule 101	Recessed	N	MH	4	1	100	S	12	295	25	425	1,770	T5	Parabolic	4'T5	E	S	4	1	28	12	295	3	115	439	1331	0	1331
24	1	Vestibule 146	Recessed	E	4'T8	1	4	32	S	12	295	13	141	499	N/A	Recessed	4'T8	E	S	1	4	32	12	295	13	141	499	0	0	0
25	1	Concession 103	Recessed	E	4'T8	11	4	32	S	12	295	13	1,421	5,491	C	Recessed	4'T8	E	OS	11	4	32	9	295	13	1421	4118	0	1373	1373
26	1	Lobby 102	Recessed	N	CFL	1	1	26	S	12	295	0	26	92	N/A	Recessed	CFL	N	S	1	1	26	12	295	0	26	92	0	0	0
27	1	Meeting Rm 104	Parabolic	E	4'T8	8	3	32	S	12	295	10	778	3,002	C	Parabolic	4'T8	E	OS	8	3	32	9	295	10	778	2251	0	750	750
28	1	Bathroom 110	Parabolic	E	4'T8	1	2	32	S	12	295	6	70	248	N/A	Parabolic	4'T8	E	S	1	2	32	12	295	6	70	248	0	0	0
29	1	Kitchen 109	Parabolic	E	4'T8	2	2	32	S	12	295	6	134	496	N/A	Parabolic	4'T8	E	S	2	2	32	12	295	6	134	496	0	0	0
30	1	Managers Office 106	Parabolic	E	4'T8	7	3	32	S	8	243	10	682	1,442	C	Parabolic	4'T8	E	OS	7	3	32	6	243	10	682	1082	0	361	361
31	1	Superintendents Office 107	Parabolic	E	4'T8	4	3	32	S	8	243	10	394	824	C	Parabolic	4'T8	E	OS	4	3	32	6	243	10	394	618	0	206	206
32	1	Storage Rm 108	Parabolic	E	4'T8	2	2	32	S	2	295	6	134	83	N/A	Parabolic	4'T8	E	S	2	2	32	2	295	6	134	83	0	0	0
33	1	Storage Rm 134	Parabolic	E	4'T8	4	2	32	S	2	295	6	262	165	N/A	Parabolic	4'T8	E	S	4	2	32	2	295	6	262	165	0	0	0
34	1	Storage Rm 132	Parabolic	E	4'T8	2	2	32	S	2	295	6	134	83	N/A	Parabolic	4'T8	E	S	2	2	32	2	295	6	134	83	0	0	0
35	1	Closet 147	Parabolic	E	4'T8	1	2	32	S	2	295	6	70	41	N/A	Parabolic	4'T8	E	S	1	2	32	2	295	6	70	41	0	0	0
36	1	Storage Rm 130	Parabolic	E	4'T8	4	2	32	S	2	295	6	262	165	N/A	Parabolic	4'T8	E	S	4	2	32	2	295	6	262	165	0	0	0
37	1	Hallway 117	Parabolic	E	4'T8	14	2	32	S	12	295	6	902	3,469	N/A	Parabolic	4'T8	E	S	14	2	32	12	295	6	902	3469	0	0	0
38	1	Hallway 117	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
39	1	Hallway 117	Recessed	N	CFL	2	1	26	S	12	295	0	52	184	N/A	Recessed	CFL	N	S	2	1	26	12	295	0	52	184	0	0	0
40	1	Vestibule 146	Recessed	N	CFL	3	1	26	S	12	295	0	78	276	N/A	Recessed	CFL	N	S	3	1	26	12	295	0	78	276	0	0	0
41	1	Concession 103	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
42	1	Lobby 102	Recessed	N	CFL	2	1	26	S	12	295	0	52	184	N/A	Recessed	CFL	N	S	2	1	26	12	295	0	52	184	0	0	0
43	1	Lobby 102	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
44	1	Vestibule 101	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
45	1	Hallway 116	Parabolic	E	4'T8	16	4	32	S	12	295	13	2,061	7,986	N/A	Parabolic	4'T8	E	S	16	4	32	12	295	13	2061	7986	0	0	0
46	1	Hallway 116	Recessed	N	CFL	4	1	26	S	12	295	0	104	368	N/A	Recessed	CFL	N	S	4	1	26	12	295	0	104	368	0	0	0
47	1	Bathroom Women 142	Recessed	N	CFL	1	1	26	S	12	295	0	26	92	C	Recessed	CFL	N	OS	1	1	26	9	295	0	26	69	0	23	23
48	1	Bathroom Women 142	Parabolic	E	4'T8	6	2	32	S	12	295	6	390	1,487	C	Parabolic	4'T8	E	OS	6	2	32	9	295	6	390	1115	0	372	372
49	1	Bathroom Men 143	Parabolic	E	4'T8	6	2	32	S	12	295	6	390	1,487	C	Parabolic	4'T8	E	OS	6	2	32	9	295	6	390	1115	0	372	372
50	1	Bathroom Men 143	Recessed	N	CFL	1	1	26	S	12	295	0	26	92	C	Recessed	CFL	N	OS	1	1	26	9	295	0	26	69	0	23	23
51	1	Women's Locker Room 141	Recessed	N	CFL	2	1	26	S	12	295	0	52	184	N/A	Recessed	CFL	N	S	2	1	26	12	295	0	52	184	0	0	0
52	1	Men's Locker Room 140	Recessed	N	CFL	2	1	26	S	12	295	0	52	184	N/A	Recessed	CFL	N	S	2	1	26	12	295	0	52	184	0	0	0
53	1	Showers Men 140	Recessed	E	4'T8	2	4	32	S	12	295	13	269	998	C	Recessed	4'T8	E	OS	2	4	32	9	295	13	269	749	0	250	250
54	1	Showers Women 141	Recessed	E	4'T8	2	4	32	S	12	295	13	269	998	C	Recessed	4'T8	E	OS	2	4	32	9	295	13	269	749	0	250	250
55	1	Bathroom Men 136	Recessed	N	CFL	1	1	26	S	12	295	0	26	92	N/A	Recessed	CFL	N	S	1	1	26	12	295	0	26	92	0	0	0
56	1	Bathroom Women 137	Recessed	N	CFL	1	1	26	S	12	295	0	26	92	N/A	Recessed	CFL	N	S	1	1	26	12	295	0	26	92	0	0	0
57	1	Bathroom Women 137	Parabolic	E	4'T8	8	2	32	S	12	295	6	518	1,982	C	Parabolic	4'T8	E	OS	8	2	32	9	295	6	518	1487	0	496	496
58	1	Bathroom Men 136	Parabolic	E	4'T8	8	2	32	S	12	295	6	518	1,982	C	Parabolic	4'T8	E	OS	8	2	32	9	295	6	518	1487	0	496	496
59	1	Staircase 135	Parabolic	E	4'T8	1	2	32	S	12	295	6	70	248	N/A	Parabolic	4'T8	E	S	1	2	32	12	295	6	70	248	0	0	0
60	1	Janitor's Closet 144	Parabolic	E	4'T8	1	2	32	S	12	295	6	70	248	N/A	Parabolic	4'T8	E	S	1	2	32	12	295	6	70	248	0	0	0

Appendix A: Lighting Survey (cont'd.)

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
61	1	Staircase 144	Parabolic	E	4'T8	1	2	32	N	12	295	6	70	248	N/A	Parabolic	4'T8	E	N	1	2	32	12	295	6	70	248	0	0	0
62	1	Gymnasium 129	Exit Sign	N	LED	5	1	5	S	24	365	1	26	263	N/A	Exit Sign	LED	N	S	5	1	5	24	365	1	26	263	0	0	0
63	1	Gymnasium 129	HID	N	MH	62	1	400	S	12	295	100	24,900	109,740	T5	Parabolic	4'T5	E	S	62	4	28	12	295	6	6950	25899	83841	0	83841
64	1	Gymnasium 129	HID	N	MH	6	1	175	S	12	295	44	1,094	4,652	T5	Parabolic	4'T5	E	S	6	4	28	12	295	6	678	2506	2145	0	2145
65	1	Gymnasium 129	Recessed	N	CFL	6	1	26	S	12	295	0	156	552	N/A	Recessed	CFL	N	S	6	1	26	12	295	0	156	552	0	0	0
66	1	Gymnasium 129	HID	N	MH	20	1	250	S	12	295	63	5,063	22,160	T5	Parabolic	4'T5	E	S	20	4	28	12	295	6	2246	8354	13806	0	13806
67	2	Mechanical Rm 134	Parabolic	E	4'T8	6	2	32	S	2	295	6	390	248	N/A	Parabolic	4'T8	E	S	6	2	32	2	295	6	390	248	0	0	0
68	2	Mechanical Rm 134	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
69	Ext	Exterior	Exterior	N	MH	16	1	100	T	12	295	25	1,625	7,080	PSMH	Exterior	PSMH	N	T	16	1	65	12	295	14	1054	4475	2605	0	2605
70	Ext	Exterior	Recessed	N	MH	4	1	100	T	12	295	25	425	1,770	PSMH	Recessed	PSMH	N	T	4	1	65	12	295	14	274	1119	651	0	651
71	Ext	Exterior	Exterior	N	MH	8	1	100	T	12	295	25	825	3,540	PSMH	Exterior	PSMH	N	T	8	1	65	12	295	14	534	2237	1303	0	1303
Totals:						387	136	3,599				821	55,959	217,419						387	145	2,093				32,701	100,679	107445	9294	116740
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Proposed Lighting Summary Table			
Total Surface Area (SF)	34,000		
Average Power Cost ($/kWh)	0.1610		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	12,390	7,830	**4,560**
Exterior Power (watts)	2,875	1,862	**1,013**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	205,029	92,849	**112,180**
Lighting Power (watts)	53,084	30,839	**22,245**
Lighting Power Density (watts/SF)	1.56	0.91	**1**
Estimated Cost of Fixture Replacement ($)	33,930		
Estimated Cost of Controls Improvements ($)	5,060		
Total Consumption Cost Savings ($)	**30,714**		

Legend				
Fixture Type	**Lamp Type**	**Control Type**	**Ballast Type**	**Retrofit Category**
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
	4'T8			PSMH (Install new Pulse-Start Metal Halide)
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

DISCLAIMER: LIGHTING COUNTS IN THE SPREADSHEET ABOVE ARE GOOD ONLY FOR AREAS ACCESSIBLE TO SWA AUDITORS. SWA DOES NOT ACCEPT RESPONSIBILITY FOR MISSING LIGHTS, AS SOME SPACES WERE NOT ACCESSIBLE ON THE DAYS OF FIELD VISIT. THEREFORE, THE LIGHTING COUNTS MAY NOT BE ACCURATE.

Appendix B: Third Party Suppliers (ESCOs)

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

PSE&G ELECTRICAL SERVICE TERRITORY Last Updated: 06/15/09		
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com	**BOC Energy Services, Inc.** 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 www.boc.com	**Commerce Energy, Inc.** 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 www.newenergy.com	**Direct Energy Services, LLC** 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 www.directenergy.com	**FirstEnergy Solutions Corp.** 300 Madison Avenue Morristown, NJ 0113113 (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	**Integrys Energy Services, Inc.** 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 www.integrysenergy.com	**Strategic Energy, LLC** 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, www.sel.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 www.libertypowercorp.com	**Pepco Energy Services, Inc.** 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (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 The Mac-Cali Building 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) 800-756-3749 www.south jerseyenergy.com	**Suez Energy Resources NA, Inc.** 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 080113 (856) 273-9995 www.ugienergyservices.com	**American Powernet Management, LP** 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com	**ConEdison Solutions** Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 665-0955 www.conedsolutions.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450 212-1138-3124 www.creditsuisse.com	**Sprague Energy Corp.** 12 Ridge Road Chatham Township NJ 011328 (800) 225-1560 www.spragueenergy.com	

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Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 www.directenergy.com	**Dominion Retail, Inc.** 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080113 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 871 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 www.hudsonenergyservices.com	**Intelligent Energy** 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-113-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1132 Freeman Street Orange, NJ 07050 800-840-4GAS 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 - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011328 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64113 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5113-1121 www.woodruffenergy.com

Appendix C: Incentive Programs

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see:

http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs's Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 80%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
- Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
- Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program

The *Renewable Energy Incentive Program (REIP)* provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found here.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Appendix D: Carbon Footprint Assessment

At the Kyoto summit of 1997, and more recently at the 2009 Copenhagen climate conference, world leaders have officially endorsed the theory that carbon dioxide (CO2) and other greenhouse gases have an impact on global climate change. The total set of greenhouse gas (GHG) emissions caused by an organization is known as that organization's "carbon footprint."Calculating the carbon footprint has become an integral part of any environmental performance assessment.

Increasingly, local and federal authorities are moving toward more stringent rules aimed at curbing carbon emissions from a number of institutions. Carbon dioxide (CO2) emissions result from activities such as heating, electricity generation, transport and wastes disposals. By reducing its carbon footprint, an organization is better able to manage resources and output, reduce energy costs, and mitigate its environmental impact.

Steven Winter Associates has conducted a carbon footprint evaluation for the city of Rahway using guidance provided by the Greenhouse Gas Protocol Initiative (GGPI). GGPI is an international accounting tool that is widely used by government and business leaders to understand quantify and manage greenhouse gas emissions. The GHG protocol initiative methodology divides emissions into three scopes depending on the source of the emissions.

Because the data collected by SWA in the Rahway energy audit were limited to energy consumption, this report focuses only on building-related emissions included in scopes 1 and 2. Excluding Scope 3 emissions, the total emission for the Recreation Center building was 388 metric tons, or 855,540 lbs of CO2, between March 2008 to February 2009.

Scope 1 emissions constitute direct emissions resulting from the combustion of natural gas to heat the building and provide hot water. They account for 15.35% of the building's emissions, or 56 metric tons. Scope 2 emissions constitute indirect emissions from the generation and transport of purchased electricity used to power appliances, such as lighting, electronics and HVAC systems. In this case, they account for 85% of the building's emissions, or 328 metric tons.

The Recreation Center building generates 33 % of the total emissions for the eight audited buildings included in SWA's scope of work (1,182 metric tons). Among the eight buildings, the Recreation Center has the fourth lowest position regarding contribution of greenhouse gases relative to its square footage (9.28 lbs of CO2 per Sqft). The table below shows how the Energy Conservation Measures proposed by Steven Winter Associates can reduce the Recreation Center greenhouse gas emissions:

Energy Conservation Measures Proposed by SWA					
ECM	**Cost**	**Savings kWh/y**	**Saving Therms/y**	**CO2 Savings in metric tons**	**Total Emissions after ECM**
Install Vending Misers	$1,016	5223	0	4.24	383.60
Building Lighting Upgrades	$38,990	116074	0	94.25	293.59
Retro-Commissioning of All HVAC Equipment	$11,560	7928	595	9.41	378.43
Demand Controlled Ventilation	$9,990	15844	1677	21.25	366.59
Install 50 Kilowatt Solar Photovoltaic System	$325,000	56721	0	46.06	341.78
Total	**$386,556**	**201790**	**2272**	175.22	212.63