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Local Government Energy Program
Energy Audit Final Report

For

Netcong Hilltop Fire House
Netcong, NJ 07857

Project Number: LGEA25

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INTRODUCTION

On September 8th and 15th Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment of the Netcong Hilltop Fire House building.

This report addresses the Netcong Hilltop Fire House building located at 49 College Road, Netcong, NJ 07857. 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 Netcong Hilltop Fire House was built in 1965 as a gas station and converted to a Fire House in 1974. It houses fire truck bays, offices and a banquet hall with kitchen and bar for volunteer members' activities. The building consists of 3,510 square feet and the one truck bay Annex across the street is 375 square feet for a total of 3,885 square feet of conditioned space.

The building is operated by Netcong Volunteer Firemen for approximately twenty hours per week by two volunteer firemen. Every couple of months, volunteer fire department members usually hold one special event in the main hall.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Netcong to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Netcong Hilltop Fire House building.

Created in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) 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 Netcong Hilltop Fire House building located at 49 College Road, Netcong, NJ 07857. The Netcong Hilltop Fire House building and its Annex are one story buildings with a combined floor area of 3,885 square feet. The original structure was built in 1965 with additions / renovations in 1974.

Based on the field visits performed by the SWA staff on September 8th and 15th 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy 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 August 2008 to July 2009 the Netcong Hilltop Fire House building consumed 17,993 kWh or $3,460 worth of electricity at an approximate rate of $0.192/kWh and 3,107 gals or $5,709 worth of fuel oil #2 at an approximate rate of $1.837/gal . The joint energy consumption for the building, including both electricity and fuel oil, was 493 MMBtu of energy that cost a total of $9,169.

SWA has entered energy information about the Netcong Hilltop Fire House building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This facility is comprised of non-eligible (Other) space type. SWA encourages the Borough of Netcong 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 126 kBtu/ft^{2}yr compared to the national average of a fire house / police station building consuming 78 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 50.2 kBtu/ft^{2}yr, which when implemented would make the building energy consumption better than the national average.

Based on the assessment of the Netcong Hilltop Fire House 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 New Roof
- Install Insulated Doors
- Replace Annex Hot Air Furnace
- Install Premium Motors When Replacements are Required

Category II Recommendations: Operations and Maintenance

- Insure Carbon Monoxide Safety
- Replace Exhaust Fans in Attic and Kitchen
- Maintain Roofs
- Maintain Downspouts
- Provide Weather Stripping / Air Sealing
- Provide Water Efficient Fixtures & Controls
- 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 **6** Energy Conservation Measures (ECMs) for the Netcong Hilltop Fire House building that are summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$47,086**. SWA estimates a first year savings of **$48,463** with a simple payback of **1 year**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Netcong Hilltop Fire House building by **34,085 lbs of CO_2**, which is equivalent to the annual CO_2 absorbed by 83 trees. SWA also recommends another **3** ECMs with 5-10 year payback that are summarized in Table 2.

There are various incentives that the Borough of Netcong could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Borough of Netcong apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, to be rolled out soon, could also assist to cover 80% of the capital investment.

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

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

Table 1 - Highly Recommended 0-5 Year Payback ECMs														
ECM #	ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
		Estimate $	Source	Use	Unit	Demand / mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
1.1	install 3 occupancy sensors, with INCENTIVES	$90	RS Means, Lit Search, NJ Clean Energy Program	1,340	kWh	0.6	kW	$257	1.2	0.3	12	$2,531	226	1,836
1.2	replace 3 incand and halogen lamps to CFL	$60	RS Means, Lit Search	416	kWh	0.2	kW	$89	0.4	0.7	7	548	116	570
2	Install 5 kW Wind System with INCENTIVE (upfront $3.20/kWh)	$40,000	Similar Projects	13,000	kWh	5.0	kW	$44,096	11.4	0.9	25	$751,016	71.1	17,810
3	install 4 programmable thermostat in truck bays and banquet and kitchen areas	$600	Similar Projects	277	kWh	0.1	kW	$893	7.7	0.7	12	$8,781	114	4,977
				209	gal	-	-							
1.3	replace building internal lights: T12s to T8s with INCENTIVES (incl. 75% labor)	$1,480	RS Means, Lit Search, NJ Clean Energy Program	2,035	kWh	0.9	kW	$391	1.8	3.8	20	$5,708	14.3	2,788
4	Retro-Commission-ing	$4,856	Similar Projects	1,799	kWh	0.8	kW	$2,738	12.7	1.8	12	$26,928	37.9	6,103
				311	gals	-	-							
	Total Proposed	**$47,086**	-	-	-	**7.6**	**kW**	**$48,463**	**35.1**	**1.0**	**23**	**$787,229**	**67.5**	**34,085**

Definitions: SPP - Simple Payback (years); LoM: Life of Measure (years); ROI: Return on Investment (%)
Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand / month indicates that it is very low / negligible

Table 2 - Recommended 5-10 Year Payback ECMs														
ECM #	M description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI, %	Annual Carbon Reduced (lbs of CO2)
		Estimate $	Source	Use	Unit	Demand / mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
5	Install 5 kW PV System (with $1/W INCENTIVE and $600/1MWh SREC)	$30,000	Similar projects	5,902	kWh	5.0	kW	$4,733	5.2	6.3	25	$80,613	6.7	8,086
6	replace 2 old refrigerators with Energy Star models	$1,000	Manufac-turer and Store Info	732	kWh	0.3	kW	$133	0.6	7.5	15	$1,568	3.8	1,003
1.4	replace 1 Fluorescent EXIT sign with LED type, with INCENTIVES	$100	RS Means, Lit Search, NJ Clean Energy Program	61	kWh	0.0	kW	$12	0.1	8.5	20	$172	3.6	84

1. HISTORIC ENERGY CONSUMPTION

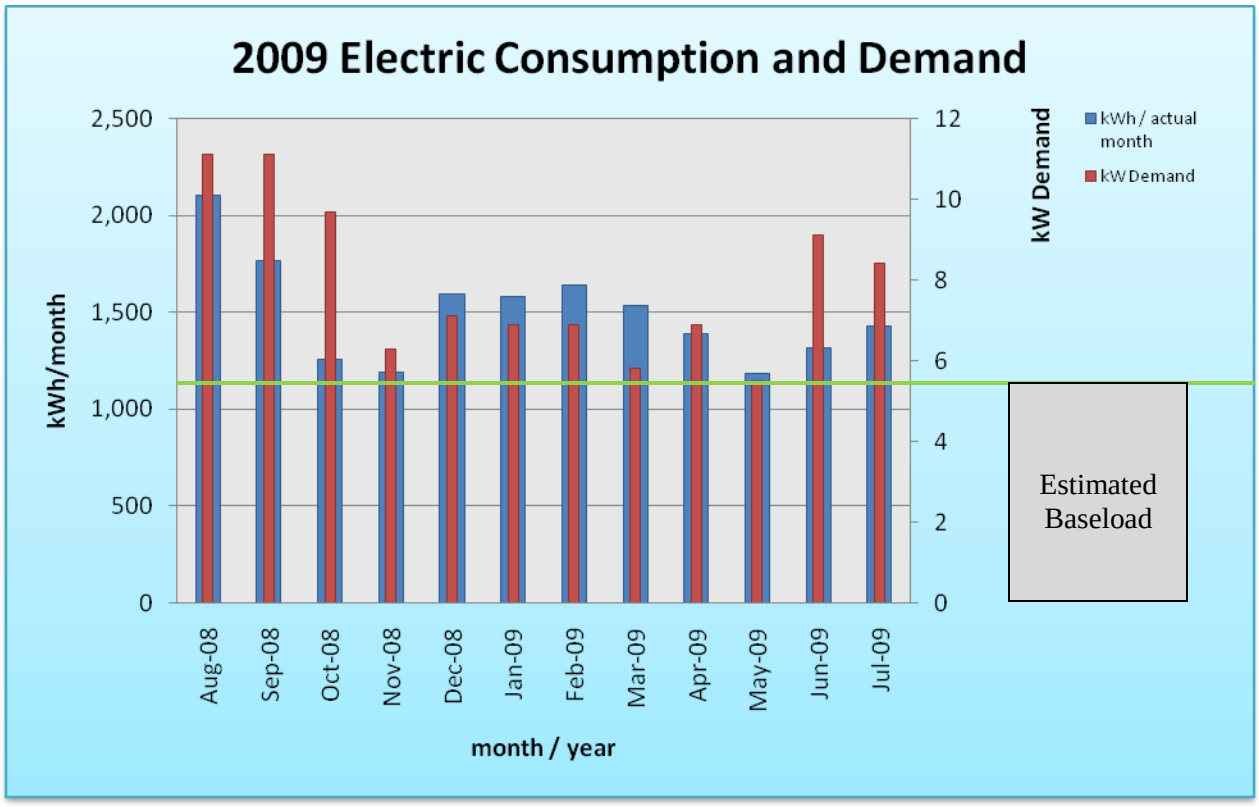
1.1. Energy usage and cost analysis

SWA analyzed utility bills from October 2007 through August 2009 that were received from the electric utility and fuel oil company supplying the Netcong Hilltop Fire House building with electric and fuel oil.

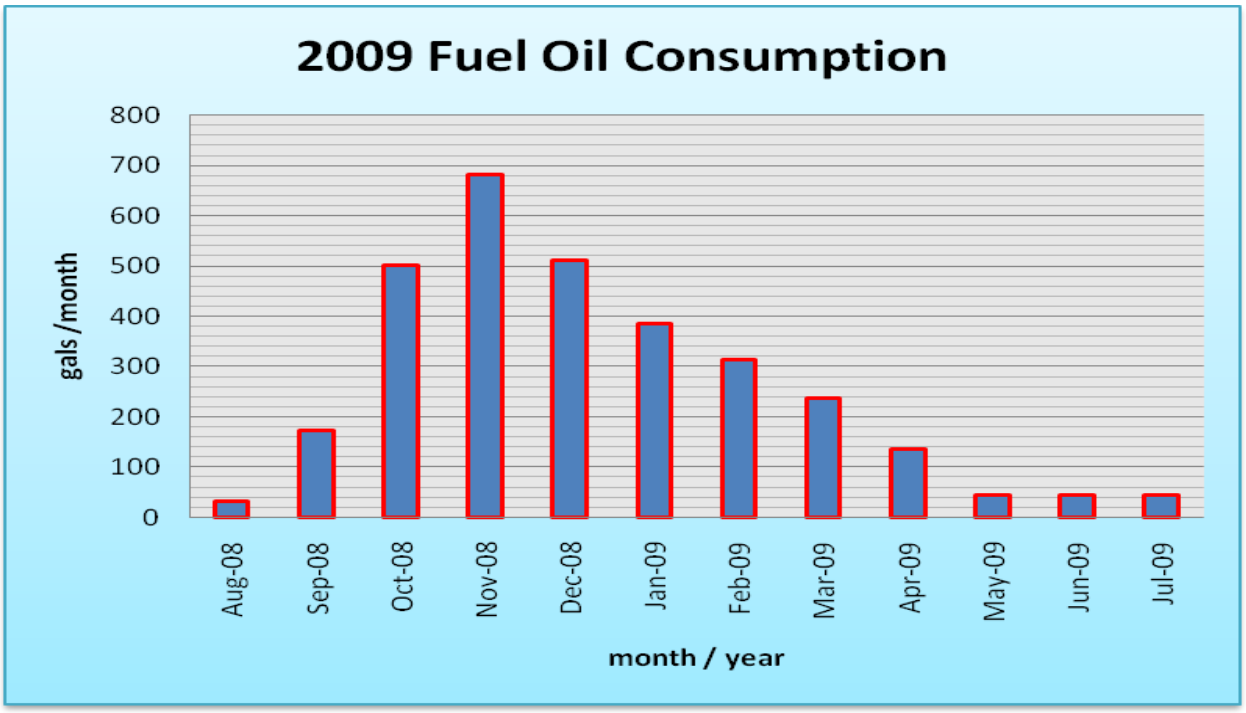
Electricity - The Netcong Hilltop Fire House building is currently served by one electric meter. The Netcong Hilltop Fire House building currently buys electricity from JCP&L at **an average rate of $0.192/kWh** based on 12 months of utility bills from August 2008 to July 2009. The Netcong Hilltop Fire House building purchased **approximately 17,993 kWh or $3,460 worth of electricity** in the previous year. The average monthly demand was 8 kW.

Fuel Oil #2 - The Netcong Hilltop Fire House building currently buys fuel oil from Eager / Northstar Oil Co. at **an average aggregated rate of $1.837/gal** based on 12 months of utility bills from August 2008 to July 2009. The Netcong Hilltop Fire House building purchased **approximately 3,107 gals or $5,709 worth of fuel oil** in the previous year.

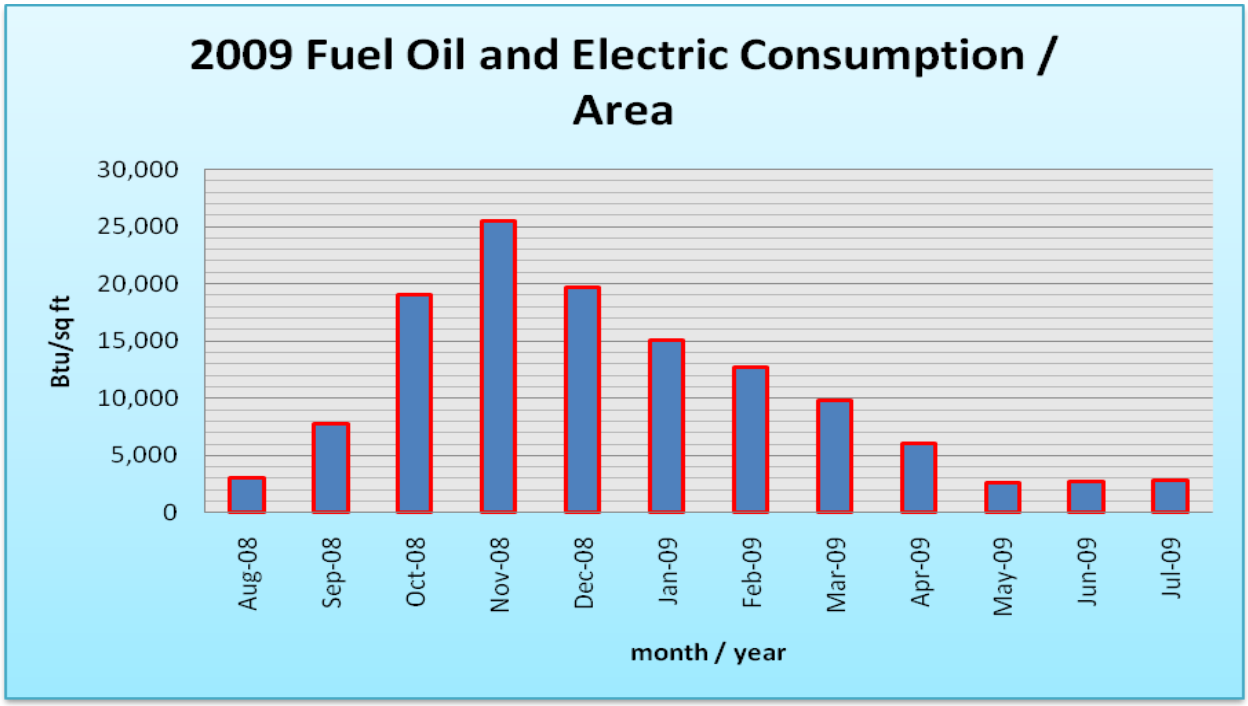
The following chart shows electricity use for the Netcong Hilltop Fire House building based on utility bills for the 12 month period of August 2008 - July 2009.



The following chart shows the fuel oil consumption for the Netcong Hilltop Fire House building based on fuel oil bills for the 12 month period of September 2008 - August 2009.

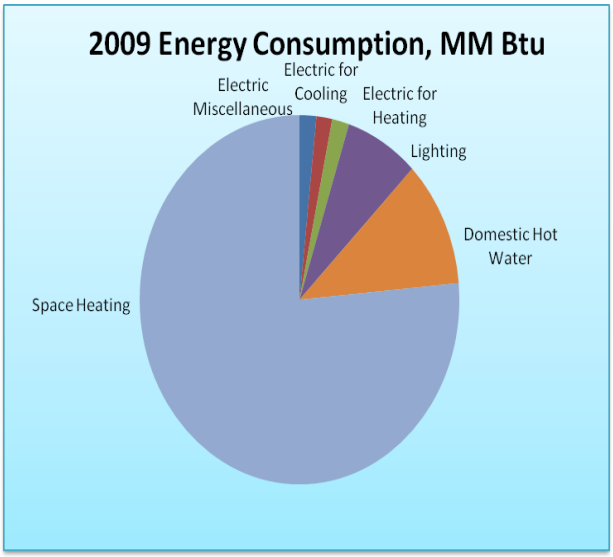


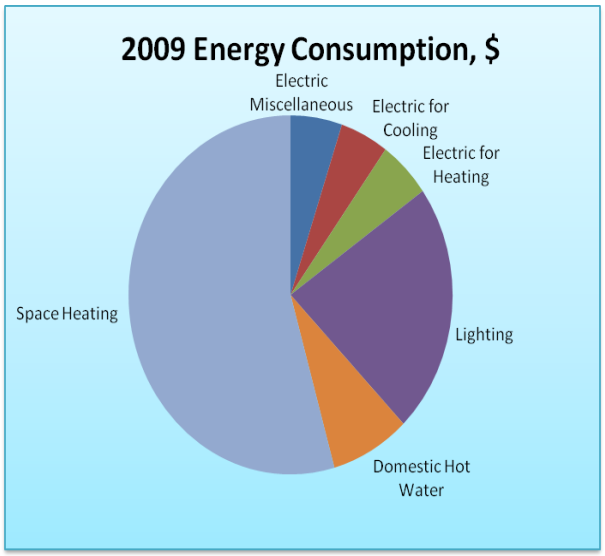
The following chart shows combined fuel oil and electric consumption in Btu/ft^2 for the Netcong Hilltop Fire House building based on utility and fuel oil bills for the 12 month period of August 2008 - July 2009.



The following table and chart pies show energy use for the Netcong Hilltop Fire House building based on utility and fuel oil bills for the 12 month period of August 2008 - July 2009. Note electrical cost at $56/MMBtu of energy is more than 4 times as expensive to use as fuel oil at $13/MMBtu.

2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	8	2%	$471	5%	$56
Electric for Cooling	8	2%	$443	5%	$56
Electric for Heating	8	2%	$478	5%	$56
Lighting	37	7%	$2,068	23%	$56
Domestic Hot Water	55	11%	$724	8%	$13
Building Space Heating	377	76%	$4,985	54%	$13
Totals	493	100%	$9,169	100%	$19
Total Electric Usage	61	12%	$3,460	38%	$56
Total Fuel Oil Usage	432	88%	$5,709	62%	$13
Totals	493	100%	$9,169	100%	$19





1.2. Utility rate

The Netcong Hilltop Fire House building currently purchases electricity from JCP&L at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Netcong Hilltop Fire House building currently pays an average rate of approximately $0.192/kWh based on the 12 months of utility bills of August 2008 - July 2009.

The Netcong Hilltop Fire House building currently purchases fuel oil supply from Eager / Northstar Oil Co. at a market rate for fuel oil (gals). Eager / Northstar Oil Co. also delivers the fuel oil. The average aggregated rate (supply and delivery) for fuel oil is approximately of $1.837/gal based on 12 months of fuel oil bills of August 2008 - July 2009.

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

1.3. Energy benchmarking

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

The Site Energy Use Intensity is 126 kBtu/ft^{2}yr compared to the national average of a fire house / police station building consuming 78 kBtu/ft^{2}yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 35.1 kBtu/ft^{2}yr, with an additional 5.9 kBtu/ft^{2}yr from the recommended ECMs and 9.2 kBtu/ft^{2}yr from improved door, attic insulation, upgraded HVAC and reduced attic venting. These recommendations could account for at least 50.2 kBtu/ft^{2}yr reduction, which when implemented would make the building energy consumption better than the national average.

SWA encourages the Borough of Netcong 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. As new space types become available, the Borough of Netcong will be able to reclassify spaces accordingly if they have previously been entered as "Other". Per the LGEA program requirements, SWA has assisted the Borough of Netcong to create an *Energy Star Portfolio Manager* account and share the Netcong Hilltop Fire House 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 Netcong (user name of "netcongboro" with a password of "EAUDIT2009") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Netcong - Hilltop Fire House

Building ID: 1857794
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 08, 2009

Facility
Borough of Netcong - Hilltop Fire House
49 College Road
Netcong, NJ 07857

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1974
Gross Floor Area (ft²): 3,885

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	65,166
Fuel Oil (No. 2) (kBtu)	424,116
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	489,282

Energy Intensity[5]

Site (kBtu/ft²/yr)	126
Source (kBtu/ft²/yr)	166

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	41

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	6%
Building Type	Fire Station/Police Station

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 single story 3,510 square feet Netcong Hilltop Fire House Company #2 building was originally built in the 1965 as a gas station. Since 1974, the building houses fire truck bays, an office, bathroom and a recreational room with bar / kitchen. The one truck bay Annex across the street is 375 square feet for a total Netcong Hilltop Fire House of 3,885 square feet of conditioned space.

The Annex

2.2. Building occupancy profiles

Occupancy for the Hilltop Fire House building is approximately 2 volunteers for 20 hours a month. There is usually one special recreational event held every 2 months for the volunteer fire department members.

2.3. Building envelope

2.3.1. Exterior Walls

The building's perimeter walls consist of either brick veneer or stucco over 8" CMU (concrete masonry unit) block with 2x framing and insulation behind it. Interior finishes are mostly GWB (gypsum wall board).

Due to warm temperature conditions at the time of the field visits, insulation levels and uniformity in walls could not be verified with help of infrared technology. If desired, the Borough of Netcong could contract a separate envelope inspection during cooler months.

Overall, exterior and interior finishes of the envelope walls were found to be in age-appropriate, good condition.

2.3.2. Roof

The steel truss, low slope membrane roof dates back 35 years and shows signs of leakage. The roof plywood and supports are rotted and need to be replaced. Replacement of this roof and decking is planned. The attic below is unconditioned and unfinished. The ceiling seems to be only insulated with two layers of ceiling tiles with egg-crate gaps for conditioned air to escape and drawn out by exhaust fans. SWA recommends adding continuous ceiling insulation at the time of roof replacement and

exhaust fan removal. The recommended levels of attic insulation in the building's geographical location are R-30-50.

Should asphalt shingle roof type be considered or chosen for replacement, please note the following: warranty, performance and longevity of asphalt shingle roofs might be compromised by inadequate under-roof-sheathing ventilation. This is accomplished most effectively by installing soffit and ridge vents that let air move freely from soffits up and out the ridge vent. SWA discourages passive or active gable vents as they were found not to be effective in reducing excessive attic heat.

2.3.3. Base

The building's base is assumed to be a 4" concrete slab-on-grade with a perimeter footing. There weren't any reported problems with water penetration or moisture. The slab edge or perimeter insulation could not be verified and should be confirmed at the time of the above recommended insulation inspection during cooler months for usable infrared data evaluation.

2.3.4. Windows

The building's double glazed, double / single hung, vinyl clad windows were recently upgraded. All the inspected windows showed proper caulking and sealing around both interior and exterior perimeters and no major signs of condensation or other problems.

2.3.5. Exterior doors

The metal framed exterior wood and metal doors were observed to be in fair condition and need to have missing or worn weather stripping installed in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept insulated.

Missing or Worn Weather-Stripping at front door

2.3.6. Building air tightness

Based on a visual inspection, the Hilltop Fire House building was observed to be a poorly-sealed building especially due to the lack of attic insulation. In addition to all recommendations made, SWA

suggests air sealing all envelope penetrations around plumbing, HVAC, structural and electrical installations.

2.4. HVAC Systems

2.4.1. Heating

The main Hilltop Fire House

Building heat is delivered via hot water from a Weil-McLain boiler with a Beckett oil burner to 3 zones via 3 B&G circulation pumps. The engine bays are heated by ceiling mounted hot water heaters controlled by a manual zone thermostat. The banquet hall baseboard heat is also controlled by another manual zone thermostat. The kitchen baseboard heat is controlled by a third manual zone thermostat.

Hilltop Fire House boiler DHW coil

Hilltop Fire House boiler flue gas automatic damper (below atmospheric damper)

Annex furnace without flue gas damper

The Annex

The one truck bay building is heated by a Heil Heating and Cooling Products air furnace with an oil burner. This unit is operating beyond its expected useful operating life and should be earmarked for replacement. Besides the furnace's low efficiency, the absence of a flue gas damper will also cool down the furnace between heating periods.

SWA recommends that the manual thermostats be replaced with Energy Star programmable thermostats for energy savings when buildings are unoccupied.

2.4.2. Cooling

Only the banquet hall is air conditioned via two window mounted air conditioners. On the day of SWA's visit the banquet hall was empty, while the air conditioners were keeping it cool.

2.4.3. Ventilation

The Netcong Hilltop Fire House building is provided with outside air via air leakage into the building and the window air conditioners. Also, there are a number of egg-crate ceiling tiles in the banquet hall that allow conditioned air to be drawn out of the room via the crawl space / plenum above the ceiling

and vent outside. To facilitate air being drawn out of the main room, an exhaust fan on a timer can be turned on as needed. This system was set up when people smoked in the banquet hall. SWA recommends that the system be removed and the egg-crate ceiling tiles be replaced with regular ceiling tiles covered with the proper insulation, in order to keep valuable conditioned air inside the building.

There aren't exhaust fans for the truck bays, which would necessitate opening the garage doors whenever the engines are turned on. SWA recommends installation of CO detectors with alarms for the truck bays.

2.4.4. Domestic Hot Water

The main boiler has a WT-14 coil (shown in the above picture) that provides domestic hot water (DHW) to the building. There is 50% expected useful operating life left on this unit.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting - The Netcong Hilltop Fire House building currently consists of mostly T12 fluorescent fixtures with magnetic ballasts with a few areas already retrofitted from T12 to T8 fixtures. Based on measurements of lighting levels for each space, there are not any vastly over-lighted areas. SWA recommends replacing T12 lighting including magnetic ballasts whenever possible with T8 lighting and electronic ballasts. There are also a few halogen and incandescent bulbs found in fixtures. SWA recommends replacement of all halogen and incandescent bulbs with compact fluorescents. SWA also recommends installing occupancy sensors in bathrooms, closets, offices and areas that are occupied only part of the day and payback on savings are justified. Since truck bays are used sporadically throughout the day and lighting is commonly left on far beyond the necessary hours of operation, SWA recommends installing occupancy sensors with time delay and acoustic capabilities. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion or sound is detected within a set time period. 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 have fluorescent bulbs. SWA recommends replacing all fluorescent Exit signs with LED bulbs.

Exterior Lighting - The exterior lighting surveyed during the building audit were found to be a mix of halogen and CFL lamps. SWA recommends the replacement of all halogen flood lights with compact fluorescent lights. Exterior lighting is controlled by timers. There is not any immediate need to upgrade to astronomical timers. Also, other street and area lighting shine on the buildings' perimeter.

2.5.2. Appliances and process

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

energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The Netcong Hilltop Fire House building computers are generally 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 Netcong Hilltop Fire House building does not have any installed elevators.

2.5.4. Others electrical systems

There is an emergency Onan 21 KVA generator operated on diesel located at the back of the building that is capable of backing up the buildings emergency systems.

The electrical service to the building is currently being upgraded from single to three phases.

There are not currently any other electrical systems installed at the Netcong Hilltop Fire House.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	cast iron hot water boiler with DHW loop, 276,000 Btu/hr input	boiler room	Weil-McLain 84.8 AFU eff NB / Serial CP3085752; DHW tubing WT-14; Beckett oil burner w/ Marathon 1/2 Hp motor	Fuel oil / Electric	Hilltop main Fire House	1998	50%
Heating	hot air furnace, 105,000 Btu/hr	back of Annex Garage	Heil Heating and Cooling Products	Fuel Oil / Electric	Annex	1986	0%
Storage	oil tank outside main bldg., 500 gal	behind Hilltop main bldg	Greenby Steel Tanks 3020422	Fuel Oil	Hilltop main Fire House	1998	50%
Storage	oil tank outside annex bldg., 300 gal	behind Annex bldg	-	Fuel Oil	Annex	1989	20%
Heating	3 zone circulator pumps	boiler room	B&G, ¼ Hp motors	Electric	Hilltop main Fire House	1998	50%
Cooling	Frigidaire window AC unit, 25,000 Btu, EER 8.7	Banquet Room window	Frigidaire	Electric	Banquet Room	1999	50%
Cooling	Frigidaire window AC unit, 25,000 Btu, EER 9.4	Banquet Room window	Frigidaire	Electric	Banquet Room	2006	90%
Ventilation	2 attic exhaust fans	attic	-	Electric	Hilltop main Fire House	1970	0%
Ventilation	exhaust fan for kitchen	kitchen	-	Electric	Kitchen	1989	0%
Domestic Hot Water	from main boiler	boiler room	Weil-McLain DHW tubing WT-14, same as above	Fuel Oil	Hilltop main Fire House	1998	50%
Generator	Onan Genset with Cummings engine - 21 kVA	next to main bldg	Onan	Electric / Diesel	Hilltop Fire House	1997	50%
Lighting	See details - Appendix A	see Appendix A	-	Electric	Hilltop Fire House	varies	varies, average 60%

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 Netcong Hilltop Fire House, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Install New Roof - The 35 year old steel truss, low sloped membrane roof condition was discovered to be in poor condition. It shows signs of leakage and there isn't any insulation above the drop ceiling. SWA recommends that the Borough of Netcong move forward with the planned roof replacement and install new insulation, batt R-30-50 or better.
- Install Insulated Doors - SWA recommends that the original building doors be replaced with ones having better insulation with the next major building upgrade.
- Replace Annex Hot Air Furnace - as it operating beyond its expected useful operating life and should be earmarked for replacement.

  The Netcong Hilltop Fire House Annex building Heil Heating and Cooling Products air furnace with an oil burner is located at the back of the truck bay. This unit is operating beyond its useful operating life and should be replaced prior to a catastrophic failure and associated damage. Besides the furnace's low efficiency, the absence of a flue gas damper cools down the furnace between heating periods. SWA recommends its replacement with a fuel oil fired 110,000 Btu/hr, AFUE 85 or better rated unit. SWA also evaluated replacing the old heater with a 95% efficient condensing oil fired furnace and stainless steel heat exchanger with molded pyro-ceramic combustion chamber designed to heat up instantly on fire-up; however the additional $1,450 has a 33 year payback based on fuel savings. Replacing the existing heater in kind with labor evaluated at prevailing wages is estimated to cost $1,950.

- 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

- Insure Carbon Monoxide Safety - Insure that there is a functioning / calibrated CO detectors with alarms in the buildings since garage areas do not have an exhaust fans now. SWA recommends that the Netcong Hilltop Fire House consider installing an exhaust fans in the future, controlled by the CO sensor.
- Provide Efficient Ventilation - SWA recommends that the above the ceiling fan ventilators be removed and the egg-crate ceiling tiles be replaced with regular ceiling tiles covered with the proper insulation, in order to keep valuable conditioned air inside the building. Also, insure that conditioned air is not escaping out the kitchen exhaust fan; replacement unit should be covered when not in use.
- Maintain Roof - 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 - SWA observed that exterior door weather-stripping in places was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the

window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Provide Water Efficient Fixtures & 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 refrigerators should replace older energy inefficient equipment.
- Use Smart Power Electric Strips - with occupancy sensors should be used to power down computer equipment when left unattended for extended periods of time.
- Create an Energy Educational Program - that teaches how to minimize their energy use. The US Department of Energy offers free information for hosting energy efficiency educational programs and plans, for more information please visit: http://www1.eere.energy.gov/education/

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1.1, 1.2 & 1.3	Install lighting CFLs, occupancy sensors and replace T12 with T8 fixtures
2	Install 5 kW Wind system
3	Install programmable thermostats in building
4	Undertake retro-commissioning of building systems and controls to optimize performance
	Description of Recommended 5-10 Year Payback ECMs
5	Install 5 kW Photovoltaic system
6	Replace old refrigerators
1.4	Upgrade Exit fluorescent signs to LED

ECM#1: *Building Lighting Upgrades*

Description:

On the day of the site visit, SWA completed a lighting inventory of the Netcong Hilltop Fire House building (see Appendix A). The existing lighting consists of mostly T8 fluorescent fixtures with electronic ballasts, and a few halogen and incandescent lights and T12s. Many of the lights in the Netcong Hilltop Fire House building appear to have been upgraded to T8 fixtures. SWA has performed an evaluation of upgrading T12 to T8 fixtures, incandescent and halogen bulbs to CFLs, installing occupancy sensors in truck bay areas, offices and bathrooms that may be left unoccupied a considerable amount of time throughout the day and replacing fluorescent EXIT sign with LED type. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Netcong may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings. SWA recommends at a minimum that the halogen and incandescent bulbs be replaced with CFLs and occupancy sensors be installed in a number of truck bay areas. See Appendix A for recommendations.

Installation cost:

Estimated installed cost: $1,730
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program (a)*

Economics (Some of the options considered with incentives):

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
install 3 occupancy sensors, with INCENTIVES	$90	(a)	1,340	kWh	0.6	kW	257	1.2	0.3	12	2,531	226	1,836
replace 3 incand and halogen lamps to CFL	$60	RS Means, Lit Search	416	kWh	0.2	kW	89	0.4	0.7	7	548	116	570
replace building internal lights: T12s to T8s with INCENTIVES (incl. 75% labor)	$1,480	(a)	2,035	kWh	0.9	kW	391	1.8	3.8	20	5,708	14.3	2,788
replace 1 Fluorescent EXIT sign with LED type, with INCENTIVES	$100	(a)	61	kWh	0.0	kW	12	0.1	8.5	20	172	3.6	84
Total Proposed	$1,730		3,853	kWh	1.7	kW	749	3.4	2.3	19	10,588	27	5,279

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA also assumed an aggregated 1/4 hr/yr to replace aging burnt out lamps vs. newly installed and included this with the annual savings.

Rebates/financial incentives:

NJ Clean Energy - Wall Mounted occupancy sensors ($20 per control)
Maximum incentive amount is $60.

NJ Clean Energy - LED Exit signs ($10-$20 per fixture)
Maximum incentive amount is $20.

NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities ($10-$30 per fixture, depending on quantity of lamps). Maximum incentive amount is $240.

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 5kW Wind System*

Description:

Wind power production may be applicable for the Netcong Hilltop Fire House building location, because of the thermal winds generated in the area. Currently, the Netcong Hilltop Fire House building does not use any renewable energy systems. Updated renewable energy systems such as "magnetic" vertical axis wind turbines (MVAWT) can be mounted on building roofs 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. Wind 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 of installing a 5kW Wind system to offset electrical demand for the building and reduce the annual net electric consumption for the building, however there are insufficient guaranteed incentives for NJ rebates at this time for this investment. The Netcong Hilltop Fire House building is not eligible for a 30% federal tax credit. The Netcong Hilltop Fire House building may consider applying for a grant and / or engage a Wind Power generator / leaser who would install the Wind system and then sell the power at a reduced rate.

There are many possible locations for a 5kW Wind system installation on top of the building ample roof area. The supplier would need to first determine via recorded analysis at the proposed location(s) consistency and wind speeds available. Area winds of 10 mph will run turbines smoothly and capture the needed power. This is a roof-mounted wind turbine (used for generating electricity) that spins around a vertical axis like a merry-go-round instead of like a windmill, as do more traditional horizontal axis wind turbines (HAWTs). A typical 5kW MVAWT wind system has a 20 ft diameter turbine by 10 ft tall.

The installation of a renewable Wind power generating system could serve as a good educational tool and exhibit for the community. **It is very important that Wind measurements and recordings are taken at the chosen location for at least a couple of months to assure that sufficient wind and speed is available for proper operation and to meet incentive requirements.**

Installation cost:

Estimated installed cost: $40,000
Source of cost estimate: Similar projects

Economics (with incentives):

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
Install 5 kW Wind System with INCENTIVE (upfront $3.20/kWh)	$40,000	Similar Projects	13,000	kWh	5.0	kW	44,096	11.4	0.9	25	751,016	71.1	17,810

Assumptions: SWA estimated the cost and savings of the system based on past wind projects. SWA projected physical dimensions based on a 5kW-Enviro Energies turbine system. **SWA assumes that the relatively low height (~30 ft) compared to the taller horizontal axis turbines is acceptable to the NJ BPU as long as the average documented annual wind speed is 11 mph at the hub.**

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive at this time only for vertically spinning high altitude turbines
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Wind Upfront Incentive Program, Expected performance buy-down (EPBB) is modeled on an annual kWh production of 1-16,000 kWh for a $3.20/kWh upfront incentive level. This has been incorporated in the above costs, 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#3: *Install Programmable Thermostats in Several Building Zones*

Description:

The Netcong Hilltop Fire House building 3 heating zones are controlled by individual wall mounted manual thermostat. Theses spaces have dedicated zone pumps coming off one boiler. The Annex hot air heater is also controlled by a wall mounted manual thermostat. Temperature controls in these spaces are without setback and have poor accuracy. These spaces are generally unoccupied. Temperatures are not setback at night or after-hours and additional energy is used to keep the spaces warm, which would not be expanded if controls could be properly operated.

SWA proposes that the Borough of Netcong replace the existing manual thermostats with a strategically placed, Energy Star, programmable- wall mounted and tampering secure thermostats that will greatly improve the control, heat and cool energy expanded in the spaces.

Installation cost:

Estimated installed cost: $600
Source of cost estimate: RS *Means; Published and established costs and Similar Projects*

Economics (without incentives):

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
install 4 programmable thermostat in truck bays and banquet and kitchen areas	$600	Similar Projects	277	kWh	0.1	kW	$893	7.7	0.7	12	$8,781	114	4,977
			209	gal	-	-							

Assumptions: Since the utility bills have some accounting fluctuations, it is difficult to determine the energy used for heating / cooling the Netcong Hilltop Fire House building. SWA estimated the heating / cooling energy usage from the electric and fuel oil bills. SWA assumed typical heating savings of 9% for scheduled setbacks and controls. Estimated programmable thermostat cost / installation are based on similar project. SWA also assumed on the average 1/4 hr/wk operational savings when systems are operating per design and schedule vs. the need to make more frequent manual adjustments and included this with the annual savings.

Rebates / financial incentives: *There are currently no incentives for this measure at this time. However, periodically the local utility and the state of NJ have incentives for this measure. Generally there are incentives for the residential sector.*

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#4: *Retro-Commissioning*

Description:

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

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

Installation cost:

Estimated installed cost: $4,856
Source of cost estimate: Similar projects

Economics (without incentives):

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
Retro-Commission-ing	$4,856	Similar Projects	1,799	kWh	0.8	kW	$2,738	12.7	1.8	12	$26,928	37.9	6,103
			311	gals	-	-							

Assumptions: Since the utility bills have some accounting fluctuations, it is difficult to determine the amount of energy used for heating and cooling the Netcong Hilltop Fire House building. Based on experience with similar buildings, SWA estimated the heating and cooling energy consumption. Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed 10% savings. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $1.25 per square foot of a total square footage of 3,885. SWA also assumed on the average 1 hr/wk operational savings when systems are operating per design vs. the need to make more frequent adjustments and included this with the annual savings.

Rebates / financial incentives: *There are currently no incentives for this measure at this time.*

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#5: *Install 5kW PV system*

Description:

Currently, the Netcong Hilltop Fire House building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, and recommends at this time that Borough of Netcong further review installing a 5kW 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 Netcong Hilltop Fire House building is not eligible for a 30% federal tax credit. Instead, the Borough of Netcong 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. JCP&L provides the ability to buy SRECs at $600 / MWh or best market offer.

There are many possible locations for a 5kW PV installation on the building roofs. 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 5kW system needs approximately 41 panels which would take up 435 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: $30,000
Source of cost estimate: Similar projects

Economics (with incentives):

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
Install 5 kW PV System (with $1/W INCENTIVE and $600/1MWh SREC)	$30,000	Similar projects	5,902	kWh	5.0	kW	4,733	5.2	6.3	25	80,613	6.7	8,086

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. Incentive amount for this application is $5,000.
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. $3,600 has been incorporated in the above costs, 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#6: *Replace Old Refrigerators with Energy Star Models*

Description:

On the day of the site visit, SWA observed that there are two old refrigerators in the kitchen area which are not Energy Star rated (using approximately 773 kWh/yr each). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerators with 18.2 cu. ft. top freezer refrigerator ENERGY STAR®, Mfr. model #6897, 407 kWh / yr, or equivalent. Besides saving energy, the replacement will also keep the kitchen and other areas cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Installation cost:

Estimated installed cost: $1,000
Source of cost estimate: *Manufacturer and Store established costs*

Economics:

ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand / mo	Unit	Savings / year $	kBtu /sq ft			Cost Savings $		
replace 2 old refrigerators with Energy Star models	$1,000	Manufac-turer and Store Info	732	kWh	0.3	kW	133	0.6	7.5	15	1,568	3.8	1,003

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

Rebates/financial incentives:

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

Options for funding 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

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

Pleases see the above recommended ECM#2.

5.3. Solar Photovoltaic

Pleases see the above recommended ECM#5.

5.4. Solar Thermal Collectors

Description:

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

5.5. Combined Heat and Power

Description:

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

5.6. Geothermal

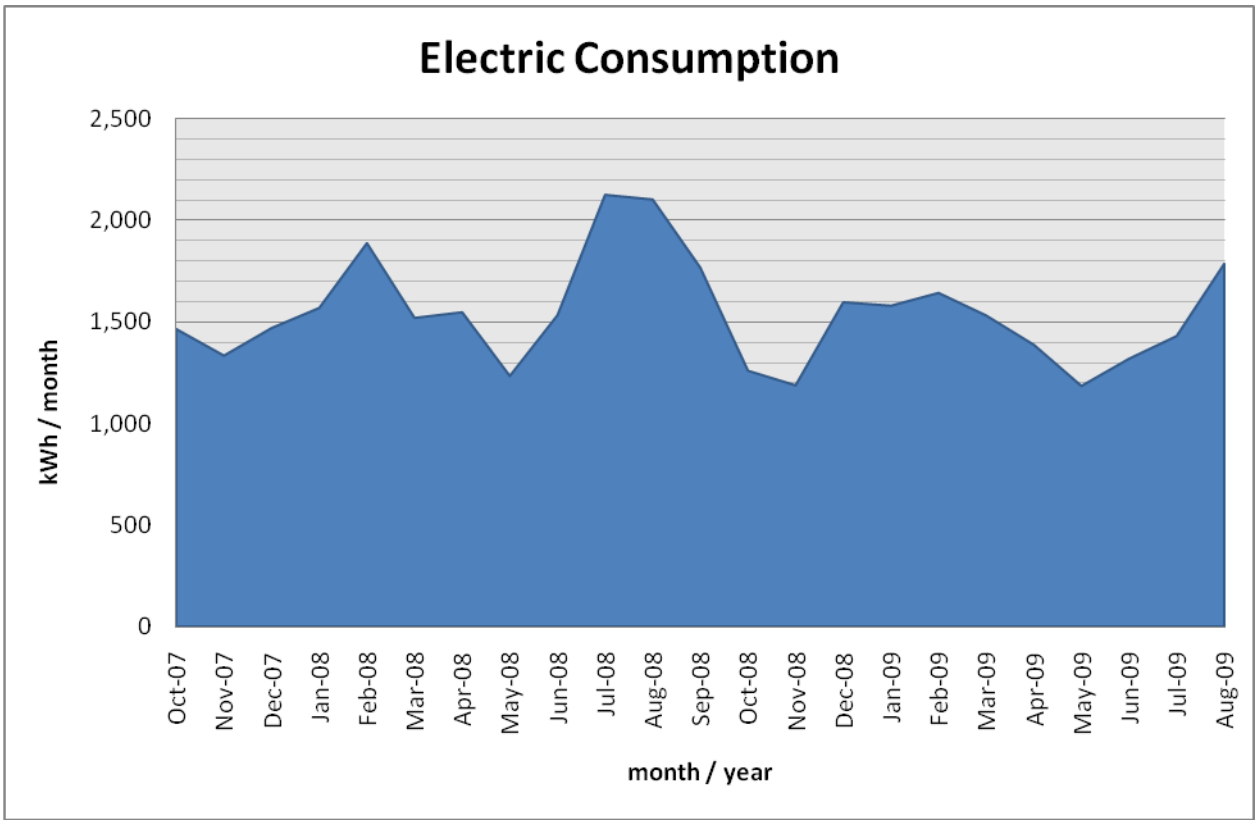
Description:

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

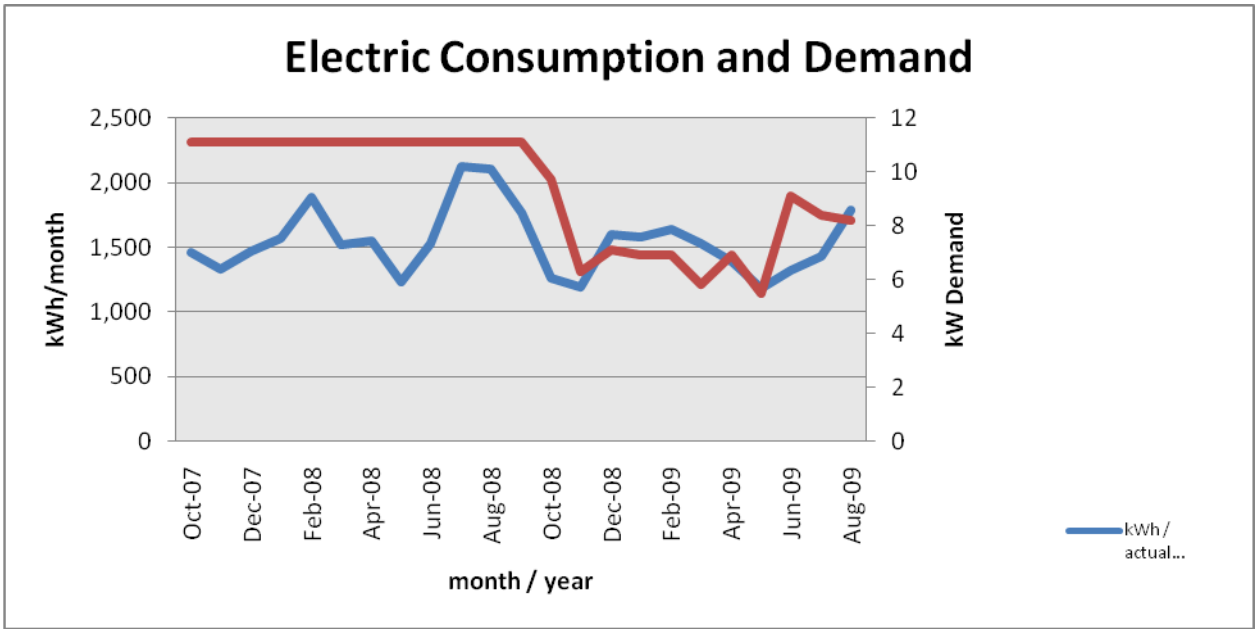
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

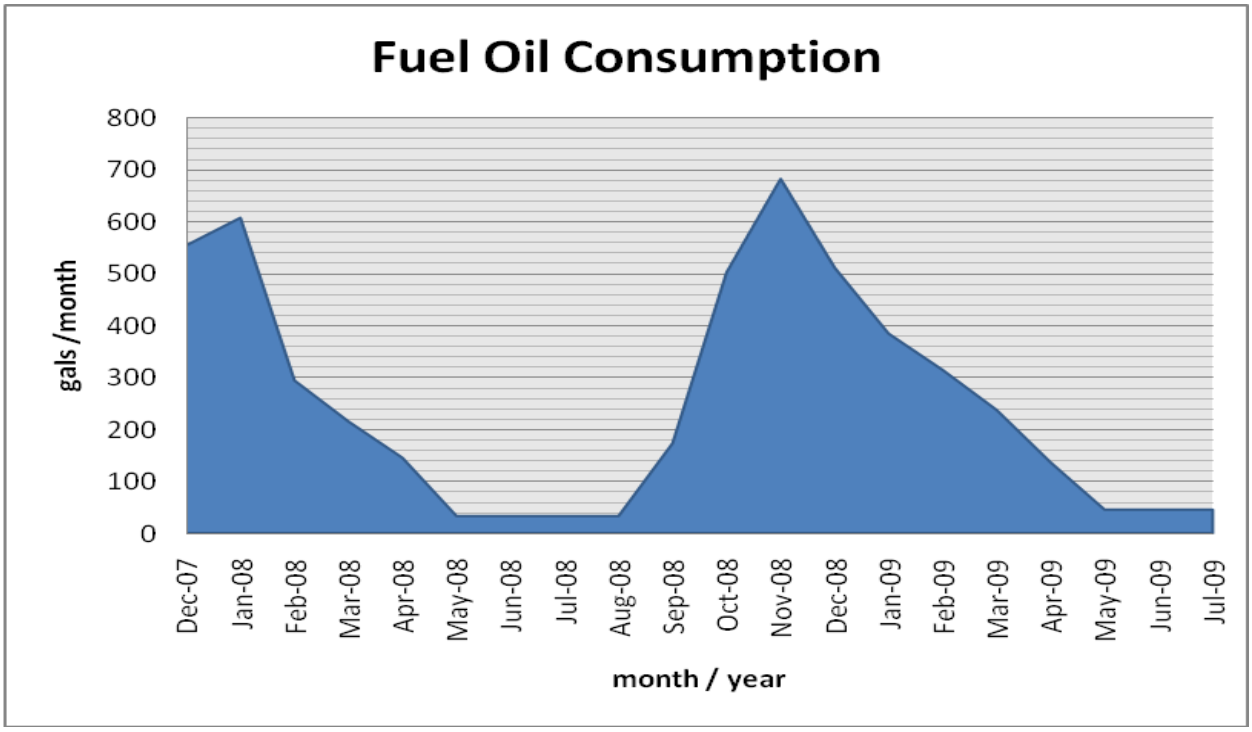
The following are charts that show the annual electric and fuel oil load profiles for the Netcong Hilltop Fire House building.

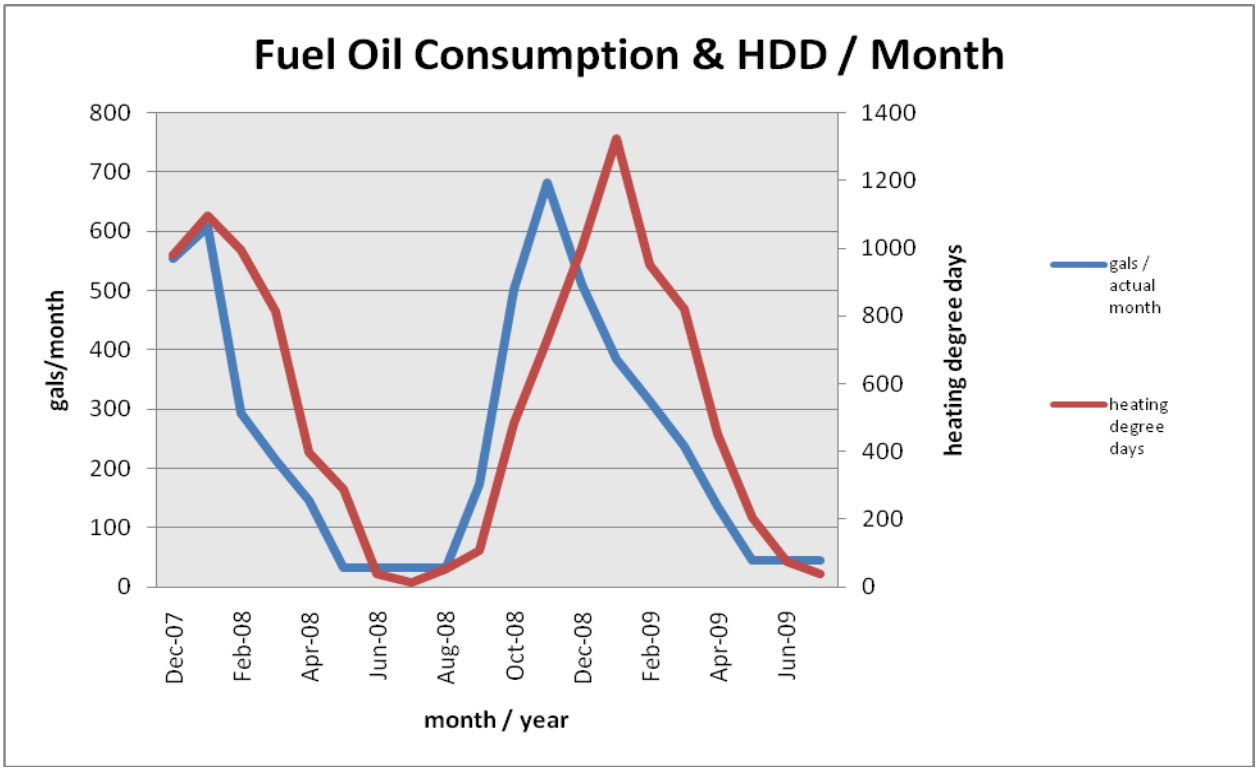


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks.



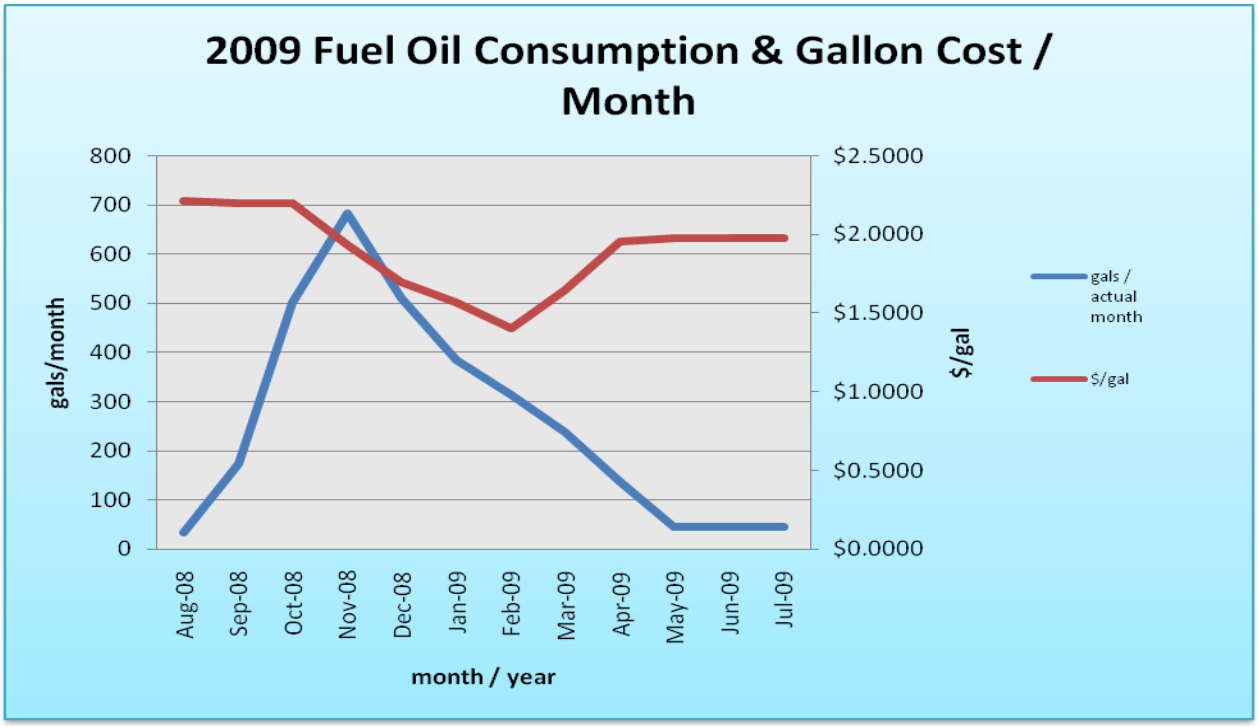
The following is a chart of the fuel oil annual load profile for the building, peaking in the coldest months of the year and a chart showing fuel oil consumption following the "heating degree days" curve.





6.2. Tariff analysis

Currently, fuel oil is provided and delivered to the Netcong Hilltop Fire House buildings by Eager / Northstar Oil Co. at the market rate. Typically, fuel oil prices increase during the heating months when fuel oil is used by the buildings' boiler and furnace.

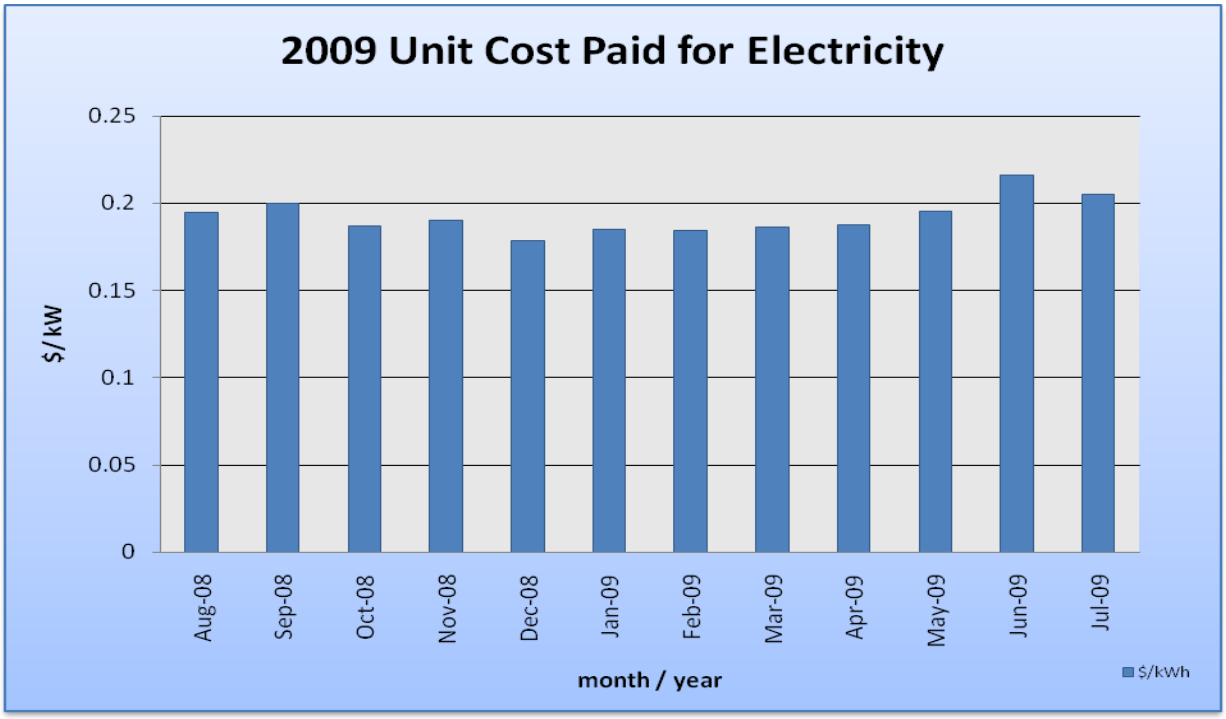


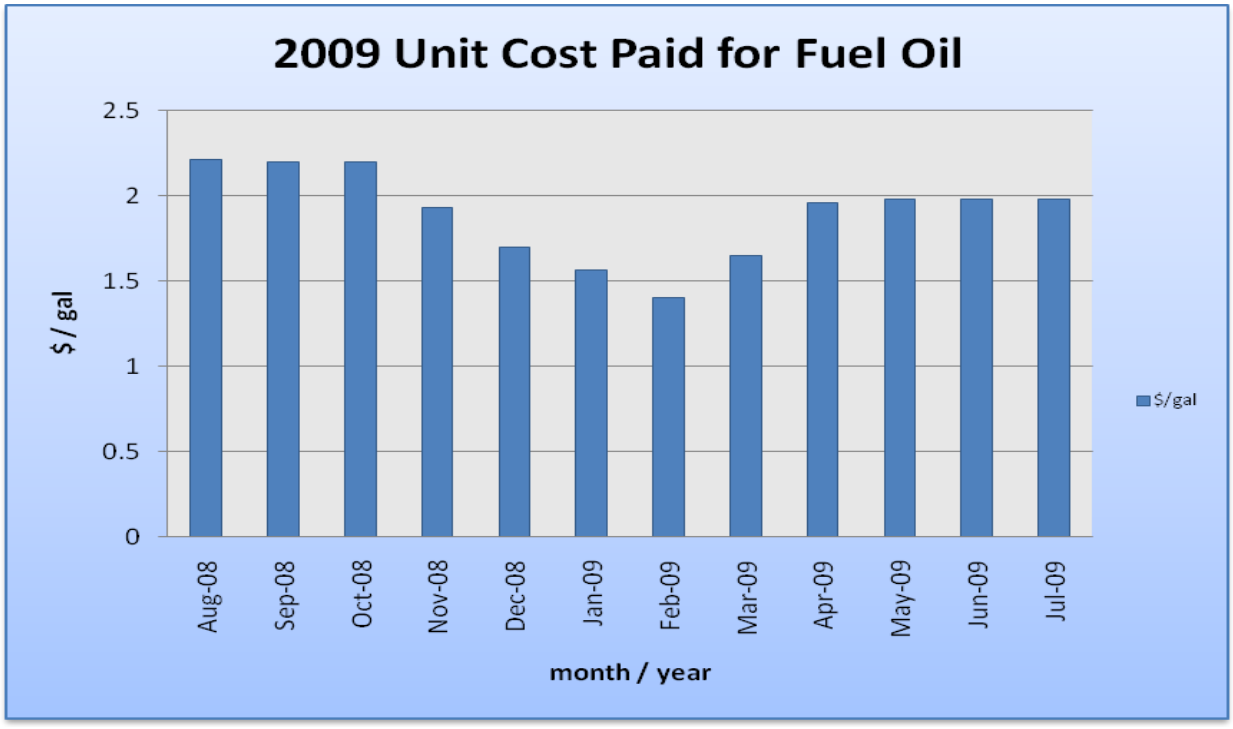
The Netcong Hilltop Fire House building is direct-metered (via one main meter) and currently purchases electricity from JCP&L at a general service rate. The general service rate for electric charges are market-rate based on use and the Netcong Hilltop Fire House building billing does show a breakdown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

6.3. Energy Procurement strategies

The Netcong Hilltop Fire House building receives fuel oil from Eager / Northstar Oil Co. 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 Netcong Hilltop Fire House building from JCP&L without an ESCO. SWA analyzed the rate for fuel oil and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 28% over the most recent 12 month period. Fuel oil bill analysis shows fluctuations are more than 100% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric and fuel oil are $0.150/kWh and $2.150/gal respectively. This building's annual utility costs are $757 higher for electric and $972 lower for fuel oil for a total of $215 lower, when compared to the average estimated NJ commercial utility rates. SWA recommends that the Borough of Netcong further explore opportunities of purchasing both fuel oil and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Netcong Hilltop Fire House building. Appendix B contains a complete list of third party energy suppliers for the Borough of Netcong service area. The Netcong Hilltop Fire House may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and fuel oil 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 Netcong Hilltop Fire House building is not eligible for enrollment in a Demand Response Program which requires capability to shed a minimum of 100 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option. The following charts show the Netcong Hilltop Fire House building monthly spending per unit of energy from Sept 2008 to Aug 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

Netcong Hilltop Fire House Existing Lighting Conditions														Proposed Lighting										
#	Bldg	Flr	Location in Building	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts /Lamp	Hrs/ Day	Energy Use (Watt hours / day)	Con-trols	Day-lighting possible?	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Con-trols	Total Power (Watts)	further W-hr/day reduction with occupancy sensors
1	NDPW	GF	Main Hall	T8 4'	E	9	4	F	32	2	2304	S	no	T8 4'	E	9	4	F	32	2	2304	S	1152	
2	NDPW	GF	Entrance	T8 4'	E	1	4	F	32	12	1536	Timer	no	T8 4'	E	1	4	F	32	12	1536	Timer	128	
3	NDPW	GF	Kitchen	T12 8'	E	2	4	F	68	2	1088	S	no	**T8 4'**	**E**	**2**	**8**	**F**	**32**	**2**	**816**	**S**	**512**	
4	NDPW	GF	Bathroom	T8 4'	E	1	4	F	32	2	256	S	no	T8 4'	E	1	4	F	32	2	256	S	128	
5	NDPW	GF	Engine Bay	T12 8'	E	3	4	F	68	24	19584	S	no	**T8 4'**	**E**	**3**	**8**	**F**	**32**	**24**	**14688**	**S**	**768**	**3,672**
6	NDPW	GF	Bathroom	Incand	none	1	1	I	60	2	120	S	no	**CFL**	-	**1**	**1**	**CFL**	**15**	**2**	**30**	**S**	**15**	
7	NDPW	GF	Mech. Rm	Incand	none	1	1	I	60	2	120	S	no	**CFL**	-	**1**	**1**	**CFL**	**15**	**2**	**30**	**S**	**15**	
8	NDPW	GF	Officer's Rm	T12 8'	E	3	4	F	68	2	1632	S	no	**T8 4'**	**E**	**3**	**8**	**F**	**32**	**2**	**1224**	**S**	**768**	
9	NDPW	GF	Main Hall	Fluoresc. Exit	E	1	1	F	12	24	288	none	no	**LED Exit**	-	**1**	**1**	**LED**	**5**	**24**	**120**	**none**	**5**	
10	NDPW	ext	Wall Sconce	CFL	E	3	1	CFL	13	12	468	Timer	no	CFL	-	3	1	CFL	13	12	468	Timer	39	
11	NDPW	ext	Wall Sconce	CFL	E	2	1	CFL	26	12	624	Timer	no	CFL	-	2	1	CFL	26	12	624	Timer	52	
12	NDPW	ext	Flag Uplight	Halogen	N/A	1	1	Hal	120	12	1440	Timer	no	**CFL**	-	**1**	**1**	**CFL**	**40**	**12**	**480**	**Timer**	**40**	
				TOTALS exterior							2,532										1,572			
				TOTALS interior							26,928										21,004		3,622	3,672
annual consumption (kWh)											10,753										6,900	includes occupancy sensors		
estimated cost ($/year)											$2,065										$1,325			OS
Netcong Hilltop Fire House total light power (Watt)											3,927										3,622			
Netcong Hilltop Fire House light power density (Watt/sq ft)											1.01										0.93			
Proposed Annual Savings (kWh)											3,853													
Proposed Annual Cost Savings ($)											$740													
Proposed Investment ($)											$1,730													
surface area (sq ft)											3,885										3,885			
Legend: NHFH - Netcong Hilltop Fire House; M - Magnetic; E - Electronic ; F - fluorescent; incand - incandescent; CFL - compact fluorescent lamp; HPS - high pressure sodium; MH - Metal Halide; S - on/off Switch: Hal - Halogen;																								
GF - Ground Floor; ext - exterior; I - incandescent; OS - Occupancy motion sensor Switch;																								

Note: Last table column shows additional electrical savings if the decision is to change out switches to occupancy sensors.

Appendix B: Third Party Energy Suppliers (ESCOs)
http://www.state.nj.us/bpu/commercial/shopping.html

JCP&L ELECTRICAL SERVICE TERRITORY Last Updated: 06/15/09		
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com	**BOC Energy Services, Inc.** 575 Mountain Avenue Murray Hill, NJ 07974 (800) 247-2644 www.boc.com	**Commerce Energy, Inc.** 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 www.newenergy.com	**Direct Energy Services, LLC** 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 www.directenergy.com	**FirstEnergy Solutions Corp.** 300 Madison Avenue Morristown, NJ 07962 (800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640 (877) 569-2841 www.glacialenergy.com	**Integrys Energy Services, Inc.** 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 www.integrysenergy.com	**Strategic Energy, LLC** 55 Madison Avenue, Suite 400 Morristown, NJ 07960 (888) 925-9115, www.sel.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-3799 www.libertypowercorp.com	**Pepco Energy Services, Inc.** 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (363-7499) www.pepco-services.com	**PPL EnergyPlus, LLC** 811 Church Road Cherry Hill, NJ 08002 (800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095 (877) 273-6772 www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza Route 54 Folsom, NJ 08037 (800) 800-756-3749 www.south jerseyenergy.com	**Suez Energy Resources NA, Inc.** 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057 (856) 273-9995 www.ugienergyservices.com	**American Powernet Management, LP** 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com	**ConEdison Solutions** Cherry Tree, Corporate Center 535 State Highway 38 Cherry Hill, NJ 08002 (888) 665-0955 www.conedsolutions.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450 212-538-3124 www.creditsuisse.com	**Sprague Energy Corp.** 12 Ridge Road Chatham Township NJ 07928 (800) 225-1560 www.spragueenergy.com	