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June 11, 2010

Local Government Energy Program
Energy Audit Final Report

Franklin Lakes Municipal Building
480 De Korte Drive, Franklin Lakes, NJ

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 buildings.

This report addresses the Franklin Lakes Municipal Building located at 480 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 two-story Franklin Lakes Municipal Building was built in 1966 with a few minor interior renovations. The building contains mostly offices, including the Court Department and Mayor's office. The building consists of 13,794 square feet of conditioned space. The Franklin Lakes Municipal Building operates 8:30am to 4:00pm Monday through Friday with evening meets twice a week. Approximately 15 administrative staff work during the day with up to 30 visitors, and 2 employees during court, twice a month with up to 100 visitors.

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 Municipal 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 Municipal Building located at 480 De Korte Drive, Franklin Lakes, NJ. The Franklin Lakes Municipal Building is a two-story building with a floor area of 13,794 square feet. The original structure was built in 1966.

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 Municipal Building consumed 135,360 kWh or $36,704 worth of electricity at an approximate rate of $0.271/kWh, and 4,030 therms or $5,932 worth of natural gas at an approximate rate of $1.472/therm. The joint energy consumption for the building, including both electricity and natural gas, was 865 MMBtu of energy that cost a total of $42,636.

SWA has entered energy information about the Franklin Lakes Municipal Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. A benchmark score was calculated for the facility designated as "Office" space type. The building has an Energy Performance Rating of 62, meaning that it performs better than 62% of all other office type buildings based on national surveys. 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.

The Site Energy Use Intensity is 65.0 kBtu/ft^2yr compared to the national average of "Office" space type of 75.0 kBtu/ft^2yr. Implementing this report's recommendations will reduce use by approximately 4.8 kBtu/ft^2yr, which when implemented would reduce the building's energy consumption further. There may be energy procurement opportunities for the Franklin Lakes Municipal Building to reduce annual electric costs, which are $16,400 higher, when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the Franklin Lakes Municipal Building, SWA has separated the recommendations into three categories (see Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Install weep holes in walls and upgrade flashing
- Replace all original windows with newer models with thermal breaks, dual glazing and low-e rating
- Install gravity dampers in Lennox twin units air supply ductwork
- Remove ductwork from existing outside air louver for mechanical room ventilation. Install a properly sized outside air damper in mechanical room and duct to furnaces for OA intake.
- Re-Design of HVAC system ductwork, equipment and controls

Category II Recommendations: Operations and Maintenance

- Adjust thermostat set-back schedule to reduce energy usage
- Remove grills between mechanical room and hallway and patch openings with fire-rated material
- Install removable, insulated cover (or gravity louvers) for exhaust fans
- Install wire mesh on any exterior ventilation panels or soffits
- Add insulation to ineffectively and under-insulated roof/ceiling sections
- Maintain downspouts - repair/install missing downspouts as needed
- Air seal / caulk around all plumbing, electrical, HVAC or structural penetrations, and maintain regularly
- Perform regular maintenance on weather-stripping for all exterior doors
- 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 **one** Energy Conservation Measure (ECMs) for the Franklin Lakes Municipal Building, as summarized in the following Table 1. The total investment cost for the ECM with incentives is **$800**. SWA estimates a first-year savings of **$225** with a simple payback of **3.6 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Franklin Lakes Municipal Building by **1,137 lbs of CO_2**. SWA also recommends **three** ECMs with a total first-year savings of $**15,318** as summarized in Table 2.

There are various incentive programs that the Borough of Franklin Lakes could apply for that could also help lower the cost of installing the ECMs, such as the NJ SmartStart 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 and is highly recommended.

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 slight/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
1	4 New occupancy sensors to be installed with incentives	RS Means, lit search	880	80	800	830	0.2	0	0.2	0	225	15	3,375	3.6	322%	21%	27	1,847	1,137

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 15 kW Solar Photovoltaic system	Similar Projects	105,000	15,000	90,000	17,700	15	0	4.4	0	14,997	25	272,918	6.0	203	8.1	15.14	291,718	31,692
4	4 New T8 fixtures to be installed with incentives	RS Means, lit search	861	120	741	183	0.0	0	0.0	34	83	15	1,252	8.9	69	4.6	7	241	250
5	3 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	2,416	75	2,341	654	0.1	0	0.2	60	237	15	3,562	9.9	52	3.5	6	454	896
	TOTALS		**108,277**	**15,195**	**93,082**	**18,537**	**15.2**	**0**	**4.6**	**94**	**15,318**		**277,732**	**6.1**	**-**	**-**	**-**	**-**	**32,838**

1. HISTORIC ENERGY CONSUMPTION

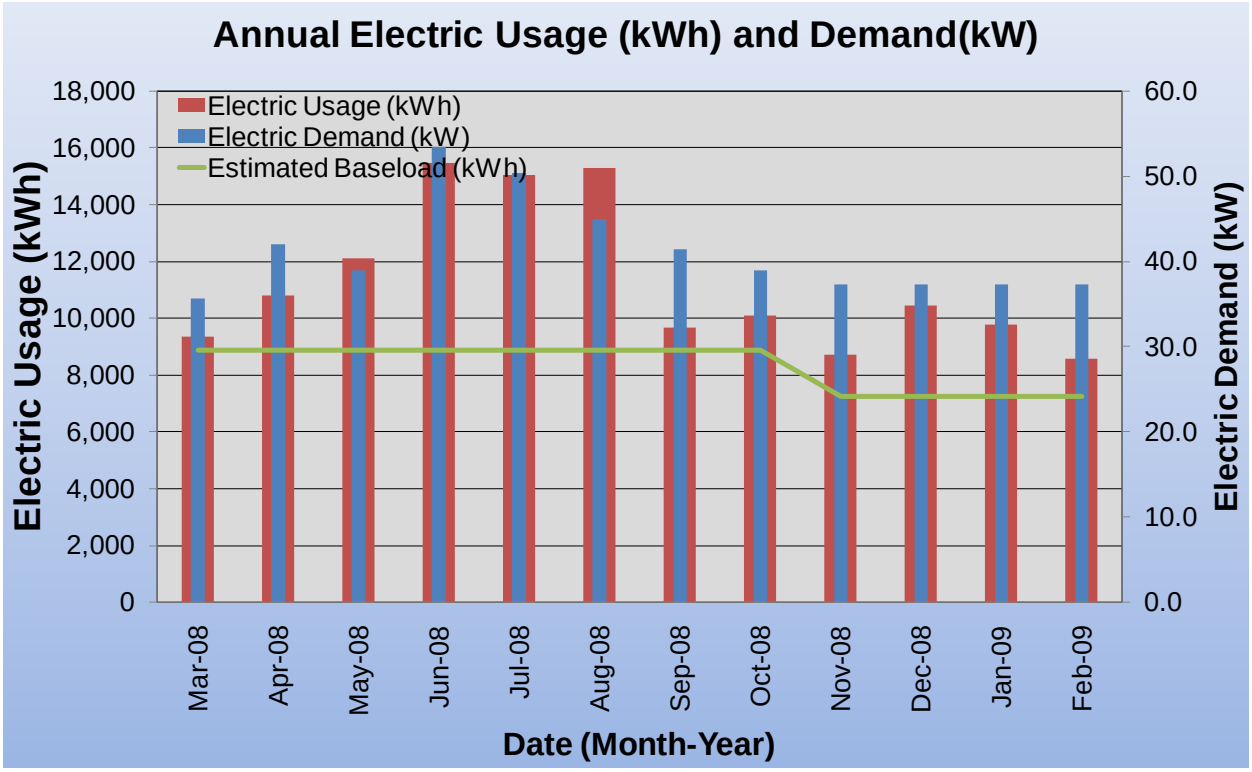
1.1 Energy usage and cost analysis

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

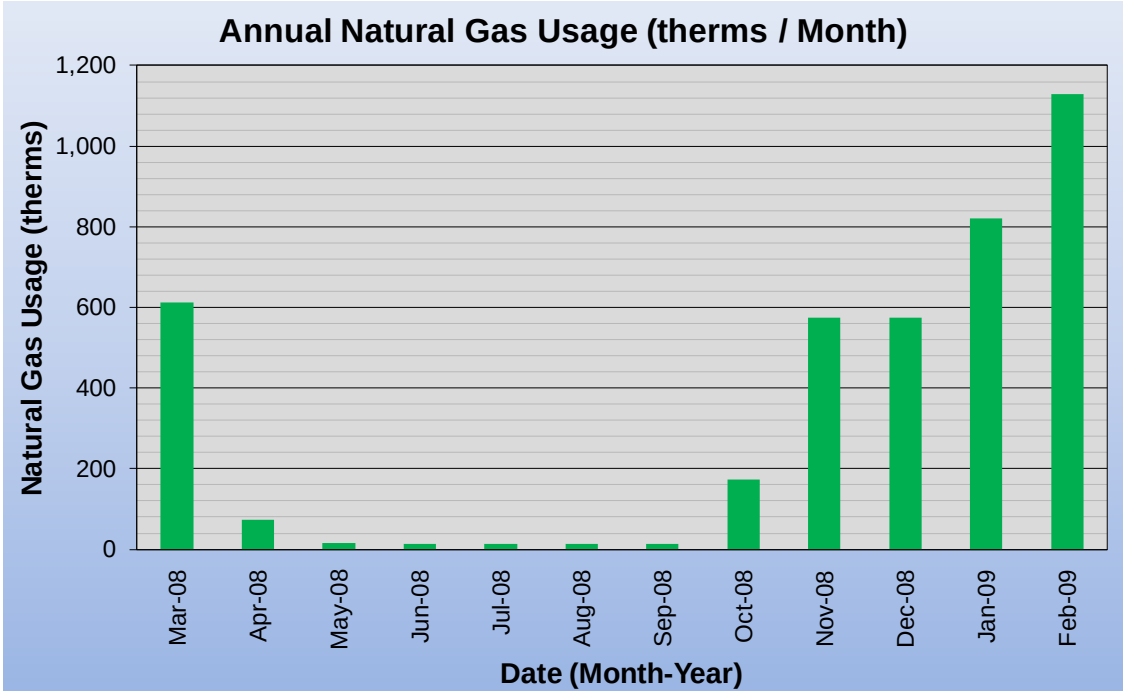
Electricity - The Franklin Lakes Municipal Building is currently served by one electric meter. The Franklin Lakes Municipal Building currently buys electricity from Orange Rockland Electric at **an average rate of $0.271/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Franklin Lakes Municipal Building purchased **approximately 135,360 kWh or $36,704 worth of electricity** in the previous year. The average monthly demand was 23 kW.

Natural gas - The Franklin Lakes Municipal Building is currently served by one meter for natural gas. The Franklin Lakes Municipal Building buys natural gas from PSE&G at **an average aggregated rate of $1.472/therm** based on 12 months of utility bills for March 2008 to February 2009. The Franklin Lakes Municipal Building purchased **approximately 4,030 therms or $5,932 worth of natural gas** in the previous year.

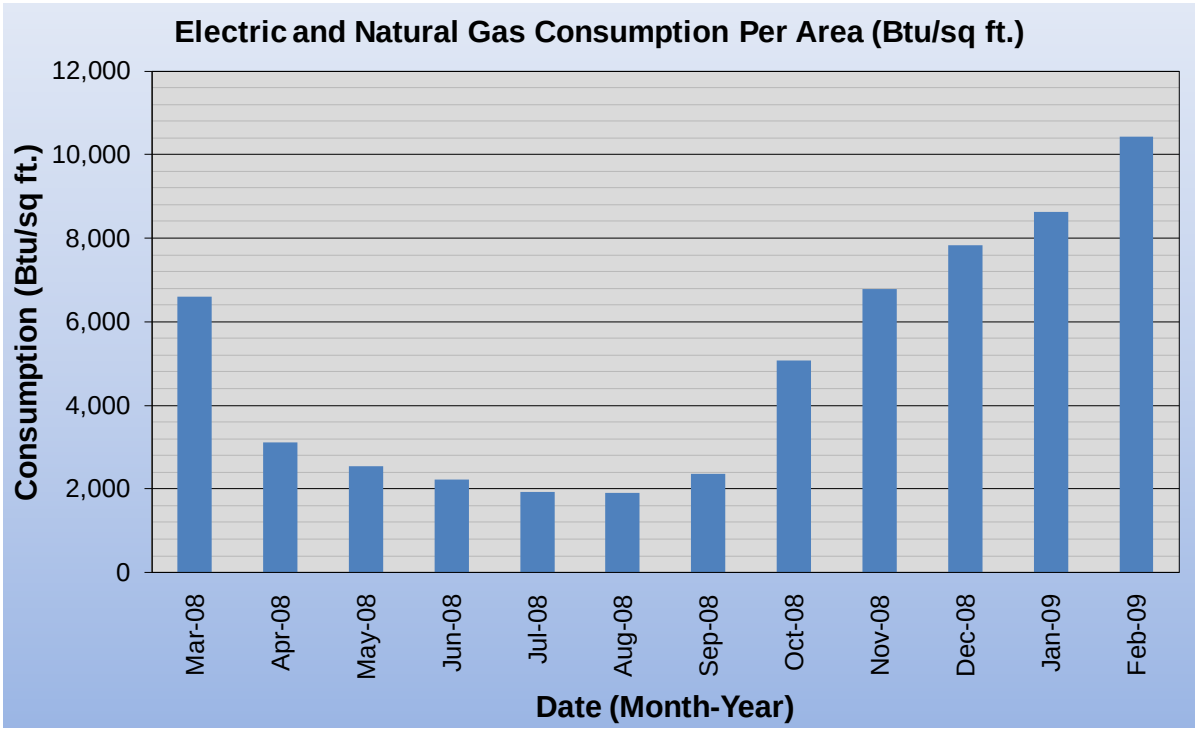
The following chart shows electricity use for the Franklin Lakes Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009.



The following chart shows the natural gas consumption for the Franklin Lakes Municipal Building based on natural gas bills for the 12 month period of March 2008 to February 2009.

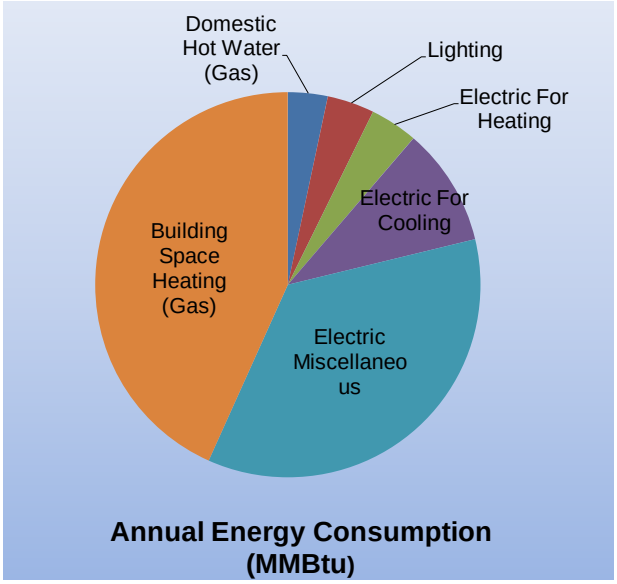


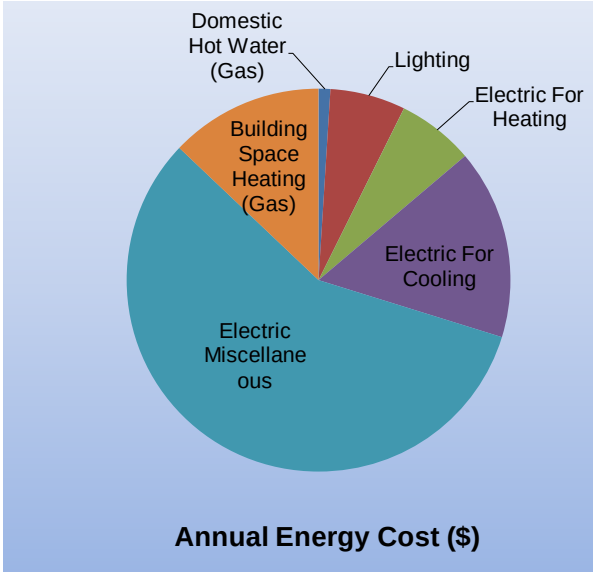
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Franklin Lakes Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and pie charts show energy use for the Franklin Lakes Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009. Note: electrical cost at $79/MMBtu of energy is more than five times as expensive as natural gas at $15/MMBtu.

2008 Annual Energy Consumption / Costs					
ELECTRIC	**MMBtu**	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	307	36%	$24,426	57%	79
Electric For Cooling	86	10%	$6,817	16%	79
Electric For Heating	35	4%	$2,750	6%	79
Lighting	34	4%	$2,712	6%	79
GAS	**MMBtu**	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Domestic Hot Water (Gas)	29	3%	$425	1%	15
Building Space Heating (Gas)	374	43%	$5,507	13%	15
Totals	865	100%	$42,636	100%	--
ELECTRIC & GAS	**MMBtu**	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Total Electric Usage	462	53%	$36,704	86%	79
Total Gas Usage	403	47%	$5,932	14%	15
Totals	865	100%	$42,636	100%	--





1.2 Utility rate

The Franklin Lakes Municipal 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 Municipal Building currently pays an average rate of approximately $0.271/kWh based on the 12 months of utility bills of March 2008 to February 2009.

The Franklin Lakes Municipal 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 Municipal Building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.472/therm based on 12 months of utility bills for March 2008 to February 2009.

1.3 Energy benchmarking

SWA has entered energy information about the Franklin Lakes Municipal Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Municipal Building facility is comprised of "Office" space type for which there is a rating system available. The Energy Performance Rating of the Municipal Building is 62.0.

The Site Energy Use Intensity is 65.0 kBtu/ft^2/yr compared to the national average of a Recreation building using 75.0 kBtu/ft^2/yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 0.2 kBtu/ft^2/yr, with an additional 4.6 kBtu/ft^2/yr from the recommended ECMs. These recommendations can further reduce the site energy use intensity to 61.2 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 Municipal Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager 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 - Municipal Building

Building ID: 1976052
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 05, 2010

Facility
Borough of Franklin Lakes - Municipal Building
480 De Korte Drive
Franklin Lakes, NJ 07417

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1966
Gross Floor Area (ft²): 13,794

Energy Performance Rating[2] (1-100) 62

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	463,976
Natural Gas (kBtu)[4]	436,792
Total Energy (kBtu)	900,768
Energy Intensity[5]	
Site (kBtu/ft²/yr)	65
Source (kBtu/ft²/yr)	145
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	68
Electric Distribution Utility	
Rockland Electric Co	
National Average Comparison	
National Average Site EUI	75
National Average Source EUI	167
% Difference from National Average Source EUI	-13%
Building Type	Office

Stamp of Certifying Professional

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

Certifying Professional
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 Municipal Building (Or Borough Hall) is a two-story structure with basement constructed in 1966. This facility houses various departments such as: the Municipal Clerk's office, the office of the Tax Collector, the Court Department, the Mayor's Office and other municipal financial administration and building offices. An elevator was installed in 1998 with other additions / renovations in 2004 and 2005. The building currently consists of a total 13,794 square feet of conditioned space.

2.2. Building occupancy profiles

The peak occupancy for the Municipal Building is approximately 23 full time Municipal administrative employees during the daytime plus visitors (approximately 10 to 15 at any one time during the week) for the various Municipal Departments and the Court Room when it is in session (as many as 100 visitors, twice per month). The administrative part of the building and court sessions are normally operated Monday - Friday 8:30 am to 4:00 pm and also evenings for committee meetings from 7:00 pm to 10:00 pm. The court administration is handled by 2 full time employees.

2.3. Building envelope

2.3.1. Exterior Walls

The exterior walls consist of 8” CMU blocks with a 4” brick veneer façade. The original structure consists of masonry wall construction. The drawings for the original structure do not specifically call for insulation to be installed on the exterior walls.

The exterior walls were inspected and found to be in overall acceptable condition. SWA recommends as part of a capital improvement plan to install weep holes in walls and upgrade flashing, thus keeping water from migrating inside the exterior walls.

2.3.2. Roof

The Municipal Building roof is a sloped asphalt shingled roof over 3/4 “ plywood and 30 lbs felt, installed in 2004. There weren’t any reported roof leaks. The roof is supported by wood trusses, planks / mostly plywood. The insulation in the attic space above the suspended ceiling (composed of 2 ft x 4 ft Armstrong Tegular ceiling tiles) is loose to sparse. Birds could enter the attic space via various soffits and side ventilation panels. SWA recommends closing up any large penetrations and wrapping wire meshes on ventilation panels. Batt fiberglass insulation should be consistent and tight throughout the attic.

Side view of the building showing attic ventilation louvers

2.3.3. Base

The building's base is a 4" concrete slab in the basement with a perimeter footing. There weren't any reported problems with water seepage through the slab or other issues related to thermal performance or moisture, including the basement. The slab edge or perimeter insulation was not accessible and hence could not be verified.

2.3.4. Windows

The building contains Anderson double-glazed fixed and double-hung aluminum-framed windows. The original building windows were replaced. Some of the windows have worn out seals. The window seals are of great concern as infiltration, water, and pests such as the bees are allowed to enter the building. SWA recommends, as part of a capital improvement plan, replacing all original windows with newer models with thermal breaks, dual glazing and a low-e rating. Proper flashing and caulking should be performed upon installation of the new windows.

Window lintel needing calking at the top as well as painting

2.3.5. Exterior doors

The aluminum framed exterior doors were observed to be in good condition except for some missing or worn weather-stripping. SWA recommends that the exterior doors of the building be weather-stripped in order to decrease the amount of expensive conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

2.3.6. Building air tightness

Based on a visual inspection, the Municipal Building could benefit from tightly sealed windows and doors, ductwork, plumbing and wire penetrations. Any water damage due to condensing un-insulated pipes, condensate lines dripping, plumbing leaks, or roof leaks should be repaired immediately and ceiling tiles should be replaced. Ceiling tiles act as an air barrier containing expensive conditioned air from leaking into ceiling or wall cavities.

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

A comprehensive HVAC study of the Municipal Building was performed by a licensed engineer in November 2008. The report divulges that the current HVAC system has significant design issues related to inadequate outside air intake and control. Also, due to several renovations throughout the building, the current ductwork distribution system is not designed for the current functions of the space. There are two approaches for improvement of the HVAC system:

1. Full HVAC Re-Design
   Capital investment in the re-design of entire HVAC system including equipment, distribution and controls by a design consultant; long term solution guaranteed to eliminate code violations and greatly enhance thermal comfort

2. HVAC Retro-Commissioning
   Study of existing design to determine how to operate the current system more effectively, but may not eliminate all code violations; long term solution with significant improvements to thermal comfort, despite the code non-compliance.

The following paragraphs describe the existing HVAC systems as observed by field visits and possible methods of improvement if a full re-design of the system is not a viable option.

The Franklin Lakes Municipal Building is cooled and heated by a series of direct vented furnaces which heat or cool the air depending on the season and temperature set points. There are considerable thermal comfort concerns in the Municipal Building; where some areas of the building experience excessive heat other areas are overcooled. This is indicative of a problematic control system.

The temperature of the air is currently controlled by four programmable thermostats. The four thermal zones are: Basement, 1st floor, Court Room, and 2nd Floor. The thermostat controls are located in the basement mechanical room and receive space condition information from local sensors in each zone.

Programmable thermostat controls locked in basement Mechanical Room for the four zones

The following thermostat set back schedule is regulated by building staff, with a 2˚F dead band during occupied hours. SWA recommends adjusting the schedule as shown in the right-most

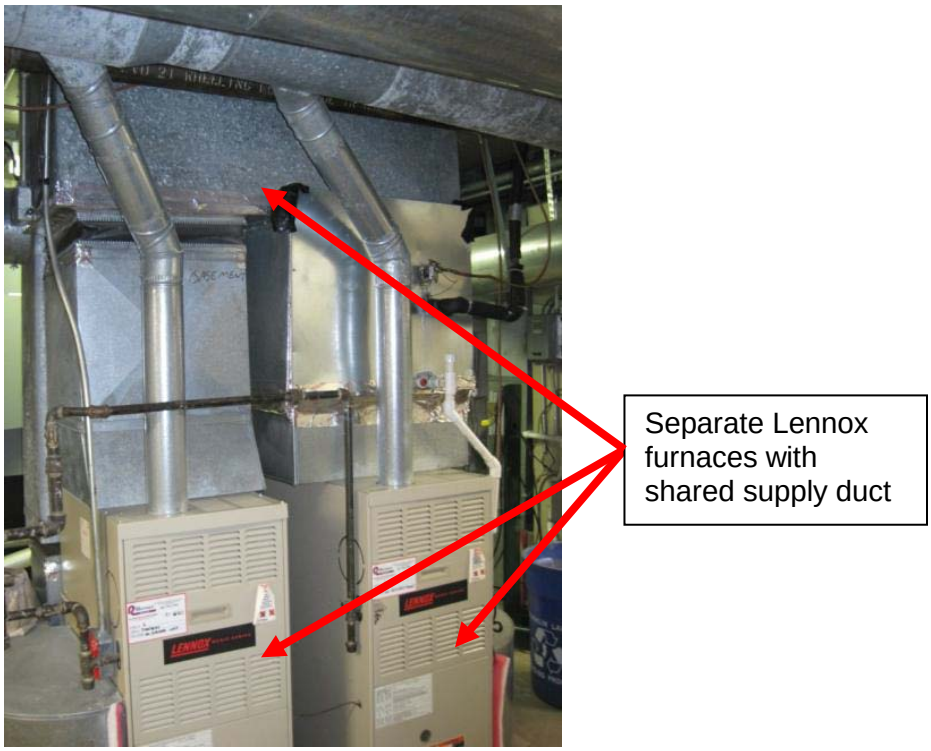
column. Reducing the temperatures in the heating season and raising temperatures in cooling, even by one or two degrees can generate significant energy savings.

Heating & Cooling Setback Schedule				
Parameters	**Existing**		**Proposed Modifications**	
	Occupied	**Unoccupied**	**Occupied**	**Unoccupied**
Time Span	6am to 11pm	11pm to 6am	6 am to 11 pm	11pm to 6 am & Weekends
# of Hours	17	7	17	7
Heating Set point	71˚ F	68˚ F	70˚ F	62˚ F
Cooling Set point	73˚ F	76˚ F	74˚ F	78˚ F

2.4.1 Heating

The building is heated by seven non-condensing direct vented natural gas residential-grade furnaces, six Lennox furnaces and one Rudd furnace. The heat of combustion of natural gas is used to heat a mixture of outside air and return air within the heating section and then a supply air fan forces the heated air through the constant volume distribution system to occupied spaces. All furnaces were installed in 2004 or later and appear in good condition.

The six Lennox furnaces each have heating and cooling elements, but the supply ductwork is shared by two units as seen in the following photo. Therefore out of the six units there are only three supply ducts. The design intent of this arrangement is not completely clear, and may have been to allow redundancy in case one furnace needs repair. There does not appear to be a damper in the ductwork between the two units, so if one of the paired furnaces is operating and the other is not the supply air can enter the unit that is not operating in the reverse air flow direction. The Lennox units are not designed to operate in this configuration and at a very minimum should have back draft dampers which prohibit reverse air flow through the unit.



Lennox Direct Vented Twin Furnaces in Basement Mechanical Room

2.4.2 Cooling

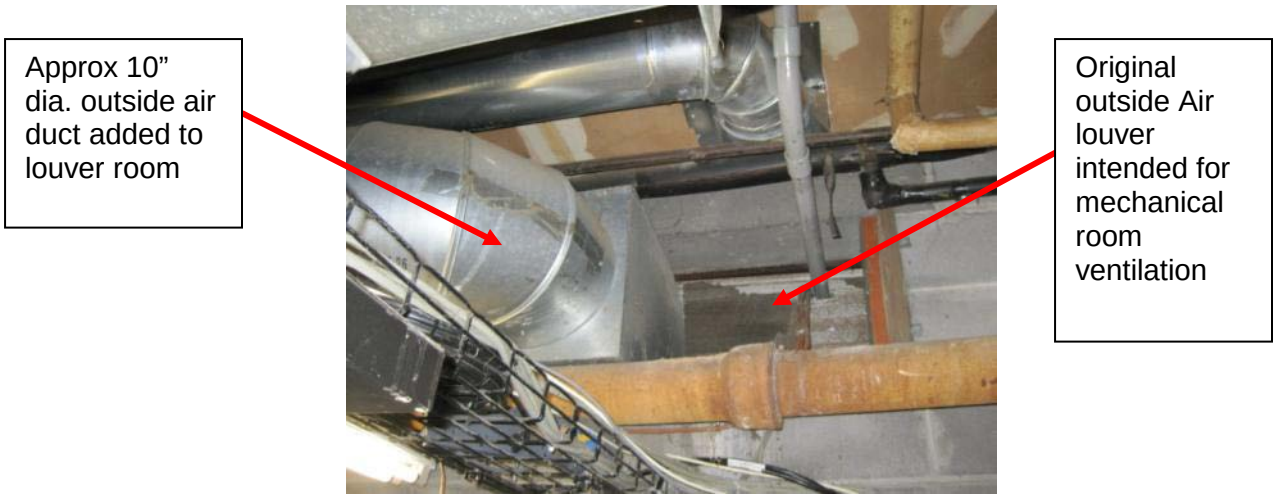
The Franklin Lakes Municipal Building is cooled by several electric DX split system with the evaporator section contained within the seven direct vented furnaces. In the evaporator section of the furnaces R-22 refrigerant is used to transfer heat from the incoming air to the atmosphere.

There are seven condensers, six Lennox and one Ruud unit, which expel heat from the refrigerant used in the DX split cooling system. The condensers are located in the back of the building and have an estimated 70% remaining useful life and appear in good condition.

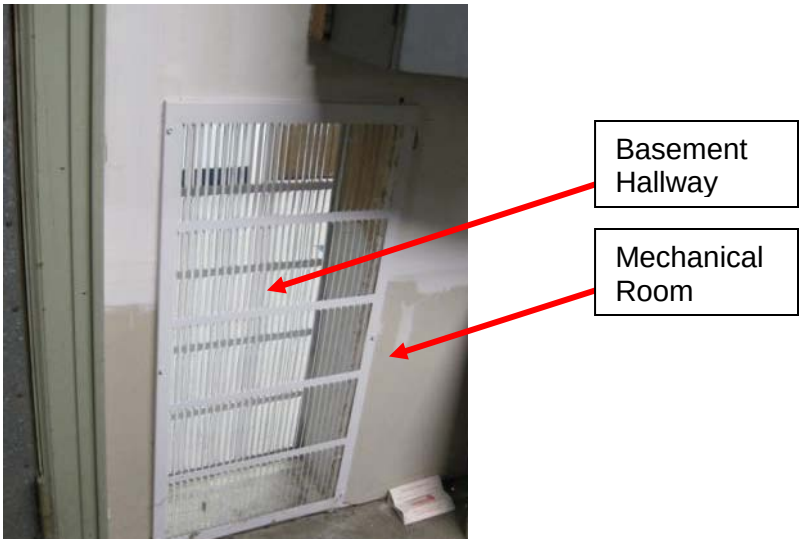
Condensers installed in back of Building

2.4.3 Ventilation

The outdoor air intake duct was added to the mechanical room outside air louver in the mechanical room and ducted to each furnace, reducing the louver area available for combustion air. This degrades the outside air intake to the mechanical room; Mechanical rooms containing combustion equipment must have adequate ventilation. Also, SWA observed that the fresh air duct size may not be sufficient to handle the total building fresh air requirement, posing code compliance issues.



Furthermore, the mechanical room must be isolated from occupied space with a fire-rated barrier; however, there are two large open grills in the mechanical room which allow air exchange between the mechanical room to the basement hallway. This is a code violation and should be addressed.



Based on field inspection it appears that the only mechanical ventilation is due to the pressure induced by the furnace supply fans. There are no outside air fans or exhaust fans for the HVAC system.

Due to the code violations, thermal comfort issues and unusual equipment arrangement, SWA recommends that the Borough of Franklin Lakes engage the services of a Professional Engineer to review the design of the HVAC system including heating and cooling equipment, ductwork distribution, controls and ventilation. SWA highly recommends that, at a minimum, the ventilation requirements for the building be determined by a licensed engineer and then adjustments made to the existing louver arrangement; this will likely require a new air intake louver in the mechanical room. It should be noted that correcting the amount of outside air intake to the building will likely increase the amount of energy the building uses for conditioning the air.

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Franklin Lakes Municipal Building is provided by a Bradford White natural gas-fired heater with 40 gal storage and 40,000 Btu/hr of hot water capacity. The air intake and flue are piped to the roof. The heater provides hot water to bathroom sinks and pantry sinks. The heater appears in good operating condition and has 80% remaining useful life.

2.5 Electrical systems

2.5.1 Lighting

Interior Lighting - The Franklin Lakes Municipal Building currently consists of mostly T8 fixtures with sporadic use of T12 fixtures and incandescent lights. The majority of the lights are controlled by switch except bathroom lights and the new elevator lobby lights which are controlled by occupied sensors. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing T12 fixtures using magnetic ballasts with T8 fixtures using electronic ballasts, which will reduce lamp wattage, ballast wattage and increase lamp lifespan. SWA also recommends installing occupancy sensor lighting controls to minimize the use of lights in kitchen areas, general meeting areas and bathrooms. 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 does not have recommendations for upgrades at this time.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of Metal Halide, High Pressure Sodium and CFL lights. SWA recommends replacing the metal halide and high pressure sodium lights with Pulse Start Metal Halide lights which operate at typically 2/3 of the wattage.

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.

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 Municipal Building computers are generally NOT programmed for the power save mode, to shut down after a period of time that they have not been used.

2.5.3 Elevators

The Franklin Lakes Municipal Building is a two-story building with a hydraulic elevator using a 25 HP motor. The elevator was installed in 1998 and the mechanical equipment has 50% remaining useful life.

2.5.4 Others electrical systems

There are not currently any other significant energy impacting electrical systems installed at the Franklin Lakes Municipal Building other than a Kohler 78 kVA Diesel Generator located at the Police Station which supplies emergency power for both buildings.

3. EQUIPMENT LIST

Building System	Description	Location	Make, Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Cooling	CU-1, 2 Condenser, 3.5 Tons, EER 10.4	BACK BLDG	LENNOX HS291202Y, 5601J02980	Electric	1ST FL	2004	70%
Cooling	CU-3 Condenser, RLA 15.4, 5 Tons, EER 10.4	BACK BLDG	LENNOX HS2906010Y, 5804E38370	Electric	2ND FL	2004	70%
Cooling	CU-4 Condenser, RLA 20.3, LRA 127, 3.5 Tons, EER 10.4	BACK BLDG	LENNOX HS290425P, 5805H28636	Electric	BASEMENT	2005	70%
Cooling	CU-6, 7 Condenser, 1/2 HP, R-22, 37.8 RLA, 239 LRA, 10 Tons, EER 10.4	BACK BLDG	LENNOX HS291203Y, 5607D05733	Electric	2ND FL	2004	70%
Cooling	Condenser, 10 Tons, LRA 137, RLA 17.3, 10.3 EER	Outside	Rudd RAWE-120CA2, 6686F360806341	Electric	All Areas	2004	70%
Cooling	Refrigerant COIL-1, 2	BASEMENT	Lennox	Electric	1ST FL	2004	70%
Cooling	Refrigerant COIL 3	BASEMENT	Lennox	Electric	2ND FL	2004	70%
Cooling	Refrigerant COIL 4	BASEMENT	LENNOX A-COIL	Electric	BASEMENT	2004	70%
Cooling	Refrigerant COIL 6	BASEMENT	LENNOX A-COIL C3360D23, 6007D06797	Electric	2ND FL	2004	70%
Cooling	Refrigerant COIL7	BASEMENT	LENNOX C3360D23, 6007D06795	Electric	2ND FL	2004	70%
Heating & Cooling	FURN1 direct vented heating and cooling with Coil 1; 125,000 btu/hr in, 100,000 btu/hr out, 80% eff.	BASEMENT	LENNOX(TWINNED) G23Q561251, 5893J0753	Natural Gas; Electric	1ST FL FRONT	2004	70%
Heating & Cooling	FURN2, direct vented heating and cooling with Coil 2 , 125,000 btu/hr in, 100,000 btu/hr out, 80% eff.	BASEMENT	LENNOX(TWINNED) G23Q561251, 5893J50746	Natural Gas; Electric	1ST FL FRONT	2004	70%
Heating & Cooling	FURN3 direct vented heating and cooling with Coil 3, 125,000 btu/hr in, 100,000 btu/hr out, 80% eff.	BASEMENT	RUDD 80PS12EDR01, GHD307F3608027023	Natural Gas; Electric	2ND FL	2008	90%
Heating & Cooling	FURN4, direct vented heating and cooling with Coil 4; 88,000 Btu/hr, 80% Eff.	BASEMENT	LENNOX(TWINNED) G40UH48B9002, 5801A35105	Natural Gas; Electric	BASEMENT	2004	70%
Heating & Cooling	FURN5, direct vented heating and cooling with Coil 5; 88,000Btu/hr, 80% Eff.	BASEMENT	LENNOX(TWINNED) G40UH36B09001, 5800G17626	Natural Gas; Electric	BASEMENT	2004	70%
Heating & Cooling	FURN6, direct vented heating and cooling with Coil 6; 100,000 Btu/hr; 80.1% Eff	BASEMENT	LENNOX(TWINNED) G16Q51005, 5886E04443	Natural Gas; Electric	2ND FL (1st fl indicated on unit)	2004	70%
Heating & Cooling	FURN7, direct vented heating and cooling with Coil , 150,000Btu/hr; 78% Eff.	BASEMENT	LENNOX(TWINNED) G20Q56E1502, 5894A43018	Natural Gas; Electric	2ND FL (1st fl indicated on unit)	2004	70%

Building System	Description	Location	Make, Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Domestic Hot Water	DHW, 40,000 Btu/hr, 40 Gal	BASEMENT	Bradford White M140T6FBN, EM11368608	Natural Gas	All areas	2006	80%
Generator	Diesel Generator w/ John Deere Engine, 62 kW, 78 kVA, 0.8 PF, 100 Gallon Tank	Outside, North	Kohler Diesel Generator ; John Deere Engine 60R02J; CD4039T400252, 189437 / 0654228	Diesel	Emergency Power	2000	30%
Lighting	See details - Appendix A	All Areas	NA	Electric	All Areas	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 Municipal Building, 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

- Install weep holes in walls and upgrade flashing to provide a path for water to exit the building structure and prolong the integrity and lift of the exterior walls.
- Replace all original windows with newer models with thermal breaks, dual glazing and low-e rating to enhance thermal insulation of the building
- Install gravity dampers in Lennox twin units air supply ductwork to prevent back raft from one unit to the other.
- Remove ductwork from existing outside air louver for mechanical room ventilation. Install a properly sized outside air damper in mechanical room and duct to furnaces for OA intake.
- Re-Design of HVAC system ductwork, equipment and controls in order to alleviate all code violations, comfort issues and to tailor the HVAC system to the current building use

Category II Recommendations: Operations and Maintenance

- Install removable, seasonal, insulated cover (or gravity louvers) for the exhaust fans.
- Remove grills between mechanical room and hallway and patch openings with fire-rated material
- Adjust thermostat setback schedule to reduce energy usage during unoccupied hours for an estimated 10% savings in heating and cooling energy costs:

Heating & Cooling Setback Schedule				
Parameters	**Existing**		**Proposed Modifications**	
	Occupied	**Unoccupied**	**Occupied**	**Unoccupied**
Time Span	6am to 11pm	11pm to 6am	6 am to 11 pm	11pm to 6 am & Weekends
# of Hours	17	7	17	7
Heating Set point	71˚ F	68˚ F	70˚ F	62˚ F
Cooling Set point	73˚ F	76˚ F	74˚ F	78˚ F

- Install wire mesh on any exterior ventilation panels or soffits.

- Add insulation to ineffectively and under-insulated roof/ceiling sections.

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

- Repair/seal all 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.

- 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 caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- 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 energy 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 - The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

Category III Recommendations: Energy Conservation Measures - Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Lighting Upgrades - Install Occupancy Sensors
	Description of Recommended 5-10 Year Payback ECMs
2	Install 15 kW Solar PV System
3	Lighting Upgrades – Replace T12 with T8 Fixtures
4	Lighting Upgrades - Replace HPS & MH with Pulse Start MH

ECM# 1, 3, 4: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Franklin Lakes Municipal Building (see Appendix A). SWA recommends adding wall-mounted occupancy sensors to bathrooms, office areas, and kitchen areas which have intermittent occupancy throughout the day. Typically, occupancy sensor control reduces the hours of operation of lights by a third. There is sporadic use of T12 lamps with magnetic ballasts. SWA recommends replacing all T12 magnetic fixtures with T8 electronic fixtures which will decrease wattage and increase lamp life for the same lumen output.

For exterior applications, SWA recommends replacing Metal Halide (MH) lights and high pressure sodium 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.

Due to frequent parking lights burn-out, it is recommended to rewire the parking light power connections before lamp replacement. 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 the Maintenance Department.

Installation cost:
Estimated installed cost: $3,882 (includes approx. $1,500 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 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. 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
4 New occupancy sensors to be installed with incentives	RS Means, lit search	880	80	800	830	0.2	0	0.2	0	225	15	3,375	3.6	322	21	27	1,847	1,137
4 New T8 fixtures to be installed with incentives	RS Means, lit search	861	120	741	183	0.0	0	0.0	34	83	15	1,252	8.9	69	5	7	241	250
3 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	2,416	75	2,341	654	0.1	0	0.2	60	237	15	3,562	9.9	52	3	6	454	896
TOTALS		**4,157**	**275**	**3,882**	**1,667**	**0**	**0.0**	**0.4**	**94**	**546**		**8,189**	**7.1**				**2,542**	**2,284**

Assumptions: SWA calculated the savings for this measure using a comprehensive lighting cost and lifespan database and occupancy schedule for lighting usage.

Rebates/financial incentives:

NJ Clean Energy – Occupancy Sensor Wall Mounted - $20 per fixture, Total $80; T12 to T8 - $30/fixture - Total $120; Metal Halide to Pulse Start - $25/fixture - $75 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 15 kW PV system*

Description:

Currently, the Franklin Lakes Municipal Building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the building roof facing south 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 15 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 15 kW system needs approximately 122 panels which would take up 1,300 square feet. Below is an ideal location to install the panels. Since the roof is sloped facing East and West, having panels on both sides of the building would ensure that at least one side obtains sun exposure throughout the day. In addition, having visible solar panels can serve as a bold reminder to the Franklin Lakes public about energy conservation and that the Borough of Franklin Lakes is leading this movement by example.

Installation cost:

Estimated installed cost: $90,000 (labor included at $3/Watt, totaling $45,000)
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 cost 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
Install 15 kW Solar Photovoltaic system	Similar Projects	105,000	15,000	90,000	17,700	15	0	4.4	0	14,997	25	272,918	6.0	203	8.1	15.14	291,718	31,692

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 15 kW or less. Incentive amount for this application is $15,000 for the Franklin Lakes Municipal Building.
NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. A total of $10,200/year, based on $600/SREC, has been incorporated in the above costs for the Municipal Building however it requires proof of performance, application approval and negotiations with the utility. *http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program*

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

Please 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 intermittent 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 HVAC system types (forced air) and intermittent domestic hot water use.

5.6 Geothermal

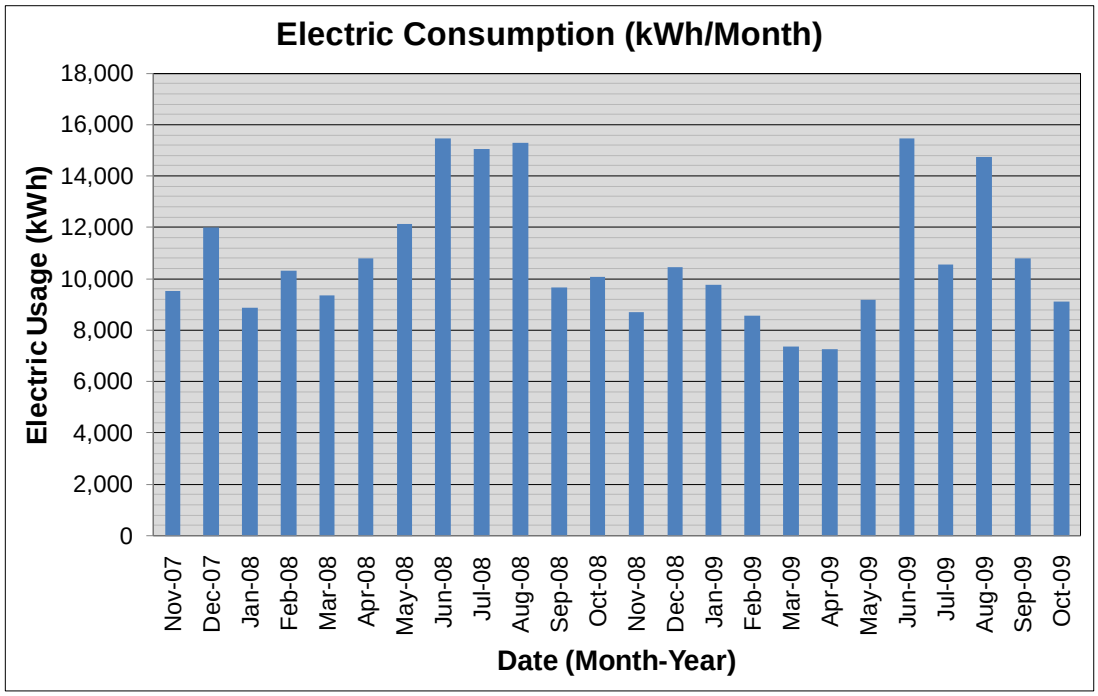
Description:

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.

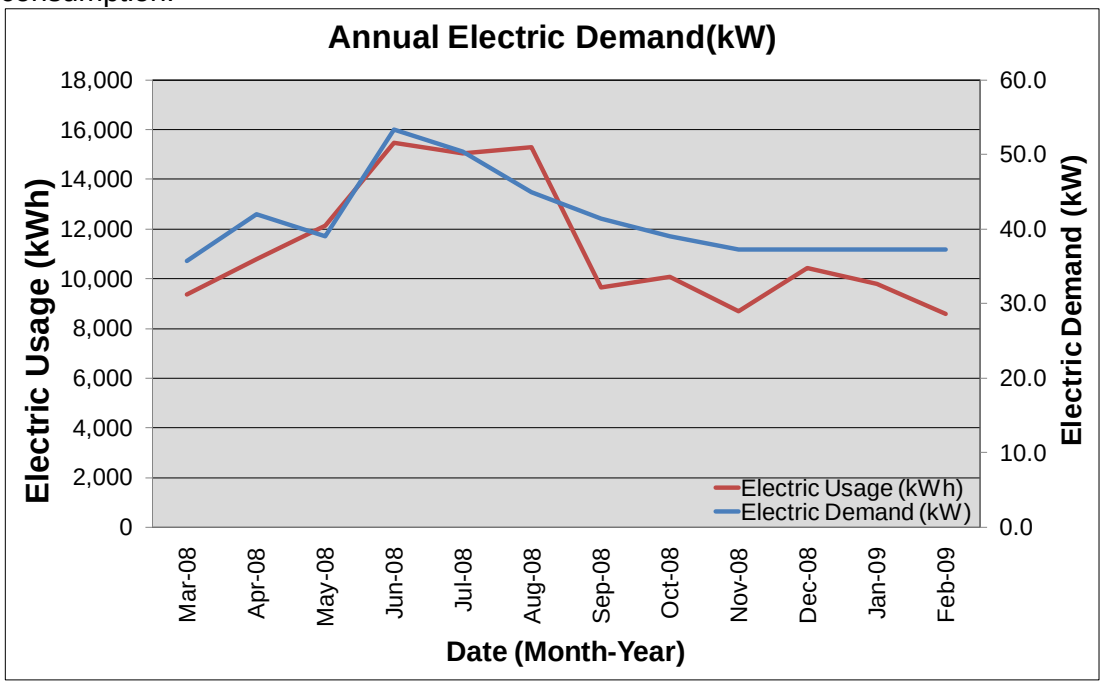
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1 Load profiles

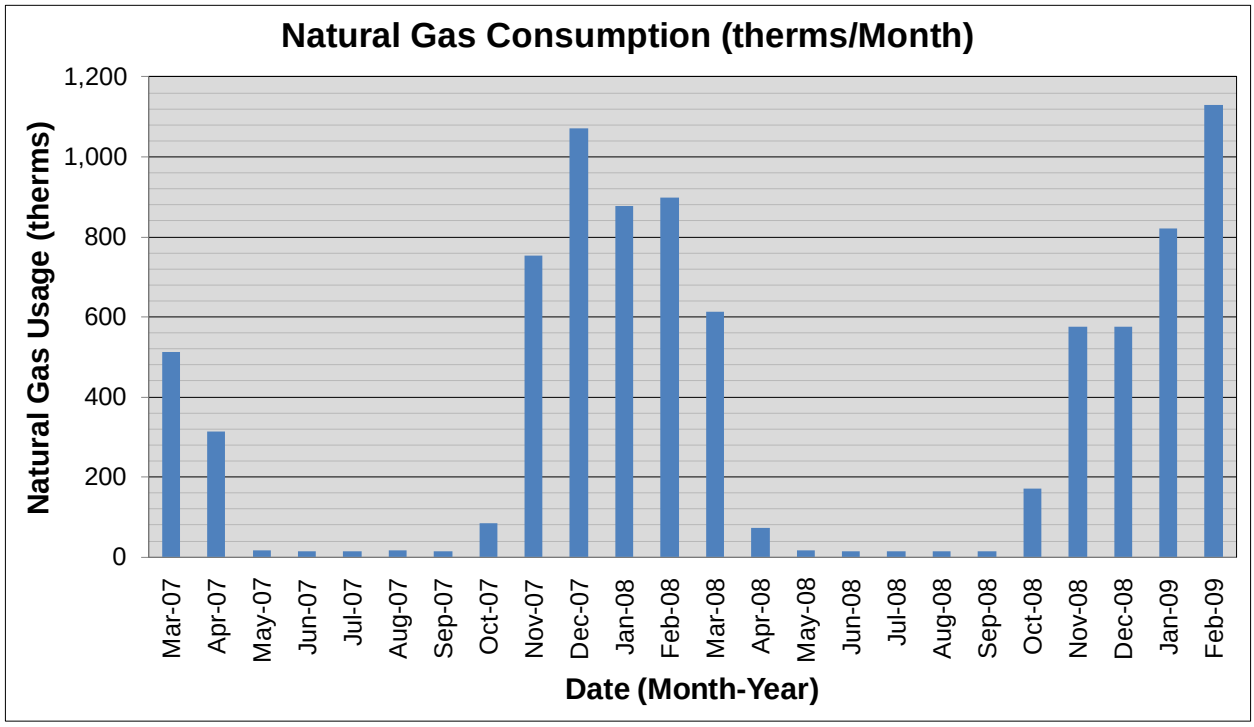
The following are charts that show the electric and natural gas load profiles for the Franklin Lakes Municipal Building.

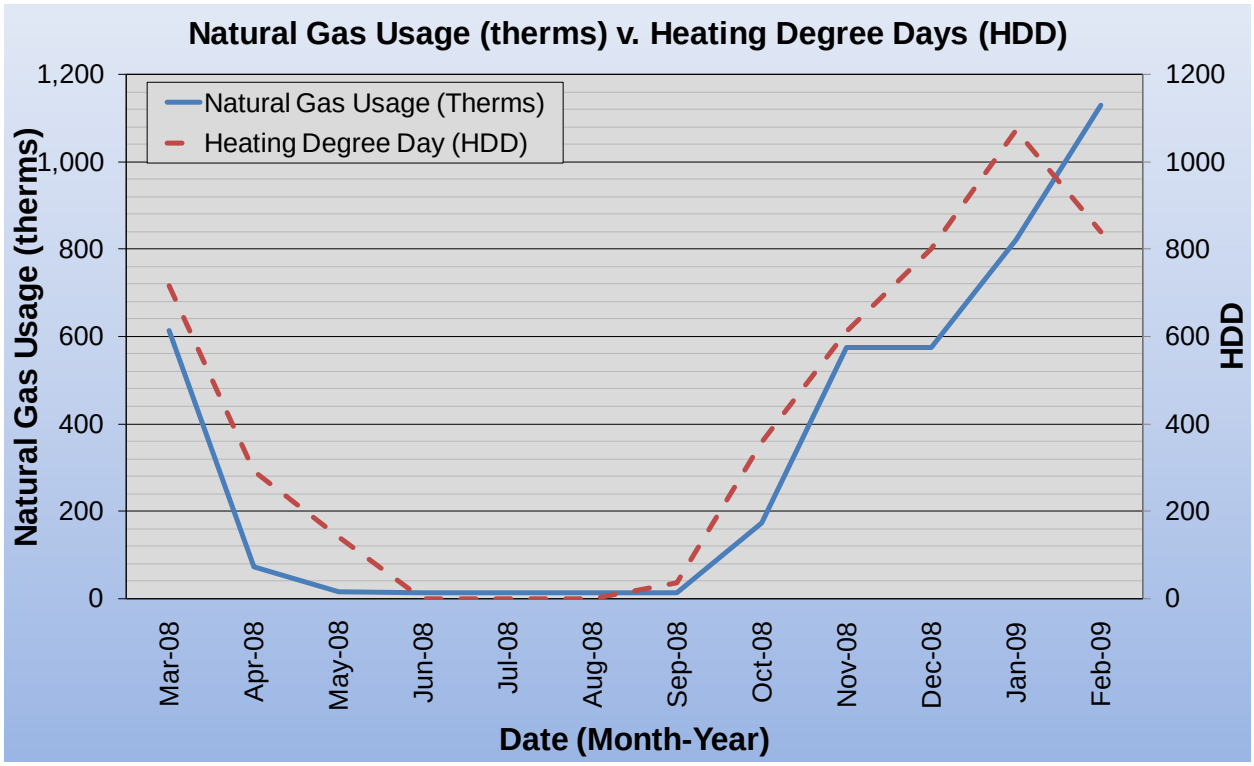


Also, note on the following chart how the electrical demand peaks follow the electrical consumption.



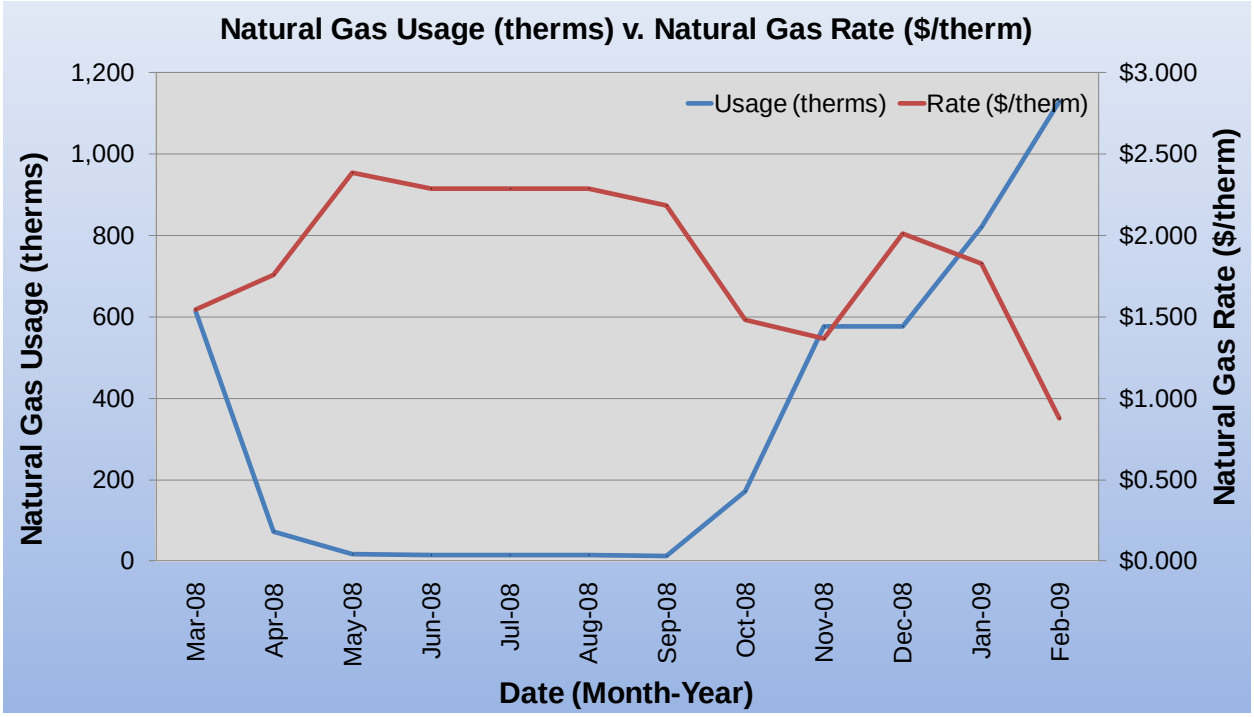
The following is a chart of the natural gas two year load profile for the building, peaking in the coldest months of the year as well as a chart showing natural gas consumption following the "heating degree days" curve.





6.2 Tariff analysis

Currently, natural gas is provided to the Franklin Lakes Municipal Building via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by 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 Municipal Building billing does not break down 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. The high gas price per therm fluctuations in the summer may be due to 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.



The Franklin Lakes Municipal 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 Municipal 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 rates decrease during the cooling months when more electricity is used by the condensers for cooling such as May through July.

6.3 Energy Procurement strategies

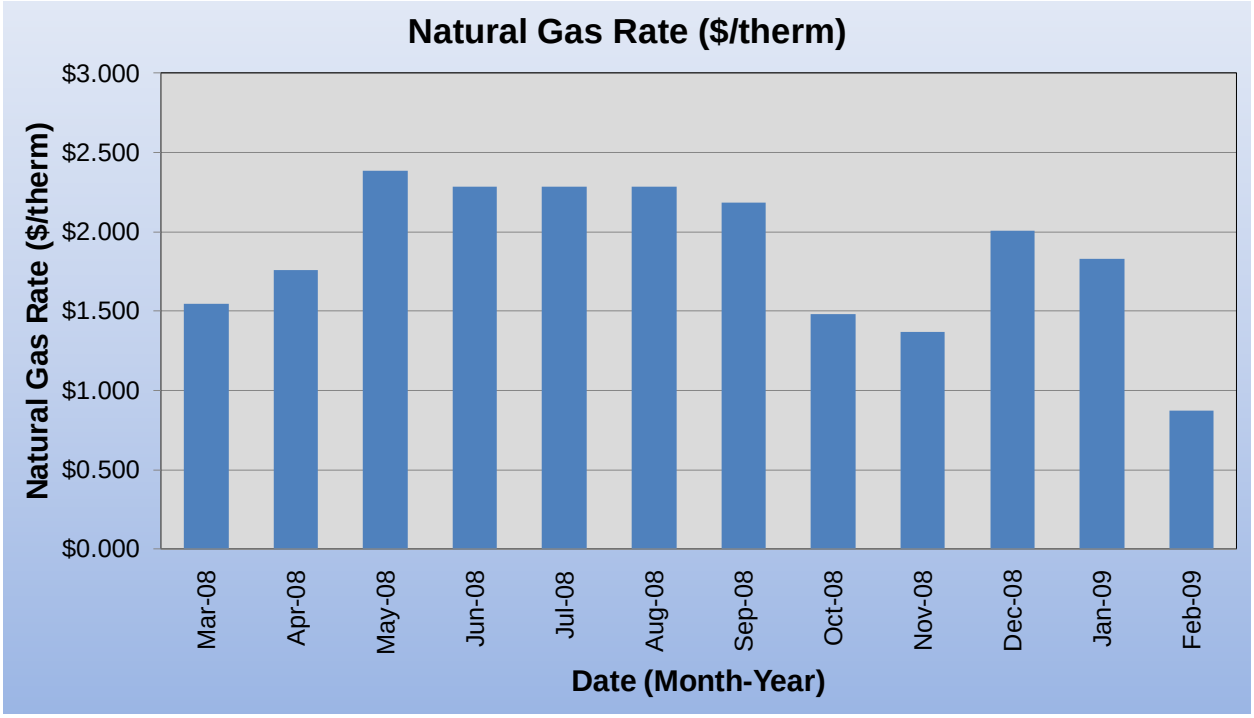
The Franklin Lakes Municipal Building receives natural gas via one incoming meter with PSE&G service for supply and transport. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance-based contract with a client firm to implement measures to reduce energy consumption and costs in a technically and financially viable manner.

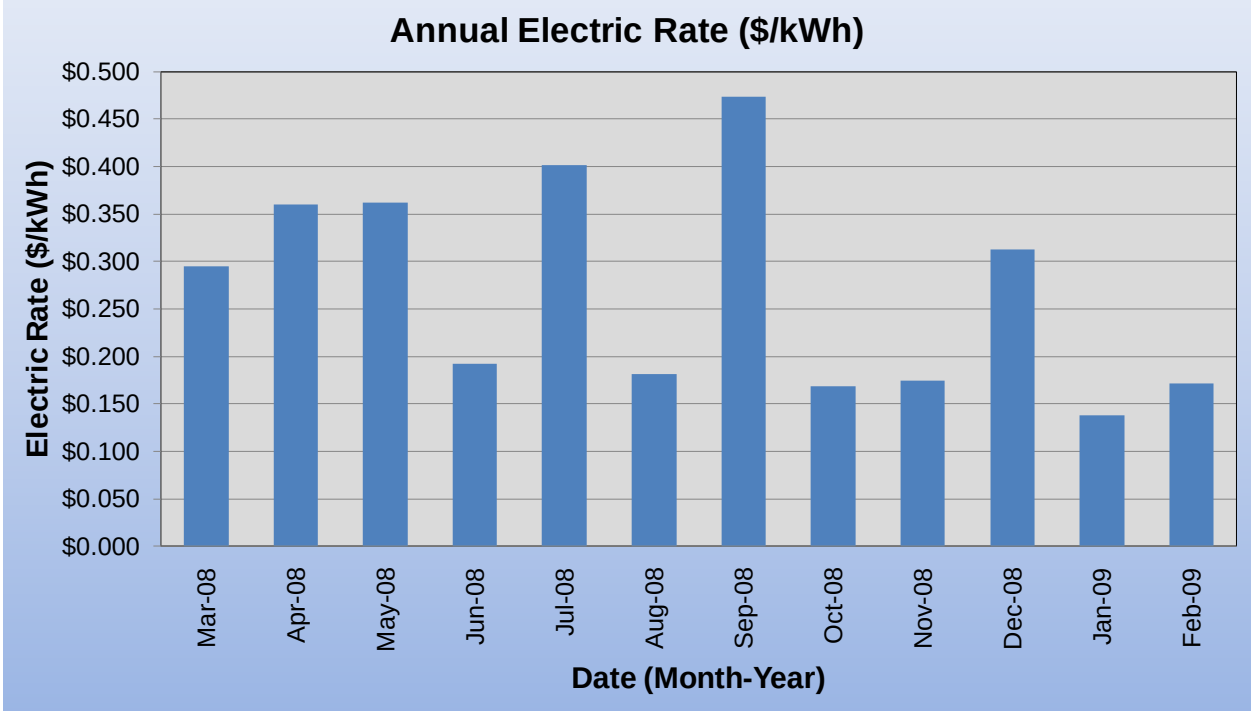
Electricity is purchased via one incoming meter directly for the main Franklin Lakes Municipal Building from Orange Rockland Electric without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 71% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 63% over the most recent 12 month period. Some of these fluctuations may be due to unusually 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 Municipal Building annual electric costs are $16,400 higher when compared to the average estimated NJ commercial utility rates.

SWA recommends that the Borough of Franklin Lakes further explore opportunities of purchasing electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Franklin Lakes Municipal Building. 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 also 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.

The Franklin Lakes Municipal 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 Municipal 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	Elevator ()	Recessed	M	4't12	1	2	40	N	24	260	15	95	593	T8	Recessed	4'T8	E	N	1	2	32	24	260	6	70	437	156	0	156
2	B	Building Dept ()	Recessed	E	4'T8	24	4	32	S	8	260	13	3,384	7,039	N/A	Recessed	4'T8	E	S	24	4	32	8	260	13	3384	7039	0	0	0
3	B	Building Dept ()	Recessed	E	4'T8	1	3	32	S	8	260	10	106	220	N/A	Recessed	4'T8	E	S	1	3	32	8	260	10	106	220	0	0	0
4	B	Hallway ()	Recessed	E	4'T8	7	4	32	S	16	260	13	987	4,106	N/A	Recessed	4'T8	E	S	7	4	32	16	260	13	987	4106	0	0	0
5	B	Planning ()	Recessed	E	4'T8	9	4	32	S	8	260	13	1,269	2,640	N/A	Recessed	4'T8	E	S	9	4	32	8	260	13	1269	2640	0	0	0
6	B	Lunch Rm ()	Recessed	E	4'T8	3	3	32	S	8	260	10	318	661	N/A	Recessed	4'T8	E	S	3	3	32	8	260	10	318	661	0	0	0
7	B	Bathroom Women ()	2'U-shape	E	4'T8	1	4	32	S	9	260	6	134	314	C	2'U-Shape	4'T8	E	OS	1	4	32	7	260	6	134	235	0	78	78
8	B	Bathroom Men ()	2'U-shape	E	4'T8	1	4	32	OS	9	260	6	134	314	N/A	2'U-Shape	4'T8	E	OS	1	4	32	9	260	6	134	314	0	0	0
9	B	Mechanical Rm ()	Recessed	E	8'T8	2	2	59	OS	2	260	13	262	136	N/A	Recessed	8'T8	E	OS	2	2	59	2	260	13	262	136	0	0	0
10	B	Mechanical Rm ()	Recessed	E	4'T12	1	2	40	OS	2	260	15	95	49	T8	Recessed	4'T8	E	OS	1	2	32	2	260	6	70	36	13	0	13
11	B	Storage Rm ()	Recessed	E	4'T8	15	4	32	S	2	260	13	2,115	1,100	N/A	Recessed	4'T8	E	S	15	4	32	2	260	13	2115	1100	0	0	0
12	B	Building Dept ()	Exit Sign	N	LED	1	1	5	N	8	260	1	6	12	N/A	Exit Sign	LED	N	N	1	1	5	8	260	1	6	12	0	0	0
13	B	Hallway ()	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
14	2	Court Room ()	Screw-in	N	CFL	17	1	23	S	4	24	0	391	38	N/A	Screw-in	CFL	N	S	17	1	23	4	24	0	391	38	0	0	0
15	2	Court Room ()	Recessed	E	4'T8	18	4	32	S	4	24	13	2,538	244	N/A	Recessed	4'T8	E	S	18	4	32	4	24	13	2538	244	0	0	0
16	2	Court Room ()	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	2	Meeting Rm ()	Recessed	E	4'T8	4	4	32	S	5	50	13	564	141	C	Recessed	4'T8	E	OS	4	4	32	4	50	13	564	106	0	35	35
18	2	Bathroom Women ()	Recessed	E	4'T8	1	4	32	OS	9	260	13	141	330	N/A	Recessed	4'T8	E	OS	1	4	32	9	260	13	141	330	0	0	0
19	2	Bathroom Women ()	Recessed	E	4'T8	1	2	32	OS	9	260	6	70	164	N/A	Recessed	4'T8	E	OS	1	2	32	9	260	6	70	164	0	0	0
20	2	Janitor's Closet ()	Screw-in	N	Inc	1	1	100	S	2	260	0	100	52	N/A	Screw-in	inc	N	S	1	1	100	2	260	0	100	52	0	0	0
21	2	Bathroom Men ()	Recessed	E	4'T8	1	4	32	OS	9	260	13	141	330	N/A	Recessed	4'T8	E	OS	1	4	32	9	260	13	141	330	0	0	0
22	2	Bathroom Men ()	Recessed	E	4'T8	1	2	32	OS	9	260	6	70	164	N/A	Recessed	4'T8	E	OS	1	2	32	9	260	6	70	164	0	0	0
23	2	Financing ()	Recessed	E	4'T8	6	3	32	S	8	260	10	636	1,323	N/A	Recessed	4'T8	E	S	6	3	32	8	260	10	636	1323	0	0	0
24	2	Office ()	Recessed	E	4'T8	8	3	32	S	9	260	10	848	1,984	C	Recessed	4'T8	E	OS	8	3	32	7	260	10	848	1488	0	496	496
25	2	Hallway ()	Recessed	E	4'T8	3	3	32	S	16	260	10	318	1,323	N/A	Recessed	4'T8	E	S	3	3	32	16	260	10	318	1323	0	0	0
26	2	Hallway ()	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
27	1	Meeting Rm ()	Recessed	E	4'T8	4	3	32	S	8	260	10	424	882	C	Recessed	4'T8	E	OS	4	3	32	6	260	10	424	661	0	220	220
28	1	Meeting Rm ()	Recessed	E	4'T8	4	3	32	OS	8	260	10	424	882	N/A	Recessed	4'T8	E	OS	4	3	32	8	260	10	424	882	0	0	0
29	1	Bathroom Women ()	Recessed	E	4'T8	1	4	32	OS	9	260	13	141	330	N/A	Recessed	4'T8	E	OS	1	4	32	9	260	13	141	330	0	0	0
30	1	Bathroom Women ()	Recessed	E	4'T8	1	2	32	OS	9	260	6	70	164	N/A	Recessed	4'T8	E	OS	1	2	32	9	260	6	70	164	0	0	0
31	1	Bathroom Men ()	Recessed	E	4'T8	1	4	32	OS	9	260	13	141	330	N/A	Recessed	4'T8	E	OS	1	4	32	9	260	13	141	330	0	0	0
32	1	Bathroom Men ()	Recessed	E	4'T8	1	2	32	OS	9	260	6	70	164	N/A	Recessed	4'T8	E	OS	1	2	32	9	260	6	70	164	0	0	0
33	1	Admin Office ()	Recessed	E	4'T8	6	3	32	S	9	260	10	636	1,488	N/A	Recessed	4'T8	E	S	6	3	32	9	260	10	636	1488	0	0	0
34	1	Office ()	Recessed	E	4'T8	3	3	32	S	9	260	10	318	744	N/A	Recessed	4'T8	E	S	3	3	32	9	260	10	318	744	0	0	0
35	1	Mayor Office ()	Recessed	E	4'T8	4	3	32	S	9	260	10	424	992	N/A	Recessed	4'T8	E	S	4	3	32	9	260	10	424	992	0	0	0
36	1	Meeting Rm 2 ()	Recessed	E	4'T8	4	3	32	S	8	260	10	424	882	N/A	Recessed	4'T8	E	S	4	3	32	8	260	10	424	882	0	0	0
37	1	Hallway ()	Recessed	E	4'T8	11	3	32	S	16	365	10	1,166	6,809	N/A	Recessed	4'T8	E	S	11	3	32	16	365	10	1166	6809	0	0	0
38	1	Hallway ()	Exit Sign	E	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	E	N	3	1	5	24	365	1	18	158	0	0	0
39	1	Janitor's Closet ()	Screw-in	N	Inc	1	1	100	S	2	50	0	100	10	N/A	Screw-in	Inc	N	S	1	1	100	2	50	0	100	10	0	0	0
40	1	Clerk Office ()	Recessed	E	4'T8	12	3	32	S	8	260	10	1,272	2,646	N/A	Recessed	4'T8	E	S	12	3	32	8	260	10	1272	2646	0	0	0
41	1	Office ()	Recessed	E	4'T8	4	3	32	S	8	260	10	424	882	N/A	Recessed	4'T8	E	S	4	3	32	8	260	10	424	882	0	0	0
42	1	Office ()	Recessed	E	4'T8	4	3	32	S	8	365	10	424	1,238	N/A	Recessed	4'T8	E	S	4	3	32	8	365	10	424	1238	0	0	0
43	1	Finance Office ()	Recessed	E	4'T8	6	3	32	S	8	260	10	636	1,323	N/A	Recessed	4'T8	E	S	6	3	32	8	260	10	636	1323	0	0	0
44	1	stairwell court ()	Recessed	E	4't12	2	1	40	S	8	50	12	104	42	T8	Recessed	4'T8	E	S	2	1	32	8	50	3	70	28	14	0	14
45	1	stairwell court ()	Exit Sign	E	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	E	S	1	1	5	24	365	1	6	53	0	0	0
46	1	elev lobby ()	Exit Sign	E	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	E	S	1	1	5	24	365	1	6	53	0	0	0
47	1	elev lobby ()	Recessed	E	4't8	2	3	32	OS	3	365	10	212	232	N/A	Recessed	4'T8	E	OS	2	3	32	3	365	10	212	232	0	0	0
48	2	elev lobby ()	Recessed	E	4't8	2	3	32	OS	3	365	10	212	232	N/A	Recessed	4'T8	E	OS	2	3	32	3	365	10	212	232	0	0	0
49	1	stairwell ()	Recessed	E	4't8	1	2	32	S	12	365	6	70	307	N/A	Recessed	4'T8	E	S	1	2	32	12	365	6	70	307	0	0	0
50	B	stairwell ()	Recessed	E	4't8	1	1	32	S	12	365	3	35	153	N/A	Recessed	4'T8	E	S	1	1	32	12	365	3	35	153	0	0	0
51	1	vestibule ()	Recessed	E	4't8	1	3	32	S	12	365	10	106	464	N/A	Recessed	4'T8	E	S	1	3	32	12	365	10	106	464	0	0	0
52	Ext	Exterior ()	Screw-in	N	CFL	4	1	15	T	16	365	0	60	350	N/A	Screw-in	CFL	N	T	4	1	15	16	365	0	60	350	0	0	0
53	Ext	Exterior ()	Screw-in	N	CFL	8	1	70	T	16	365	0	560	3,270	N/A	Screw-in	CFL	N	T	8	1	70	16	365	0	560	3270	0	0	0
54	Ext	Exterior ()	Screw-in	N	MH	2	1	75	T	16	365	19	188	1,098	PSMH	Screw-in	PSMH	N	T	2	1	50	16	365	11	122	712	385	0	385
55	Ext	Exterior ()	Screw-in	N	HPS	1	1	100	T	16	365	25	125	730	PSMH	Screw-in	PSMH	N	T	1	1	65	16	365	14	79	461	269	0	269
Totals:						227	137	1,881				471	23,542	50,393						227	137	1,797			425	23,346	48,726	837	830	1,667

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

Proposed Lighting Summary Table			
Total Surface Area (SF)	13,794		
Average Power Cost ($/kWh)	0.2710		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	5,449	4,795	**654**
Exterior Power (watts)	933	821	**112**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	44,945	43,932	**1,667**
Lighting Power (watts)	22,609	22,525	**84**
Lighting Power Density (watts/SF)	1.64	1.63	**0.01**
Estimated Cost of Fixture Replacement ($)	3,277		
Estimated Cost of Controls Improvements ($)	880		
Total Consumption Cost Savings ($)	**546**		

Appendix B: Third Party Energy Suppliers (ESCOs)

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

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

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 www.directenergy.com	**Dominion Retail, Inc.** 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080113 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 871 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 www.hudsonenergyservices.com	**Intelligent Energy** 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-113-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1132 Freeman Street Orange, NJ 07050 800-840-4GAS www.natgasco.com	**Pepco Energy Services, Inc.** 112 Main Street Lebanon, NJ 08833 800-363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011328 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64113 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5113-1121 www.woodruffenergy.com

Appendix C: 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.

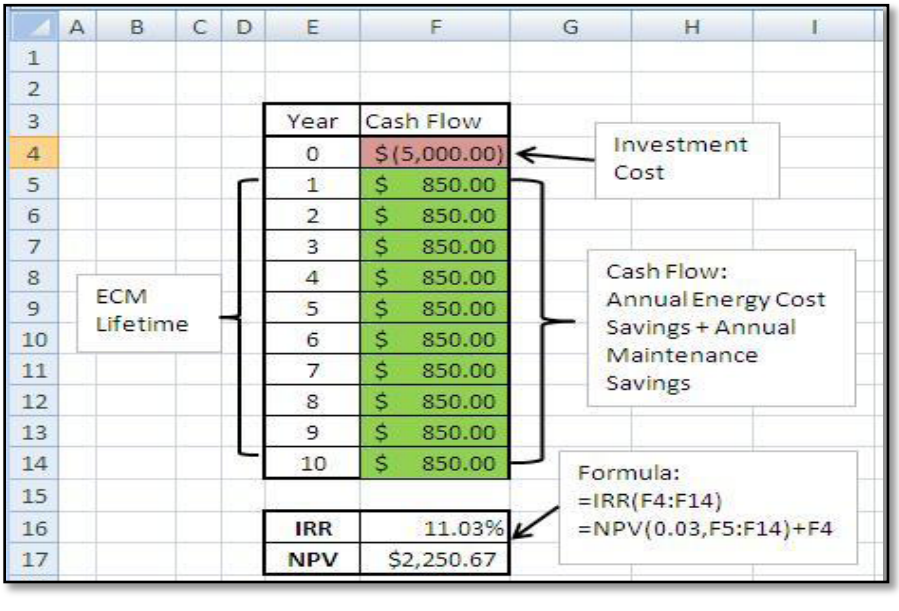
Calculation References

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