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Local Government Energy Program
Energy Audit Final Report

Franklin Lakes Department of Public Works Building
De Korte Drive, Franklin Lakes, NJ 07417

Project Number: LGEA46

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INTRODUCTION

On December 16, 2009 and January 13, 2010 Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Borough of Franklin Lakes municipal buildings. The audit included a review of the:

- Franklin Lakes Municipal Building
- Franklin Lakes Police Station
- Franklin Lakes Recreational Center
- Franklin Lakes Firehouse (Main)
- Franklin Lakes Firehouse (Southside)
- Franklin Lakes DPW
- Franklin Lakes Ambulance Corps.

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

This report addresses the Franklin Lakes DPW building located at De Korte Drive, Franklin Lakes, NJ. 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 single-story Franklin Lakes DPW building was built in 1979 and was doubled in size in 2001. The building houses administrative offices, locker rooms, bathrooms, kitchen area and 13 double dump truck size garage bays. The building consists of 12,240 square feet of heated space. The Franklin Lakes DPW is occupied 7:30 to 3:30 by a minimum of 3 employees on weekdays.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Franklin Lakes to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Franklin Lakes DPW 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. For projects awarded on or prior to December 31, 2009 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 Franklin Lakes DPW building located at De Korte Drive, Franklin Lakes, NJ. The Franklin Lakes DPW building is a single-story building with a floor area of 12,240 square feet. In 2001 the building size was doubled, adding six truck bays to the existing six bays.

Based on the field visits performed by the SWA staff on December 16, 2009 and January 13, 2010 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 March 2008 to February 2009 the Franklin Lakes DPW building consumed 95,000 kWh or $23,783 worth of electricity at an approximate rate of $0.250/kWh and 9,769 therms or $13,378 worth of natural gas at an approximate rate of $1.369/therm. The joint energy consumption for the building, including both electricity and natural gas, was 1,301 MMBtu of energy that cost a total of $37,161.

SWA has entered energy information about the Franklin Lakes DPW building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. This DPW building is not an available space type in the database and therefore is designated as "Other", or a typical use, space type which is not eligible to receive a an Energy Star rating. SWA encourages the Borough of Franklin Lakes 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 112 kBtu/ft^2/yr compared to the national average of "Other" space type of 104 kBtu/ft^2yr. Implementing this report's recommendations will reduce use by approximately 21.3 kBtu/ft^2yr, which when implemented would bring the building's energy consumption below the national average. There may be energy procurement opportunities for the Franklin Lakes DPW building to reduce annual electric utility costs, which are $9,533 higher, when compared to the average estimated NJ commercial electric rates.

Based on the assessment of the Franklin Lakes DPW, 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

- Replace Old DPW Airmation air cleaners with new Air Vac air cleaning system
- Install AirVac air cleaning system in New DPW
- Install premium motors when replacements are required

Category II Recommendations: Operations and Maintenance

- After installing new AirVac exhaust removal systems to both garages remove automatic operation of exhaust fans, leave on manual operation for emergencies.
- Maintain / repair garage doors so that they fully close and are sealed all around

- Maintain wall and roof insulation by patching any damage or penetrations that may result from weather or age.
- Install a removable, insulated cover (or gravity louvers) for the exhaust fan
- Maintain roofs and verify water is draining correctly
- Maintain downspouts - repair / install missing downspouts as needed
- Provide weather stripping on all doors
- Provide air sealing, particularly between the drop ceiling and attic space
- 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 **three** Energy Conservation Measures (ECMs) for the Franklin Lakes DPW building that is summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$10,658**. SWA estimates a first year savings of **$6,602** with a simple payback of **1.6 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Franklin Lakes DPW building by **24,464 lbs of CO_2** which is the equivalent of removing 2 cars off the road for a year and eliminating enough CO_2 as can be absorbed by 60 trees. SWA also recommends **two** ECM's with a total first year savings of **$25,967** that is summarized in Table 2. Due to equipment reaching beyond useful life, SWA also recommends **two** End of Life ECM's with a total investment cost of $19,000, as summarized in Table 3.

There are various incentives that the Borough of Franklin Lakes could apply for that could also help lower the cost of installing the ECMs, such as enroll in the NJ Smart Start program through the New Jersey Office of Clean Energy. This incentive program can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment of energy saving measures. These and other incentive programs are outlined in detail in Appendix D.

Renewable ECMs require application approval and negotiations with the utility and proof of performance. There is also a utility-sponsored program that would allow the building to pay for the installation of the PV system through a loan issued by Orange Rockland Electric.

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

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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
1a	43 New T5 fixtures to be installed with incentives	RS Means, lit search	10,099	1,849	8,250	16,331	3.4	0.0	4.6	2,015	6,106	15	91,585	1.4	1010	67	74	51,807	22,373
1b	1 New CFL fixtures to be installed with incentives	RS Means, lit search	50	none at this time	50	117	0.0	0.0	0.0	2	32	15	475	1.6	846	56	63	261	160
1c	11 New T8 fixtures to be installed with incentives	RS Means, lit search	2,689	330	2,359	1,409	0.3	0.0	0.4	120	472	15	7,085	5.0	200	13	18	2,287	1,931
	TOTALS		**12,837**		**10,658**	**17,857**	**4**	**0**	**5.0**		**6,602**	**45**	**99,025**	**1.6**	**-**	**-**	**-**	**-**	**24,464**

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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
2	Install 25 kW Solar Photovoltaic system	Similar Projects	175,000	25,000	150,000	29,500	25.0	0.0	8.2	0	25,075	25	449,875	6.0	200	8.0	15.2	483,883	52,820
1d	10 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	8,053	250	7,803	3,567	0.7	0.0	1.0	0	892	15	13,375	8.8	71	5	8	968	4,886
	TOTALS		**183,053**	**25,250**	**157,803**	**33,067**	**25.7**	**0.0**	**9.2**	**0**	**25,967**	**40**	**463,250**	**6.1**	**-**	**-**	**-**	**484,852**	**57,706**

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 energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	Replace (4) ceiling heaters in Old DPW with 4 new Infrared Heaters	Published Case Studies	14,000	0	14,000	0	0.0	832.0	6.8	105	1,244	20	18,508	11	4719.8%	236.0%	623.5%	4,508	9,734
4	Replace Goodman 5 Ton Condenser & coil with Carrier 24APA7 Puron (R-410a) 5 Ton Condesner & Coil	Online Research	5,000	460	4,540	916	0.0	0.0	0.3	0	229	20	4,580	20	0.9%	0.0%	-3.3%	-2,288	1,255
	TOTALS		**19,000**	**460**	**18,540**	**916**	**0.0**	**832.0**	**7.1**	**105**	**1,473**	**40**	**23,088**	**12.6**	**-**	**-**	**-**	**2,220**	**10,989**

1. HISTORIC ENERGY CONSUMPTION

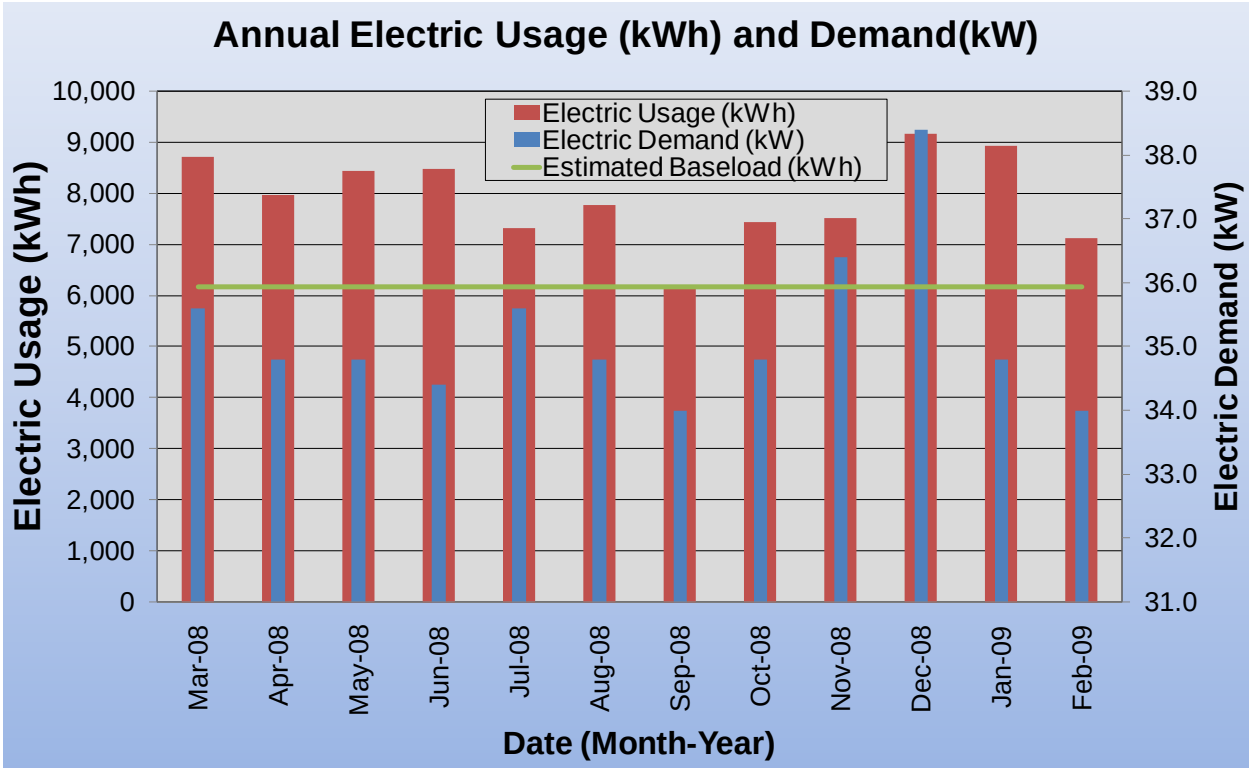
1.1 Energy usage and cost analysis

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

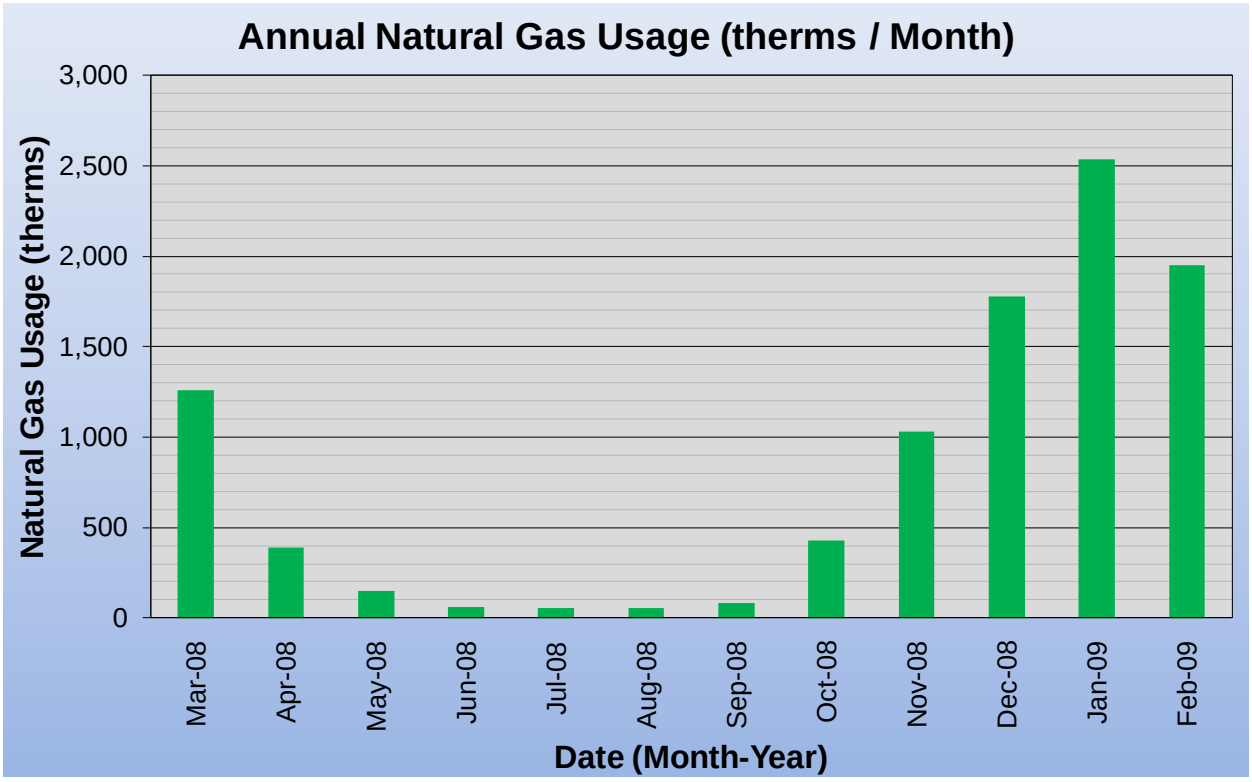
Electricity - The Franklin Lakes DPW is currently served by one electric meter. The Franklin Lakes DPW building currently buys electricity from Orange Rockland Electric at **an average rate of $0.250/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Franklin Lakes DPW building purchased **approximately 95,000 kWh or $23,783 worth of electricity** in the previous year. The average monthly demand was 35 kW.

Natural gas - The Franklin Lakes DPW is currently served by one main meter for natural gas. The Franklin Lakes DPW buys natural gas from PSE&G at **an average aggregated rate of $1.369/therm** based on 12 months of utility bills for March 2008 to February 2009. The Franklin Lakes DPW purchased **approximately 9,769 therms or $13,378 worth of natural gas** in the previous year.

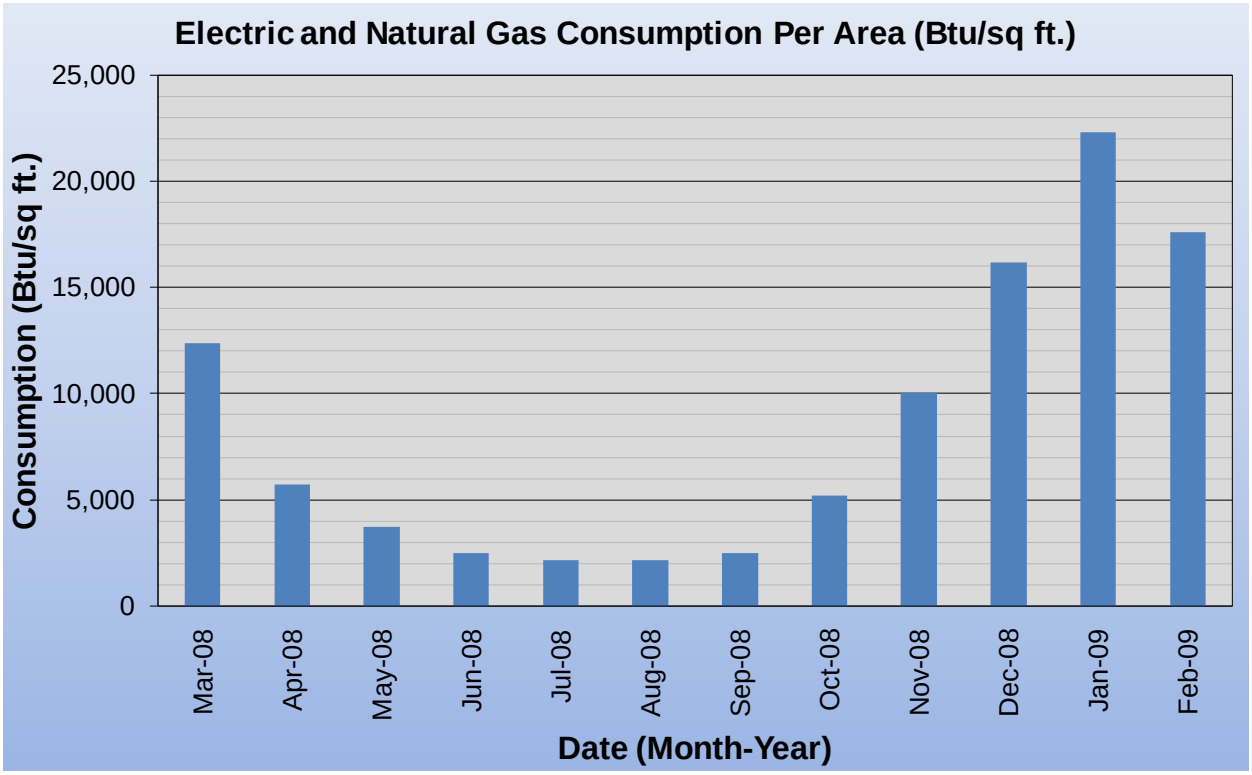
The following chart shows electricity use for the Franklin Lakes DPW building based on utility bills for the 12 month period of March 2008 through February 2009.



The following chart shows the natural gas consumption for the Franklin Lakes DPW building based on natural gas bills for the 12 month period of March 2008 through February 2009.



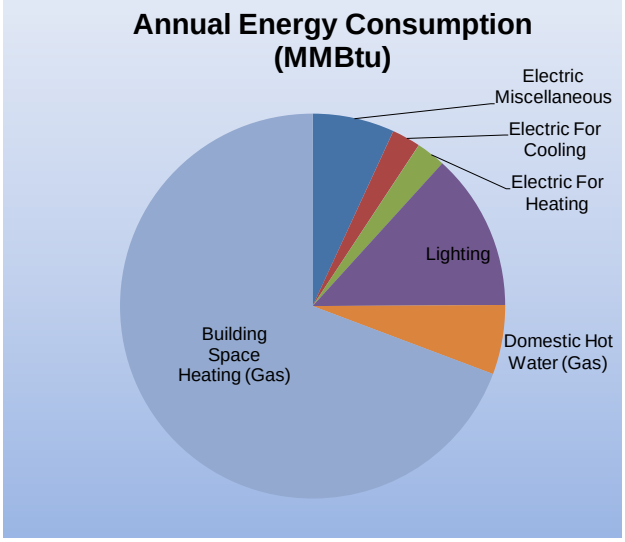
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Franklin Lakes DPW building based on utility bills for the 12 month period of March 2008 through February 2009.

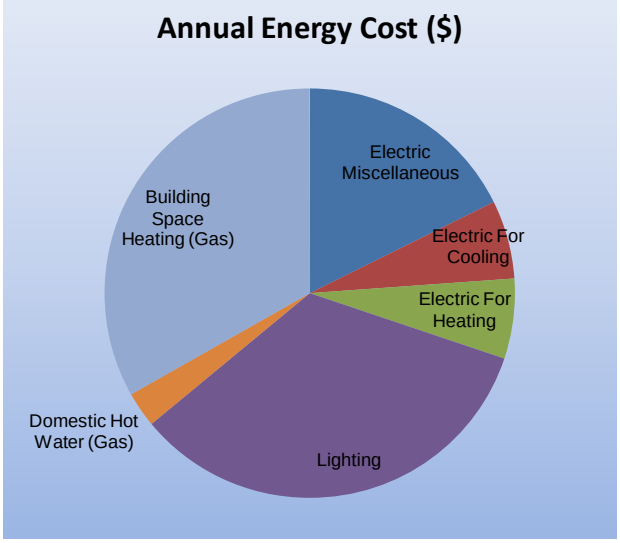


The following table and chart pies show energy use for the Franklin Lakes DPW building based on utility bills for the 12 month period of March 2008 through February 2009. Note electrical cost at $73/MMBtu of energy is more than 5 times as expensive to use as natural gas at $14/MMBtu.

2009 Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	90	7%	$6,570	18%	73
Electric For Cooling	31	2%	$2,293	6%	73
Electric For Heating	32	2%	$2,343	6%	73
Lighting	171	13%	$12,577	34%	73
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Domestic Hot Water (Gas)	76	6%	$1,039	3%	14
Building Space Heating (Gas)	901	69%	$12,339	33%	14
Totals	1,301	100%	$37,161	100%	--
Gas & Electric	**MMBtu**	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Total Electric Usage	324	25%	$23,783	64%	73
Total Gas Usage	977	75%	$13,378	36%	14
Totals	1,301	100%	$37,161	100%	--

Notice that although the lighting is less than 25% of the consumption for the building it accounts for over 30% of the cost. This is due to the fact that electric rates are much more expensive than gas rates.





1.2 Utility rate

The Franklin Lakes DPW building currently purchases electricity from Orange Rockland Electric at a general service market rate for electricity use (kWh) with a separate (kW) demand charge.

The Franklin Lakes DPW building currently pays an average rate of approximately $0.250/kWh based on the 12 months of utility bills of March 2008 through February 2009.

The Franklin Lakes DPW building currently purchases natural gas supply from the PSE&G at a 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 Franklin Lakes DPW building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.369/therm based on 12 months of utility bills for March 2008 through February 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 Franklin Lakes DPW building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. The DPW Facility is comprised of non-eligible "Other" space type. This building type is 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 Franklin Lakes DPW is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 112 kBtu/ft^2/yr as compared to the national average of "Other" space type buildings, 104 kBtu/ft^2/yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 5 kBtu/sqft yr, with an additional 16.3 kBtu/sq ft yr from the recommended ECMs. These recommendations could account for at least 21.3 kBtu/ft^2/yr and therefore reduce the site energy utilization index to 90.7 kBtu/ft^2/yr.

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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Franklin Lakes - DPW

Building ID: 1976185
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 10, 2010

Facility
Borough of Franklin Lakes - DPW
De Korte Drive
Franklin Lakes, NJ 07417

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1979
Gross Floor Area (ft²): 12,240

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	335,545
Natural Gas (kBtu)[4]	1,032,184
Total Energy (kBtu)	1,367,729

Energy Intensity[5]	
Site (kBtu/ft²/yr)	112
Source (kBtu/ft²/yr)	180

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	87

Electric Distribution Utility
Rockland Electric Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	-15%
Building Type	Other

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 Department of Public Works building is a one level building with mezzanine storage areas in the center. The building now consists of 12,240 square feet of space. The Department of Public Works building was built in 1979 and houses the following areas: administrative offices, locker rooms, bathrooms, a kitchen / lunchroom area and 13 double dump truck size bays. In 2001 the building was renovated and doubled in size with the addition of 6 truck bays (approximately 6,720 additional square feet to the original 5,520 square feet). The original section is referred to as “Old DPW” and the new section is “New DPW”.

2.2. Building occupancy profiles

The peak occupancy for the Department of Public Works building is approximately 13 employees with generally 3 employees in the building at any onetime. The building is generally operated from 7:30 am to 3:30 pm Monday through Friday for 35 hours / week. The building may be utilized during nights and weekends for emergencies.

2.3. Building envelope

2.3.1. Exterior Walls

The exterior walls are an insulated metal panel wall system of the Butler building style and texture. The exterior walls appear to be in good condition with proper drainage including gutters and flashing. The mezzanine storage area walls appeared to be insulated with R-30 batt insulation between studs.

Batt insulation in mezzanine exterior wall which needs to be closed up

2.3.2. Roof

The new sloped roof sections are covered with common asphalt shingles over wood truss rafters with in-between R-30 fiberglass batt cavity insulation. The original roof sections and office area are insulated with R-19 batt fiberglass. Insulation is also laid on top of the drop ceiling tiles. SWA suggests inspection of all roof vents to ensure proper air flow in the attic. Where insulation is placed directly on the underside of the sheathing, and without vent baffles, as per asphalt shingle manufacturer, warranty is voided due to faulty installation. This 2001 roof looked age appropriate, with gutters in visually good condition. There weren't any reported roof leaks.

Insulation in the mezzanine floor area

DPW back side continuous asphalt shingle earth colored roof

2.3.3. Base

The building's base is a 6" concrete slab-on grade with perimeter footing. There weren't any reported problems with water seepage through the slab or other issues related to thermal performance or moisture. There are 2" of rigid board insulation at the interior of the foundation walls and extending 2 feet from the foundation walls under the slab. This is standard for this type of structure. SWA does not recommend any additional insulation as it would not be cost effective. The slab edge or perimeter insulation could not be verified.

2.3.4. Windows

The building contains aluminum framed double glazed windows with low-e rating. Some of the windows are non-operable. The operable casement windows were observed to be in good working condition and to seal tightly. According to specifications, all of the windows are installed with thermal breaks. There weren't any comfort related complaints or signs of condensation found. There weren't any visible damage to the window frames or to the caulking.

2.3.5. Exterior doors

The aluminum framed exterior doors, hollow metal doors and garage 12 ft by 14 ft overhead doors were observed to be in good condition except for some missing or worn weather-stripping. SWA also recommends checking the weather-stripping of each door (including garage doors) on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

Office door in need of weather stripping; typical garage doors

2.3.6. Building air tightness

Based on a visual inspection, the building was observed to be a relatively well-sealed building. There weren't any major observed deficiencies of air tightness within the building besides some of the exterior doors.

In addition to the above mentioned recommendations, SWA suggests air sealing, caulking and / or insulating around all plumbing, electrical, HVAC and structural envelope penetrations. This should include bottom and top plates, recessed light fixtures, electrical boxes and windows.

The air tightness of buildings helps to maximize other implemented energy measures and investments and minimizes long term maintenance and repair cost.

2.4 HVAC Systems

The Franklin Lakes DPW offices, locker room and bathrooms are heated and cooled by direct vented natural gas furnaces and package units located outside the building, respectively. The garage spaces are only heated with ceiling hung unit heaters.

2.4.1 Heating

The occupied space, offices, bathrooms, and break room are heated with forced hot air from direct vented Goodman furnace with 115,00 Btu/hr heating capacity. The original garage section of the DPW is heated by three Modine and one Lennox natural gas unit heaters hung from the ceiling with a combined heating capacity of 788,000 Btu/hr, and a thermal efficiency of 80%. These heaters were installed in 1980 and are well beyond their estimated useful life. The new section is heated by four Dayton ceiling hung unit heaters with a combined heating capacity of approximately 800,000 Btu/hr, installed in 2001.

The heaters are controlled by several manual thermostats in each garage area which are kept between 62˚F and 68˚F at all times, with no evening setback.

Wall mounted manual thermostat located in the new section of DPW

The Modine and Lennox heaters are well beyond their estimated useful life and should be replaced with four high efficiency Modine unit heaters with 200,000 Btu/hr output and 93% thermal efficiency. See Section 4, End of Life ECM's for more details. SWA also recommends upgrading to programmable thermostats for evening setback control. All other heating equipment is in good condition and should be properly maintained.

2.4.2 Cooling

The Franklin Lakes DPW offices, bathrooms, break rooms and locker rooms are cooled by 5 ton Goodman split DX system with the evaporator coil contained within the Goodman furnace. R-22 refrigerant is the coolant that transfers room heat to the atmosphere. The Goodman condensing unit located in the back of the building expels the heat from the refrigerant to the atmosphere using fan power. The Goodman furnace section was installed in 2008 but the outside condenser was installed in 1995 and is at the end of its estimated useful life and should be replaced. See section 4, End of Life ECMs for more details.

2.4.3 Ventilation

The Franklin Lakes DPW is ventilated by three large exhaust fans in each garage section, six in total. The fans operate based on CO sensors. When CO levels are above normal conditions, the fans power on and exhaust air to the outside until the concentration of CO decreases. Even if one sensor indicates a high level, all fans power on at full speed. The installed fans are in good condition and have 50% remaining useful life. When the fan motors approach the end of their useful life it is recommended to replace them with premium efficiency motors since the incremental cost difference is negligible.

One of six exhaust fans (left) controlled by several CO sensors (right)

The original DPW garage section has six ceiling hung Airmation air cleaners which were installed in 1980 and at the end of their useful life. AirVac air cleaning units are designed for truck bays and use fans to draw space air through filters to remove toxic particles. This system has many advantages to the exhaust fan purge type ventilation system since the investment made into conditioning the air is not lost. SWA recommends removing the six Airmation air cleaners from the old garage and adding the AirVac air cleaning system to both garages. The system is also activated by CO sensors. The existing exhaust fan system should be removed from automatic operation and can remain on manual operation in case of emergencies.

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Franklin Lakes DPW building is provided by a Bradford Rheem natural gas fired heater with 40 gal storage and 32,000 Btu/hr capacity. The heater has 70% estimated useful operating life remaining and appears in good condition.

2.5 Electrical systems

2.5.1 Lighting

Interior Lighting - The Franklin Lakes DPW building currently consists of T8 fluorescent fixtures in meeting and office spaces, high intensity discharge metal halide (MH) lights in garage areas and sporadic use of T12 fluorescent and incandescent lights. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA

recommends replacing the MH lights with 5 lamp T5 fixtures. Metal halides lights have a warm up time and degrade much more quickly than high efficiency T5 fixtures. Also SWA recommends replacing all T12 fixtures with high performance T8, and incandescent lights with CFLs to reduce wattage with the same lumen output. 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 LED type. SWA is not recommending any upgrades at this time.

Exterior Lighting - The exterior lighting surveyed during the building audit was mostly metal halide lights with a few LED lights. The metal halide lights are controlled by photocells, and the LEDs are motion sensor activated. SWA recommends replacing the metal halide lights with pulse start metal halides to decrease the energy usage for the same amount of light and longer useful life. SWA does not recommend any changes to the controls at this time.

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. 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 drink and snack 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. See section 4, Energy Conservation Measures for details on replacing refrigerators and installing energy vending miser devices.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions, DVDs, stereos, computers, and kitchen appliances often have internal memories or clocks which consume approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances, (other than refrigerators and freezers), be plugged into power strips and turned off each evening just as the lights are turned off. The Franklin Lakes DPW 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 Franklin Lakes DPW is a single-story building without elevators.

2.5.4 Others electrical systems

There are not currently any other significant energy impacting electrical systems installed at the Franklin Lakes DPW building.

3. EQUIPMENT LIST

Building System	Description	Location	Make, Model #	Fuel	Space Served	Date Installed	Est. Remaining Useful Life %
Air Compressor	Air compressor, 7.5 HP,	OLD DPW	Ingersoll Rand IR-T30, 2475 / 211200166	Electric	OLD DPW	2004	70%
Air Compressor	Air compressor, 5 HP, 1745 RPM	New DPW	Ingersoll Rand IR-1978, 242502 / 30T430418	Electric	NEW DPW	1978	0%
Cooling	**CU1, Condenser for FURN 1**	**BACK BLDG**	**GOODMAN CKL60-1 / 0206521495**	**Electric**	**OFFICES**	**1995**	**0%**
Cooling	**COIL1, Refrigerant coil for FURN 1**	**2ND FL**	**GOODMAN U-60 / 0112404491**	**NA**	**OFFICES**	**1985**	**0%**
Domestic Hot Water	DHW, 32,000 Btu/hr, 40 Gal storage	ATTIC	Rheem 21V41-32 / RHNG1202H04836	Natural gas	OLD DPW	2004	70%
Heating	HTR7 ceiling hung heater, 228 Btu/hr, 80% Thermal Eff.	LEFTSIDE SHOP	DAYTON 3E228D / K006014268	Natural Gas	NEW DPW	2001	40%
Heating	HTR8 ceiling hung heater, 228 Btu/hr, 80% Thermal Eff.	LEFTSIDE SHOP	DAYTON 3E228D / L00G015562	Natural Gas	NEW DPW	2001	40%
Heating	**HTR1, Ceiling hung heater, 250,000 Btu/hr, 80.5% Eff.**	**RIGHTSIDE SHOP**	**LENNOX LF24-250A-5 / 56003M09735**	**Natural gas**	**OLD DPW**	**1980**	**0%**
Heating	**HTR2, ceiling hung heater, 175 btu/hr, 80% thermal Eff.**	**RIGHTSIDE SHOP**	**MODINE PA175AB / 15011010580**	**Natural gas**	**OLD DPW**	**1980**	**0%**
Heating	**HTR3, ceiling hung heater, 163 Btu/hr, 80% thermal Eff.**	**RIGHTSIDE SHOP**	**MODINE PA175AB**	**Natural gas**	**OLD DPW**	**1980**	**0%**
Heating	**HTR4, ceiling hung heater, 200 Btu/hr, 80% thermal Eff.**	**RIGHTSIDE SHOP**	**MODINE PA200AB / 15011040480**	**Natural gas**	**OLD DPW**	**1980**	**0%**
Heating	HTR5, ceiling hung heater, 228 Btu/hr, 80% Thermal Eff.	LEFTSIDE SHOP	DAYTON 3E228D / B01G002337	Natural Gas	NEW DPW	2001	40%
Heating	HTR6 ceiling hung heater, 228 Btu/hr , 80% Thermal Eff.	LEFTSIDE SHOP	DAYTON 3E228D	Natural Gas	NEW DPW	2001	40%
Heating / Cooling	FURN 1, Direct vented Heating & Cooling, 115 MBH, 80% Eff.	2ND FL	GOODMAN GMT115-5 / 020161952	Natrual Gas / Electric	OFFICES	2008	90%
Heating / Cooling	AH1, could not access on sight	ATTIC	FIRST CO. 36HDX0HP / M01467FC431394	Natrual Gas / Electric	NEW DPW	2001	40%
Ventilation	**Six (6) AirMation air cleaners, ceiling hung**	**RIGHTSIDE SHOP**	**AIRMATION, Filter: AMCF26-002**	**Electric**	**OLD DPW**	**1980**	**0%**

Building System	Description	Location	Make, Model #	Fuel	Space Served	Date Installed	Est. Remaining Useful Life %
Ventilation	Three (3) Exhaust fans controlled by CO sensor by truck bays, could not access at field	New DPW	NA	Electric	New DPW	2001	40%
Ventilation	Three (3) Exhaust fans, turn on based on CO sensor alarm, could not access in field	Old DPW	NA	Electric	Old DPW Building	2001	50%
Lighting	See details - Appendix A	See details - Appendix A	NA	Electric	DPW Building	NA	NA

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 Franklin Lakes DPW, SWA has separated the investment opportunities into three recommended categories:

Capital Improvements - Upgrades not directly associated with energy savings
Operations and Maintenance - Low Cost / No Cost Measures
Energy Conservation Measures - Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- Replace Old DPW Airmation air cleaners that are beyond useful life, with new Air Vac air exhaust removal system which cleans the air within the garage rather than purging conditioned air to the outside with exhaust fans, saving heating energy.

- Install AirVac exhaust removal system in New DPW garage

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.

Category II Recommendations: Operations and Maintenance

- Maintain / repair garage doors so that they fully close and seal all around.

- After installing new AirVac exhaust removal systems to both garages remove automatic operation of exhaust fans, leave on manual operation for emergencies.

- Thoroughly and evenly insulate space (with batt insulation) and plug all penetrations to the outside. SWA recommends properly maintaining exterior wall and roof insulation in an effort to minimize energy loss. Also, install a removable, seasonal, insulated cover (or gravity louvers) for the exhaust fan.

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

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

- Provide weather stripping / air sealing - 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 caulked areas 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 and seal wall penetrations wherever necessary in order to keep insulation dry and effective.

- Repair / seal space between drop ceiling and attic – SWA recommends providing additional air sealing, between the drop ceiling and attic space

- 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
1a , 1b, 1c	Building Lighting Upgrades
	Description of Recommended 5-10 Year Payback ECMs
1d	Building Lighting Upgrades
2	Install 20 kW Photovoltaic System on Roof
	Description of End of Life ECMs
3	Replace Old DPW unit heaters with (4) Infrared Heaters
4	Replace Goodman Condenser with 5 Ton Condenser

ECM# 1a, 1b, 1c & 1d: Building Lighting Upgrades

Description:

On the days of the site visits, SWA completed a lighting inventory of the Franklin Lakes DPW building (see Appendix A). SWA recommends replacing 250 Watt Metal Halide (MH) lights in the garage areas with 5-lamp T5 fixtures at a total of 140 watts per fixture. The lumen output is greater with a 5-lamp T5, and does not degrade as rapidly. Also the T5 lamps do not require a warm up time and have twice the lamp lifespan. Any incandescent lights should be replaced with compact fluorescent lights (CFL's) which typically operate at a third of the wattage for the same lumen output and longer life. SWA also recommends replacing T12 lights with magnetic ballasts to T8 lamps with electronic ballast for further energy reduction and increased lamp life. For exterior applications, SWA recommends replacing Metal Halide (MH) lights with pulse-start Metal Halide fixtures. The pulse start lamps produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via a one-to-one substitution of lower-wattage systems. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Franklin Lakes may decide to perform this work with in-house resources from its Maintenance Department to obtain savings.

Installation cost:
Estimated installed cost: $18,461 (includes approx. $5,000 labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program; Quoted bids

Economics (Some of the options considered 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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
1a	43 New T5 fixtures to be installed with incentives	RS Means, lit search	10,099	1,849	8,250	16,331	3.4	0.0	4.6	2,015	6,098	15	91,466	1.4	1009	67	74	51,729	22,373
1b	1 New CFL fixtures to be installed with incentives	RS Means, lit search	50	none at this time	50	117	0.0	0.0	0.0	2	32	15	475	1.6	846	56	63	261	160
1c	11 New T8 fixtures to be installed with incentives	RS Means, lit search	2,689	330	2,359	1,409	0.3	0.0	0.4	120	472	15	7,085	5.0	200	13	18	2,287	1,931
1d	10 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	8,053	250	7,803	3,567	0.7	0.0	1.0	0	892	15	13,375	8.8	71	5	8	968	4,886
	TOTALS		**20,889**		**18,461**	**21,424**	**4**	**0**	**6.0**		**7,493**	**60**	**112,400**	**2.5**	**-**	**-**	**-**	**-**	**29,351**

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 2 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:
NJ Clean Energy – HID light > 250 to T5 - $43 per fixture, $1,849 total; T-12 to T8 - $30 per lamp, $330 total, MH to PSMH - $25 per fixture $250 total
Options for funding the Lighting ECM: This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#2: Install 25 kW PV system

Description:

Currently, the Franklin Lakes DPW building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building slated roof south and/or west 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. SWA presents below the economics, and recommends at this time that Borough of Franklin Lakes further review installing a 25 kW PV system to offset electrical demand and reduce the annual net electric consumption for the building, and review guaranteed incentives from NJ rebates to justify the investment. The Borough of Franklin Lakes may 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. Orange Rockland Electric provides the ability to buy SRECs at $600 / MWh or best market offer.

The size of the system was determined using the amount of roof surface area as a limiting factor, as well as the facilities annual base load. A PV system could be installed on a portion of the sloped roof that faces South or West. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 10 kW system needs approximately 200 panels which would take up 2,174 square feet. Below are possible locations to install the panels.

Installation cost:

Estimated installed cost: $150,000 (labor included at $3/Watt, totaling $75,000)
Source of cost estimate: Similar projects

Economics (with incentives):

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
Install 25 kW Solar Photovoltaic system	Similar Projects	175,000	25,000	150,000	29,500	25.0	0.0	8.2	0	25,075	25	449,875	6.0	200	8.0	15.2	483,883	52,820

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 (123 Watts, Model ND-123UJF). 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 - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application for systems 50kW or less. Incentive amount for this application is $25,000 for the Franklin Lakes DPW.
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program
NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. A total of $17,400 / year, based on $600/SREC, has been incorporated in the above costs for the panels however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#1*: Replace all Electric Unit Heaters with Natural Gas Type*

SWA conducted a complete HVAC equipment inspection and compiled an inventory in Appendix A. All of the heating for the garage areas is provided by electric powered unit heaters. There are eight 15 kW electric heaters, five 5 kW heaters and two vestibule heaters, assumed to be 3kW. Although electric unit heaters typically operate at a rated efficiency of 98% to 100%, electric energy costs nearly four times as much as natural gas for the same heat output. Therefore, savings can be realized by replacing this equipment with natural gas type heaters.

Infrared tube heaters are designed for garage applications and have a linear flue which acts as a diffuser so that a fan is not necessary, and is available in all heat ranges. SWA recommends replacing all electric unit heaters with Infrared linear diffuser heaters sized for each garage space. Also, in an effort for further optimize this system, the manual thermostats for the heaters should be replaced with programmable type thermostats. See ECM #9 for details.

Estimated installed cost: $13,900 (includes $4,500 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM #	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	annual return on investment, %	CO_2 reduced, lbs/yr
1	13,900	0	13,900	150,800	0.00	-5145	2.2	0	17,555	20	351093	0.8	121	213,291

Assumptions: SWA calculated the savings for this measure using the latest electric usage for the building and published full load heating hours in New Jersey established by the EPA.

Rebates/financial incentives: None at this time

Please see Appendix F for more information on Incentive Programs.

ECM#3: *Replace Unit Heaters with Infrared Heaters*

Description:

The DPW old section has three Modine and one Lennox ceiling hung unit heaters with 80% thermal efficiency which are at the end of their useful life.

Infrared tube heaters are designed for garage applications and heat surfaces they come into contact with by emitting infrared light instead of heating the surrounding air. Although highly dependent upon proper installation, studies have shown that infrared heaters can save heating energy up to 40% over conventional heating methods. For the purposes of this analysis, a moderate efficiency improvement of 10% was assumed. SWA recommends replacing the four Old DPW unit heaters with four 200,000 Btu/hr Infrared heaters.

Estimated installed cost: $14,000 (includes $4,000 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*
The Borough of Franklin Lakes may choose to have their in-house staff purchase and install the equipment for a slightly reduce labor rate.

Economics (without incentives):

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
Replace (4) ceiling unit heaters in Old DPW with (4) Infrared Heaters	Published Case Studies	14,000	0	14,000	0	0.0	832.0	6.8	105	1,244	20	18,508	11	4719.8%	236.0%	623.5%	4,508	9,734

Assumptions: SWA assumes thermal savings based on heating loads calculated by conducting the billing analysis. In order to estimate savings for this measure, SWA assumed a 10% savings for the heating annual usage for the old section of the DPW building.

Rebates/financial incentives: This measure does not qualify for a rebate or financial incentive at this time, however is an eligible technology for the Direct Install program. See Appendix D for more details.

ECM#4: Replace Condenser with R-410a Condenser

Description:

The installed 5-Ton Goodman split unit consists of evaporator coils in Furnace 1 and an outside condenser and serves the furnace to cool all offices, bathrooms and break room. The split system was installed in 1995 and is approaching the end of its useful life. In order to optimize the cooling system, SWA recommends replacing the Goodman unit with a new Energy Star Split DX unit with a 5 Ton capacity unit with an SEER of 17.0 and using Puron, or R-410a refrigerant, or similar. A new 5 Ton evaporator coil would be installed in the downstream ductwork of the furnace. The increased efficiency will save an estimated 10% of cooling energy costs. Puron or R-410a is a hydrofluorocarbon, HFC, which has a negligible effect on the ozone layer if released into the atmosphere. As per the Montreal Protocol, Hydrochlorofluorocarbons (HCFC's), such as R-22 will be phased out by 2020.

Installation cost:

Estimated installed cost: $5,000 (including $1,500 for labor)
Source of cost estimate: Published and established costs; Similar projects

Economics:

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
Replace Goodman 5 Ton Condenser & Coil with Puron (R-410a) 5 Ton Condenser	Online Research	5,000	460	4,540	916	0.0	0.0	0.3	0	229	20	4,580	20	0.9	0.0	-3.3	-2,288	1,255

Assumptions: SWA assumes thermal savings based on cooling loads calculated by conducting the billing analysis. In order to estimate savings for this measure, SWA assumed a 10% savings over the annual cooling load for the building.

Rebates/financial incentives:

NJ Clean Energy – Split Systems < 5.4 tons & 14 SEER, $92/ton, totaling $460

Options for funding ECM:

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

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

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1 Existing systems

There aren't currently any existing renewable energy systems.

5.2 Wind

Description:

There aren't any recommendations for this renewable energy source at this time due to lack of necessary wind conditions in this region.

5.3 Solar Photovoltaic

Pleases see the above recommended ECM#2.

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 absence of a major cooling system and insufficient domestic hot water use.

5.6 Geothermal

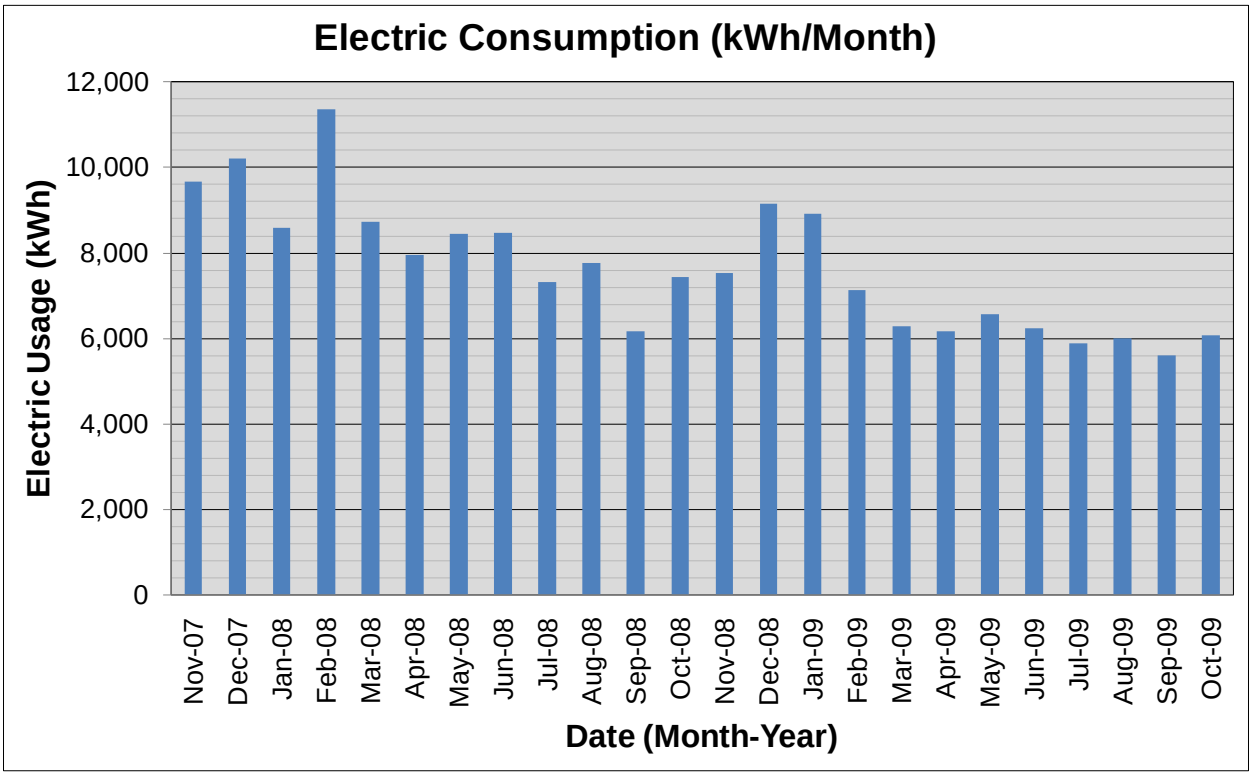
Description:

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

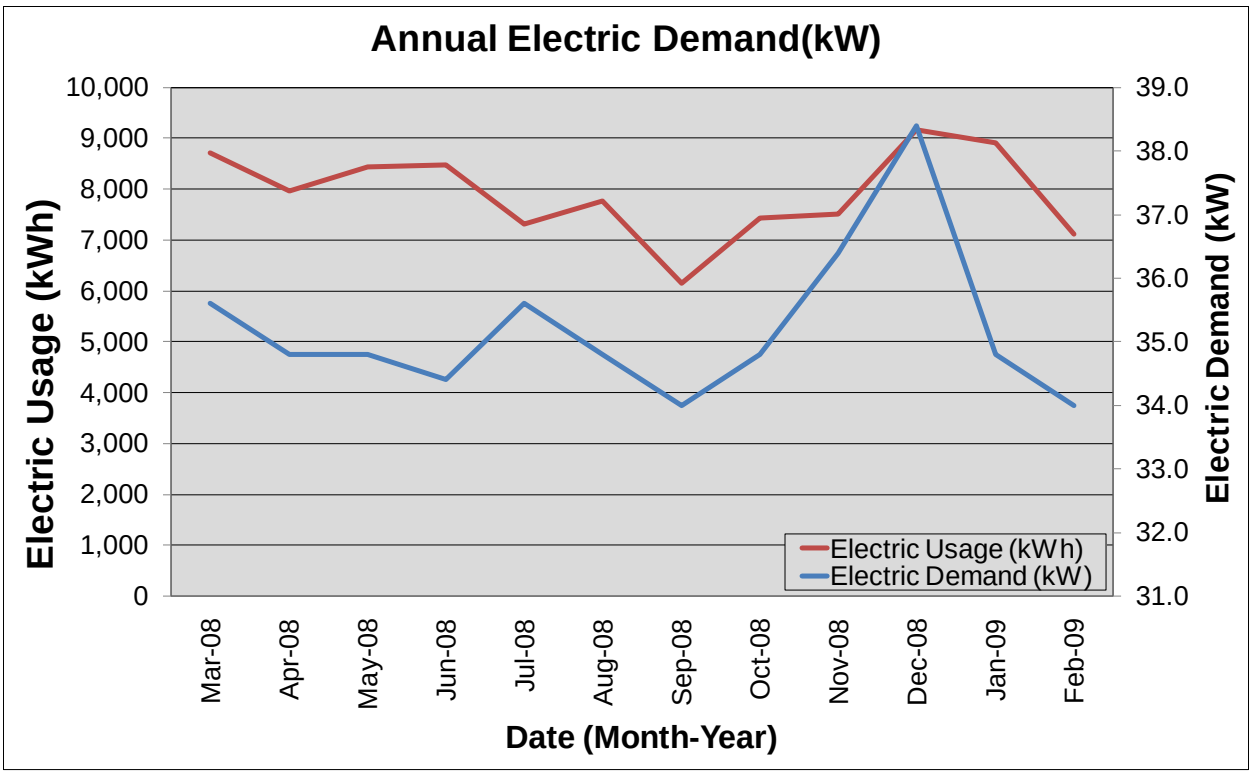
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1 Load profiles

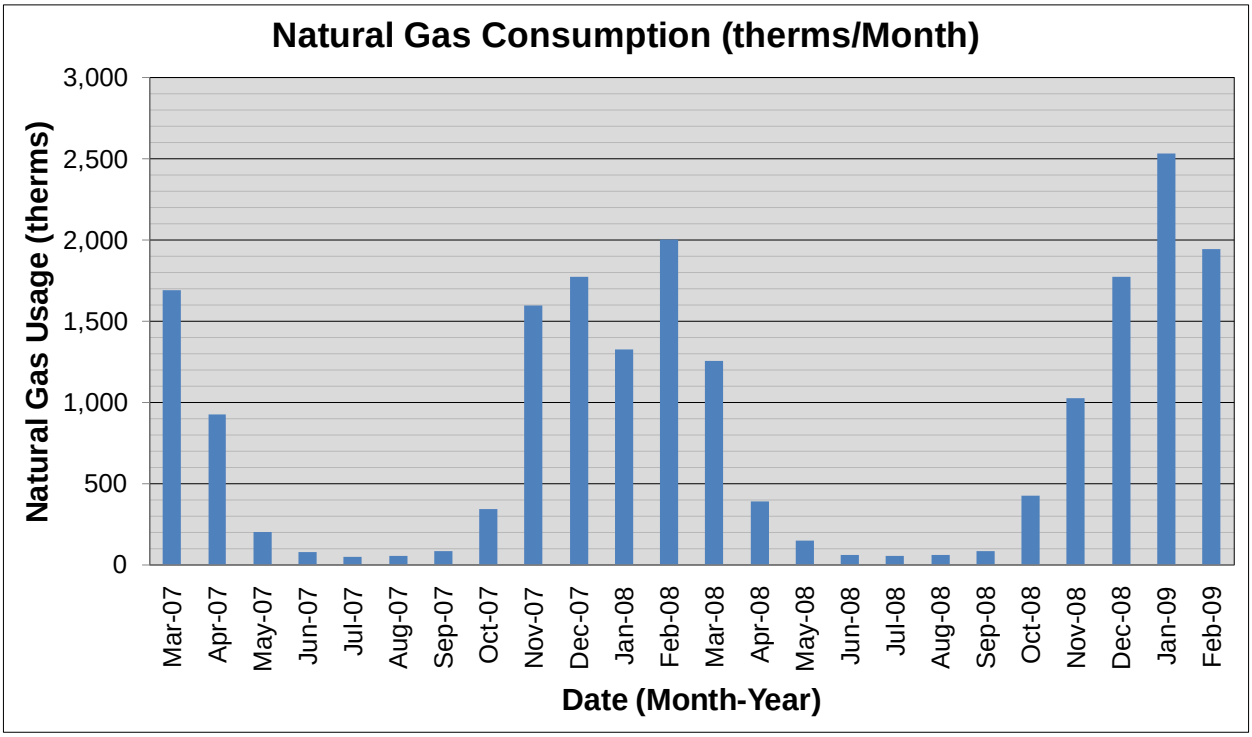
The following are charts that show the electric and natural gas load profiles for the Franklin Lakes DPW.

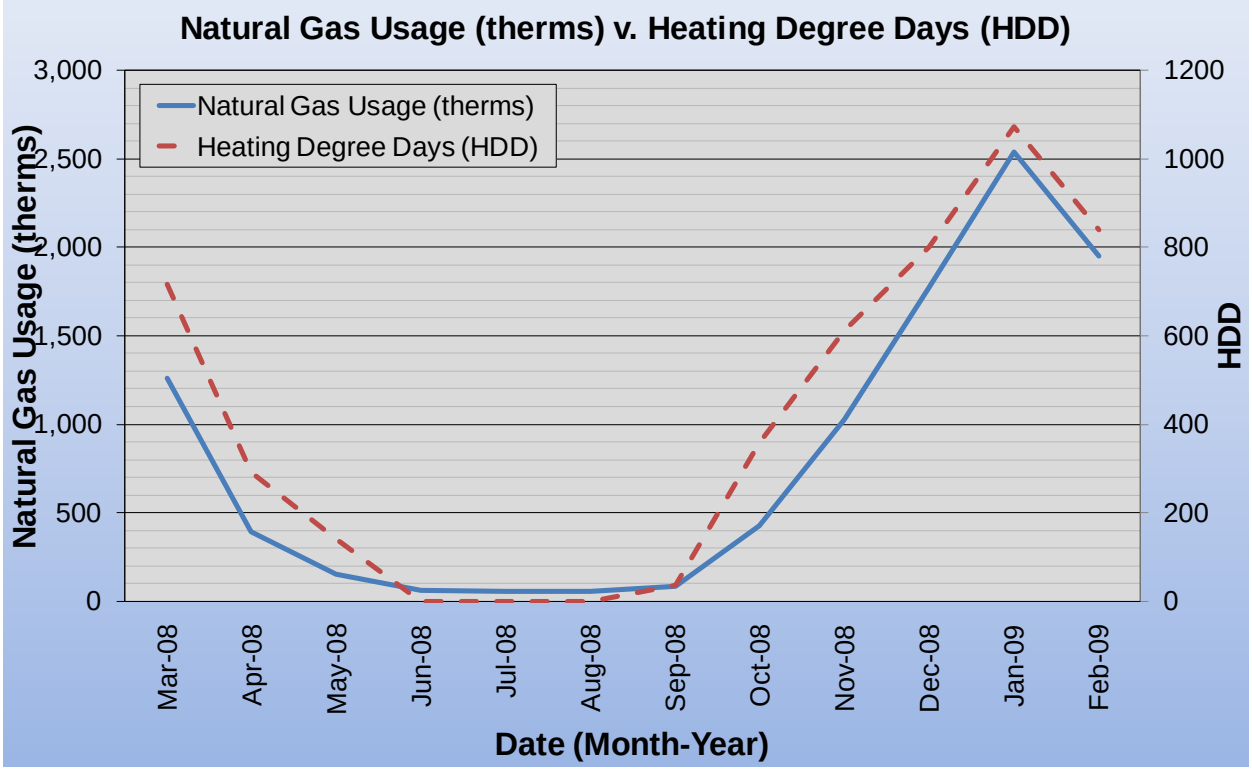


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption and are a steady draw.



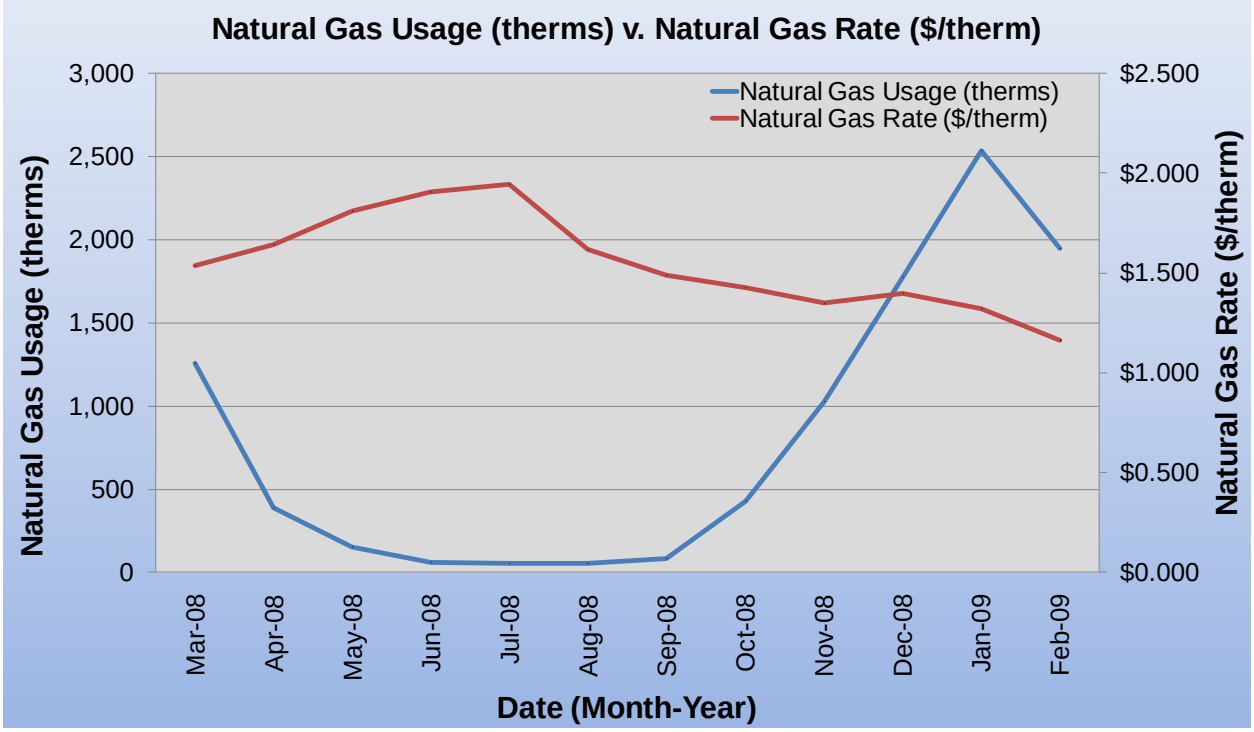
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the "heating degree days" curve. Some utility bills have more than one month estimated and combined.



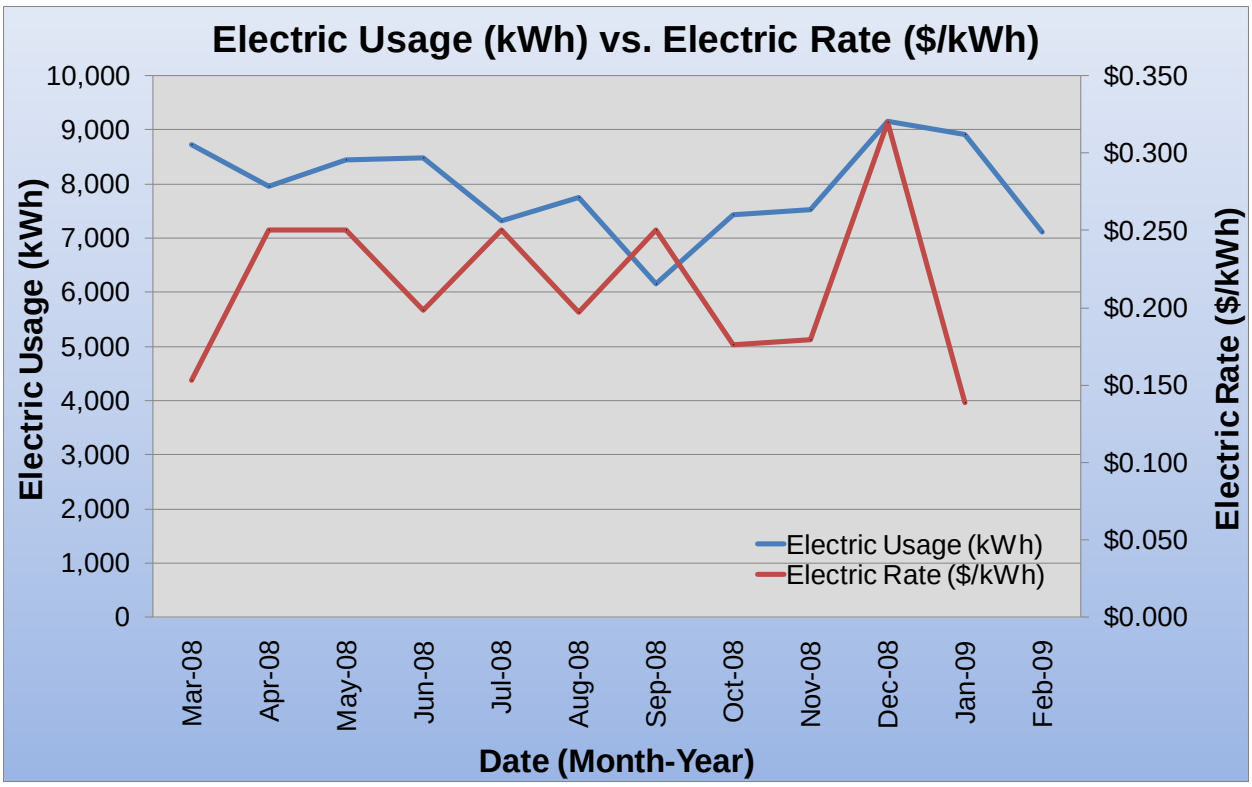


6.2 Tariff analysis

Currently, natural gas is provided to the Franklin Lakes DPW 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 service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Franklin Lakes DPW 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 hot water boiler units. The 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 as seen in June and July. Thus the building pays for fixed costs such as meter reading charges during the summer months. Below is a normalized chart to display the rate fluctuations.



The Franklin Lakes DPW building is direct-metered and currently purchases electricity from Orange Rockland Electric at a general service rate. The general service rate for electric charges are market-rate based on use and the Franklin Lakes DPW building billing does show a breakdown of demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by air conditioning systems. Outliers during peak cooling months were normalized as to not skew the chart scale. Electric rate peaks during winter months, such as December can be due to peak charges in the evening when lighting is need for more hours than during the summer.

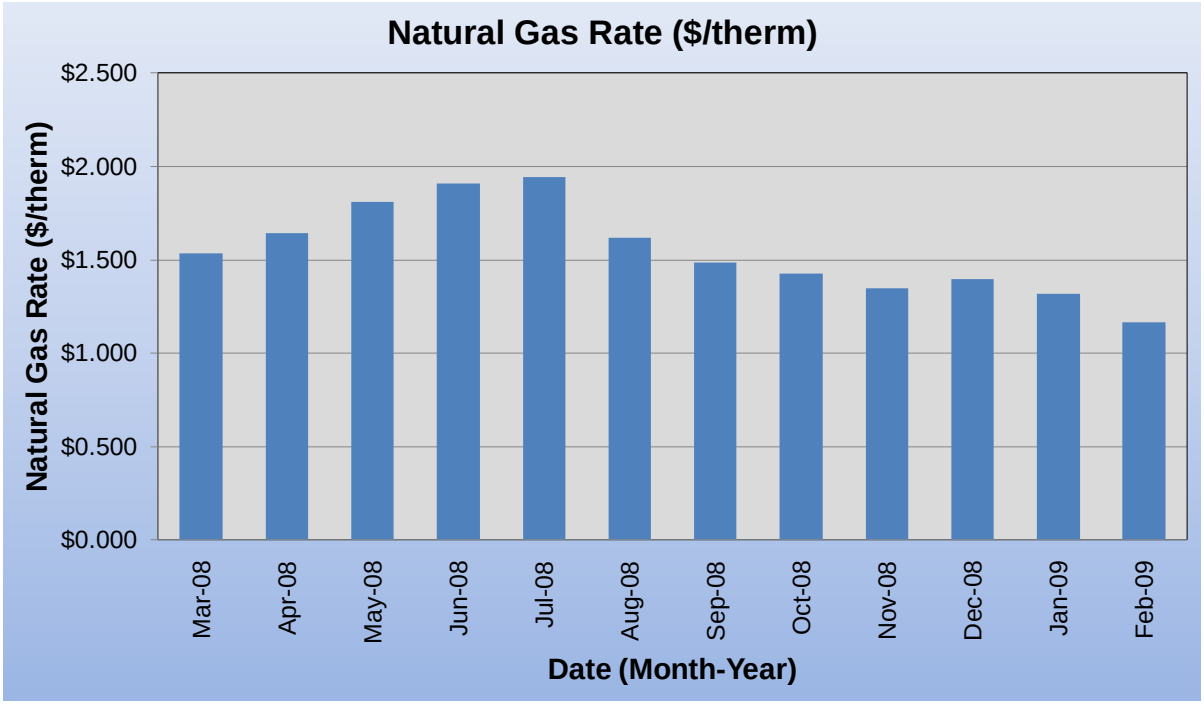


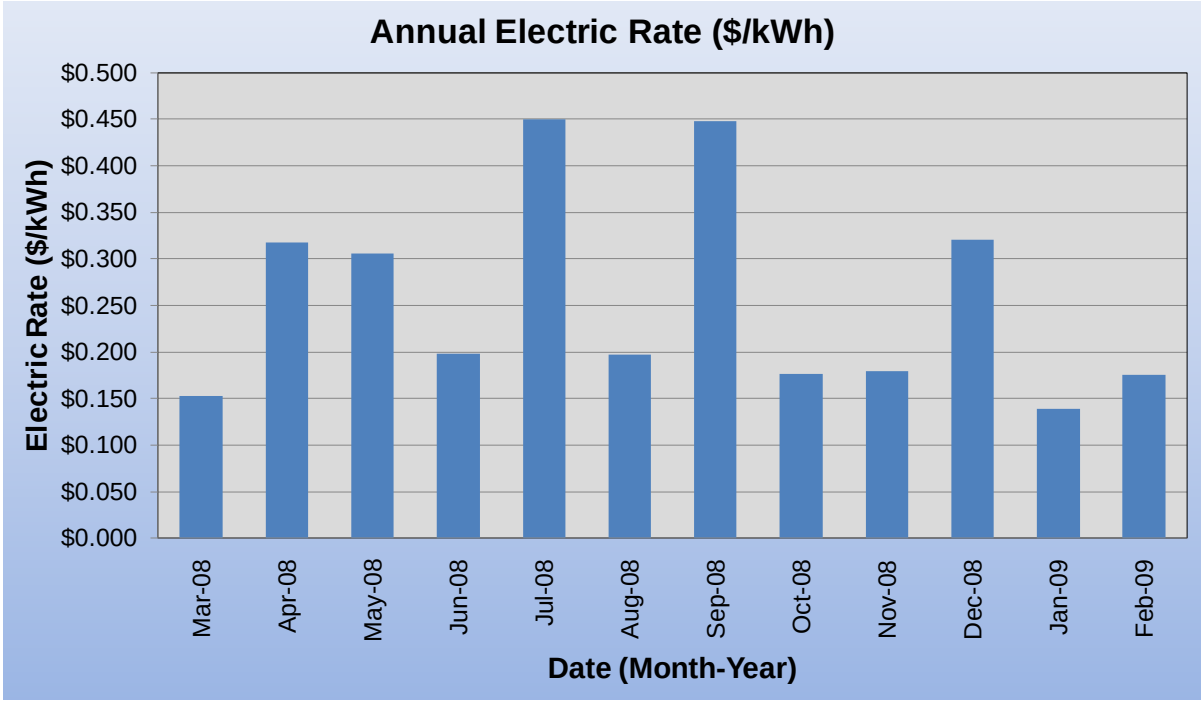
6.3 Energy Procurement strategies

The Franklin Lakes DPW building receives natural gas via one incoming meter. The 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 purchased via one incoming meter directly for the main Franklin Lakes DPW building from Orange Rockland Electric without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 66% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 40% 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 Franklin Lakes DPW building annual electric costs are $9,533 higher when compared to the average estimated NJ commercial utility rates. SWA recommends that the Borough of Franklin Lakes 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 Franklin Lakes DPW. Appendix B contains a complete list of third party energy suppliers for the Borough of Franklin Lakes service area. The Borough of Franklin Lakes may want to consider partnering with other school districts, municipalities, townships 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 Franklin Lakes DPW

building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time (without a large capital investment) 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. Demand Response could be an option in the future when the Borough of Franklin Lakes may install a large enough back-up emergency generator.

The following charts show the Franklin Lakes DPW building monthly spending per unit of energy from March 2008 to February 2009.





7. METHOD OF ANALYSIS

7.1 Assumptions and tools

Energy modeling tool:	established / standard industry assumptions
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs

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

7.2 Disclaimer

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

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

Appendix A: Lighting 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	1	Truck Bay (New DPW)	Screw-in	E	MH	18	1	250	D	9	260	63	5,634	13,184	T5	Parabolic	4'T5	E	D	18	5	28	9	260	7	2646	6192	6992	0	6992
2	1	Truck Bay (New DPW)	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
3	1	Lunch Rm (105)	Recessed	E	4'T8	4	2	32	S	8	260	6	280	582	N/A	Recessed	4'T8	E	S	4	2	32	8	260	6	280	582	0	0	0
4	1	Men's Locker Room (106)	Recessed	E	4'T8	4	2	32	S	8	260	6	280	582	N/A	Recessed	4'T8	E	S	4	2	32	8	260	6	280	582	0	0	0
5	1	Men's Locker Room (106)	Recessed	M	4'T12	1	2	40	S	8	260	15	95	198	T8	Recessed	4'T8	E	S	1	2	32	8	260	6	70	146	52	0	52
6	1	Kitchen (104)	Recessed	E	4'T8	4	2	32	S	9	260	6	280	655	N/A	Recessed	4'T8	E	S	4	2	32	9	260	6	280	655	0	0	0
7	1	Bathroom Men (103)	Recessed	M	4'T12	1	2	40	S	9	260	15	95	222	T8	Recessed	4'T8	E	S	1	2	32	9	260	6	70	164	59	0	59
8	1	Bathroom Men (103)	Recessed	M	4'T12	1	4	40	S	9	260	24	184	431	T8	Recessed	4'T8	E	S	1	4	32	9	260	13	141	330	101	0	101
9	1	Office (101)	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	Recessed	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
10	1	Bathroom Women ()	Recessed	E	4'T8	1	2	32	S	9	260	6	70	164	N/A	Recessed	4'T8	E	S	1	2	32	9	260	6	70	164	0	0	0
11	1	Storage Rm (108)	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
12	1	Office Area (109)	Recessed	E	4'T8	4	2	32	S	9	260	6	280	655	N/A	Recessed	4'T8	E	S	4	2	32	9	260	6	280	655	0	0	0
13	1	office (102)	Recessed	E	4't8	2	4	32	S	9	260	13	282	660	N/A	Recessed	4'T8	E	S	2	4	32	9	260	13	282	660	0	0	0
14	1	Hallway ()	Recessed	E	4'T8	1	2	32	S	12	260	6	70	218	N/A	Recessed	4'T8	E	S	1	2	32	12	260	6	70	218	0	0	0
15	1	Truck Bay (2)	Recessed	E	8'T8	7	1	59	S	9	260	6	455	1,065	N/A	Recessed	8'T8	E	S	7	1	59	9	260	6	455	1065	0	0	0
16	1	Truck Bay ()	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	1	Office Area (109)	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
18	2	Office (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
19	1	Men's Locker Room (106)	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
20	2	Mechanical Rm (105)	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
21	1	Truck Bay (Old DPW)	Recessed	N	MH	24	1	250	S	9	260	63	7,512	17,578	T5	Parabolic	4'T5	E	S	24	5	28	9	260	7	3528	8256	9323	0	9323
22	1	Truck Bay (Old DPW)	Recessed	M	8't12	8	2	80	S	9	260	35	1,560	3,650	T8	Recessed	8'T8	E	S	8	2	59	9	260	13	1048	2452	1198	0	1198
23	1	Lunch Rm (Old DPW)	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	1	Truck Bay (Old DPW)	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
25	1	Truck Bay (New DPW)	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
26	1	Truck Bay (New DPW)	Screw-in	N	Inc	1	1	75	S	9	260	0	75	176	CFL	Screw-in	CFL	N	S	1	1	25	9	260	0	25	59	117	0	117
27	2	MECHRM (2ND FL)	Recessed	E	4'T8	6	4	32	S	2	260	13	846	440	N/A	Recessed	4'T8	E	S	6	4	32	2	260	13	846	440	0	0	0
28	1	TRUCK BAY (Old DPW)	Recessed	N	HPS	1	1	100	S	9	260	25	125	293	T5	Recessed	4'T5	E	S	1	4	28	9	260	6	118	276	16	0	16
29	Ext	Old DPW (exterior)	Recessed	N	mh	2	1	75	PC	14	365	19	188	961	PSMH	Recessed	PSMH	N	PC	2	1	50	14	365	11	122	623	337	0	337
30	Ext	Old DPW (exterior)	Recessed	N	mh	1	1	175	PC	14	365	44	219	1,119	PSMH	Recessed	PSMH	N	PC	1	1	115	14	365	25	140	715	404	0	404
31	Ext	Old DPW (exterior)	Recessed	N	led	2	1	1	MS	14	365	0	2	10	N/A	Recessed	LED	N	MS	2	1	1	14	365	0	2	10	0	0	0
32	Ext	New DPW (exterior)	Recessed	N	mh	7	1	175	PC	14	365	44	1,533	7,834	PSMH	Recessed	PSMH	N	PC	7	1	115	14	365	25	980	5008	2826	0	2826
Totals:						**115**	**52**	**1,725**				**436**	**20,411**	**51,655**						**115**	**63**	**969**			**208**	**12,079**	**30,231**	**21,424**	**0**	**21,424**

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

Proposed Lighting Summary Table			
Total Surface Area (SF)	12,240		
Average Power Cost ($/kWh)	0.2500		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	9,924	6,357	**3,567**
Exterior Power (watts)	1,942	1,244	**698**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	41,731	23,874	**21,424**
Lighting Power (watts)	18,469	10,835	**7,634**
Lighting Power Density (watts/SF)	1.51	0.89	**0.62**
Estimated Cost of Fixture Replacement ($)	20,890		
Estimated Cost of Controls Improvements ($)	0		
Total Consumption Cost Savings ($)	**7,493**		

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)			

Appendix B: Third Party Energy Suppliers (ESCOs)

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

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 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	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

Third Party Electric Suppliers for Orange Rockland Service Territory	Telephone & Web Site
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07097	(800) 437-7872 www.hess.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-03799 www.libertypowercorp.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornal Street, 6th Floor Edison, NJ 08837	(888) 999-8374 www.suezenergyresources.com

Appendix C: Glossary and Method of Calculations

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.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

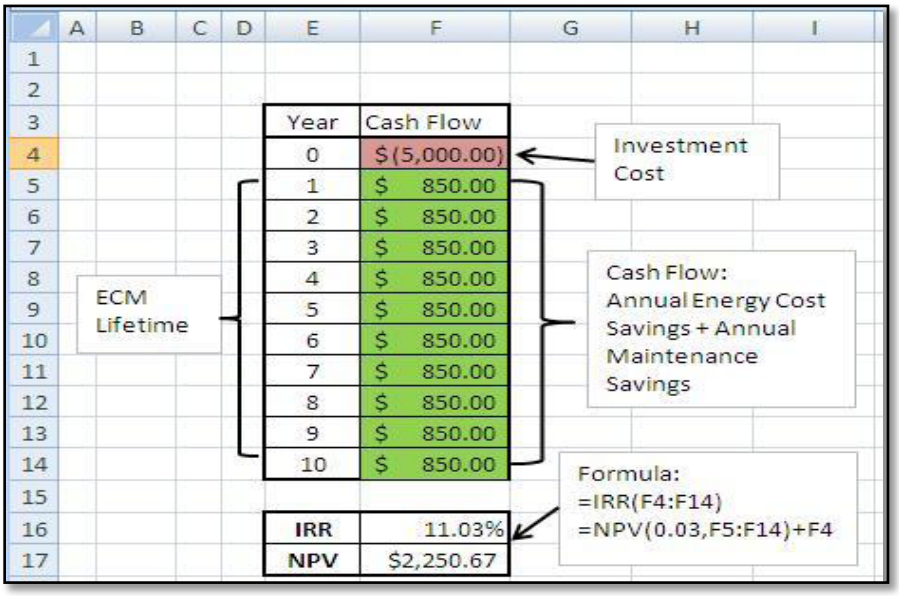
Calculation References

Term	Definition
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
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)]

* 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).

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:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 50kW or less, $1/Watt incentive subtracted from installation cost
Incentive 2:	Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $600/Megawatt hour /1000 * 15 years]

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.

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

Measure	Life Span
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

Appendix D: Incentive Programs

New Jersey Clean Energy Pay for Performance

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

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

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

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

Eligibility:

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

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

Smart Start

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

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

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

Renewable Energy Incentive Program

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

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

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

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

LIGHTING

Proposed Fixture
2' T8 1-lamp with EB
2' T8 2-lamp with EB
2' T8 3-lamp with EB
2' T8 4-lamp with EB
4' T8 1-lamp with EB
4' T8 2-lamp with EB
4' T8 3-lamp with EB
4' T8 4-lamp with EB
2' T8 1-lamp with EB plus reflector
4' T8 1-lamp with EB plus reflector
4' T8 2-lamp with EB plus reflector
4' T8 3-lamp with EB plus reflector
8' T8 2-lamp with EB
4' T8 4-lamp with EB plus reflector
4' T8 6-lamp with EB plus reflector
8' T8 2-lamp with EB plus reflector
2' T8 U-Lamp with EB
4' T8 2-lamp w/ HPEB
4' T8 2-lamp w/ HPEB plus reflector
4' T8 4-lamp w/ HPEB
4' T8 4-lamp w/ HPEB plus reflector
54T5HO 2-lamp and fixture
54T5HO 3-lamp and fixture
T8 3-lamp fixture with EB & reflector
T8 4-lamp fixture with EB & reflector
54T5HO 4-lamp and fixture
5W CF Screw-in Quad Lamp
5W CF Screw-in Torpedo or R20 Lamp
CF 7-1L SCREW IN CFL
CF 9-1L SCREW IN CFL
CF 13-1L SCREW IN CFL
CF 18-1L SCREW IN CFL
CF 22-1L SCREW IN CFL
CF 26-1L SCREW IN CFL
CF 28-1L SCREW IN CFL
CF 32-1L SCREW IN CFL
CF 36-1L SCREW IN CFL
CF 42-1L SCREW IN CFL
CF 7-1L SCREW IN CFL DIMMABLE
CF 18-1L SCREW IN CFL DIMMABLE
CF 23-1L SCREW IN CFL DIMMABLE
18W CIRCLINE w/ dome
32W CIRCLINE w/ dome
40W CIRCLINE w/ dome
58W CIRCLINE w/ dome
28W CF Exterior Floodlight w/PE
1 LAMP T5 HIGH BAY HO FIXTURE
2 LAMP T5 HIGH BAY HO FIXTURE
3 LAMP T5 HIGH BAY HO FIXTURE
4 LAMP T5 HIGH BAY HO FIXTURE
5 LAMP T5 HIGH BAY HO FIXTURE
6 LAMP T5 HIGH BAY HO FIXTURE
MH PS (320 W) RETRO.
MH PS (250W) RETRO.
MH PS (200 W) RETRO.
MH PS (175 W) RETRO.
NEW MH PS (320 W) FIXTURE
NEW MH PS (250 W) FIXTURE
NEW MH PS (200 W) FIXTURE
NEW MH PS (175 W) FIXTURE
42W Halogen Lamp (12 V System)
50W Halogen Lamp (12 V System)
65W Halogen Lamp (12 V System)
LED Exit Sign Retrofit Kit
LED Universal Exit Sign
LED EXIT Sign w/ Batt. Backup

LIGHTING CONTROLS

Proposed Sensor
Occ. Sensor Ceiling Mount (line volt)
Occ. Sensor Ceiling Mount (low volt)
Dual Tech. Occ.Sens Ceiling (line v)
Dual Tech. Occ.Sens Ceiling (low v)
Occ. Sens. Wall/Corner Mount (line v)
Occ. Sens. Wall/Corner Mount (low v)
Dual Tech Occ.Sens Wall/Corner (line v)
Dual Tech Occ.Sens Wall/Corner (low v)
Occupancy Sensor Wall Switch
Dual Tech Occ. Sensor Wall Switch
Occ.Sensor for High Bay Fixtures
Photocell Control w/ Dimmable Balast
Programmable Time Clock
Add'l Power Pack (a.k.a. Relay)

VFDS

Lookup
VFD for 1 HP Motor
VFD for 1.5 HP Motor
VFD for 2 HP Motor
VFD for 3 HP Motor
VFD for 5 HP Motor
VFD for 7.5 HP Motor
VFD for 10 HP Motor

GAS MEASURES

Measure Description
Low Intensity IR Heating Unit (Gas)
Gas-Fired Furnace
Gas-Fired Boiler

HVAC & HW CONTROLS

Equipment Type
Outside Economizer
Demand Control Ventilation
Programmable Thermostats

Pipe Wrap

0.75
1
1.25
1.5
2
2.5
3
4
6
8

MOTORS

Motor Description
Open Drip Proof - 1200 RPM - 5 HP
Open Drip Proof - 1200 RPM - 7.5 HP
Open Drip Proof - 1200 RPM - 10 HP
Open Drip Proof - 1800 RPM - 1.5 HP
Open Drip Proof - 1800 RPM - 2 HP
Open Drip Proof - 1800 RPM - 3 HP
Open Drip Proof - 1800 RPM - 5 HP
Open Drip Proof - 1800 RPM - 7.5 HP
Open Drip Proof - 1800 RPM - 10 HP
Open Drip Proof - 3600 RPM - 7.5 HP
Open Drip Proof - 3600 RPM - 10 HP
Enclosed, Fan-Cooled - 1200 RPM - 2 HP
Enclosed, Fan-Cooled - 1200 RPM - 3 HP
Enclosed, Fan-Cooled - 1200 RPM - 5 HP
Enclosed, Fan-Cooled - 1200 RPM - 7.5 HP
Enclosed, Fan-Cooled - 1200 RPM - 10 HP
Enclosed, Fan-Cooled - 1800 RPM - 3 HP
Enclosed, Fan-Cooled - 1800 RPM - 5 HP
Enclosed, Fan-Cooled - 1800 RPM - 7.5 HP
Enclosed, Fan-Cooled - 1800 RPM - 10 HP
Enclosed, Fan-Cooled - 3600 RPM - 7.5 HP
Enclosed, Fan-Cooled - 3600 RPM - 10 HP

OIL/PROPANE MEASURES

Measure /Capacity (Btus)
Oil-Fired Furnace
60,001 to 80,000
80,001 to 100,000
100,001 to 120,000
120,001 to 140,000
Propane-Fired Furnace
25,000 to 40,000
40,001 to 60,000
60,001 to 80,000
80,001 to 100,000
100,001 to 120,000
120,001 to 140,000
Oil-Fired Boiler
75,000 to 100,000
100,001 to 150,000
150,001 to 225,000
225,001 to 300,000
300,001 to 400,000
400,001 to 500,000
Propane-Fired Boiler
75,000 to 100,000
100,001 to 150,000
150,001 to 225,000
225,001 to 300,000
300,001 to 400,000
400,001 to 500,000

HOT WATER MEASURES
Low-flow Showerhead
Low-flow faucet aerators
Low-flow Kitchen Pre-Rinse Spray Valves

Fuel Economizer Control

Models	For Use with	Fuel	For HVAC Sizes	
IntelliCon-HW+	Resid. Hot Water Sys	Oil/Gas	<300	kBTU/hr
IntelliCon-LCH	Lt. Comm. Hot Water Sys.	Oil/Gas	300-2500	kBTU/hr
IntelliCon-CHW	Comm. Hot Water Sys.	Oil/Gas	>2500	kBTU/hr
IntelliCon-LCS	Lt. Comm. Steam Boilers	Oil/Gas	<2500	kBTU/hr
IntelliCon-CHS	Comm. Steam Boiler Sys.	Oil/Gas	>2500	kBTU/hr
IntelliCon-FA	Res/Comm. Forced Air Heat Sys.	Oil/Gas	all sizes	
IntelliCon-AC	Resid. Central AC	Electric	0-5	tons
IntelliCon-CAC	Comm. Central AC	Electric	>5	tons
IntelliCon-RU	Refrigeration Units	Electric	all sizes	

REFRIGERATION

Measure Description
Evaporator/Compressor Controller for one Cooler
Incremental Cost for each additional Cooler
First Cooler/Freezer Door Heater Control
Incremental Cost for each additional Cooler/Freezer Heater Circuit

PACKAGED HVAC

Equipment Type
2.5-Ton Packaged Unitary A/C (Elec.)
3-Ton Packaged Unitary A/C (Elec.)
4-Ton Packaged Unitary A/C (Elec.)
5-Ton Packaged Unitary A/C (Elec.)
7.5-Ton Packaged Unitary A/C (Elec.)
10-Ton Packaged Unitary A/C (Elec.)
12-Ton Packaged Unitary A/C (Elec.)
15-Ton Packaged Unitary A/C (Elec.)
2.5-Ton Packaged Unit (Elec. AC/Gas Heat)
3-Ton Packaged Unit (Elec. AC/Gas Heat)
4-Ton Packaged Unit (Elec. AC/Gas Heat)
5-Ton Packaged Unit (Elec. AC/Gas Heat)
7.5-Ton Packaged Unit (Elec. AC/Gas Heat)
10-Ton Packaged Unit (Elec. AC/Gas Heat)
12-Ton Packaged Unit (Elec. AC/Gas Heat)
15-Ton Packaged Unit (Elec. AC/Gas Heat)
2-Ton Electric Split System A/C
2.5-Ton Electric Split System A/C
3-Ton Electric Split System A/C
4-Ton Electric Split System A/C
5-Ton Electric Split System A/C
7.5-Ton Electric Split System A/C
2-Ton Air Source Heat Pump
2.5-Ton Air Source Heat Pump
3-Ton Air Source Heat Pump
4-Ton Air Source Heat Pump
5-Ton Air Source Heat Pump
7.5-Ton Air Source Heat Pump
2.5-Ton Water Source Heat Pump
3-Ton Water Source Heat Pump
4-Ton Water Source Heat Pump
5-Ton Water Source Heat Pump
7.5-Ton Water Source Heat Pump