Steven Winter Associates, Inc.
Architects and Engineers

293 Route 18 South, Suite 330
East Brunswick, NJ 08816
www.swinter.com

Telephone: (866) 676-1972
E-mail: swinter@swinter.com

April 30, 2010

Local Government Energy Program
Energy Audit Final Report

South River Human Services Building
South River, NJ 08882

Project Number: LGEA48

TABLE OF CONTENTS

INTRODUCTION 3
EXECUTIVE SUMMARY 4
1. HISTORIC ENERGY CONSUMPTION 8
1.1. ENERGY USAGE AND COST ANALYSIS 8
1.2. UTILITY RATE 11
1.3. ENERGY BENCHMARKING 11
2. FACILITY AND SYSTEMS DESCRIPTION 14
2.1. BUILDING CHARACTERISTICS 14
2.2. BUILDING OCCUPANCY PROFILES 14
2.3. BUILDING ENVELOPE 14
2.3.1. EXTERIOR WALLS 15
2.3.2. ROOF 15
2.3.3. BASE 16
2.3.4. WINDOWS 16
2.3.5. EXTERIOR DOORS 16
2.3.6. BUILDING AIR TIGHTNESS 17
2.4. HVAC SYSTEMS 17
2.4.1. HEATING 17
2.4.2. COOLING 18
2.4.3. VENTILATION 19
2.4.4. DOMESTIC HOT WATER 19
2.5. ELECTRICAL SYSTEMS 19
2.5.1. LIGHTING 19
2.5.2. APPLIANCES AND PROCESS 20
2.5.3. ELEVATORS 20
2.5.4. OTHERS ELECTRICAL SYSTEMS 20
3. EQUIPMENT LIST 21
4. ENERGY CONSERVATION MEASURES 22
5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES 35
5.1. EXISTING SYSTEMS 35
5.2. WIND 35
5.3. SOLAR PHOTOVOLTAIC 35
5.4. SOLAR THERMAL COLLECTORS 35
5.5. COMBINED HEAT AND POWER 35
5.6. GEOTHERMAL 35
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES 35
6.1. LOAD PROFILES 35
6.2. TARIFF ANALYSIS 38
6.3. ENERGY PROCUREMENT STRATEGIES 38
7. METHOD OF ANALYSIS 40
7.1. ASSUMPTIONS AND TOOLS 40
7.2. DISCLAIMER 40
APPENDIX A: LIGHTING STUDY 41
APPENDIX B: THIRD PARTY ENERGY SUPPLIERS (ESCOS) 43
APPENDIX C: GLOSSARY AND METHOD OF CALCULATIONS 44

INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Borough of South River municipal buildings. The audit, conducted on January 5th, 11th and 12th, included a review of the:

- Human Services Building
- Public Library
- War Memorial Building
- George Street Firehouse
- Appleby Avenue Firehouse
- Municipal Building
- Criminal Justice Building
- Roads Department Building
- Human Services Building

The buildings are located in South River, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the South River Human Services Building located at 55 Reid St., South River, NJ 08882. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The two-story with basement South River Human Services Building was a Communion dress factory before the Borough of South River bought it in 2002 and renovated it in 2005. The building consists of 16,250 square feet of conditioned space and houses storage areas, mechanical rooms, locker rooms, bathrooms, exercise areas, administrative offices, a computer lab, multipurpose / activity rooms, a food bank, the office for the aging, the office of emergency management, TV 35 office and studio and the Recreation Department office. Occupancy for Human Services Building is approximately 40 Senior citizens who socially gather for various activities during weekdays from 9:45 am to 3:00 pm. There are generally 5 of the 10 staff employees in the building during weekdays from 9:00 am to 4:30 pm. The Recreation Department coordinates various community technical (computer classes) and fitness / sports activities. The building is closed on weekends. There are some off-hours activities in the TV 35 (a local station) office and studio.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of South River to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Human Services Building.

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

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Human Services Building located at 55 Reid St., South River, NJ 08882. The Human Services Building is a two-story building with basement comprising of a total floor area of 16,250 square feet. The original structure was built pre 1950s, with additions and renovations, last major upgrade occurring in the 2005.

Based on the field visits performed by the SWA staff on January 5th, 11th and 12th and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

From November 2008 through October 2009 the Human Services Building consumed 77,880 kWh or $10,124 worth of electricity at an approximate rate of $0.130/kWh and 2,716 therms or $3,178 worth of natural gas at an approximate rate of $1.170/therm. The joint energy consumption for the building, including both electricity and natural gas, was 537 MMBtu of energy that cost a total of $13,302.

SWA has entered energy information about the Human Services Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Public Assembly / Recreation facility is comprised of non-eligible (Other) space type, therefore there wasn't any score rating generated. SWA encourages the Borough of South River to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time. EPA is continually working to expand the available space types.

The Site Energy Use Intensity is 33.0 kBtu/ft^{2}yr compared to the national average of Borough Public Assembly / Recreation building consuming 65.0 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 4.0 kBtu/ft^{2}yr, which when implemented would make the building energy consumption much better than the national average.

Based on the assessment of the Human Services 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

- Select NEMA Premium motors when replacing motors at the end of their useful operating lives
- Install a Building Management System (BMS)

Category II Recommendations: Operations and Maintenance

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly
- Maintain downspouts and cap flashing - repair / install missing downspouts and cap flashing as needed
- Provide weather stripping / air sealing
- Repair / seal wall cracks and penetrations
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances

- Use smart power electric strips
- Create an energy educational program

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

At this time, SWA highly recommends a total of **2** Energy Conservation Measures (ECMs) for the Human Services Building that is summarized in the following Table 1. The total investment cost for these ECMs without incentives is **$1,400**. SWA estimates a first year savings of **$375** with a simple payback of **3.7 years**. SWA also recommends **3** more ECMs with a total first year savings of **$21,278** that is summarized in Table 2 and **1** recommended End of Life Cycle ECM with a total first year savings of **$79** that is summarized in Table 3. SWA estimates that implementing these recommended ECMs will reduce the carbon footprint of the Human Services Building by **23,629 lbs of CO_2**, which is equivalent to removing approximately 2 cars from the roads each year or avoiding the need of 58 trees to absorb the annual CO_2 generated.

There are various incentives available in New Jersey to lower the cost of installing the Energy Conservation Measures (ECMs), like NJ SmartStart program and Direct Install through the New Jersey Office of Clean Energy. These incentive programs can help provide technical assistance for the building in the implementation phase of any energy conservation project. The Borough of South River and 6 other nearby boroughs have a long term contract to purchase electricity as a consortium from the South River Electric Utility and do not pay the Societal Benefit Charges (SBCs) that fund NJCEP programs. Therefore, the Borough of South River is not eligible to receive any equipment incentives for energy conservation under the New Jersey Clean Energy Program (NJCEP) at the present time. SWA recommends the Borough of South River initiate a dialogue with the Board of Public Utilities (BPU) to gain access to these and other incentives in the future.

The following three 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 have ECMs interact (i.e. lighting savings impact, heating and cooling savings).

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 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
1.1	replace (2) incandescent and (4) Metal Halide lamps with CFLs	RS Means, Lit Search	300	0	300	1,135	0.4	0	0.2	18	165	5	825	1.8	175	35	47	438	2,032
1.2	install (5) occupancy sensors	RS Means, Lit Search	1,100	0	1,100	1,615	0.5	0	0.3	0	210	12	2,519	5.2	129	11	16	935	2,892
	Totals		**1,400**	**0**	**1,400**	**2,750**	**0.9**	**0**	**0.6**	**18**	**375**	**-**	**3,345**	**3.7**	**139**	**-**	**21**	**1,373**	**4,924**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

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 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	retro commission-ing	similar projects	20,313	none at this time	20,313	7,788	2.6	272	3.3	1,820	3,150	12	37,803	6.4	86	7	11	10,343	16,938
1.3	replace (1) T12 fixture in elevator with T8 fixture	RS Means, Lit Search	215	0	215	219	0.1	0	0.0	0	28	15	427	7.6	99	7	10	116	392
3	replace old (2nd flr) kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	750	0	750	350	0.1	0	0.1	50	96	12	1,146	7.9	53	4	7	183	627
	Totals		**21,278**	**0**	**21,278**	**8,357**	**2.8**	**272**	**3.4**	**1,870**	**3,274**	**-**	**39,376**	**6.5**	**85**	**-**	**11**	**10,642**	**17,957**

Table 3 - Recommended End of Life Cycle 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 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	replace (1) old 89% eff DHW with new (1) condensing type DHW - 95% eff	Energy Star purchasing and procurement site, similar projects	2,250	0	2,250	0	0.0	68	0.0	0	79	13	1,032	28.3	-54	-4	-10	-1,372	748
	Totals		**2,250**	**0**	**2,250**	**0**	**0.0**	**68**	**0.0**	**0**	**79**	**13**	**1,032**	**28.3**	**-54**	**-4**	**-10**	**-1,372**	**748**

1. HISTORIC ENERGY CONSUMPTION

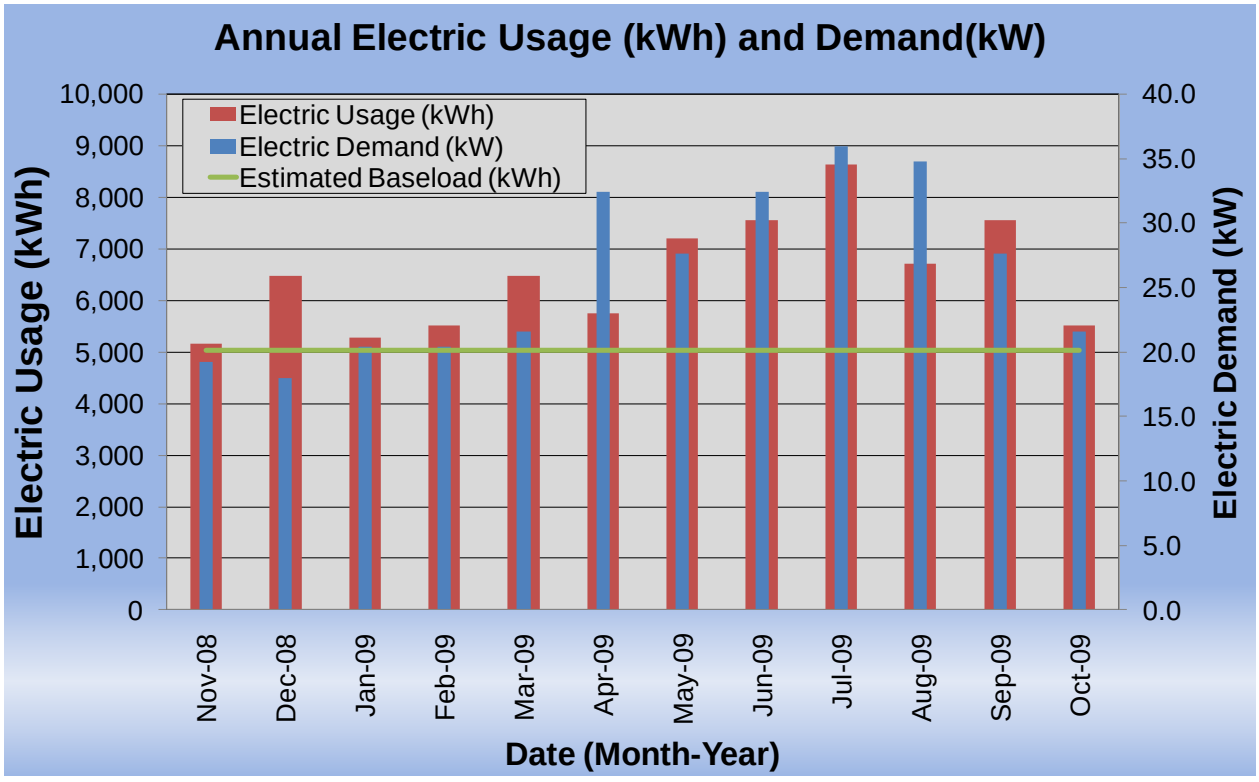
1.1. Energy Usage and Cost Analysis

SWA analyzed utility bills from December 2007 through October 2009 that were received from the utility companies supplying the South River Human Services Building with electric and natural gas.

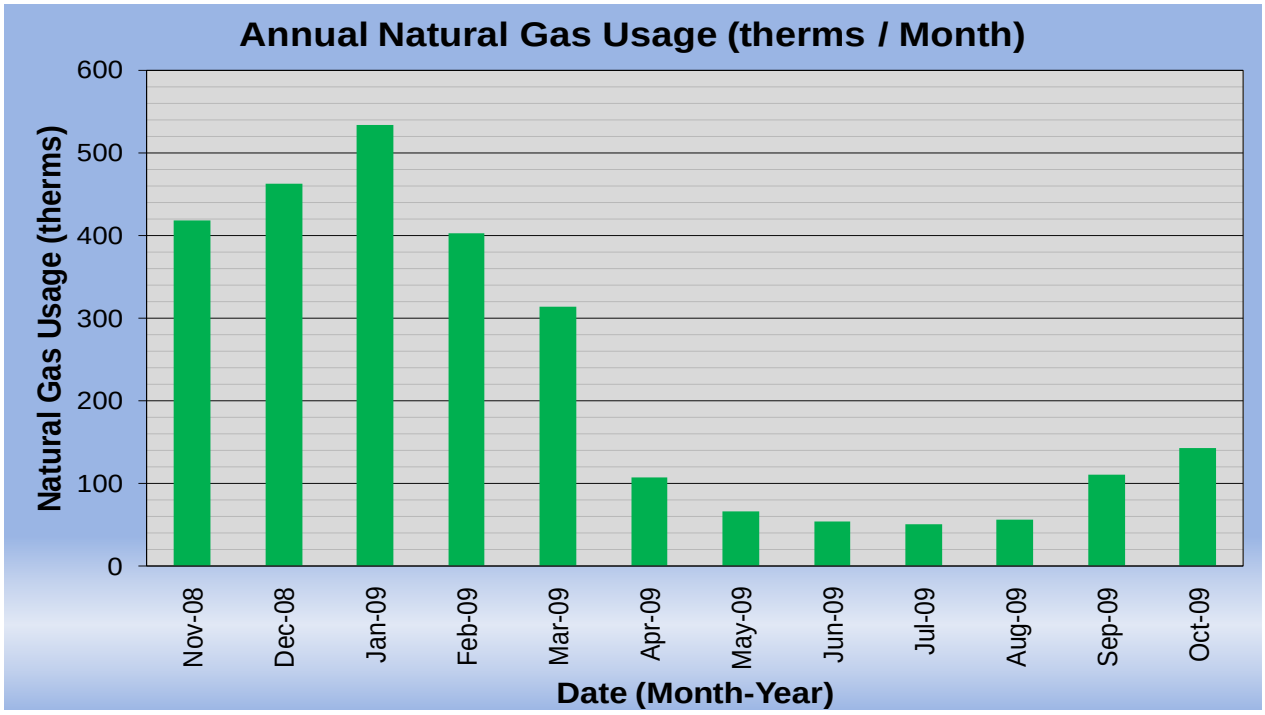
Electricity - The South River Human Services Building is currently served by one electric meter. The Human Services Building currently buys electricity from South River Electric Utility at **an average rate of $0.130/kWh** based on 12 months of utility estimates from November 2008 through October 2009. The Human Services Building purchased **approximately 77,880 kWh or $10,124 worth of electricity** in the previous year. The average monthly demand was 26 kW.

Natural gas - The South River Human Services Building is currently served by one meter for natural gas. The South River Human Services Building currently buys natural gas from PSE&G at **an average aggregated rate of $1.170/therm** based on 12 months of utility bills for November 2008 through October 2009. The South River Human Services Building purchased **approximately 2,716 therms or $3,178 worth of natural gas** in the previous year at a very competitive rate.

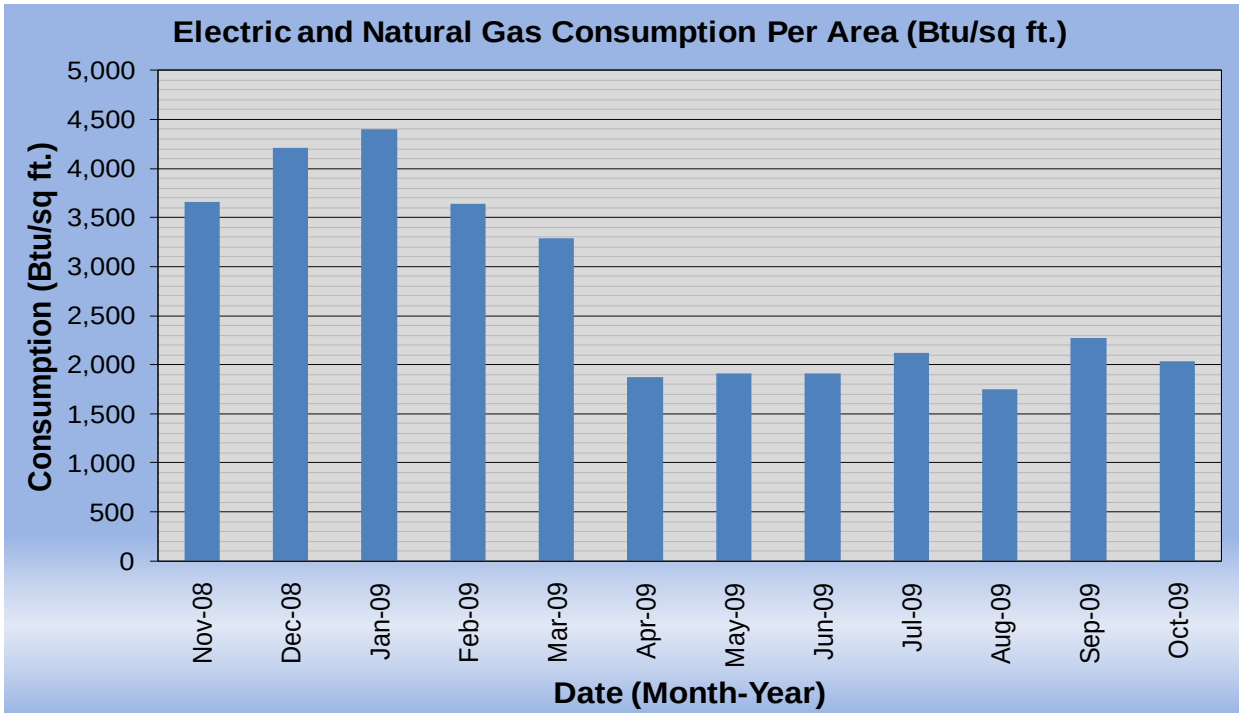
The following chart shows electricity consumption for the Human Services Building based on electric bills for the 12 month period of November 2008 through October 2009.



The following chart shows the natural gas consumption for the Human Services Building based on natural gas bills for the 12 month period of November 2008 through October 2009.

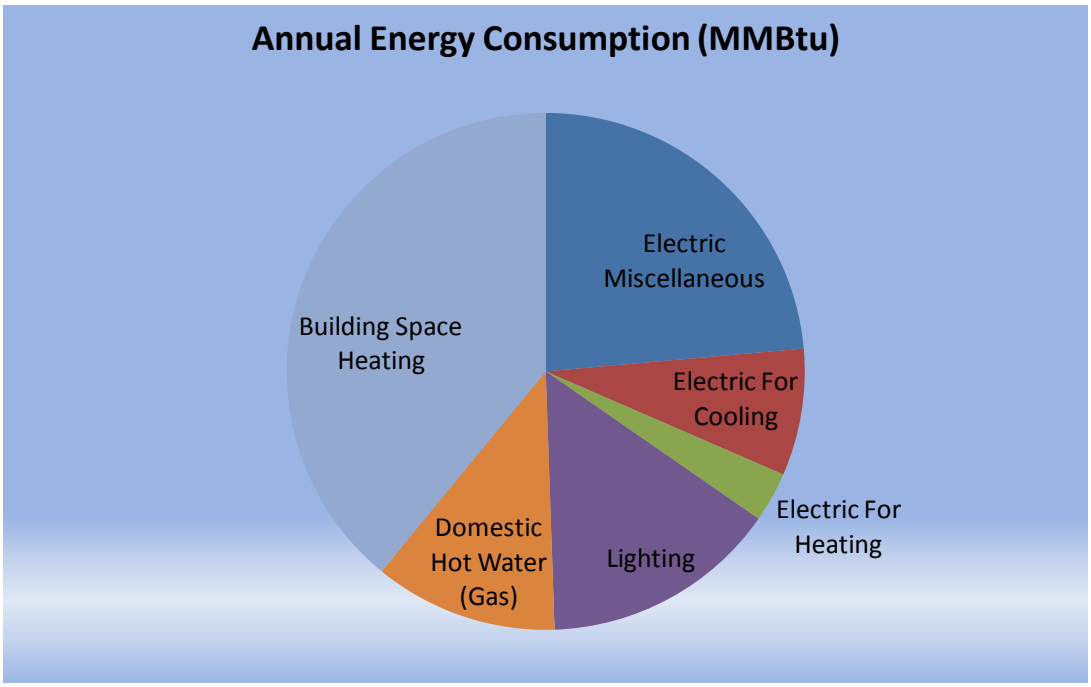


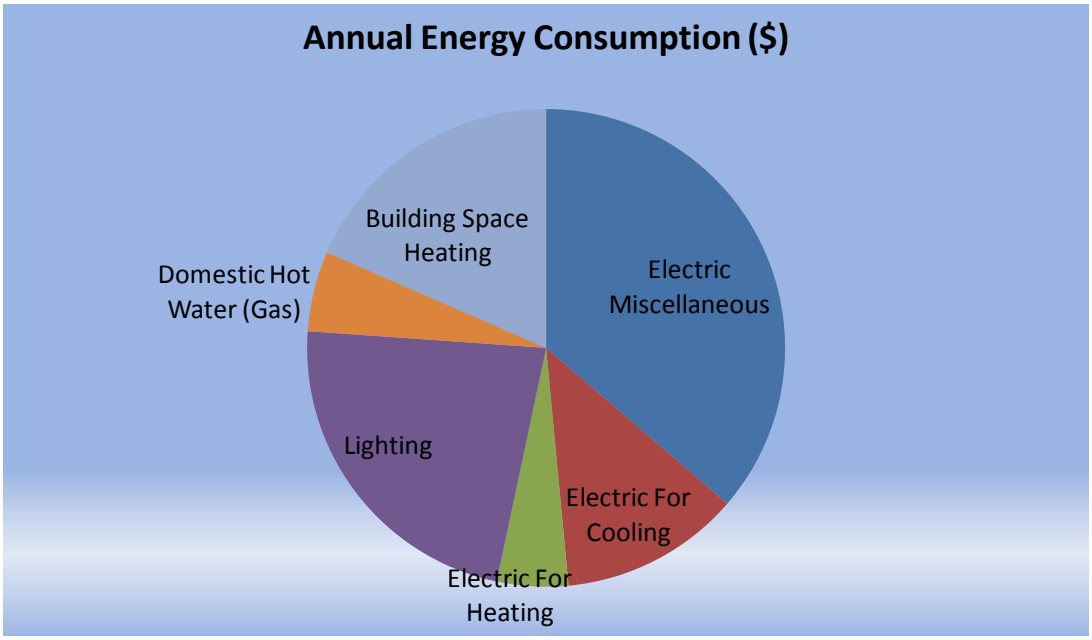
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Human Services Building based on estimates and utility bills for the 12 month period of November 2008 through October 2009.



The following table and chart pies show energy use for the Human Services Building based on utility bills for the 12 month period of November 2008 through October 2009. Note electrical cost at $38/MMBtu of energy is more than 3 times as expensive to use as natural gas at $12/MMBtu.

2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	127	24%	$4,830	36%	38
Electric For Cooling	43	8%	$1,622	12%	38
Electric For Heating	17	3%	$640	5%	38
Lighting	80	15%	$3,033	23%	38
Domestic Hot Water (Gas)	62	11%	$722	5%	12
Building Space Heating	210	39%	$2,456	18%	12
Totals	537	100%	$13,302	100%	25
Total Electric Usage	266	49%	$10,124	76%	38
Total Gas Usage	272	51%	$3,178	24%	12
Totals	537	100%	$13,302	100%	25





1.2. Utility Rate

The Human Services Building currently purchases electricity from South River Electric Utility at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Human Services Building currently pays an average rate of approximately $0.130/kWh based on the 12 months estimates of November 2008 through October 2009.

The Human Services Building currently purchases natural gas supply from the PSE&G at a competitive general service market rate for natural gas (therms). PSE&G also acts as the transport company. There is one gas meter that provides natural gas service to the Human Services Building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.170/therm based on 12 months of utility bills for November 2008 through October 2009.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.

1.3. Energy Benchmarking

SWA has entered energy information about the Human Services Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Public Assembly / Recreation facility is comprised of non-eligible (Other) space type. A Public Assembly / Recreation facility space or "Other" can be used to classify a facility or a portion of a facility where the primary activity does not fall into any of the available space types. Consequently, the Human Services Building is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 33.0 kBtu/sq ft yr compared to the national average of a Borough Public Assembly / Recreation building consuming 65.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 0.6 kBtu/sq ft yr, with an additional 3.4 kBtu/sq ft yr from the recommended

ECMs. These recommendations could account for at least 4.0 kBtu/sq ft yr reduction, which when implemented would make the building energy consumption much better than the national average.

Per the LGEA program requirements, SWA has assisted the Borough of South River to create an *Energy Star Portfolio Manager* account and share the Human Services Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager site information with the Borough of South River (user name of "sriverboro" with a password of "sriverboro") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of South River - Human Resources Building

Building ID: 2018886
For 12-month Period Ending: October 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: January 29, 2010

Facility
Borough of South River - Human Resources Building
55 Reid Street
South River, NY 08882

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2002
Gross Floor Area (ft²): 16,250

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	262,550
Natural Gas (kBtu)[4]	277,541
Total Energy (kBtu)	540,091

Energy Intensity[5]

Site (kBtu/ft²/yr)	33
Source (kBtu/ft²/yr)	72

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	55

Electric Distribution Utility
Borough of South River

National Average Comparison

National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	-47%
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.

Certifying Professional
N/A

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 two-story with basement South River Human Services Building was a Communion dress factory before the Borough of South River bought it in 2002. In 2005 the building was renovated and expanded. The building consists of 16,250 square feet of conditioned space. The basement houses storage / janitor closets, a mechanical room, a food bank, a men's locker room, a women's locker room, a seniors' exercise center, an exercise center mechanical room, a massage room and an elevator machine room. The first floor houses two offices, a computer lab, the office for the aging, a women's bathroom, a men's bathroom, the administration office, a records / file room, a reading room / activity room, a conversation room and various closets. The second floor houses the office of emergency management, the TV 35 office and studio, the TV 35 equipment room, the Recreation Department office, a women's bathroom, a men's bathroom, an administration office, a records / file room, a coat closet, a janitor closet and a multipurpose room.

Front and Side Façade

Partial Rear Façade (typ.)

2.2. Building Occupancy Profiles

Occupancy for the entire Human Services Building is approximately 40 Senior citizens who socially gather for various activities during weekdays from 9:45 am to 3:00 pm. There are generally 5 of the 10 staff employees in the building during weekdays from 9:00 am to 4:30 pm. On Wednesdays the food bank, located in the basement gives away Care packages. The Recreation Department, located on the second floor, coordinates various community technical (computer classes are offered) and fitness / sports activities. The building is closed on weekends. There are some off-hours activities in the TV 35 (a local station) office and studio.

2.3. Building envelope

Due to unfavorable weather conditions for the building's exterior envelope finish material (EIFS) (min. 20 deg F delta-T in / outside & no / low wind) no exterior envelope infrared (IR) images were taken during the field audit of this building.

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

2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of EIFS (Exterior Insulation Finishing System) over 5-1/2" light gauge steel framing with 5 inches of fiberglass batt cavity insulation. The interior is mostly painted gypsum wallboard.

Note: Wall insulation levels could not be verified in the field and are based on available construction plans.

During the field audit exterior and interior wall surfaces were inspected. They were found / reported to be in overall good / age appropriate condition with no major signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

The following specific exterior wall problem spot was identified:

Uncontrolled roof water run-off due to missing/ ineffective downspout deflector

In light of the exterior wall conditions mentioned above SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Install / repair and maintain downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.

2.3.2. Roof

The building's roof is predominantly a low-pitch gable type over a wood structure with an asphalt shingle finish. It was replaced recently. 8 inches of fiberglass batt attic / ceiling and no detectable / assumed roof insulation were recorded.

Note: Roof insulation levels could not be verified in the field and are based on available construction plans.

During the field audit, roofs, related flashing, gutters and downspouts were inspected. They were found / reported to be in overall good / age appropriate condition with no signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

In light of the roof conditions mentioned above, SWA has no recommendations at this time.

2.3.3. Base

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

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

The building's base and its perimeter were inspected. Judging from signs of uncontrolled moisture or water presence and other energy compromising issues, overall the base was found / reported to be in acceptable / age appropriate condition with no signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

In light of the base conditions mentioned above, SWA has no recommendations at this time.

2.3.4. Windows

The building contains only one main type of window.

1. 38 double-hung type windows with a vinyl frame, low-E coated double glazing with some individual interior shading devices.

Windows, shading devices, sills, related flashing and caulking were inspected from the exterior and interior as far as accessibility allowed. Based on signs of moisture, air-leakage and other energy compromising issues, overall the windows were found and / or reported to be in good / age appropriate condition with no signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

In light of the window conditions mentioned above, SWA has no recommendations at this time.

2.3.5. Exterior doors

The building contains only one main type of exterior door.

1. 2 glass metal framed type exterior doors. They are located on the main floor and were installed recently.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected. Based on signs of moisture, air-leakage and other energy compromising issues, overall the doors were found / reported to be in acceptable / age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

The following specific door problem spot was identified:

Missing/ worn weather stripping

In light of the door conditions mentioned above, SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Install / replace / maintain weather stripping around all exterior doors.

2.3.6. Building Air Tightness

Overall the field auditors found the building to be reasonably air-tight, considering the building's use and occupancy, as described in more detail in the previous sections under *2.3. Building Envelope*

In addition to all the above mentioned findings SWA recommends air sealing, caulking and / or insulating around all structural members, recessed lighting fixtures, electrical boxes that are part of or penetrate the exterior envelope and where air-leakage can occur.

The air tightness of buildings helps maximize all other implemented energy measures and investments and minimizes potentially costly long term maintenance / repair / replacement expenses.

2.4. HVAC Systems

The Human Services Building heating is provided by a number of condensing furnaces located on each floor with the cooling provided by evaporators located in the furnace discharge ductwork. The split system individual fan-cooled condensers which are associated with each evaporator are located at the back and the north side of the building.

2.4.1. Heating

Heating to the building is provided by York condensing furnaces. They were installed during the 2005 building upgrade and have 92-93% AFUE efficiency. They have approximately 70% useful life left on them. Each of the three floors has its dedicated furnace and associated ductwork system. The basement has two separate furnaces, one for the gym / exercise room; the other for the balance of the basement. All forced air heat is distributed via diffusers supported by the drop ceiling. There isn’t any wall perimeter heating. There are three small electric heaters mounted in the vestibule walls to overcome the cold air carried into the building from the outside. Generally, each furnace system has a couple of thermostats controlling it. These programmable thermostats are generally located in public areas, such as the first floor arrangement with one thermostat on the corridor, the other in the conversation room area. When doors are closed and depending on the higher activity in

some areas of the building vs. other lower occupancy spaces, the comfort level for heating / cooling varies significantly to the point where floor plug in heaters and room fans are often used to alleviate the ambient conditions. Also, there isn't any heating / cooling / ventilation schedule controlled by a Building Management System (BMS). SWA recommends that some of the diffusers be replaced with variable air volume (VAV) boxes for modulating flow better with more local programmable thermostats, as well as reheat electric elements in the VAV boxes to assist when local temperatures became too cold. SWA also recommends rebalancing the air distribution in the building, as well as investment into a building-wide state of the art BMS (should comfort complaints persist).

Condensing furnaces with PVC air inlet and flue gas discharge piping, and evaporators on the discharge ductwork with small bore PVC piping for condensate removal

2.4.2. Cooling

The Human Services Building cooling is provided by York evaporator coils (located in the furnace discharge ductwork). These York split systems and (8) eight fan cooled Energy Star condensers, 13 SEER efficiency, are located on the northern building exposure at ground level. They use R-22 Freon for air cooling. Thermostat control issues are similar to those addressed in the above 2.4.1 Heating section.

A typical arrangement draws fresh air via a 3" PVC pipe and brings it into a mixing chamber where it is combined with return air and filtered. The air (furnace) blower then pushes the filtered, conditioned air to the distribution system. The air is then distributed via diffusers into the building spaces. The air handlers and outdoor condensers, installed in 2005, have an estimated 70% useful operating life remaining.

2.4.3. Ventilation

The various spaces of the building are ventilated by the furnace units that serve the respective spaces as described in the “Heating / Cooling” sections above. The bathrooms, some closets / storage areas and the kitchen also have exhaust fans that purge air to the outside. In general, the building exhaust fans have 70% estimated useful operating life remaining.

2.4.4. Domestic Hot Water

The domestic hot water (DHW) for the Human Resources Building is provided by an A. O. Smith Power Shot natural gas fired heater with 50 gal storage. This unit obtains combustion air from the living space but has fan-assisted exhaust. This heater is leaking water on the bottom and therefore has 0% estimated useful operating life left. SWA recommends that it is replaced soon with another higher efficiency gas fired, condensing type unit, prior to catastrophic failure, and should repair options fail.

Leaking DHW heater

2.5. Electrical Systems

2.5.1. Lighting

Interior Lighting - The Human Resources Building contains a mix of CFL (Compact Fluorescent Lamp) fixtures, incandescent fixtures, 2ft-U shaped, 2ft and 4ft T8 fixtures with electronic ballasts, and T12 fixtures. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing the following inefficient fixtures with more energy efficient types: Incandescent lamps should be replaced with screw-in CFLs and 4ft T12 fixtures should be replaced with 4ft T8 fixtures. CFL lamps produce the same lumen output with less wattage than incandescent lamps and last up to 5 times longer. All replacements should meet local code requirements, such as

shielding for safety hazards. SWA also recommends installing 6 occupancy sensors in areas that are occupied only part of the day and payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if motion is undetected within a set time period. Advance micro-phonic lighting sensors include sound detection as a mean to control lighting operation. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights - Exit signs were found to be efficient LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide lamp fixtures. Exterior lighting is controlled by photocells. SWA recommends replacing the Metal Halide lamps with Compact Fluorescent Lamps (CFL). SWA is not recommending at this time any upgrades to the exterior photocells.

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.

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 (DVDs, stereos, computers, and kitchen appliances which now have internal memories or clocks which always require a trickle of power) 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. The Human Services Building computers are generally NOT programmed for the power save mode, to shut down after a period of time that they have not been used.

2.5.3. Elevators

The Human Services Building is a two-story building with basement and one 3,000 lbs capacity ThyssenKrupp elevator. The hydraulic system driving the elevator piston is located in the basement and has a 20 HP 3425 RPM motor with an estimated 80% useful operating life remaining.

2.5.4. Others Electrical Systems

There are not currently any other significant energy impacting electrical systems installed at the Human Services Building, besides a few small transformers.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating / Cooling	1 condensing furnace (120 MBTUH input, 112 MBTUH output) - 93% est. htg. eff. with 5 Ton evaporator (R22)	basement gym mech room	York furnace GY9S120D2OUP11J, evaporator G1FA060S24TG; Serial #s: furnace:WOD6192017, evaporator: AON5460261	Natural Gas - furnace / Electric - blower	basement gym	2005	70%
Heating / Cooling	1 condensing furnace (100 MBTUH input, 93 MBTUH output) - 93% est. htg. eff. with 5 Ton evaporator (R22)	basement storage room	York furnace GY9S100C2OUP11J, evaporator G1FA048S24TG; Serial #s: furnace:WOD6147908, evaporator: AON5708037	Natural Gas - furnace / Electric - blower	basement rooms, excluding the gym	2005	70%
Heating / Cooling	2 condensing furnace (120 MBTUH input, 112 MBTUH output) - 92% est. htg. eff. with 2 * 5 Ton evaporators (R22)	1st flr mech closet	York furnace GY9S120D2OUP11H, evaporator G1FA060S24TG; Serial #s: furnace:WOM5254951, WOD6192021, evaporators: AON5460264 & AON5460260	Natural Gas - furnace / Electric - blower	1st flr	2005	70%
Heating / Cooling	3 condensing furnace (1st: 80 MBTUH input, 75 MBTUH output, 2nd: 120 MBTUH input, 112 MBTUH output, 3rd: 120 MBTUH input, 112 MBTUH output) - 93% est. htg. eff. with 5 Ton evaporators (R22)	2nd flr exercise rm or multipurpose rm closet	York furnaces GY9S080C2OUP11J, GY9S120D2OUP11J and GY9S120D2OUP11J; evaporators FC36C2ANIA, GIFA066S24TG & GIFA060S24T6; Serial #s: furnace:WOB6875571, WOD6192022 & WOD6192018, evaporators: AOC6071364 & AON5460262 & AON5460265	Natural Gas - furnace / Electric - blower	2nd flr	2005	70%
Cooling	8 split condenser units, 1/4 and 1/3 HP fan motors, R22 refrigerant, 13 SEER eff.	outside on the bldg north exposure	York Energy Star models, (5) H1RD060S06H - Serial#s W0C6069363, W0C6069290, W0C6069288, W0C6069285 & W0C6069364; H2RD036S06A - Serial# W0C6113980; H1RD030S06G - Serial# W0B6985063; H2RD048S06A - Serial# W0C6123136	Electric	Human Services Bldg	2005	70%
Heating	1electric htr side entrance, 2 electric htrs main entrance vestibules	1st flr main and side vestibules	Chromalox	Electric	1st flr vestibules	2005	70%

continued on the next page

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
continued from the previous page							
Ventilation	ceiling fan EP2 in sprinkler room - 70% est. eff. ; small exhaust fans in janitor rooms and bathrooms	basement sprinkler / fire alarm mech room; bathroom & janitor room ceilings	Z8STDA - sprinkler room, nametag on other bathroom fans inaccessible	Electric	janitor rooms, basement sprinkler rooms and bathrooms	2005	70%
Domestic Hot Water	1 DHW 50 gal unit, Energy Star est usage - 242 therms/yr (of max 272 therms/yr), storage tank bottom is leaking	basement gym utility room	A.O. Smith Power Shot GPSH50 200; Serial #: E06A048827	Natural Gas	Human Services Bldg	2005	0%
Elevator	one 3,000 lbs capacity ThyssenKrupp elevator; hydraulic US Motors 20 HP, 3425 RPM, pump GR40SMU150	hydraulic unit is in basement	hydraulic unit: Porta-Flex Mfg. PU152045; Serial #: hydraulic unit: KD6-J198-M	Electric	Human Services Bldg	2005	80%
Lighting	See details - Appendix A	See details - Appendix A	See details - Appendix A	Electric	Human Services Bldg	2005	70%

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 the South River Human Services Building, SWA has separated the investment opportunities into three recommended categories:

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 premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives, such as those operating the furnace blowers.

- Install a Building Management System (BMS) - Currently, the building is controlled by individual stand alone programmable thermostats. An overall digital BMS will result in energy savings via improved temperature control and coordination for the building. This recommendation will ensure that the retro-commissioning estimated savings (per ECM#2) are maintained and reproducible. SWA recommends this upgrade with the next major building renovation (should comfort complaints persist).

Category II Recommendations: Operations and Maintenance

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

- Maintain downspouts and cap flashing - Repair / install missing downspouts and cap flashing as needed to prevent water / moisture infiltration and insulation damage. Install / repair and maintain downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.

- Provide weather stripping / air sealing - SWA observed that exterior door weather-stripping in places was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Repair / seal wall cracks and penetrations - SWA recommends as part of the maintenance program to install proper flashing, seal wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- Provide water efficient fixtures and controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective 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-consumption fixtures / appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills.

- Use Energy Star labeled appliances - such as Energy Star refrigerators that should replace older energy inefficient equipment.

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

- Create an energy educational program - that teaches how to minimize their energy use. The US Department of Energy offers free information for hosting energy efficiency educational programs and plans, for more information please visit: http://www1.eere.energy.gov/education/ .

Category III Recommendations: Energy Conservation Measures - Summary Table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1.1, 1.2 & 1.3	replace incandescent and Metal Halide lamps and with CFLs and T12 with T8 fixtures, install occupancy sensors
	Description of Recommended 5-10 Year Payback ECMs
2	retro-commission mechanical equipment
3	replace old refrigerator with Energy Star type model
	Description of Recommended End of Life Cycle ECMs
4	replace leaking DHW heater if new condensing Energy Star model
	Description of Renewable ECMs
5	install a 5 kW solar PV rooftop system

ECM#1: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Human Services Building (see Appendix A). The interior lighting in the Human Services Building consists of a mix of CFL (Compact Fluorescent Lamp) fixtures, incandescent fixtures, 2ft-U shaped, 2ft and 4ft T8 fixtures with electronic ballasts, and T12 fixtures. SWA recommends replacing the following inefficient fixtures with more energy efficient types: Incandescent lamps should be replaced with screw-in CFLs and 4ft T12 fixtures should be replaced with 4ft T8 fixtures. CFL lamps produce the same lumen output with less wattage than incandescent lamps and last up to 5 times longer. All replacements should meet local code requirements, such as shielding for safety hazards. SWA also recommends installing 6 occupancy sensors in areas that are occupied only part of the day and payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if motion is undetected within a set time period. Advance micro-phonic lighting sensors include sound detection as a mean to control lighting operation. The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide lamp fixtures. Exterior lighting is controlled by photocells. SWA recommends replacing the Metal Halide lamps with Compact Fluorescent Lamps (CFL). See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of South River 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: $1,615 (includes $1,036 of labor)
Source of cost estimate: RS *Means; Published and established costs*

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 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
1.1	replace (2) incandescent and (4) Metal Halide lamps with CFLs	RS Means, Lit Search	300	0	300	1,135	0.4	0	0.2	18	165	5	825	1.8	175	35	47	438	2,032
1.2	install (5) occupancy sensors	RS Means, Lit Search	1,100	0	1,100	1,615	0.5	0	0.3	0	210	12	2,519	5.2	129	11	16	935	2,892
1.3	replace (1) T12 fixture in elevator with T8 fixture	RS Means, Lit Search	215	0	215	219	0.1	0	0.0	0	28	15	427	7.6	99	7	10	116	392
	Totals		**1,615**	**0**	**1,615**	**2,969**	**1.0**	**0**	**0.6**	**18**	**403**	**-**	**3,772**	**4.0**	**134**	**-**	**19**	**1,489**	**5,316**

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 0.5 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates / Financial Incentives:

NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#2: *Retro-Commissioning*

Description:

Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and / or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants.

Since the systems at the Human Services building have undergone some renovations in recent years, and the building continues to have concerns with thermal comfort control, SWA recommends undertaking retro-commissioning to optimize system operation as a follow-up to completion of the upgrades. The retro-commissioning process should include a review of existing operational parameters for both newer and older installed equipment. During retro-commissioning, the individual loop temperatures should also be reviewed to identify opportunities for optimizing system performance.

Installation cost:

Estimated installed cost: $20,313 (includes $17,266 of labor)
Source of cost estimate: Similar projects

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 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	retro commission-ing	similar projects	20,313	none at this time	20,313	7,788	2.6	272	3.3	1,820	3,150	12	37,803	6.4	86	7	11	10,343	16,938

Assumptions: Since the utility bills have some accounting fluctuations, it is difficult to determine the amount of energy used for heating and cooling the Human services building. Based on experience with similar buildings, SWA estimated the heating and cooling energy consumption. Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed 10% savings. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $1.25 per square

foot of a total square footage of 16,250. SWA also assumed on the average 1 hr/wk operational savings when systems are operating per design vs. the need to make more frequent adjustments.

Rebates / financial incentives:

There are currently no incentives for this measure at this time.

Options for funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#3: *Replace Old Refrigerator with an Energy Star Model*

Description:

On the day of the site visit, SWA observed that there was an old refrigerator in the second floor pantry area which was not Energy Star rated (using approximately 773 kWh/yr). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerator with an 18.2 cu. ft. top freezer refrigerator ENERGY STAR®, Mfr. model #6897, 407 kWh / yr, or equivalent. Besides saving energy, the replacement will also keep the pantry and other areas cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, 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.

Installation cost:

Estimated installed cost: $750 (includes $70 of labor)
Source of cost estimate: *Manufacturer and Store established costs*

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 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
3a	replace (1) old (2nd flr) kitchen refrigerator with an 18 cu ft model in kind	Energy Star purchasing and procurement site, similar projects	700	0	700	50	0.0	0	0.0	50	57	12	678	12.4	-3	0	0	-140	90
3b	incremental difference to replace (1) old (2nd flr) kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	50	0	50	300	0.1	0	0.1	0	39	12	468	1.3	836	70	78	323	537
3c	replace old (2nd flr) kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	750	0	750	350	0.1	0	0.1	50	96	12	1,146	7.9	53	4	7	183	627

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis.

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#4: *Replace Domestic Water Heater*

Description:

There is one (1) gas fired floor-mounted domestic water heater located in the basement gym utility room that produces the domestic hot water for the entire year. The water heater utilizes an external 50 gal storage tank. The heater was installed circa 2005 and is now leaking water on the bottom and therefore has 0% estimated useful operating life left. SWA recommends that it is replaced soon with another higher efficiency gas fired, condensing type unit, prior to catastrophic failure.

Installation cost:

Estimated installed cost: $2,250 (includes $720 of labor)
Source of cost estimate: Similar projects

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 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
4a	replace (1) old 89% eff DHW with a new model in kind	Energy Star purchasing and procurement site, similar projects	1,800	0	1,800	0	0.0	31	0.2	0	36	13	469	49.9	-74	-6	-15	-1,377	340
4b	incremental difference to replace (1) old 89% eff DHW with new (1) condensing type DHW - 95% eff	Energy Star purchasing and procurement site, similar projects	450	0	450	0	0.0	37	0.2	0	43	13	563	10.4	25	2	3	5	408
4c	replace (1) old 89% eff DHW with new (1) condensing type DHW - 95% eff	Energy Star purchasing and procurement site, similar projects	2,250	0	2,250	0	0.0	68	0.4	0	79	13	1,032	28.3	-54	-4	-10	-1,372	748

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated that the annual natural gas usage for the domestic water heating system is approximately 617 therms and a 6.0% savings with the

upgrade. The efficiency of the existing leaking water heater is assumed in the 80-85% range, and a new high efficiency water heater would operate with an efficiency of approximately 95%.

Rebates / Financial Incentives:

NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#5: *Install a 5 kW PV System*

Description:

Currently the South River Human Services building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. The Borough of South River may want to review installing a 5 kW PV system to offset electrical demand and reduce the annual net electric consumption for the Human Services building. The Human Services building is not eligible for a 30% federal tax credit. The Human Services building may want to consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. Typically, a major utility provides the ability to buy SREC's at $600/MWh or best market offer. However, this option is not available from the local utility. See below for more information.

Considering the available square footage of the Human Services building roof at this time, it would be possible to install a 50 kW PV system. However, considering the facts that:

- the solar PV system should be limited in size to below the minimum electrical demand since the utility will not buy back excess power generated by the system
- the solar PV system installation cost should be limited to allow for available grant money to considerably shorten the payback period

SWA has considered the system size stated above. Should the Human Services decide to expand the building and increase the air conditioned spaces, the minimum demand would increase over the historical data cited in this analysis, and therefore further study into expanding the proposed system would be recommended.

There are many possible locations for a 5 kW PV installation on the building roofs. A commercial crystalline 230 watt panel has 17.5 square feet of surface area (13.1 watts per square foot). A 5 kW system needs approximately 22 panels which would take up 380 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: $37,500 (includes $15,000 of labor)
Source of cost estimate: Similar Projects

Economics (<u>without</u> NJ EECBG Grant):

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 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 a 5 kW Solar Photovoltaic system	Similar Projects	37,500	0	37,500	5,902	5.0	0	1.2	0	767	25	19,182	48.9	0	0	-5	-23,675	10,568

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. 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:

NJ Clean Energy rebates are not available since the South River Utility is part of an energy consortium that does not pay the Societal Benefits Charge that funds these rebates.

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (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. An estimated SREC value of $3,000 could be realized with a traditional solar PV system setup. However, since net metering is not available from the local utility, savings in the form of SRECs were NOT incorporated into the above analysis.

Options for funding ECM:

This project may benefit from applying for a grant from the State of New Jersey Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

Description:

A Wind system is not applicable for this building because the area does not have winds of sufficient velocity to justify installing a wind turbine system.

5.3. Solar Photovoltaic

Description:

A Solar PV System would not be cost effective because of insufficient financial incentives and a simple payback greater than 40 years. See 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 not constant use of domestic hot water throughout the building to justify the expenditure.

5.5. Combined Heat and Power

Description:

CHP is not applicable for this building because of existing cooling systems and insufficient domestic hot water use.

5.6. Geothermal

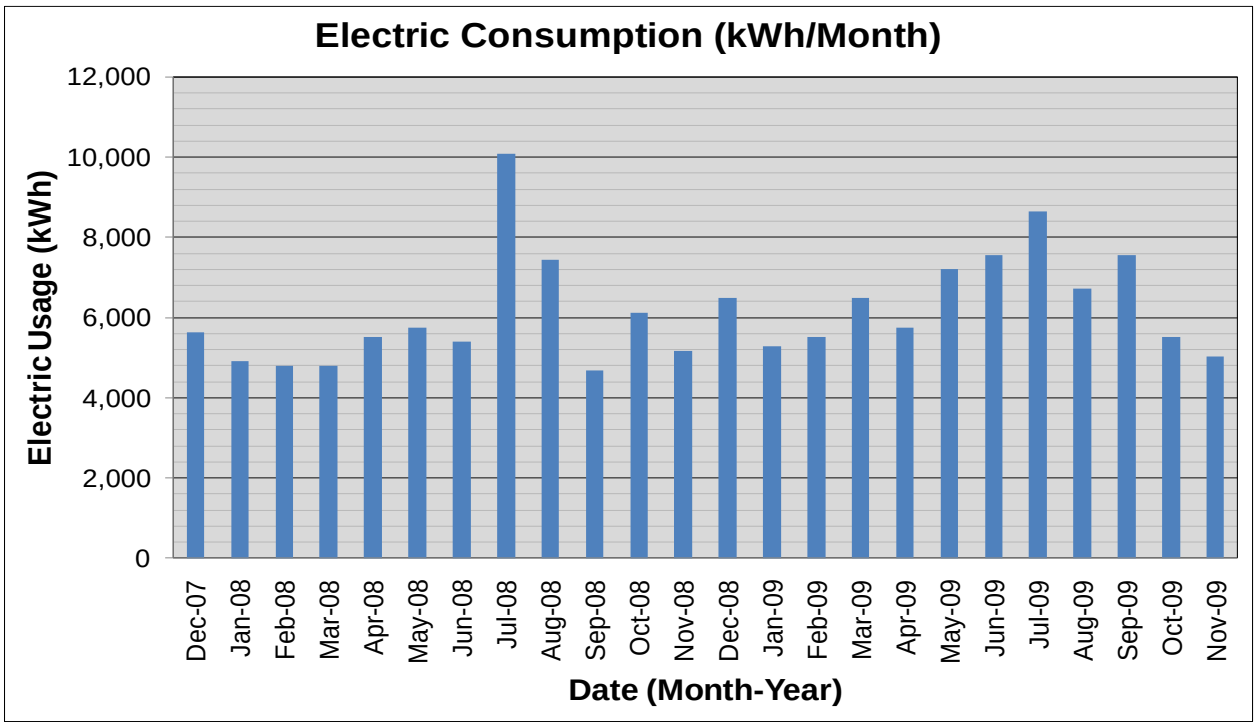
Description:

Geothermal would not be cost effective because it would require replacement of the existing HVAC system, of which major components still have as a whole a number of useful operating years.

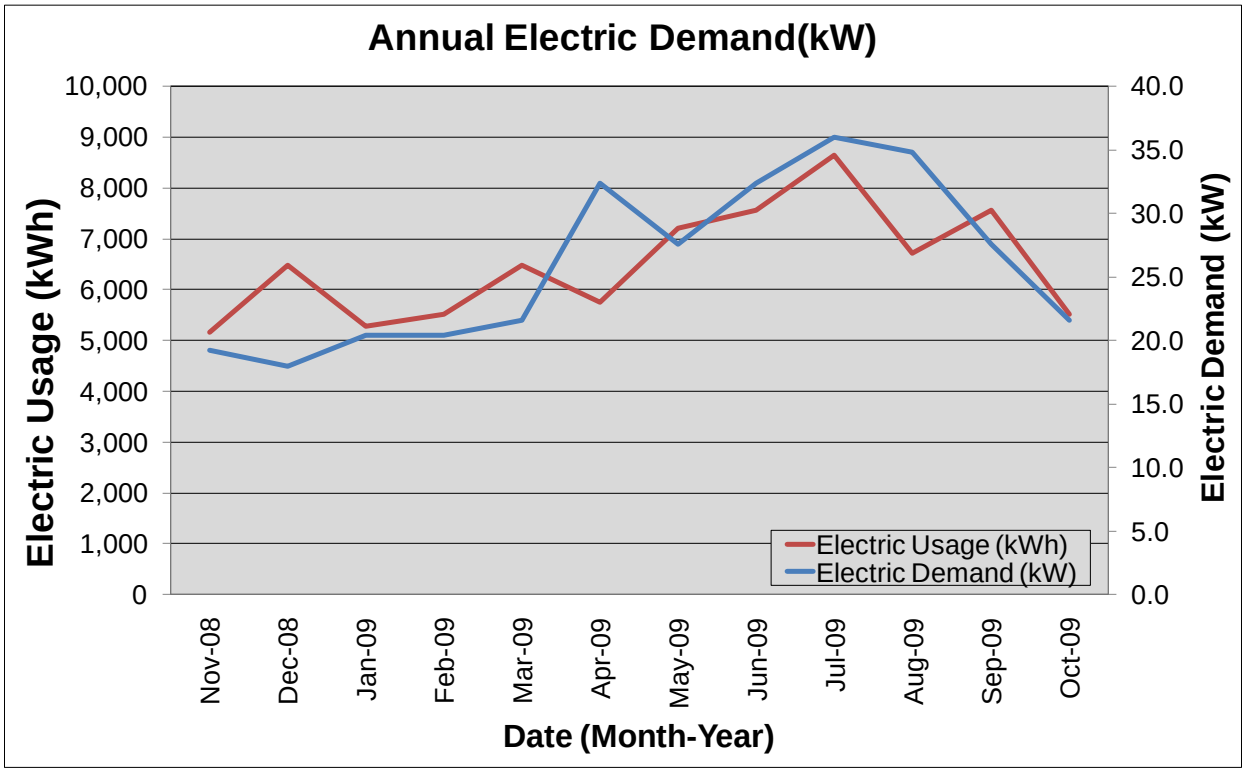
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load Profiles

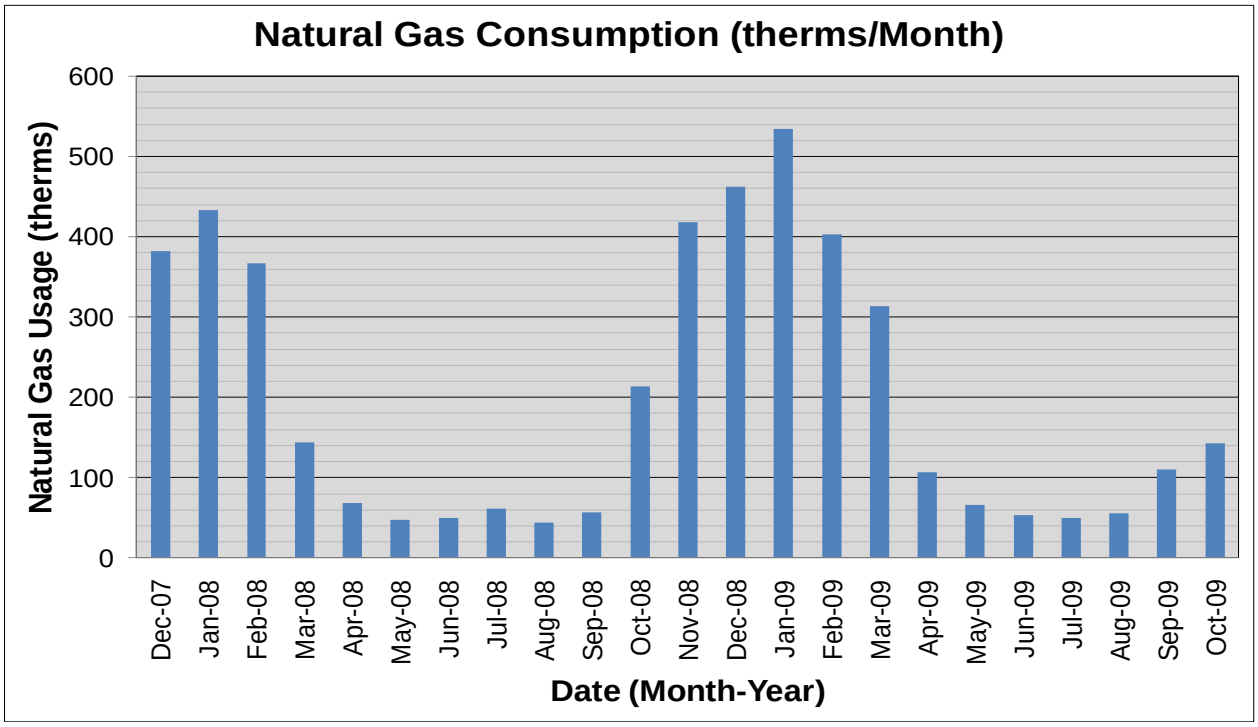
The following are charts that show the annual electric and natural gas load profiles for the South River Human Services Building. For annual electric and natural gas usage please also see Section 1. Historic Energy Consumption.

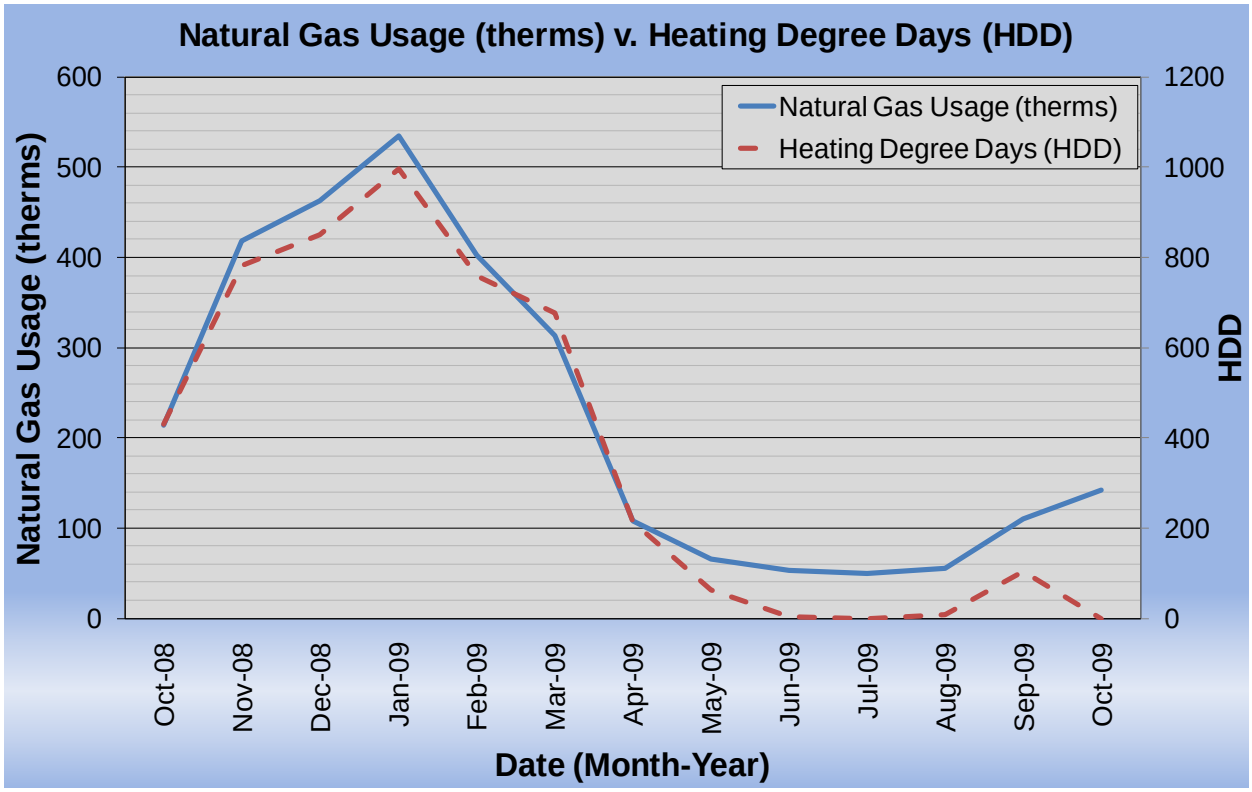


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks.



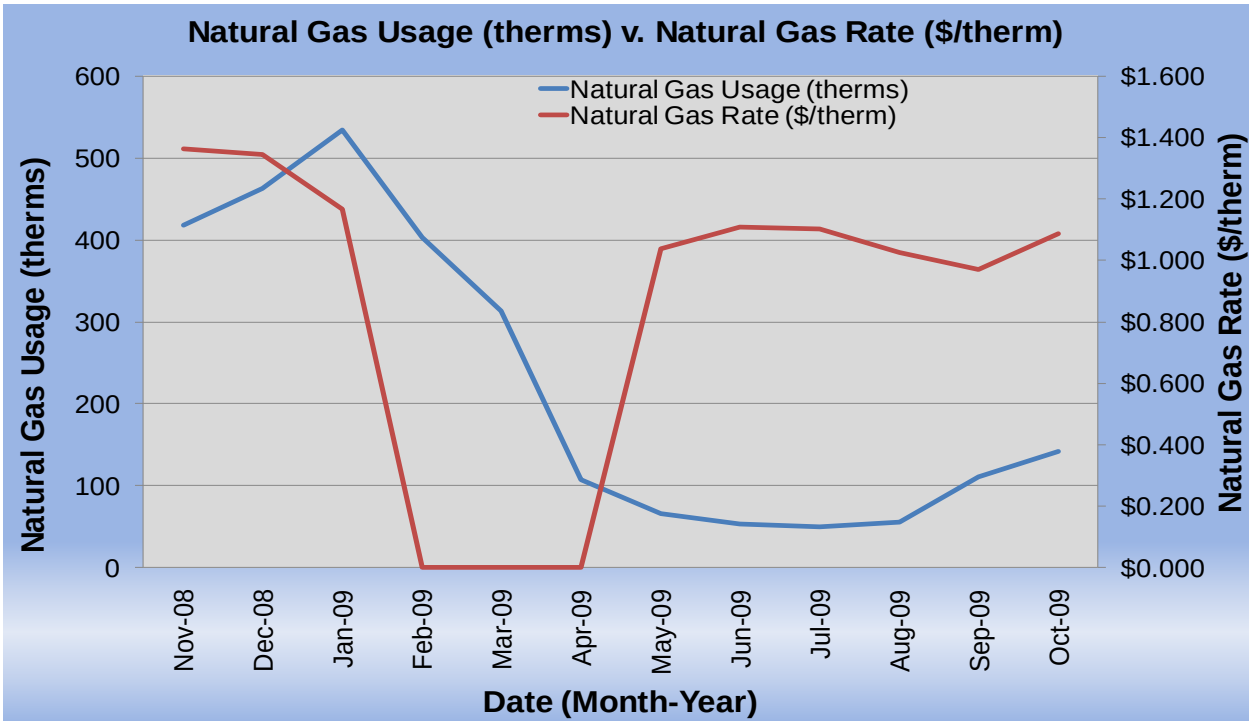
The following is a chart of the natural gas load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.





6.2. Tariff Analysis

Currently, natural gas is provided to the Human Services Building via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by the PSE&G at a general and very competitive service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Human Services Building billing does not breakdown demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the boiler and the furnace units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months. Some of the cap payments are excluded from the following chart.

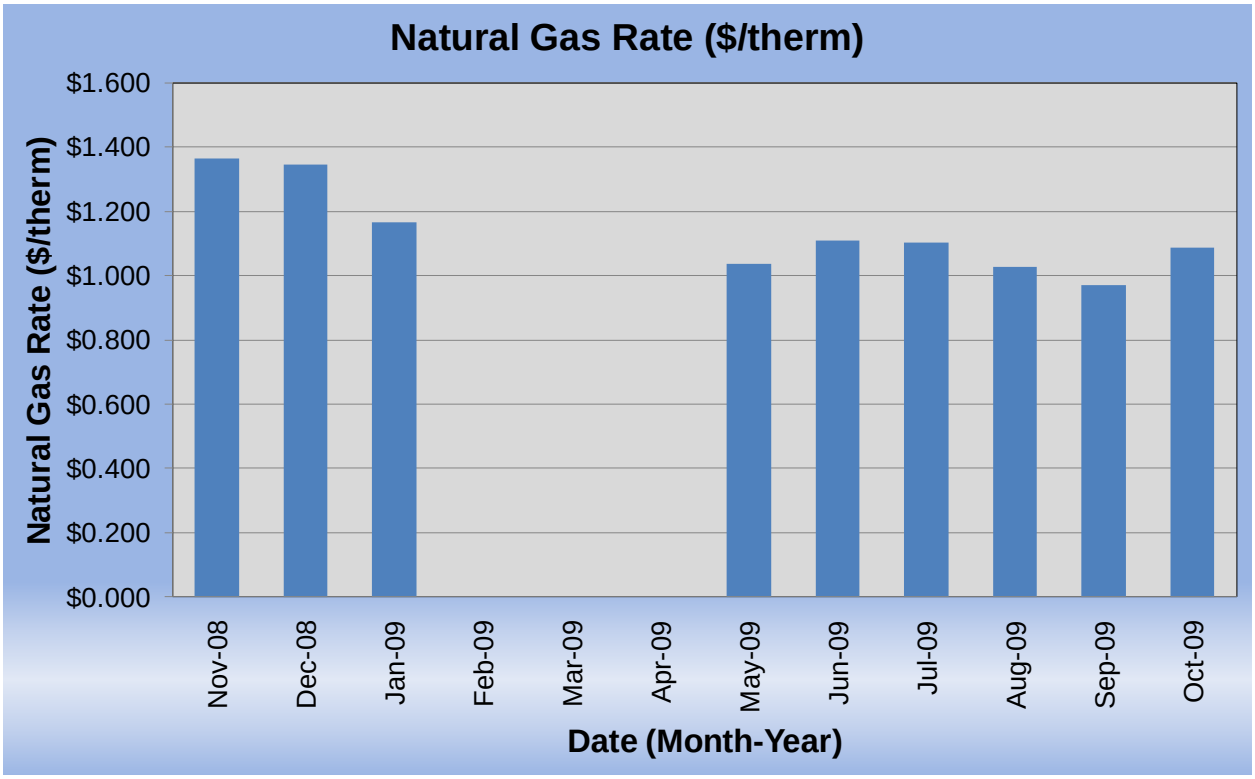


The Human Services Building is direct-metered and currently purchases electricity from the South River Electric Utility at a general service rate. The general service rate for electric charges is market-rate based on use and the Human Services Building does not track a breakdown of demand costs. Demand prices are generally 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 Human Services Building receives natural gas via one incoming meter. PSE&G supplies the gas and transports it. There is not an 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. Electricity is also purchased via one incoming meter directly for the main Human Services Building from South River Electricity Company without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric rates were estimated by the Borough of South River over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 19% 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 recent escalating energy costs. The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Human Services Building annual utility costs are competitive when compared to the average estimated NJ commercial utility rates. SWA recommends that the Borough of South River 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 Human Services Building. Appendix B contains a complete list of third party energy suppliers for the Borough of South River service area. The Borough of South River may want to consider partnering with other school districts, municipalities, boroughs and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey. Also, the Human Services 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 chart show the Human Services Building monthly natural gas spending per unit of energy in 2009. Electric rates were estimated by the Borough at a constant rate of $0.130/kWh.



7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	established / standard industry assumptions, 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 & established specialized equipment material & 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 Study

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	B	Counter Service (1)	2'u-shape	E	4'T8	4	2	32	S	4	52	6	280	58	N/A	2'U-Shape	4'T8	E	S	4	2	32	4	52	6	280	58	0	0	0
2	B	Food bank (3)	2'u-shape	E	4'T8	15	2	32	S	4	52	6	1,050	218	N/A	2'U-Shape	4'T8	E	S	15	2	32	4	52	6	1050	218	0	0	0
3	B	Vomen's Locker Room (4	2'u-shape	E	4'T8	3	2	32	S	5	260	6	210	273	N/A	2'U-Shape	4'T8	E	S	3	2	32	5	260	6	210	273	0	0	0
4	B	Vomen's Locker Room (4	Recessed	E	CFL	1	1	18	S	5	260	0	18	23	N/A	Recessed	CFL	E	S	1	1	18	5	260	0	18	23	0	0	0
5	B	Men's Locker Room (5)	2'u-shape	E	4'T8	3	2	32	S	2	260	6	210	109	N/A	2'U-Shape	4'T8	E	S	3	2	32	2	260	6	210	109	0	0	0
6	B	Men's Locker Room (5)	Recessed	E	CFL	1	1	18	S	2	260	0	18	9	N/A	Recessed	CFL	E	S	1	1	18	2	260	0	18	9	0	0	0
7	B	Exercise Rm (6)	2'u-shape	E	4'T8	16	2	32	S	5	260	6	1,120	1,456	C	2'U-Shape	4'T8	E	OS	16	2	32	4	260	6	1120	1092	0	364	364
8	B	massage Rm (7)	2'u-shape	E	4'T8	3	2	32	S	5	260	6	210	273	N/A	2'U-Shape	4'T8	E	S	3	2	32	5	260	6	210	273	0	0	0
9	B	Mechanical Rm (8)	2'u-shape	E	4'T8	1	2	32	S	1	260	6	70	18	N/A	2'U-Shape	4'T8	E	S	1	2	32	1	260	6	70	18	0	0	0
10	B	Staircase 3 (11)	Parabolic	E	4'T8	2	2	32	N	5	260	6	140	182	N/A	Parabolic	4'T8	E	N	2	2	32	5	260	6	140	182	0	0	0
11	B	Staircase 3 (11)	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
12	B	ec. Dept. Storage Rm (1	Parabolic	E	4'T8	6	1	32	S	1	260	3	210	55	N/A	Parabolic	4'T8	E	S	6	1	32	1	260	3	210	55	0	0	0
13	B	pt. Storage Rm-mech clo	screw-in	N	inc	1	1	60	S	1	260	0	60	16	CFL	Screw-in	CFL	N	S	1	1	20	1	260	0	20	5	10	0	10
14	B	HALLWAY (18)	Recessed	E	2'T8	10	2	17	S	5	260	3	370	481	N/A	Recessed	2'T8	E	S	10	2	17	5	260	3	370	481	0	0	0
15	B	HALLWAY (18)	2'u-shape	E	4'T8	1	2	32	S	5	260	6	70	91	N/A	2'U-Shape	4'T8	E	S	1	2	32	5	260	6	70	91	0	0	0
16	B	HALLWAY (18)	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
17	B	BATHROOM (14)	Recessed	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	Recessed	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
18	B	ELEVATOR RM (15)	Parabolic	E	4'T8	1	2	32	S	1	260	6	70	18	N/A	Parabolic	4'T8	E	S	1	2	32	1	260	6	70	18	0	0	0
19	B	C. DEPT. Storage Rm (1	2'u-shape	E	4'T8	4	1	32	S	5	260	3	140	182	N/A	2'U-Shape	4'T8	E	S	4	1	32	5	260	3	140	182	0	0	0
20	B	HALLWAY (13)	2'u-shape	E	4'T8	4	2	32	S	5	260	6	280	364	N/A	2'U-Shape	4'T8	E	S	4	2	32	5	260	6	280	364	0	0	0
21	B	HALLWAY (13)	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
22	B	STAIR 1 (19)	Parabolic	E	4'T8	2	2	32	N	5	260	6	140	182	N/A	Parabolic	4'T8	E	N	2	2	32	5	260	6	140	182	0	0	0
23	B	STAIR 1 (19)	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
24	B	Mechanical Rm (21)	Parabolic	E	4'T8	4	2	32	S	1	260	6	280	73	N/A	Parabolic	4'T8	E	S	4	2	32	1	260	6	280	73	0	0	0
25	1	Multipurpose room (101)	2'u-shape	E	4'T8	12	2	32	S	5	260	6	840	1,092	C	2'U-Shape	4'T8	E	OS	12	2	32	4	260	6	840	819	0	273	273
26	1	Multipurpose room (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
27	1	library (102)	2'u-shape	E	4'T8	5	2	32	S	5	260	6	350	455	N/A	2'U-Shape	4'T8	E	S	5	2	32	5	260	6	350	455	0	0	0
28	1	crafts/projects (102b)	2'u-shape	E	4'T8	5	2	32	S	1	260	6	350	91	N/A	2'U-Shape	4'T8	E	S	5	2	32	1	260	6	350	91	0	0	0
29	1	JANITOR CLOSET (103	Parabolic	E	4'T8	1	2	32	S	1	260	6	70	18	N/A	Parabolic	4'T8	E	S	1	2	32	1	260	6	70	18	0	0	0
30	1	office on aging (104)	2'u-shape	E	4'T8	5	2	32	S	5	260	6	350	455	N/A	2'U-Shape	4'T8	E	S	5	2	32	5	260	6	350	455	0	0	0
31	1	dministrative/recept. (105	2'u-shape	E	4'T8	5	2	32	S	5	260	6	350	455	N/A	2'U-Shape	4'T8	E	S	5	2	32	5	260	6	350	455	0	0	0
32	1	dministrative/recept. (105	Pin	E	CFL	2	1	12	S	5	260	0	24	31	N/A	Pin	CFL	E	S	2	1	12	5	260	0	24	31	0	0	0
33	1	records/files (106)	2'u-shape	E	4'T8	4	2	32	S	5	260	6	280	364	N/A	2'U-Shape	4'T8	E	S	4	2	32	5	260	6	280	364	0	0	0
34	1	kitchen (107)	2'u-shape	E	4'T8	4	2	32	S	5	260	6	280	364	N/A	2'U-Shape	4'T8	E	S	4	2	32	5	260	6	280	364	0	0	0
35	1	conversation room (108)	Recessed	E	4'T8	10	4	32	S	5	260	13	1,410	1,833	C	Recessed	4'T8	E	OS	10	4	32	4	260	13	1410	1375	0	458	458
36	1	conversation room (108)	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
37	1	Staircase 3 (112)	Parabolic	E	4'T8	2	2	32	N	5	260	6	140	182	N/A	Parabolic	4'T8	E	N	2	2	32	5	260	6	140	182	0	0	0
38	1	reading room (113)	2'u-shape	E	4'T8	12	2	32	S	5	260	6	840	1,092	C	2'U-Shape	4'T8	E	OS	12	2	32	4	260	6	840	819	0	273	273
39	1	reading room (113)	Recessed	E	4'T8	1	2	32	S	5	260	6	70	91	N/A	Recessed	4'T8	E	S	1	2	32	5	260	6	70	91	0	0	0
40	1	en's accessible toilet (11	2'u-shape	E	4'T8	5	2	32	S	2	260	6	350	182	N/A	2'U-Shape	4'T8	E	S	5	2	32	2	260	6	350	182	0	0	0
41	1	entrance lobby (117)	Recessed	E	CFL	4	1	12	S	5	260	0	48	62	N/A	Recessed	CFL	E	S	4	1	12	5	260	0	48	62	0	0	0
42	1	entrance lobby (117)	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
43	1	main floor lobby (118)	Recessed	E	CFL	5	1	12	S	5	260	0	60	78	N/A	Recessed	CFL	E	S	5	1	12	5	260	0	60	78	0	0	0
44	1	main floor lobby (118)	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	Women's toilet (120)	2'u-shape	E	4'T8	3	2	32	S	2	260	6	210	109	N/A	2'U-Shape	4'T8	E	S	3	2	32	2	260	6	210	109	0	0	0
46	1	Computer lab (121)	2'u-shape	E	4'T8	6	2	32	S	5	260	6	420	546	N/A	2'U-Shape	4'T8	E	S	6	2	32	5	260	6	420	546	0	0	0
47	1	HALLWAY (122)	2'u-shape	E	4'T8	4	2	32	S	5	260	6	280	364	N/A	2'U-Shape	4'T8	E	S	4	2	32	5	260	6	280	364	0	0	0
48	1	HALLWAY (122)	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
49	1	stair 1 (123)	Parabolic	E	4'T8	2	2	32	N	5	260	6	140	182	N/A	Parabolic	4'T8	E	N	2	2	32	5	260	6	140	182	0	0	0
50	Ext	portico	exterior	E	CFL	2	1	12	PC	12	365	0	24	105	N/A	Exterior	CFL	E	PC	2	1	12	12	365	0	24	105	0	0	0
52	Ext	façade	exterior	N	mh	4	1	70	PC	12	365	18	352	1,542	cfl	Exterior	cfl	N	PC	4	1	25	12	365	0	100	438	1104	0	1104
54	2	Lobby	Recessed	N	CFL	7	1	18	S	9	261	0	126	296	N/A	Recessed	CFL	N	S	7	1	18	9	261	0	126	296	0	0	0
56	2	Lobby	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
58	2	Staircase	Recessed	N	CFL	4	1	18	S	9	261	0	72	169	N/A	Recessed	CFL	N	S	4	1	18	9	261	0	72	169	0	0	0
60	2	Elevator	Recessed	M	4'T12	1	2	40	S	24	365	15	95	832	T8	Recessed	4'T8	E	S	1	2	32	24	365	6	70	613	219	0	219
62	2	Office	2'U-shape	E	4'T8	5	2	32	S	9	261	6	350	822	N/A	2'U-Shape	4'T8	E	S	5	2	32	9	261	6	350	822	0	0	0
64	2	Office	2'U-shape	E	4'T8	5	2	32	S	9	261	6	350	822	N/A	2'U-Shape	4'T8	E	S	5	2	32	9	261	6	350	822	0	0	0
66	2	Lunch Rm	2'U-shape	E	4'T8	2	2	32	S	9	261	6	140	329	N/A	2'U-Shape	4'T8	E	S	2	2	32	9	261	6	140	329	0	0	0
68	2	Server / AV Room	2'U-shape	E	4'T8	6	2	32	S	9	261	6	420	987	C	2'U-Shape	4'T8	E	OS	6	2	32	7	261	6	420	740	0	247	247
70	2	Electrical Rm	2'U-shape	E	4'T8	5	2	32	S	2	261	6	350	183	N/A	2'U-Shape	4'T8	E	S	5	2	32	2	261	6	350	183	0	0	0
72	2	Storage Rm	2'U-shape	E	4'T8	10	2	32	S	2	261	6	700	365	N/A	2'U-Shape	4'T8	E	S	10	2	32	2	261	6	700	365	0	0	0
74	2	Staircase	Parabolic	E	4'T8	4	1	32	S	9	261	3	140	329	N/A	Parabolic	4'T8	E	S	4	1	32	9	261	3	140	329	0	0	0
76	2	Hallway	2'U-shape	E	4'T8	3	2	32	S	9	261	6	210	493	N/A	2'U-Shape	4'T8	E	S	3	2	32	9	261	6	210	493	0	0	0
78	2	Hallway	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
80	2	Bathroom Women	2'U-shape	E	4'T8	3	2	32	S	9	261	6	210	493	N/A	2'U-Shape	4'T8	E	S	3	2	32	9	261	6	210	493	0	0	0
82	2	Bathroom Men	2'U-shape	E	4'T8	4	2	32	S	9	261	6	280	658	N/A	2'U-Shape	4'T8	E	S	4	2	32	9	261	6	280	658	0	0	0
84	2	Janitor's Closet	2'U-shape	E	4'T8	1	2	32	S	2	261	6	70	37	N/A	2'U-Shape	4'T8	E	S	1	2	32	2	261	6	70	37	0	0	0
86	2	Multipurpose Room	2'U-shape	E	4'T8	24	2	32	S	2	261	6	1,680	877	N/A	2'U-Shape	4'T8	E	S	24	2	32	2	261	6	1680	877	0	0	0
88	2	Multipurpose Room	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
90	2	Storage Rm	2'U-shape	E	4'T8	2	2	32	S	2	261	6	140	73	N/A	2'U-Shape	4'T8	E	S	2	2	32	2	261	6	140	73	0	0	0
92	2	Mechanical Rm	Screw-in	N	Inc	1	1	60	S	2	261	0	60	31	CFL	Screw-in	CFL	N	S	1	1	20	2	261	0	20	10	21	0	21
94	2	Hallway	2'U-shape	E	4'T8	2	2	32	S	9	261	6	140	329	N/A	2'U-Shape	4'T8	E	S	2	2	32	9	261	6	140	329	0	0	0
96	2	Hallway	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
Totals:						291	121	1,936				329	17,947	22,762						291	121	1,803			302	17,590	19,793	1,354	1,615	2,969

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

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)
HID (High Intensity Discharge)	4'T8			
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	Halogen			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

Proposed Lighting Summary Table			
Total Surface Area (SF)	16,250		
Average Power Cost ($/kWh)	0.1300		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	1,647	543	**1,104**
Exterior Power (watts)	376	124	**252**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	21,680	19,815	**2,969**
Lighting Power (watts)	17,571	17,466	**105**
Lighting Power Density (watts/SF)	1.08	1.07	**0.01**
Estimated Cost of Fixture Replacement ($)	515		
Estimated Cost of Controls Improvements ($)	1,100		
Total Consumption Cost Savings ($)	**1,615**		

Appendix B: Third Party Energy Suppliers (ESCOs)

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

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
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 080111 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** 920 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 888-111-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1112 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 011128 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64111 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5111-1121 www.woodruffenergy.com

Appendix C

Glossary and Method of Calculations

Glossary of ECM Terms

.

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measure (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings
LCS = Lifetime Cost Savings

NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

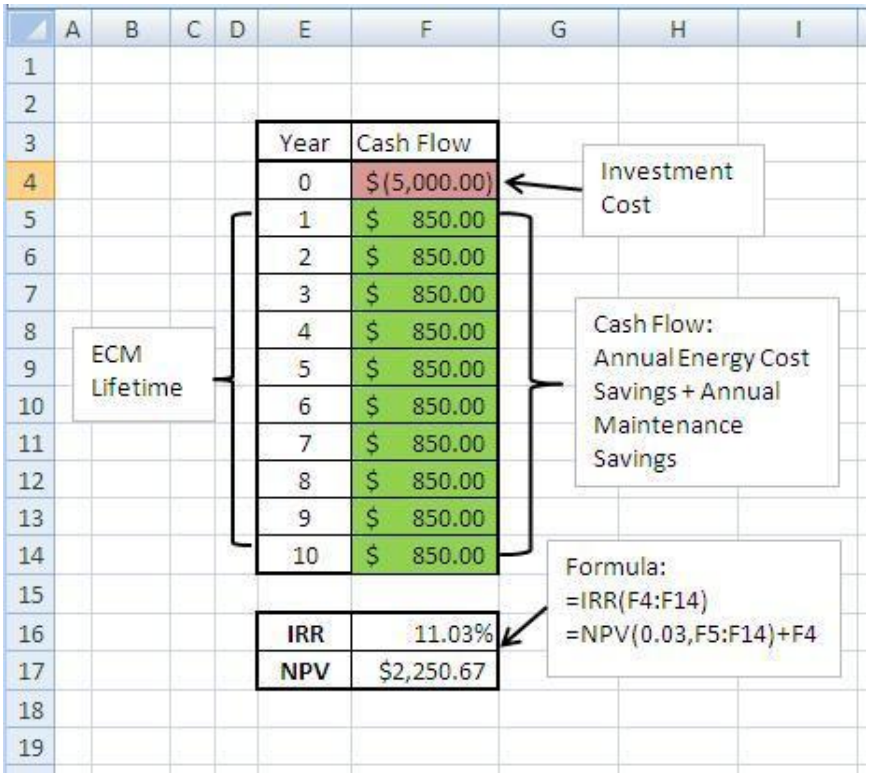
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime
LCS = LOCS+LECS

Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Simple Payback = Net ECM Cost / (AECS + AOCS)
Lifetime ROI = (LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI = (Lifetime ROI / Lifetime) = (AECS + OCS) / Net ECM Cost – 1 / Lifetime
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

Excel NPV and IRR Calculation

In Excel, function =IRR(values) and =NPV(rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.
Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

.

NJCEP C & I Lifetimes

Measure	Measure Life
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8