ASSURED PERFORMANCE CONTRACT
EXHIBIT I–COMPREHENSIVE ENERGY AUDIT

Comprehensive Energy Audit

City of Beacon
Beacon, NY
April 15, 2011
Wendel Project No. 4471-01

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Section 1

Executive Summary

EXECUTIVE SUMMARY

The City of Beacon located in Dutchess County is approximately four square miles of a developing city boarding the east bank of the Hudson River, the 2000 Census, placed the County population at approximately 13,808 people.

The City would like to increase the energy efficiency of their facilities and coordinate this initiative with planned facility improvements. Like most cities, the availability of capital is scarce and they would like to maximize the amount of construction that can be done by cost effectively implementing energy efficiency improvements.

To accomplish this objective, the City of Beacon is implementing a performance contract. The following City owned facilities were identified as having the potential for energy savings through upgrades and improvements:

Facilities with Potential ECM's

No.	Building	Square Feet	Construction Date
1	Memorial Building	10,124	1924
2	Municipal Building	20,000	1996
3	Mase Hook and Ladder Fire House	7,000	1911
4	Beacon Engine Fire House	10,000	1886
5	Lewis Tompkins Hose Fire House	10,000	1980
6	Wastewater Treatment Plant	14,500	1962-1972ref.
7	Water Treatment Plant	17,500	1980
8	Water Well Site 1 & 2	3,000	N/A
	Total	92,124	

Energy conservation measures recommended for implementation include:

FIM #2 – Heating and HVAC System Upgrades
FIM #3 – HVAC Controls Upgrades
FIM #4 – Building Envelope Improvements
FIM #6 – Pump and Motor Upgrades – WWTP and WTP
FIM #7 – Air Blower and Aerobic Digester Improvements
FIM #8 – Belt Press and Polymer System Upgrades – WWTP
FIM #9 – Water Well Pump Upgrades – WTP
FIM #10 – Electric Room Heat Recovery – WTP
FIM#12 – Demand Response
FIM#13 – Well Site Inspection and Cleaning
FIM#14 – Generator Replacement - WWTP
FIM#15 – Roof Replacement
FIM#16 – Furnace Replacement
FIM#17 – WWTP Valve Replacement - WWTP

The following "Total Project Summary" table lists the implementation costs, energy savings and simple payback for each measure studied.

Section 2

Facility Descriptions

FACILITY DESCRIPTION

The summary table below summarizes information about each of the City facilities included in the scope of this study.

The City has requested the following facilities to be included in this study:

No.	Building	Square Feet	Construction Date
1	Memorial Building	10,124	1924
2	Municipal Building	20,000	1996
3	Mase Hook and Ladder Fire House	7,000	1911
4	Beacon Engine Fire House	10,000	1886
5	Lewis Tompkins Hose Fire House	10,000	1980
6	Wastewater Treatment Plant	14,500	1962-1972ref.
7	Water Treatment Plant	17,500	1980
8	Water Well Site 1 & 2	3,000	N/A
	Total	92,124	

Memorial Building

The Memorial Building was constructed in 1924. The 10,124 sq. ft. structure is utilized for weekly Bingo games on Thursday, Friday and Sunday at 5:00 pm. and for the American Legion VFW Post 666 meetings and events. The building is also open during the day for setup and cleaning activities.

A single oil fired Weil McLain cast iron boiler provides steam to the perimeter radiation system which is controlled by a single thermostat located in the multipurpose room. Domestic hot water is provided by a gas fired 30 gallon Bradford White domestic hot water heater. Cooling is provided by three rooftop Carrier units that serve the multipurpose room and window units in specific areas

of the building.

Lighting at the Memorial Building consists of various size fluorescent fixtures with T12 lamps and incandescent lamps in storage areas.

Municipal Building

The structure consists of a 20,000 sq. ft. masonry concrete block brick façade with aluminum windows and mixture of steel and wooden doors. The building was constructed in 1996. It houses the town's administration office, police station with holding cells and the main court. The hours of operation are normal business hours, 8:00 am to 5:00 pm. The police station operates 24 hours.

Eight Caravan atmospheric hot water boilers serve the heating that provide domestic hot water via a heat exchanger. Hot water is pumped to hot water coils in the air handles and perimeter unit ventilators. The boilers are controlled by a boiler staging controller based on outside air temperature. The distribution system is a two pipe system that is shared with the cooling system. An outdoor Trane package unit provides cooling to the entire building via the perimeter units and cooling coils in the air handlers.

The lighting at the Municipal Building consists of energy efficient T8 fluorescent fixtures which are controlled by occupancy sensors. The Main Court room is lighted by 750 Watt incandescent lamps.

Mase Hook and Ladder Fire House

The Mase Hook and Ladder Fire House was constructed in 1911. The 7,000 sq. ft., three level brick façade structure has undergone some refurbishment since its construction in order to house a fire engine and keep up with new technology. Equipment operating hours vary depending on the level of occupancy during day or evening hours.

The oil fired Weil McLain hot water boiler supplies heating hot water to the perimeter radiation system throughout the building. A 50 gallon domestic hot water heater provides domestic hot water to the bathrooms and kitchenette. The bay area that houses the fire engine is heated by two hot water unit heaters. The cooling is provided by two split air conditioning units in the hallway and offices.

The lighting in the building predominately consists of fluorescent T12 fixtures with some incandescent lamps in storage areas. The bay area has a mixture of fluorescent and High Discharge Intensity (HID) low bay fixtures.

Beacon Engine Fire House

The building was constructed in 1886. The concrete block brick façade 10,000 sq. ft. had an addition constructed to house the new fire engine which consists of a single truck bay with a roll up door. Equipment operating hours vary depending on the level of occupancy during day or evening hours.

The building is heated by a single gas fire Weil McLain atmospheric hot water boiler which is located in the basement of the building. The hot water is pumped through a perimeter base board heating. Domestic hot water is supplied by a gas fired Mor-Flo 40 gallon domestic hot water heater. The bay area is heated by one Trane unit heater. The building is cooled by window air

conditioning units that are located in specific areas of the building. Supplemental cooling is provided by a split system International Comfort Product air handler with a refrigerant coil.

The lighting of the building primarily consists of 2x4 recessed T12 fluorescent lamp fixtures. There is a combination of U-lamps and straight fluorescent lamps.

Lewis Tompkins Hose Fire House

The 10,000 sq. ft building was constructed in 1980. This is the largest and newest firehouse in the City of Beacon. The structure consists of part metal frame and part masonry concrete block brick façade. The bay area consists of three bay roll up doors to store three fire engines. The building is also used for scheduled events in the multipurpose room. Equipment operating hours vary depending on the level of occupancy during day or evening hours.

The heating is provided by a Peerless cast iron hot water boiler. Heating hot water is pumped through a perimeter radiation system and to heating coils to the bay area Trane air handler. Domestic hot water is provided by a 100 gallon Bock heater. The cooling is provided mainly with Trane split system and supplemented by two Carrier rooftop electric package units.

The lighting of the building primarily consists of 2x4 recessed T12 fluorescent lamp fixtures. There is a combination of U-lamps and straight fluorescent lamps as well as incandescent fixtures.

Wastewater Treatment Plant (WWTP)

The Wastewater Treatment Plant was originally constructed in 1967 and refurbished in 1972. The concrete block brick façade structure houses only the administrative offices and storage for some equipment for the wastewater plant equipment.

The City of Beacon wastewater treatment plant receives sewage from the City of Beacon and the Dutchess Park area of nearby Fishkill. The plant has a design capacity of 6 MGD. The plant utilizes conventional activated sludge process for biological treatment of sewage and includes aerobic digestion, sludge stabilization and dewatering.

Space heating in the main building is provided by Peerless hot water boiler which has reached its useful life. The cast iron sectional boiler has a heating coil for domestic hot water. Heating hot water is distributed to a perimeter radiation system in the main floor of the building and unit heaters in storage areas.

The lighting of the building primarily consists of 2x4 recessed T12 fluorescent lamp fixtures.

Water Treatment Plant (WTP)

The original Water Treatment Plant was constructed in 1980 and a new addition was constructed recently. The 17,500 sq. ft. concrete block with a brick façade with aluminum windows houses the administration offices and the water treatment testing process. It also houses the city's water tank monitor station. The facility is a 24 hour operation, but fully staffed from 6:00 am to 4:00pm during the week.

The City of Beacon water treatment plant receives water from three (3) surface water sources; Cargill, Mt. Beacon and Melzingah reservoirs and three (3) groundwater sources, described below. It has a capacity of 4 MGD. At the plant, water is filtered and chlorinated prior to distribution to its water customers. The City of Beacon Water Supply serves approximately 19,000 people, including residential and commercial customers in the City of Beacon, the Department of Corrections and customers in the Town of Fishkill. The average daily water production is 2.3 MGD.

Space heating is provided by a newly installed Weil McLain gas fired hot water boiler. Heating hot water is distributed through a hot water radiation system. Heating hot water is also distributed through various unit heaters in the bay area and the basement of the original building. The new extension of the building is heated by various gas fired unit heaters. Domestic hot water is provided by a 40 gallon American Water Heaters. Cooling is provided by electric Trane unit ventilators in two of the administrative offices.

Water Well Sites 1 & 2

Well Sites 1 & 2 are two (2) of the aforementioned groundwater sources for the City of Beacon. The third groundwater source, Well 8, is owned by the Village of Fishkill and only utilized during emergencies. Raw water is pumped from Well Sites 1 & 2 to the water treatment plant for processing prior to distribution to the City of Beacon water customers.

Section 3

Utility Description

UTILITY DESCRIPTION

Wendel analyzed historical utility information from the City of Beacon for the purposes of identifying usage trends and determining average utility rates for use in the analysis of energy conservation measures. This section describes each utility and how the rates were determined. Electrical and natural gas are provided by Central Hudson. The City holds an annual contract with the local fuel oil company, Bottini.

The unit kWh cost for the above facilities was calculated by adding the annual supply and delivery costs minus the annual demand costs (including delivery and transition charges) from the bills provided by the Owner, and dividing this total by the annual kWh consumption.

Natural gas unit costs were calculated by dividing the total annual natural gas costs by the total annual consumption in mmBtu. Natural gas usage is reported in Therms. The thermal content of 1 Therm is assumed to be 100,000 Btu throughout this report. Savings are reported in mmBtu. Therefore, 10 Therms are equal to 1 mmBtu.

Fuel oil (#2) unit costs were calculated by dividing the total annual fuel oil costs by the total annual consumption in mmBtu. Fuel oil usage is reported in gallons. The thermal content of 1 gallon is assumed to be 141,000 Btu throughout this report. Savings are reported in mmBtu. Therefore, 7 gallons are approximately equal to 1 mmBtu.

Monthly consumption details and graphs may be found in Appendix B of this report. The tables that follow summarize the rates used for this study based on the utility data provided to Wendel.

Customer Rate Structure Description

Memorial Building

Memorial Building	Unit Cost ($)	Units
Electric Usage*	0.11	/kWh
Electric Demand*	8.00	/kW
Natural Gas	N/A	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	1.71	/mmBtu

Note: The Memorial Building and Mase Hook & Ladder Firehouse share the same electric account.

Municipal Building

Municipal Building	Unit Cost ($)	Units
Electric Usage	0.091	/kWh
Electric Demand	8.00	/kW
Natural Gas	13.36	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	N/A	/mmBtu

Mase Hook and Ladder Fire House

Mase Hook and Ladder Fire House	Unit Cost ($)	Units
Electric Usage*	0.11	/kWh
Electric Demand*	8.00	/kW
Natural Gas	N/A	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	1.71	/mmBtu

Note: The Memorial Building and Mase Hook & Ladder Firehouse share the same electric account.

Beacon Engine Fire House

Beacon Engine Fire House	Unit Cost ($)	Units
Electric Usage	0.101	/kWh
Electric Demand	8.00	/kW
Natural Gas	13.67	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	N/A	/mmBtu

Lewis Tompkins Hose Fire House

Lewis Tompkins Hose Fire House	Unit Cost ($)	Units
Electric Usage	0.095	/kWh
Electric Demand	8.00	/kW
Natural Gas	13.53	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	N/A	/mmBtu

Wastewater Treatment Plant (WWTP)

Wastewater Treatment Plant (WWTP)	Unit Cost ($)	Units
Electric Usage	0.086	/kWh
Electric Demand	6.30	/kW
Natural Gas	N/A	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	1.71	/mmBtu

Water Treatment Plant (WTP)

Water Treatment Plant (WTP)	Unit Cost ($)	Units
Electric Usage	0.088	/kWh
Electric Demand	8.00	/kW
Natural Gas	13.90	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	N/A	/mmBtu

Water Well Site 1 & 2

Water Well Site 1 & 2	Unit Cost ($)	Units
Electric Usage	0.091	/kWh
Electric Demand	8.00	/kW
Natural Gas	N/A	/mmBtu
Propane	N/A	/mmBtu
Fuel Oil	N/A	/mmBtu

WEATHER NORMALIZATION

Some calculations in this report use 30 year weather data for New York City, NY to predict the energy savings likely to result in a given measure. The normal number of heating degree-days (HDD) for this area is 4,777 HDD. The normal number of cooling degree days (CDD) is 1141 CDD. Weather information was obtained from the National Weather Service/NYSERDA's website.

New York City

(La Guardia Airport)

Cooling Degree Day										
	2010	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**Normal**
January	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0
April	13	31	5	10	6	6	0	7	59	6
May		51	30	129	67	17	75	9	44	54
June		131	325	276	267	304	242	168	253	209
July		301	470	401	492	424	343	387	458	377
August		403	318	385	414	500	326	412	425	336
September		117	184	251	137	304	186	160	200	141
October		7	14	114	31	42	8	5	39	17
November		0	0	0	0	0	0	7	0	1
December		0	0	0	0	0	0	0	0	0
TOTAL		1041	1346	1566	1414	1597	1180	1155	1478	1141

New York City

(La Guardia Airport)

Heating Degree Day										
	2010	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**Normal**
January	988	1114	848	806	722	1056	1213	1137	754	1008
February	871	780	810	981	786	815	839	995	668	861
March	520	713	683	682	645	810	672	700	637	713
April	219	360	321	421	264	321	355	470	338	392
May		111	148	75	95	204	80	203	161	136

June		27	0	3	11	10	11	41	20	16
July		0	0	0	0	1	0	0	0	1
August		0	0	6	0	0	0	0	1	1
September		23	15	5	12	5	11	11	6	40
October		256	252	91	213	194	230	263	297	249
November		395	547	530	342	413	474	422	555	524
December		868	802	808	600	878	829	806	871	836
TOTAL		4647	4426	4408	3690	4707	4714	5048	4308	4777

Note: Normal is a 30-year degree day average value for the period 1971-2000.**Source:** National Oceanic and Atmospheric Administration

Section 4

FIM #2: Heating System Upgrades – Boiler Replacement

FIM #2: HEATING SYSTEM UPGRADES – BOILER REPLACEMENT

INVESTIGATION

Wendel visited the City of Beacon to investigate their HVAC systems and determine opportunities to save energy and maintenance costs at each building. Facility personnel were interviewed regarding the existing condition and operation of these systems. It was determined that the Wastewater Treatment Plant offers an opportunity to reduce energy usage without compromising occupant comfort or indoor air quality.

Nameplate data from each of the AHUs, hours of operation and utility costs incorporated in the energy savings calculations are included in the spreadsheets provided in this report. Cost estimates for material and labor are based on a contractor pricing. An economic summary of these measures is included at the end of this section.

Wastewater Treatment Plant

Existing System

The existing Peerless fuel oil cast iron hot water boiler at the Wastewater Treatment Plant provides heating hot water to the main administrative building. The boiler delivers hot water to four zones, each zone with a dedicated circulator pump controlled by a wall-mounted thermostat in the space. Hot water serves unit heaters in storage areas and perimeter radiation in office areas. It also provides domestic hot water an existing domestic hot water tank that is being used as a storage tank. The existing boiler is in poor condition and is at the end of its useful life.

Proposed System

The new boiler shall be a fuel-efficient cast iron sectional with a fuel spark ignition burner, new operating controls, low water cut-off, and factory supplied trim materials. The unit will be equipped with a local controller capable of operating in full outdoor air temperature reset and unoccupied set-back modes. The zone pumps shall be replaced with ultra-efficient, wet-rotor circulators. The domestic hot water storage tank will be replaced with an indirect domestic hot

water heater served by the new boiler.

RECOMMENDATIONS

It is recommended to replace the existing boiler in Wastewater Treatment Administration Building due to the energy savings and increased reliability of the new boiler system.

Heating System Upgrades
Boiler Replacement
City of Beacon - Wastewater Treament Plant
Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	105	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,282	Per Year
Total Energy & O&M Savings	$1,282	Per Year
Project Costs		
Total Measure Cost	$53,504	
Payback		
Simple Payback	41.7	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	41.7	Year(s)

Estimate of Project Savings
Boiler Replacement
City of Beacon - Wastewater Treament Plant

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)	Existing Boiler Cost (Dollars)	Proposed Boiler Usage with new Boiler(mmBtu)	Proposed Boiler Cost (Dollars)	Estimated Savings (mmBtu)	Estimated Savings (Dollars)
December-08	0.00	$0.00	335.25	$573.62	46.94	$573.62	46.94	$573.62	33.93	$414.67	13.01	$158.95
January-09	0.00	$0.00	738.19	$1,263.05	104.09	$1,263.05	104.09	$1,272.07	75.24	$919.57	28.84	$352.50
February-09	0.00	$0.00	466.98	$799.00	65.84	$799.00	65.84	$804.71	47.60	$581.72	18.25	$222.99
March-09	0.00	$0.00	510.15	$872.87	71.93	$872.87	71.93	$879.10	52.00	$635.50	19.93	$243.61
April-09	0.00	$0.00	127.31	$217.82	17.95	$217.82	17.95	$219.38	12.98	$158.58	4.97	$60.79
May-09	0.00	$0.00	44.26	$75.73	6.24	$75.73	6.24	$76.27	4.51	$55.14	1.73	$21.14
June-09	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00
July-09	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00
August-09	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00
September-09	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00	0.00	$0.00
October-09	0.00	$0.00	201.68	$345.07	28.44	$345.07	28.44	$347.53	20.56	$251.23	7.88	$96.30
November-09	0.00	$0.00	262.96	$449.92	37.08	$449.92	37.08	$453.13	26.80	$327.57	10.27	$125.57
Totals	-	$0	2686.78	$4,597.08	378.50	$4,597.08	378.50	$4,625.82	273.61	$3,343.97	104.89	$1,281.85

Assumptions:

1 mmBtu = 1 Mcf
Summer = June, July, August
operating hours are unchanged.
60.0% Existing Boiler System Efficiency (average)
83.0% Proposed Boiler System Efficiency
100.0% Estimated consumption due to boilers
$0.00 Cost per CCF
$1.71 Cost per Gallon
$1.71 Cost per Gallon
$0.00 Cost per CCF
$0.00 Cost per mmBtu(gas)
$12.22 Cost per mmBtu
$12.21 Cost per mmBtu(as agreed by town)
$0.00 Cost per mmBtu(proposed gas rate as agreed by town)

Total Base/Summer Load
Consumption 0.00
% of total 0.00%

Total Space Heating/Winter Load
Consumption 378.50
% of total 100.00%

Building Area
7,000 square feet

Building Annual Energy Values
$0.66 Cost per square foot
0.054 mmBtu per square foot

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon - Wastewater Treament Plant	Estimated by:	JG
Project #:	4471-01	Checked by:	
Measure:	Boiler Replacement	Approved by:	
Date:	05/02/11	File:	Cost Estimate

Item				Material		Labor		Total Cost
No.	Description	Qty.	Unit	Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$27,858.00	$27,858.00	$18,572.00	$18,572.00	$46,430.00
2	Bond	1	LS	$928.80	$928.80		$0.00	$928.80
3	Flue Alternate	1	LS	($10,510.00)	($10,510.00)		$0.00	($10,510.00)
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$18,276.80		$18,572.00	$36,848.80
						Contingency:	10.0%	$3,684.88
						TOTAL DIRECT CONSTRUCTION COST:		$40,533.68
						Audit, Engineering, & Construction Management:	32.0%	$12,970.78
							SUBTOTAL:	$53,504.46
						Asbestos Abatement Services:		$0.00
						Contingency:	0.0%	$0.00
						TOTAL ASBESTOS CONSTRUCTION COST:		$0.00
						Asbestos Abatement Services Fee:	0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$53,504.46

Section 5

FIM #3: HVAC Controls Upgrades

FIM #3: HVAC CONTROL UPGRADES

INVESTIGATION

The HVAC controls in the City of Beacon buildings are predominantly early generation or limited capability controllers that provide simple control of the general HVAC equipment in each building. Most of these controls have either been bypassed or set to operate manually.

A reduction in energy consumption at the facilities will be achieved through night setback control and time of day operating control functions which will be applied through the new programmable thermostats and boiler staging controllers. The programmable thermostats in combination with boiler staging controllers in the all fire houses and thermostatic valves at the Memorial Building will be capable of monitoring the building temperature during occupied and unoccupied hours and can automatically turn off or lower/raise temperature set points to decrease the amount of energy used to heat/cool the building during these times. Each programmable thermostat is capable to provide a fail-safe feature that will ensure the building is always adequately heated to prevent damage to the building interior surfaces during the winter months.

This data along with the hours of operation and utility costs are incorporated into the energy calculations. These spreadsheets are provided in this report. Cost estimates for material and labor are based on bid pricing. An economic summary of this measure is included at the end of this section.

Space temperatures within the buildings listed below are maintained by manually set residential style space temperature thermostats. These thermostats are set to a specific temperature by the occupants and do not have any night setback capabilities. At the time of the facility audit, the space temperature set point for each thermostat was noted and is documented in the energy savings calculation sheets included at the end of this section.

This energy savings will be attained during the heating season by instituting temperature setbacks within the buildings during unoccupied times when space temperatures can be allowed to be lower

since the building is not occupied. During the unoccupied times without affecting building finishes or the ability to properly raise the temperature to the occupied space temperature. It should be noted that the volunteer fire houses are primarily unoccupied and therefore should be set to maintain the unoccupied temperature set point during the majority of the heating season. This scope of work was investigated for the following buildings:

- Lewis Tompkins Fire House
- Beacon Fire House
- Memorial Building
- Mase Hook and Ladder Fire House

RECOMMENDATIONS

Wendel recommends the installation of programmable thermostats in the Memorial Building, Mase Hook and Ladder Firehouse, Lewis Tompkins Firehouse and the Wastewater Treatment Plant. Boiler staging controllers are recommended for the Memorial Building and in all of the fire houses and the addition of thermostatic valves at the Memorial building to maximize the energy savings potential for the existing HVAC equipment.

Programmable Thermostats, Thermostatic Valves & Boiler Staging Control

City of Beacon-Memorial Building

Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	109	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,328	Per Year
Total Energy & O&M Savings	$1,328	Per Year
Project Costs		
Total Measure Cost	$11,700	
Payback		
Simple Payback	8.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	8.8	Year(s)

Programmable Thermostats & Thermostatic Valves
Temperature Setback Savings - Heating

Assumptions:

Occ. Indoor Temp.	74
Reduced Occ Temp,	72
Unocc. Indoor Temp.	65
Peak Heating Load	417 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	4	8	4
Unoccupied	4	0	4
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	64.29%	100.00%	64.29%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	0	6	2
Unoccupied	8	2	6
Weekends			
Occupied	0	6	2
Unoccupied	8	2	6
% Occupied	0.00%	75.00%	25.00%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load at IAT =	% Load at IAT =	% Load at IAT =	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
Bin Temp	0 - 8	8 - 16	16 - 24	74	72	65	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Usage (mmBtu)	Cost ($)
-7.5	5	0	1	89%	89%	79%	371	1.4	330	0.7	2.1	370	0.1	330	1.9	2.0	0.1	$1.81
-2.5	9	1	3	84%	83%	74%	349	3.0	308	1.3	4.4	347	0.5	308	3.5	4.1	0.3	$3.64
2.5	24	6	9	78%	78%	68%	326	8.9	285	3.4	12.2	324	2.2	285	9.2	11.4	0.9	$10.42
7.5	50	16	25	73%	72%	63%	303	19.5	262	7.0	26.5	300	5.5	262	19.1	24.5	1.9	$23.60
12.5	76	37	51	67%	66%	57%	280	33.2	239	10.8	44.1	277	11.2	239	29.5	40.8	3.3	$40.67
17.5	108	58	80	62%	61%	52%	257	46.0	216	14.5	60.6	254	16.1	216	39.5	55.6	5.0	$60.57
22.5	146	90	121	56%	55%	46%	235	61.4	194	18.5	79.9	231	22.5	194	50.2	72.7	7.1	$86.99
27.5	205	138	167	51%	50%	41%	212	79.9	171	22.7	102.6	207	30.1	171	62.3	92.4	10.2	$124.33
32.5	261	223	256	45%	44%	36%	189	105.0	148	27.3	132.3	184	42.5	148	75.3	117.9	14.5	$176.79
37.5	201	223	238	40%	39%	30%	166	84.0	125	19.6	103.7	161	36.4	125	54.5	91.0	12.7	$155.05
42.5	130	179	153	34%	33%	25%	144	51.8	103	10.4	62.2	137	23.7	103	29.7	53.4	8.8	$107.30
47.5	94	135	105	29%	27%	19%	121	31.7	80	5.7	37.4	114	14.6	80	16.5	31.0	6.4	$78.17
52.5	69	107	74	23%	22%	14%	98	19.5	57	2.9	22.4	91	9.0	57	8.6	17.6	4.8	$58.80
57.5	44	97	41	18%	16%	8%	75	11.4	34	1.0	12.4	68	5.6	34	3.4	9.0	3.4	$42.14
62.5	22	62	25	13%	11%	3%	52	4.8	11	0.2	5.0	44	2.3	11	0.6	3.0	2.0	$25.03
67.5	7	43	19	7%	5%	0%	30	1.8	0	0.0	1.8	21	0.8	0	0.0	0.8	1.0	$12.13
Total	1,451	1,415	1,368					562			707		223		402	625	82	$1,005.64

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

Cost of mmBtu $12.22

707 Annual Heat Load
707 Annual Btu Usage

11.6% Savings

Annual Savings Summary	
Fuel (mmBtu)	82
Cost ($)	$1,005.64

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon-Memorial Building	Estimated by:	JG
Project #:	4471-01	Checked by:	
Measure:	HVAC Control Upgrades	Approved by:	
Date:	05/02/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$4,740.00	$4,740.00	$3,160.00	$3,160.00	$7,900.00
2	Bond	1	LS	$158.03	$158.03		$0.00	$158.03
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00

SUBTOTALS:	$4,898.03		$3,160.00	$8,058.03
Contingency:			10.0%	$805.80
TOTAL DIRECT CONSTRUCTION COST:				$8,863.83
Audit, Engineering, & Construction Management:			32.0%	$2,836.43
SUBTOTAL:				$11,700.26
Asbestos Abatement Services:				$0.00
Contingency:				$0.00
TOTAL ASBESTOS CONSTRUCTION COST:				$0.00
Asbestos Abatement Services Fee:				$0.00
Asbestos SUBTOTAL:				$0.00
TOTAL:				$11,700.26

Programmable Thermostats & Boiler Staging Control

City of Beacon-Mase Hook and Ladder

Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	65	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$796	Per Year
Total Energy & O&M Savings	$796	Per Year
Project Costs		
Total Measure Cost	$8,738	
Payback		
Simple Payback	11.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	11.0	Year(s)

Programmable Thermostats
Temperature Setback Savings - Heating

Assumptions:

Occ. Indoor Temp.	72
Reduced Occ Temp,	72
Unocc. Indoor Temp.	65
Peak Heating Load	323 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	2	8	4
Unoccupied	6	0	4
Weekends			
Occupied	2	8	4
Unoccupied	6	0	4
% Occupied	25.00%	100.00%	50.00%

Bin Temperature Data (Heating Only)				Occ % Load at IAT =	Red. Occ % Load at IAT =	Unocc % Load at IAT =	Existing Conditions					Proposed Condiitions					Total Reduced	Total Reduced
	Hours/Bin						Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	72	72	65	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	(mmBtu)	($)
-7.5	5	0	1	89%	89%	81%	287	1.7	261	0.0	1.7	287	0.5	261	1.1	1.6	0.1	$1.31
-2.5	9	1	3	83%	83%	75%	269	3.5	243	0.0	3.5	269	1.3	243	2.0	3.3	0.2	$2.54
2.5	24	6	9	78%	78%	70%	251	9.8	225	0.0	9.8	251	4.1	225	5.1	9.2	0.6	$6.94
7.5	50	16	25	72%	72%	64%	233	21.2	207	0.0	21.2	233	9.5	207	10.4	19.9	1.3	$15.42
12.5	76	37	51	66%	66%	59%	215	35.2	189	0.0	35.2	215	17.5	189	15.6	33.1	2.1	$25.45
17.5	108	58	80	61%	61%	53%	197	48.3	171	0.0	48.3	197	24.6	171	20.7	45.3	3.1	$37.33
22.5	146	90	121	55%	55%	47%	179	63.7	153	0.0	63.7	179	33.4	153	26.1	59.4	4.3	$52.44
27.5	205	138	167	50%	50%	42%	160	81.8	135	0.0	81.8	160	43.8	135	32.1	75.9	6.0	$73.19
32.5	261	223	256	44%	44%	36%	142	105.4	117	0.0	105.4	142	59.3	117	37.9	97.2	8.2	$99.87
37.5	201	223	238	39%	39%	31%	124	82.4	99	0.0	82.4	124	48.8	99	26.8	75.6	6.8	$83.21
42.5	130	179	153	33%	33%	25%	106	49.1	81	0.0	49.1	106	30.6	81	14.1	44.8	4.4	$53.68
47.5	94	135	105	27%	27%	20%	88	29.5	63	0.0	29.5	88	18.6	63	7.8	26.4	3.1	$37.94
52.5	69	107	74	22%	22%	14%	70	17.6	45	0.0	17.6	70	11.3	45	4.0	15.3	2.2	$27.38
57.5	44	97	41	16%	16%	8%	52	9.5	27	0.0	9.5	52	6.7	27	1.4	8.2	1.4	$16.50
62.5	22	62	25	11%	11%	3%	34	3.7	9	0.0	3.7	34	2.7	9	0.3	3.0	0.7	$8.95
67.5	7	43	19	5%	5%	0%	16	1.1	0	0.0	1.1	16	0.9	0	0.0	0.9	0.2	$2.93
Total	1,451	1,415	1,368					562			562		313		204	517	44	$543.77

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

Cost of mmBtu $12.22

562 Annual Heat Load
562 Annual Btu Usage

7.9% Savings

Annual Savings Summary	
Fuel (mmBtu)	44
Cost ($)	$543.77

LABOR & MATERIAL ESTIMATE

WENDEL

	Project : City of Beacon-Mase Hook and Ladder	Estimated by: JG	
	Project #: 4471-01	Checked by:	
	Measure: HVAC Control Upgrades	Approved by:	
	Date: 05/02/11	File: Cost Estimate	

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$3,540.00	$3,540.00	$2,360.00	$2,360.00	$5,900.00
2	Bond	1	LS	$118.03	$118.03		$0.00	$118.03
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00

SUBTOTALS:	$3,658.03	$2,360.00 $6,018.03
Contingency:	10.0%	$601.80
TOTAL DIRECT CONSTRUCTION COST:		$6,619.83
Audit, Engineering, & Construction Management:	32.0%	$2,118.35
SUBTOTAL:		$8,738.18
Asbestos Abatement Services:		$0.00
Contingency:		$0.00
TOTAL ASBESTOS CONSTRUCTION COST:		$0.00
Asbestos Abatement Services Fee:		$0.00
Asbestos SUBTOTAL:		$0.00
TOTAL:		$8,738.18

Boiler Staging Controls
City of Beacon-Beacon Hose Fire House
Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	21	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$282	Per Year
Total Energy & O&M Savings	$282	Per Year
Project Costs		
Total Measure Cost	$8,738	
Payback		
Simple Payback	31.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	31.0	Year(s)

Estimate of Project Savings
Boiler Staging Controls
City of Beacon-Beacon Hose Fire House

Month	Existing Facility Usage(Therms)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)	Proposed Boiler Usage with new Boiler(mmBtu)	Estimated Savings (mmBtu)	Estimated Savings (Dollars)
Jan-09	866	$1,354.53	0.00	$0.00	86.60	$1,354.53	82.57	78.64	3.93	$53.76
Feb-09	11	$36.81	0.00	$0.00	1.10	$36.81	1.05	1.00	0.05	$0.68
Mar-09	1,657	$2,327.90	0.00	$0.00	165.70	$2,327.90	157.98	150.46	7.52	$102.87
Apr-09	450	$566.62	0.00	$0.00	45.00	$566.62	42.90	40.86	2.04	$27.94
May-09	245	$256.64	0.00	$0.00	24.50	$256.64	23.36	22.25	1.11	$15.21
Jun-09	77	$94.86	0.00	$0.00	7.70	$94.86	7.34	6.99	0.35	$4.78
Jul-09	16	$41.78	0.00	$0.00	1.60	$41.78	1.53	1.45	0.07	$0.99
Aug-09	10	$41.45	0.00	$0.00	1.00	$41.45	0.95	0.91	0.05	$0.62
Sep-09	19	$52.17	0.00	$0.00	1.90	$52.17	1.81	1.73	0.09	$1.18
Oct-09	193	$240.46	0.00	$0.00	19.30	$240.46	18.40	17.53	0.88	$11.98
Nov-09	362	$427.62	0.00	$0.00	36.20	$427.62	34.51	32.87	1.64	$22.47
Dec-09	518	$608.64	0.00	$0.00	51.80	$608.64	49.39	47.04	2.35	$32.16
Totals	4,424	$6,049	0.00	$0.00	442.40	$6,049.48	421.80	401.71	20.09	$274.66
Using Normalized Data							432.57	411.97	20.60	$281.67

Avg Annual HDD 4,655
30 YR HDD 4,777
Normalization 2.6%

Assumptions:
Proposed Boiler Usage =
1 mmBtu = 1 Mcf
Summer =July, August, September
operating hours are unchanged.

80.0% Existing Boiler System Efficiency (average)
84.0% Proposed Boiler System Efficiency
95.3% Estimated consumption due to boilers
$1.37 Cost per Therms $13.67 Cost per mmBtu(gas)
$0.00 Cost per Gallon $0.00 Cost per mmBtu(oil)

Total Base/Summer Load
Consumption 20.60
% of total 4.66%

Total Space Heating/Winter Load
Consumption 421.80
% of total 95.34%

Building Area
10,000 square feet

Building Annual Energy Values
$0.60 Cost per square foot
0.044 mmBtu per square foot

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon-Beacon Hose Fire House	Estimated by:	JG
Project #:	4471-01	Checked by:	
Measure:	HVAC Control Upgrades	Approved by:	
Date:	05/02/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$3,540.00	$3,540.00	$2,360.00	$2,360.00	$5,900.00
2	Bond	1	LS	$118.03	$118.03		$0.00	$118.03
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$3,658.03		$2,360.00	$6,018.03
						Contingency:	10.0%	$601.80
							TOTAL DIRECT CONSTRUCTION COST:	$6,619.83
							Audit, Engineering, & Construction Management: 32.0%	$2,118.35
							SUBTOTAL:	$8,738.18
							Asbestos Abatement Services:	$0.00
							Contingency: 0.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
							Asbestos Abatement Services Fee: 0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$8,738.18

Programmable Thermostats
City of Beacon-Wastewater Treatment Plant
Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	26	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$316	Per Year
Total Energy & O&M Savings	$316	Per Year
Project Costs		
Total Measure Cost	$6,591	
Payback		
Simple Payback	20.9	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	20.9	Year(s)

Programmable Thermostats
Temperature Setback Savings - Heating

Assumptions:

Occ. Indoor Temp.	72
Reduced Occ Temp,	72
Unocc. Indoor Temp.	65
Peak Heating Load	157 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	2	8	2
Unoccupied	6	0	6
Weekends			
Occupied	2	8	2
Unoccupied	6	0	6
% Occupied	25.00%	100.00%	25.00%

Bin Temperature Data (Heating Only)				Occ % Load at IAT =	Red. Occ % Load at IAT =	Unocc % Load at IAT =	Existing Conditions					Proposed Condiitions					Total Reduced	Total Reduced
	Hours/Bin						Occupied		Unoccupied		Total	Occupied		Unoccupied		Total		
Bin Temp	0 - 8	8 - 16	16 - 24	72	72	65	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Usage (mmBtu)	Cost ($)
-7.5	5	0	1	89%	89%	81%	140	0.8	127	0.0	0.8	140	0.2	127	0.6	0.8	0.1	$0.68
-2.5	9	1	3	83%	83%	75%	131	1.7	119	0.0	1.7	131	0.5	119	1.1	1.6	0.1	$1.35
2.5	24	6	9	78%	78%	70%	122	4.8	110	0.0	4.8	122	1.7	110	2.7	4.5	0.3	$3.72
7.5	50	16	25	72%	72%	64%	113	10.3	101	0.0	10.3	113	3.9	101	5.7	9.6	0.7	$8.45
12.5	76	37	51	66%	66%	59%	104	17.1	92	0.0	17.1	104	7.2	92	8.8	16.0	1.2	$14.31
17.5	108	58	80	61%	61%	53%	96	23.5	83	0.0	23.5	96	10.0	83	11.8	21.8	1.7	$21.18
22.5	146	90	121	55%	55%	47%	87	31.0	75	0.0	31.0	87	13.6	75	14.9	28.6	2.5	$30.08
27.5	205	138	167	50%	50%	42%	78	39.9	66	0.0	39.9	78	18.1	66	18.4	36.4	3.4	$41.91
32.5	261	223	256	44%	44%	36%	69	51.3	57	0.0	51.3	69	24.4	57	22.1	46.6	4.8	$58.24
37.5	201	223	238	39%	39%	31%	61	40.1	48	0.0	40.1	61	20.2	48	15.9	36.1	4.0	$49.45
42.5	130	179	153	33%	33%	25%	52	23.9	40	0.0	23.9	52	12.9	40	8.4	21.3	2.6	$31.88
47.5	94	135	105	27%	27%	20%	43	14.4	31	0.0	14.4	43	7.9	31	4.6	12.5	1.8	$22.42
52.5	69	107	74	22%	22%	14%	34	8.6	22	0.0	8.6	34	4.9	22	2.4	7.2	1.3	$16.11
57.5	44	97	41	16%	16%	8%	25	4.6	13	0.0	4.6	25	3.0	13	0.8	3.9	0.8	$9.58
62.5	22	62	25	11%	11%	3%	17	1.8	4	0.0	1.8	17	1.2	4	0.2	1.4	0.4	$5.29
67.5	7	43	19	5%	5%	0%	8	0.5	0	0.0	0.5	8	0.4	0	0.0	0.4	0.2	$1.88
Total	1,451	1,415	1,368					274			274		130		118	248	26	$315.84

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

Cost of mmBtu $12.22

274 Annual Heat Load
274 Annual Btu Usage (from proposed boiler sheet)

9.4% Savings

Annual Savings Summary	
Fuel (mmBtu)	26
Cost ($)	$315.84

LABOR & MATERIAL ESTIMATE

WENDEL

	Project : City of Beacon-Wastewater Treatment Plant	Estimated by: JG	
	Project #: 4471-01	Checked by:	
	Measure: HVAC Control Upgrades	Approved by:	
	Date: 05/02/11	File: Cost Estimate	

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$2,670.00	$2,670.00	$1,780.00	$1,780.00	$4,450.00
2	Bond	1	LS	$89.02	$89.02		$0.00	$89.02
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00

SUBTOTALS:		$4,539.02
Contingency:	10.0%	$453.90
TOTAL DIRECT CONSTRUCTION COST:		$4,992.92
Audit, Engineering, & Construction Management:	32.0%	$1,597.74
SUBTOTAL:		$6,590.66
Asbestos Abatement Services:		$0.00
Contingency:		$0.00
TOTAL ASBESTOS CONSTRUCTION COST:		$0.00
Asbestos Abatement Services Fee:		$0.00
Asbestos SUBTOTAL:		$0.00
TOTAL:		$6,590.66

Programmable Thermostats & Boiler Staging Control
City of Beacon-Tompkins Fire Hose
Project No.: 4471-01

Measure Summary Table

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	55	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$740	Per Year
Total Energy & O&M Savings	$740	Per Year
Project Costs		
Total Measure Cost	$8,738	
Payback		
Simple Payback	11.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	11.8	Year(s)

Programmable Thermostats
Temperature Setback Savings - Heating

Assumptions:

Occ. Indoor Temp.	72
Reduced Occ Temp,	72
Unocc. Indoor Temp.	65
Peak Heating Load	247 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	2	8	4
Unoccupied	6	0	4
Weekends			
Occupied	2	8	6
Unoccupied	6	0	2
% Occupied	25.00%	100.00%	57.14%

Bin Temperature Data (Heating Only)				Occ % Load at IAT =	Red. Occ % Load at IAT =	Unocc % Load at IAT =	Existing Conditions					Proposed Condiitions					Total Reduced	Total Reduced
	Hours/Bin						Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	72	72	65	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	(mmBtu)	($)
-7.5	5	0	1	89%	89%	81%	219	1.3	200	0.0	1.3	219	0.4	200	0.8	1.2	0.1	$1.09
-2.5	9	1	3	83%	83%	75%	205	2.7	186	0.0	2.7	205	1.0	186	1.5	2.5	0.2	$2.09
2.5	24	6	9	78%	78%	70%	192	7.5	172	0.0	7.5	192	3.3	172	3.8	7.1	0.4	$5.69
7.5	50	16	25	72%	72%	64%	178	16.2	159	0.0	16.2	178	7.6	159	7.6	15.3	0.9	$12.56
12.5	76	37	51	66%	66%	59%	164	26.9	145	0.0	26.9	164	14.0	145	11.4	25.4	1.5	$20.54
17.5	108	58	80	61%	61%	53%	150	37.0	131	0.0	37.0	150	19.6	131	15.1	34.7	2.2	$30.03
22.5	146	90	121	55%	55%	47%	136	48.7	117	0.0	48.7	136	26.7	117	18.9	45.6	3.1	$42.03
27.5	205	138	167	50%	50%	42%	123	62.6	103	0.0	62.6	123	34.9	103	23.3	58.2	4.3	$58.70
32.5	261	223	256	44%	44%	36%	109	80.6	90	0.0	80.6	109	47.3	90	27.4	74.7	5.9	$79.58
37.5	201	223	238	39%	39%	31%	95	63.0	76	0.0	63.0	95	38.9	76	19.2	58.1	4.9	$65.84
42.5	130	179	153	33%	33%	25%	81	37.6	62	0.0	37.6	81	24.3	62	10.1	34.4	3.1	$42.48
47.5	94	135	105	27%	27%	20%	68	22.6	48	0.0	22.6	68	14.8	48	5.6	20.3	2.2	$30.09
52.5	69	107	74	22%	22%	14%	54	13.4	34	0.0	13.4	54	9.0	34	2.9	11.8	1.6	$21.74
57.5	44	97	41	16%	16%	8%	40	7.3	21	0.0	7.3	40	5.3	21	1.0	6.3	1.0	$13.17
62.5	22	62	25	11%	11%	3%	26	2.9	7	0.0	2.9	26	2.1	7	0.2	2.3	0.5	$7.09
67.5	7	43	19	5%	5%	0%	12	0.9	0	0.0	0.9	12	0.7	0	0.0	0.7	0.2	$2.24
Total	1,451	1,415	1,368					430			430		249		148	397	32	$433.89

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

Cost of mmBtu $13.50

430 Annual Heat Load
430 Annual Btu Usage

7.5% Savings

Annual Savings Summary	
Fuel (mmBtu)	32
Cost ($)	$433.89

LABOR & MATERIAL ESTIMATE

WENDEL

	Project : City of Beacon-Tompkins Fire Hose	Estimated by: JG	
	Project #: 4471-01	Checked by:	
	Measure: HVAC Control Upgrades	Approved by:	
	Date: 05/02/11	File: Cost Estimate	

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$3,540.00	$3,540.00	$2,360.00	$2,360.00	$5,900.00
2	Bond	1	LS	$118.03	$118.03		$0.00	$118.03
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00

SUBTOTALS:	$3,658.03	$2,360.00	$6,018.03
Contingency:		10.0%	$601.80
TOTAL DIRECT CONSTRUCTION COST:			$6,619.83
Audit, Engineering, & Construction Management:		32.0%	$2,118.35
SUBTOTAL:			$8,738.18
Asbestos Abatement Services:			$0.00
Contingency:			$0.00
TOTAL ASBESTOS CONSTRUCTION COST:			$0.00
Asbestos Abatement Services Fee:			$0.00
Asbestos SUBTOTAL:			$0.00
TOTAL:			$8,738.18

Section 6

FIM #4: Building Envelope Improvements

FIM #4: BUILDING ENVELOPE IMPROVEMENTS

INVESTIGATION

The City buildings were designed and constructed at varying times, and significantly differs in architectural styles. The buildings identified for this measure include: the Memorial Building, Municipal Building, Lewis Tompkins Fire House, Mase Hook and Ladder Fire House, and Beacon Engine Fire House. The poor performance of the caulking and weather stripping in these buildings contributes to the overall infiltration of air. A weatherization energy measure therefore, will result in decreased fuel usage as well as added occupant comfort by minimizing drafts in the winter.

A field survey was conducted to assess the condition of each of these buildings. The findings were analyzed using a spreadsheet that calculates building heat losses based on crack length and width. Using Heating Degree Day (HDD) data and contractor implementation pricing, Wendel developed a scope of work for the successful implementation of this measure.

The purpose of this measure is to reduce the infiltration rate to the buildings, thereby retaining the cooling or heating produced by the HVAC and reducing the energy consumption required to maintain an acceptable working environment.

This measure will utilize commercial grade door sweeps and weather stripping to help decrease existing infiltration rates. The sweep units will be constructed from a vinyl strip that will not corrode or conduct temperatures like aluminum door sweeps. Weather-stripping around exterior doors and door jambs will also be installed to minimize the infiltration rate to the building.

RECOMMENDATIONS

The following improvements have been identified at each of the buildings noted above. These improvements are based on an inspection of the exterior door systems, internal structural

connections of the roofline and exterior walls.

Given the age of many of these buildings, the weather-stripping utilized in the door systems should be replaced. Similarly, there are several locations where preventive maintenance such as lubrication and repair work should be performed to further reduce infiltration and exfiltration.

Building Envelope Improvements

Beacon Engine #1

Project No.: 4471-01

Measure Summary Table

5/2/2011

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	57	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$776	Per Year
Total Energy & O&M Savings	$776	Per Year
Project Costs		
Total Measure Cost	$10,804	
Payback		
Simple Payback	13.9	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	13.9	Year(s)

Project Name: City of Beacon ECM # 4
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 5/2/2011

Building Envelope Improvements

Beacon Engine #1

Existing Condition:

The existing door and window seals are aging and allowing infiltration. Also areas such as roof/wall joints are not sealed and allowing infiltration. The infiltration through these areas increases the heating load.

Proposed Condition:

Areas of infiltration will be sealed and new weather stripping will be installed reducing the heating load.

Given and Assumed Data:

k (Constant)	=	20
$(dP)^n$ (Constant)	=	6.69
DD - Degree Days	=	5940
Price per Therm	=	$1.37

Area of Infiltration

160 feet door/hatch perimeter at 1/16"
.45 sqft hole in foundation
.1 sqft foundation vents
20 Misc arched window sealing at 1/16"
110 feet of rim joist/wall intersection at 1/16"

Total sqft	=	2.06

Calculations:

Infiltration Rate ($Q = k \times (dP)^n \times A$)	=	275.68
Natural Gas Thermal Savings ($T = (Q \times DD) / 2890$)	=	566.63 therms
Dollar Savings (D = T x Price per Therm)	=	$776.28

LABOR & MATERIAL ESTIMATE — WENDEL

Project :	Beacon Engine #1	Estimated by:	AMB
Project #:	4471-01	Checked by:	DI
Measure:	Building Envelope Improvements	Approved by:	DI
Date:	05/02/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material Unit Price	Material Total	Labor Unit Price	Labor Total	Total Cost Labor & Material
1	Zerodraft Bid 3/26/11	1	LS	$4,334.53	$4,334.53	$2,889.68	$2,889.68	$7,224.21
2	Bond	1	LS	$216.73	$216.73		$0.00	$216.73
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$4,551.26		$2,889.68	$7,440.94
						Contingency:	10.0%	$744.09
						TOTAL DIRECT CONSTRUCTION COST:		$8,185.03
						Audit, Engineering, & Construction Management:	32.0%	$2,619.21
						SUBTOTAL:		$10,804.24
						Asbestos Abatement Services:		$0.00
						Contingency:	10.0%	$0.00
						TOTAL ASBESTOS CONSTRUCTION COST:		$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
						Asbestos SUBTOTAL:		$0.00
						TOTAL:		$10,804.24

Building Envelope Improvements

Mase Hook & Ladder

Project No.: 4471-01

Measure Summary Table

5/2/2011

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	30	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$510	Per Year
Total Energy & O&M Savings	$510	Per Year
Project Costs		
Total Measure Cost	$9,687	
Payback		
Simple Payback	19.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	19.0	Year(s)

Project Name: City of Beacon ECM # 4
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 5/2/2011

Building Envelope Improvements

Mase Hook & Ladder

Existing Condition:

The existing door and window seals are aging and allowing infiltration. Also areas such as roof/wall joints are not sealed and allowing infiltration. The infiltration through these areas increases the heating load.

Proposed Condition:

Areas of infiltration will be sealed and new weather stripping will be installed reducing the heating load.

Given and Assumed Data:

k (Constant)	=	20
$(dP)^n$ (Constant)	=	6.69
DD - Degree Days	=	5940
Price per Gallon	=	$1.71

Area of Infiltration

213 feet door/hatch perimeter at 1/16"
28 feet of operable window sash perimeter at 1/32"
100 feet of roof/wall intersection at 1/16"

Total sqft	=	1.70

Calculations:

Infiltration Rate ($Q = k \times (dP)^n \times A$)	=	227.88
Fuel Oil Thermal Savings ($T = (Q \times DD) / 4537$)	=	298.34 therms
Dollar Savings (D = T x Price per gallon)	=	$510.17

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	Mase Hook & Ladder	Estimated by:	AMB
Project #:	4471-01	Checked by:	DI
Measure:	Building Envelope Improvements	Approved by:	DI
Date:	05/02/11	File:	Cost Estimate

Item				Material		Labor		Total Cost
No.	Description	Qty.	Unit	Unit Price	Total	Unit Price	Total	Labor & Material
1	Zerodraft Bid 3/26/11	1	LS	$3,886.33	$3,886.33	$2,590.88	$2,590.88	$6,477.21
2	Bond	1	LS	$194.32	$194.32		$0.00	$194.32
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
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					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$4,080.65		$2,590.88	$6,671.53
						Contingency:	10.0%	$667.15
							TOTAL DIRECT CONSTRUCTION COST:	$7,338.68
						Audit, Engineering, & Construction Management:	32.0%	$2,348.38
							SUBTOTAL:	$9,687.06
							Asbestos Abatement Services:	$0.00
						Contingency:	10.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$9,687.06

Building Envelope Improvements
Memorial Building
Project No.: 4471-01

Measure Summary Table

5/2/2011

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	27	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$462	Per Year
Total Energy & O&M Savings	$462	Per Year
Project Costs		
Total Measure Cost	$9,952	
Payback		
Simple Payback	21.5	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	21.5	Year(s)

Project Name: City of Beacon ECM # 4
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 5/2/2011

Building Envelope Improvements

Memorial Building

Existing Condition:

The existing door and window seals are aging and allowing infiltration. Also areas such as roof/wall joints are not sealed and allowing infiltration. The infiltration through these areas increases the heating load.

Proposed Condition:

Areas of infiltration will be sealed and new weather stripping will be installed reducing the heating load.

Given and Assumed Data:

k (Constant)	=	20
$(dP)^n$ (Constant)	=	6.69
DD - Degree Days	=	5940
Price per Gallon	=	$1.71

Area of Infiltration

146 feet door/hatch perimeter at 1/16"
600 feet of window frame perimeter at 1/64"

Total sqft	=	1.54

Calculations:

Infiltration Rate ($Q = k \times (dP)^n \times A$)	=	206.28
Fuel Oil Thermal Savings ($T = (Q \times DD) / 4537$)	=	270.06 therms
Dollar Savings (D = T x Price per gallon)	=	$461.81

LABOR & MATERIAL ESTIMATE — WENDEL

Project :	Memorial Building	Estimated by:	AMB
Project #:	4471-01	Checked by:	DI
Measure:	Building Envelope Improvements	Approved by:	DI
Date:	05/02/11	File:	Cost Estimate

Item				Material		Labor		Total Cost
No.	Description	Qty.	Unit	Unit Price	Total	Unit Price	Total	Labor & Material
1	Zerodraft Bid 3/26/11	1	LS	$3,992.53	$3,992.53	$2,661.68	$2,661.68	$6,654.21
2	Bond	1	LS	$199.63	$199.63		$0.00	$199.63
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$4,192.16		$2,661.68	$6,853.84
						Contingency:	10.0%	$685.38
							TOTAL DIRECT CONSTRUCTION COST:	$7,539.22
						Audit, Engineering, & Construction Management:	32.0%	$2,412.55
							SUBTOTAL:	$9,951.78
							Asbestos Abatement Services:	$0.00
						Contingency:	10.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$9,951.78

Building Envelope Improvements
Municipal Building
Project No.: 4471-01

Measure Summary Table

5/2/2011

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	97	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,299	Per Year
Total Energy & O&M Savings	$1,299	Per Year
Project Costs		
Total Measure Cost	$17,896	
Payback		
Simple Payback	13.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	13.8	Year(s)

Project Name: City of Beacon ECM # 4
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 5/2/2011

Building Envelope Improvements

Beacon Engine #1

Existing Condition:

The existing door and window seals are aging and allowing infiltration. Also areas such as roof/wall joints are not sealed and allowing infiltration. The infiltration through these areas increases the heating load.

Proposed Condition:

Areas of infiltration will be sealed and new weather stripping will be installed reducing the heating load.

Given and Assumed Data:

k (Constant)	=	20
$(dP)^n$ (Constant)	=	6.69
DD - Degree Days	=	5940
Price per Therm	=	$1.34

Area of Infiltration

218 feet door/hatch perimeter at 1/16"
250 feet of window frame perimeter at 1/64"
.45 sqft hole in attic wall
50 seal ducting perim in roof at 1/16"
260 feet of roof/wall intersection at 1/16"

Total sqft	=	3.53

Calculations:

Infiltration Rate ($Q = k \times (dP)^n \times A$)	=	471.71
Natural Gas Thermal Savings ($T = (Q \times DD) / 2890$)	=	969.55 therms
Dollar Savings ($D = T \times$ Price per Therm)	=	$1,299.19

LABOR & MATERIAL ESTIMATE WENDEL

Project : Municipal Building		Estimated by: AMB
Project #: 4471-01		Checked by: DI
Measure: Building Envelope Improvements		Approved by: DI
Date: 05/02/11		File: Cost Estimate

Item No.	Description	Qty.	Unit	Material Unit Price	Material Total	Labor Unit Price	Labor Total	Total Cost Labor & Material
1	Zerodraft Bid 3/26/11	1	LS	$7,179.79	$7,179.79	$4,786.52	$4,786.52	$11,966.31
2	Bond	1	LS	$358.99	$358.99		$0.00	$358.99
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$7,538.78		$4,786.52	$12,325.30
						Contingency:	10.0%	$1,232.53
							TOTAL DIRECT CONSTRUCTION COST:	$13,557.83
						Audit, Engineering, & Construction Management:	32.0%	$4,338.51
							SUBTOTAL:	$17,896.34
							Asbestos Abatement Services:	$0.00
						Contingency:	10.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$17,896.34

Building Envelope Improvements

Tompkins Firehouse

Project No.: 4471-01

Measure Summary Table

5/2/2011

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	130	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,760	Per Year
Total Energy & O&M Savings	$1,760	Per Year
Project Costs		
Total Measure Cost	$26,119	
Payback		
Simple Payback	14.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	14.8	Year(s)

Project Name: City of Beacon ECM # 4
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 5/2/2011

Building Envelope Improvements

Beacon Engine #1

Existing Condition:

The existing door and window seals are aging and allowing infiltration. Also areas such as roof/wall joints are not sealed and allowing infiltration. The infiltration through these areas increases the heating load.

Proposed Condition:

Areas of infiltration will be sealed and new weather stripping will be installed reducing the heating load.

Given and Assumed Data:

k (Constant)	=	20
$(dP)^n$ (Constant)	=	6.69
DD - Degree Days	=	5940
Price per Therm	=	$1.35

Area of Infiltration

218 feet door/hatch perimeter at 1/16"
260 feet of roof/wall intersection at 1/16"

Total sqft	=	4.74

Calculations:

Infiltration Rate ($Q = k \times (dP)^n \times A$)	=	634.16
Natural Gas Thermal Savings ($T = (Q \times DD) / 2890$)	=	1303.42 therms
Dollar Savings ($D = T \times$ Price per Therm)	=	$1,759.62

LABOR & MATERIAL ESTIMATE — WENDEL

Project : Tompkins Firehouse	Estimated by: AMB
Project #: 4471-01	Checked by: DI
Measure: Building Envelope Improvements	Approved by: DI
Date: 05/02/11	File: Cost Estimate

Item No.	Description	Qty.	Unit	Material Unit Price	Material Total	Labor Unit Price	Labor Total	Total Cost Labor & Material
1	Zerodraft Bid 3/26/11	1	LS	$10,478.65	$10,478.65	$6,985.76	$6,985.76	$17,464.41
2	Bond	1	LS	$523.94	$523.94		$0.00	$523.94
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$11,002.59		$6,985.76	$17,988.35
						Contingency:	10.0%	$1,798.84
						TOTAL DIRECT CONSTRUCTION COST:		$19,787.19
						Audit, Engineering, & Construction Management:	32.0%	$6,331.90
						SUBTOTAL:		$26,119.08
						Asbestos Abatement Services:		$0.00
						Contingency:	10.0%	$0.00
						TOTAL ASBESTOS CONSTRUCTION COST:		$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
						Asbestos SUBTOTAL:		$0.00
						TOTAL:		$26,119.08

Section 7

FIM #6: Pump and Motor Upgrades

FIM #6: PUMP AND MOTOR UPGRADES

INVESTIGATION

A number of pump systems throughout the City of Beacon water treatment and wastewater treatment facilities were evaluated for potential energy efficiency improvements. Many of the pumps and process equipment motors are at or beyond their expected design life and of lower efficiency than currently available models. The opportunity exists to replace existing pumps with more efficient models, replace motors with new premium efficiency models or to rehabilitate existing pumps with pump coating or mechanical rebuilds to improve wire-to-water efficiency.

Motor and pump replacements for the various equipment and processes at the water and wastewater facilities were investigated to reduce electrical consumption and demand. Wendel identified potential pump replacement and motor retrofit opportunities and determined annual energy and maintenance cost savings for the various pump and motor systems evaluated. Improvements at the two water well sites were covered as a separate measure in this report.

Pump coating opportunities were investigated because they decrease the friction of the pumped materials against the pump, allowing for more efficient pumping. For the pump coating work, installed pump efficiency values provided by manufacturers were utilized as the baseline for the existing pumps. Wendel identified feasible pump coating retrofits and determine annual energy and maintenance cost savings for the applicable pumps at the water and wastewater facilities.

Existing System

The tables on the following page highlight the major existing pumps at the water and wastewater treatment facilities in the City of Beacon. They include HP, efficiency, and hours of operation for equipment greater than 5 HP, and operating at least 2,000 hours per year. Motor loading, power factor, pump and motor efficiency will be estimated based on the age of the equipment or pulled

from the available nameplate and pump curve data provided by the City of Beacon.

City of Beacon Water Treatment Plant

Item Description	Motor Efficiency	Pump Efficiency	Operating hours	Q (gpm)	TDH (ft)	Motor HP	VFD
Recycle Pump 1[1]	86.0%	47.0%	2000	340	48	10	No
Recycle Pump 2	87.0%	56.7%	2000	340	48	10	No
High Lift Pump 1	95.0%	83.0%	5870	1390	210	100	Yes
High Lift Pump 2	95.0%	83.0%	5870	1390	210	100	Yes
High Lift Pump 3	95.0%	83.0%	5870	1390	210	100	Yes

1. Motor efficiencies were not available for recycle pump 1; therefore, it was assumed that it had an efficiency of 86% for calculations.

City of Beacon Wastewater Treatment Plant

Item Description	Motor Efficiency	Pump Efficiency	Operating hours	Q (gpm)	TDH (ft)	Motor HP	VFD
Return Sludge Pump 1	87.0%	70.0%	2920	2100	13	15	No
Return Sludge Pump 2	89.0%	70.0%	2920	2100	13	15	No
Return Sludge Pump 3	92.4%	70.0%	2920	2100	13	15	No
Raw Sewage Pump 1	92.4%	64.0%	2920	5250	24	60	Yes
Raw Sewage Pump 2	92.4%	64.0%	2920	5250	24	60	Yes
Raw Sewage Pump 3	92.4%	64.0%	2920	5250	24	60	No

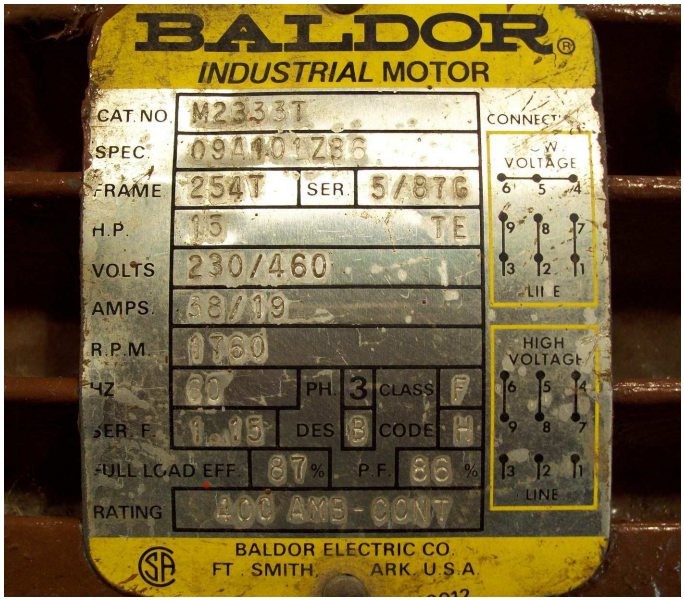
Proposed System

Three (3) options were considered as part of this study for increasing the efficiency of the pumps currently operating at the City of Beacon water and wastewater facilities. These options, which include motor replacement, pump coating and pump rehabilitation/replacement, are described below.

Option 1: Motor Replacements

There are several motors at the water treatment plant (WTP) and wastewater treatment plant (WWTP) that meet the 5HP and 2,000 or more operating hours per year criteria for consideration for upgrade. The analysis of the return sludge pumps and raw sewage pumps at the WWTP highlighted that the anticipated energy savings of replacing motors with efficiencies less than 90% would offset the projected capital costs within a reasonable period of time. The motors in recycle pump No's 1 and 2 had efficiencies of 87% and 89%, respectively. The remaining pumps at the WWTP had efficiencies 91.5% and higher.

The recycle pumps at the WTP met the criteria for consideration; however, further analysis revealed that the motors were integral to the pump for this type of pump and could not be replaced. The high lift pumps also met the criteria; however, they were already equipped with high efficiency motors. Therefore, the recycle pump motors and the high lift pump motors were removed from further investigation for this option, and no motor replacements were recommended for the WTP.



The calculations that follow this section indicate the energy savings, projected costs and simple payback for this option for recycle pump No's 1 and 2 at the WTP. Equipment and replacement costs were obtained from vendors, and pump and motor information was obtained from plant personnel. It was assumed that motor replacements would not have a quantifiable effect on operation and maintenance of the pumps.

Option 2: Pump Coating

It is proposed that the pumps which are in service for at least 2,000 hours per year have pump coatings applied to increase their efficiencies. According to the website of Belzona (a coating

manufacturer), increases in efficiency following pump coating range from 7% to 40%, depending on the age and condition of the pump, with the newest pumps having the lowest efficiency gains. This is due to the fact that the cited efficiency improvements include efficiency gains provided by disassembly and preparation (sand blasting and cleaning) of pump prior to coating. In addition, a white paper highlighting a pilot study performed by the Monroe County Water Authority (MCWA) with funding from NYSERDA showed increases in efficiency of 6-14% attributable to pump coating alone. Based on the MCWA study, an average efficiency increase of 10% due to the pump coating process was utilized for this analysis. Payback period changes significantly depending on what percent improvement is estimated. For example, at the WTP, efficiency increases of 6%, 10% and 14% give estimated payback periods of 15.3 years, 9.9 years and 7.5 years, respectively.

Based on the above criterion, pumps that were evaluated for pump coating included the recycle pumps and high lift pumps at the water treatment plant, and the return sludge and raw sewage pumps at the wastewater treatment plant. The calculations that follow this section indicate the energy savings, projected costs and simple payback for this option. Coating costs and pump disassembly and reassembly costs were obtained separately from two different vendors. Pump efficiencies for the existing pumps were provided by plant personnel. It was assumed that pump coating would not have a quantifiable effect on operation and maintenance of the pumps; however, the smooth coating would improve the operating point of the pumps so that they would use less electricity for operation.

Option 3: Pump Replacement/Rehabilitation

It is proposed that pumps with efficiencies 70% or lower be evaluated for replacement with newer, more efficient models or rehabilitated to attempt to bring them back to their original installed efficiencies. Pump impellers wear down over time, resulting in reduced efficiencies due to internal recycle and mechanical parts need periodic replacement to keep a pump operating at or near its design parameters. The sludge pumps in the water treatment plant have low design efficiencies; however, they each only run approximately 125 hours per year, thus, there would not be significant energy cost savings associated with replacing them, resulting in a poor payback. The recycle pumps at the WTP were considered for replacement; however, newer pumps didn't provide any significant efficiency gains due to operating constraints. These pumps, therefore, will not be considered for replacement until warranted by attrition.

The three high lift pumps at the WTP were evaluated to compare their current working efficiencies to their original certified pump curve. These pumps were originally installed in 1995, with pump No. 1 replaced some time later. To perform the analysis, the following steps were taken. First, the pump system head was calculated and the corresponding system curve was generated based on information obtained from plant personnel and drawings. Next, the certified pump curve provided by the manufacturer was plotted. Third, based on pressure and flow readings taken for the high lift pumps over a period from 4/13/10 through 4/21/10, a field pump curve was generated. This field curve was compared to the manufacturer's curve where it was determined that the pump was no longer operating at its optimal efficiency. Using centrifugal pump affinity laws, the pump heads obtained at various efficiencies vs. flow were plotted along with the original manufacturer's certified curve. Finally, using the same head and flow from the field data, the potential efficiency increase due to pump rehabilitation was determined.

The return sludge pumps and the raw sewage pumps at the WWTP all have low efficiencies and they have operational problems that have led to some of them being left out of service rather than rotating them with their counterparts. These pumps need to be replaced to provide adequate pumping capacity and redundancy, thus, they were evaluated for replacement as part of this study.

Using simple payback analysis, it is not cost effective to upgrade the existing pumps at the WWTP solely based on energy savings. However, due to their age and poor condition, it is likely that these pumps will need to be replaced in the near future. Replacing the pumps in kind will result in no energy savings. Replacing them with different, more energy efficient pumps under this measure will generate energy savings while bringing back functionality for the pumps. The calculations that follow this section indicate the energy savings, projected costs and simple payback for this option. Pump replacement costs were obtained from pump vendors. Installation costs were estimated based on previous jobs. Existing pump information and field data was provided by plant personnel.

It was assumed that pump rehabilitation would not have a quantifiable effect on operation and maintenance of the pumps. However, replacement of the pumps at the WWTP would likely decrease operation and maintenance costs. This rationale is due to the fact that since the pumps are in poor working condition, some sort of rehabilitation is necessary in the near future to keep/make the pumps operational. For this calculation, a price was obtained for rehabilitation, and then it was assumed that the rehabilitation would have a service life of 15 years. The cost of rehabilitation was divided over 15 years and considered to be maintenance cost savings, since new pumps would not require overhaul for at least 15 years.

RECOMMENDATIONS

Water Treatment Plant

It is recommended that the following improvements be implemented at the WTP to increase energy efficiency of pump operation:

- Rehabilitate two of the three high lift pumps, including impeller replacements, and other worn mechanical parts, such as bearings and seals, that have contributed to decreased efficiencies (relative to original certified pump curves).
- Install a new higher efficiency 18-pulse VFD.
- Install pump coating on the three high lift pumps.
- Install pump coating on the two recycle pumps.

There were no motor replacements recommended at the WTP. Existing motors were already high

efficiency, or they did not meet the criteria for replacement. The recycle pump motors were integral to the pumps and could not be replaced.

Wastewater Treatment Plant

It is recommended that the following improvements be implemented at the WWTP to increase energy efficiency of pump operation:

- Replace the three existing return sludge pump assemblies with three new 15 HP pump assemblies.
- Replace the three existing raw sewage pump assemblies with three new 40 HP pump assemblies.
- Install pump coating on the new return sludge pumps.
- Install pump coating on the new raw sewage pumps.
- Allowance of $285,803 with fees is included for valve replacements and / or bypass pumping to accommodate pump replacements. (FIM – 17 on "Total Project Summary")

Pump and Motor Upgrades - WWTP

Wastewater Treatment Plant

Project No.: 4471-01

Measure Summary Table

2-May-11

Savings		
Annual Demand Savings	135.5	kW/Year
Electrical Energy Savings	98,930	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings (NOTE 1)	$17,794	Per Year
Energy Savings ($)	$9,362	Per Year
Total Energy & O&M Savings	$27,156	Per Year
Project Costs		
Total Measure Cost	$788,579	
Payback		
Simple Payback	29.0	Year(s)

1. Annual operational and maintenance savings are calculated based on the cost to repair the existing pumps, which are all in poor working condition, divided over an estimated 20-year lifespan of the repaired equipment.

Project Name: City of Beacon EPC FIM#6 WWTP - Pump Replacement
Project Number 4471-01
Calculated By: CLM
Checked By:
Date: 1/11/2011

Wastewater Plant - Return Sludge Pump Installation

Existing System Parameters: **3** Pumps
Existing Motor Nameplate HP: **15** HP
Pump BHP = (Flow * Head * SG / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Existing Head : **13** ft

Existing Pumps

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
2,100	2,920	60.0%	87.0%	11.5	13.2	9.9	28,798
2,100	2,920	60.0%	89.0%	11.5	12.9	9.6	28,151
2,100	2,920	60.0%	92.4%	11.5	12.4	9.3	27,115
Total:	8,760					9.6	84,063

Proposed System Parameters: 3 Pumps
Proposed Motor Nameplate HP: **15** HP
Pump BHP = (Flow * Head * Specific Gravity / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Proposed Head: **13** ft

Proposed Pump

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
2,100	2,920	73.0%	92.4%	9.5	10.2	7.6	22,286
2,100	2,920	73.0%	92.4%	9.5	10.2	7.6	22,286
2,100	2,920	73.0%	92.4%	9.5	10.2	7.6	22,286
Total:	8,760					7.6	66,858

Summary

Estimated Existing Total Hours per Year	8,760
Estimated Proposed Hours per Year	8,760
Estimated Monthly kW Savings	2.0
Estimated kWh Savings	17,205
Estimated Cost / kW	$6.30
Estimated Cost / kWh	$0.086
Estimated Dollar Savings	$1,628

Assumptions:

1. The existing pumps have three (3) different motors with three (3) different efficiencies. It is recommended that the two motors whose efficiencies are less than 90% be replaced with NEMA premium motors (which are indicated in the motor calculation).
2. Since the existing RAS pumps are older the existing pump efficiencies were decreased by 10% from 70% to 60%.

Project Name: City of Beacon EPC FIM#6 WWTP - Pump Replacement
Project Number 4471-01
Calculated By: CLM
Checked By:
Date: 1/11/2011

Wastewater Plant - Raw Sewage Pump Installation

Existing System Parameters: **3 Pumps**
Existing Motor Nameplate HP: **60 HP**
Pump BHP = (Flow * Head * SG / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Existing Head : **24 ft**

Existing Pumps

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
5,250	2,920	64.0%	91.5%	49.8	54.4	40.6	118,477
5,250	2,920	64.0%	92.4%	49.8	53.9	40.2	117,323
5,250	2,920	64.0%	92.4%	49.8	53.9	40.2	117,323
Total:	8,760					40.3	353,124

Proposed System Parameters: **3 Pumps**
Proposed Motor Nameplate HP: **60 HP**
Pump BHP = (Flow * Head * Specific Gravity / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Proposed Head: **24** ft

Proposed Pumps

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
5,250	2,920	83.0%	92.4%	38.4	41.5	31.0	90,466
5,250	2,920	83.0%	92.4%	38.4	41.5	31.0	90,466
5,250	2,920	83.0%	92.4%	38.4	41.5	31.0	90,466
Total:	8,760					31.0	271,398

Summary

Estimated Existing Total Hours per Year	8,760
Estimated Proposed Hours per Year	8,760
Estimated Monthly kW Savings	9.3
Estimated kWh Savings	81,725
Estimated Cost / kW	$6.30
Estimated Cost / kWh	$0.086
Estimated Dollar Savings	$7,734

Assumptions:

1. The existing pumps have three (3) different motors with two (2) different efficiencies. These motors were not changed for this exercise because they were already efficient. In the future, when the motors ae at the end of their service life, it is recommended that they be replaced with NEMA

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon EPC	Estimated by:	CLM
Project #:	4471-01	Checked by:	
Measure:	Pump and Motor Upgrades - WWTP	Approved by:	
Date:	05/02/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost Labor & Material
				Unit Price	Total	Unit Price	Total	
1	Blue Heron Bid 4/1/11	1	LS	$300,000.00	$300,000.00	$200,000.00	$200,000.00	$500,000.00
2	ITT A-C Pump alternate	1	LS	$33,000.00	$33,000.00		$0.00	$33,000.00
3	Bond	1	LS	$10,098.18	$10,098.18		$0.00	$10,098.18
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
26					$0.00		$0.00	$0.00
27					$0.00		$0.00	$0.00
28					$0.00		$0.00	$0.00
29					$0.00		$0.00	$0.00
30					$0.00		$0.00	$0.00
31					$0.00		$0.00	$0.00
32					$0.00		$0.00	$0.00
33					$0.00		$0.00	$0.00
34					$0.00		$0.00	$0.00
35					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$343,098.18		$200,000.00	$543,098.18
						Contingency:	10.0%	$54,309.82
							TOTAL DIRECT CONSTRUCTION COST:	$597,408.00
						Audit, Engineering, & Construction Management:	32.0%	$191,170.56
							SUBTOTAL:	$788,578.56
							Asbestos Abatement Services:	$0.00
						Contingency:	0.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$788,578.56

Pump and Motor Upgrades
City of Beacon Water Treatment Plant
Project No.: 4471-01

Measure Summary Table

19-Apr-10

Savings		
Average Demand Savings	509.3	kW/Month
Electrical Energy Savings	389,092	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$38,315	Per Year
Total Energy & O&M Savings	$38,315	Per Year
Project Costs		
Total Measure Cost	$165,908	
Payback		
Simple Payback	4.3	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	4.3	Year(s)

Project Name:	City of Beacon EPC - FIM#6 Pump and Motor Upgrades Option 2: Pump Coating
Project Number:	4471-01
Calculated By:	SJR
Checked By:	BMS
Date:	4/19/2010

Purpose:

Pump coating has the potential to increase the efficiency of existing pumps at the City of Beacon Water Treatment Plant. If the pumps are more efficient, less electricity is required to achieve the same results. Case studies provided by the vendor have shown pump efficiency improvements of 6-14% due to pump coating alone, with additional efficiency gains due to pump rebuild.

Assumptions:

Pump Coating Efficiency Improvement:	10%
Specific Gravity (of water):	1

It was assumed that pumps were operating at their manufacturer's rated efficiencies.

Motor Efficiency for Recycle P-1 was unknown. Due to the age of the pump, it was assumed that the motor efficiency 86%

For Demand calculations, it was assumed that the recycle pumps would not operate during peak demand; however, two (2) high lift pumps would be in operation during peak demand periods.

Cost estimate does not include disassembly and reassembly of the High Lift Pumps (HLP) because it is included in the HLP calculation on the following pages.

Existing Pumps:

Pump ID	Head (ft)	Flow (gpm)	Run Time (hrs/yr)	Pump Efficiency	Motor Efficiency	WHP	BHP	kW	kWh
Recycle P-1	48	340	2000	47.0%	86.0%	4.12	10.20	7.60	15,206
Recycle P-2	48	340	2000	56.7%	87.0%	4.12	8.35	6.23	12,460
High Lift P-1	157	800	5870	70.0%	95.0%	31.72	47.69	35.57	208,773
High Lift P-2	157	800	5870	70.0%	95.0%	31.72	47.69	35.57	208,773
High Lift P-3	157	800	5870	70.0%	95.0%	31.72	47.69	35.57	208,773
							Total Annual kWh		**653,986**

Proposed Coated Pumps:

Pump ID	Head (ft)	Flow (gpm)	Run Time (hrs/yr)	Pump Efficiency	Motor Efficiency	WHP	BHP	kW	kWh
Recycle P-1	48	340	2000	57.0%	86.0%	4.12	8.41	6.27	12,539
Recycle P-2	48	340	2000	66.7%	87.0%	4.12	7.10	5.30	10,592
High Lift P-1	157	800	5870	80.0%	95.0%	31.72	41.73	31.12	182,677
High Lift P-2	157	800	5870	80.0%	95.0%	31.72	41.73	31.12	182,677
High Lift P-3	157	800	5870	80.0%	95.0%	31.72	41.73	31.12	182,677
							Total Annual kWh		**571,160**

Summary:

Simple Payback	
WTP Annual kWh Savings:	82,826
WTP Monthly kW Savings:	7.48
Electricity Cost per kWh:	$0.088
Electricity Cost per kW:	$8.00
Annual Dollar Savings:	$8,007
Cost of Pump Coating:	$118,413
Payback (years)	**14.8**

Project Name:	City of Beacon EPC - FIM#6 Pump and Motor Upgrades Option 3: Pump Rehabilitation
Project Number:	4771-01
Calculated By:	SJR
Checked By:	BMS
Date:	5/19/2010

PUMP REHABILITATION - HIGH LIFT PUMP NO'S 2 & 3

Existing System Parameters: 2 Pumps concurrent operation
Existing Nameplate Motor HP: 100 **HP**
Motor Efficiency (ME): **95%**
Input HP = Pump BHP / ME
Input kW = Input HP * 0.746
Pump BHP from pump curve

Existing

Measured Flow - GPM	Hours (HRH)	Measured TDH	Pump Efficiency (PE)	Pump BHP	Input HP	Input kW	Input kWh
800	8,760	157	46%	69	73	54	474,783
800	8,760	157	46%	69	73	54	474,783
Total:	17,520					108	949,565

Proposed System Parameters:
Proposed Nameplate Motor HP: 100 **HP**
New VSD Efficiency (VE): **97%**
Pump BHP = (Flow * Head * Specific Gravity / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME / VE
Input kW = (Input Hp * 0.746)
Proposed Discharge Head (PDH): **157** ft

Proposed

Flow - GPM	Hours (MH)	TDH	Pump Efficiency (PE)	Pump HP	Input HP	Input kW	Input kWh
800	8,760	157	70%	45	49	37	321,650
800	8,760	157	70%	45	49	37	321,650
Total:	17,520					73	643,299

Summary

Estimated Total Run Hours	17,520
Proposed Total Run Hours	17,520
Electricity Cost per kWh	$0.088
Electricity Cost per kW	$8.00
Estimated kW Savings per month	35
Estimated annual kWh Savings	306,266
Estimated Dollar Savings	$30,308

Assumptions:

1. Calculation was based on data obtained from field measurements taken from 4/13/10 through 4/21/10 and certified pump curves provided by the City of Beacon.

2. Two of three pumps run concurrently; each pump operates a total of 5760 hours per year. Two pumps are in simultaneous operation 8760 hours per year. High lift pump no. 1, which was a different model from pump no's 2 and 3, was assumed to have similar savings to those of pump no's 2 and 3. The hours of operation of pump #1 were added to the hours for pump no's 2 and 3 for this calculation.

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon	Estimated by:	SJR
Project #:	447101	Checked by:	BMS
Measure:	Pump and Motor Upgrades - Combined	Approved by:	
Date:	04/19/10	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost Labor & Material
				Unit Price	Total	Unit Price	Total	
1	Blue Heron Bid 4/1/11	1	LS	$67,200.00	$67,200.00	$44,800.00	$44,800.00	$112,000.00
2	Bonds	1	LS	$2,261.99	$2,261.99		$0.00	$2,261.99
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00

SUBTOTALS:	$69,461.99		$44,800.00	$114,261.99
Contingency:			10.0%	$11,426.20
TOTAL DIRECT CONSTRUCTION COST:				$125,688.19
Audit, Engineering, & Construction Management:			32.0%	$40,220.22
SUBTOTAL:				$165,908.41
Asbestos Abatement Services:				$0.00
Contingency:			10.0%	$0.00
TOTAL ASBESTOS CONSTRUCTION COST:				$0.00
Asbestos Abatement Services Fee:			9.0%	$0.00
Asbestos SUBTOTAL:				$0.00
TOTAL:				$165,908.41

Section 8

FIM #7: Air Blower Improvements

FIM #7: AIR BLOWER IMPROVEMENTS

INVESTIGATION

The City of Beacon wastewater treatment plant is currently equipped with three positive displacement aeration blowers that utilize variable frequency drives to adjust blower output. Blower output required is determined by an automated dissolved oxygen control system that continually monitors dissolved oxygen levels in the three aeration basins. The potential exists to utilize a more efficient aeration blower technology such as a turbo blower to reduce energy requirements.

Existing System

The City of Beacon is currently equipped with an activated sludge system that utilizes three blowers equipped with variable frequency drives. The blowers are manufactured by Sanitaire, model number 121 x i7885 with a capacity of 5078 CFM and 21.7 psi and equipped with 200 HP premium efficiency motors with a nominal efficiency of 95%. The City of Beacon also utilizes an automated control system to adjust blower output to maintain aeration basin dissolved oxygen levels in the 1 to 2 mg/L range. During a site visit the dissolved oxygen levels in the three aeration basins were 2.32, 0.82 and 1.98 mg/L respectively. Each aeration blower is equipped with a Robicon 3VX9000 variable frequency drive that is used to vary air output to match demand conditions.

Proposed System

The potential to replace the three existing blowers with turbo centrifugal blowers was evaluated. This blower type has been shown to be approximately 5% more efficient than positive displacement blowers that the City of Beacon utilizes. The proposed system would include the replacement of the three existing blowers with two new turbo blowers. The anticipated savings is approximately 366,875 kWh per year for an approximate dollar savings of $34,717 per year, with a project cost of approximately $583,123 and a simple payback of 16.8 years. The cost estimate was developed based on equipment quotations and benchmarking from similar projects completed within the last year.

RECOMMENDATIONS

It is recommended that the City of Beacon install this type of blower technology because the existing blowers are 30 years old. The turbo blowers would provide similar air output with 5% less energy usage resulting in reduced electrical bills throughout the life of the equipment.

Air Blower Improvements
Wastewater Treatment Plant
Project No.: 4471-01

Measure Summary Table

2-May-11

Savings		
Annual Demand Savings	502.6	kW/Year
Electrical Energy Savings	366,875	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$34,717	Per Year
Total Energy & O&M Savings	$34,717	Per Year
Project Costs		
Total Measure Cost	$542,263	
Payback		
Simple Payback	15.6	Year(s)
Potential Incentives (Note 1)	$33,019	
Simple Payback with Incentives	14.7	Year(s)

Project Name:	City of Beacon EPC FIM#9 WWTP - Aeration Blower Upgrades
Project Number:	4471-01
Calculated By:	CLM
Checked By:	BMS
Date:	1/6/2011

Wastewater Plant - Aeration Blower Improvements

Existing System Parameters: **3 Blowers**

Existing Motor Nameplate HP: 200 HP

Blower BHP = Motor HP x LF

Input HP = Blower BHP / TME

kW = (HP * 0.746)

TME = ME x BE

Load Factor (LF) = 0.65

Motor Eff. (ME) = 0.95

Blower Eff (BE) = 0.75

Existing Blowers

	Hours	Total Mechanical Efficiency (TME)	Blower BHP	Input HP	Input kW	Input kWh
Blower 1	2,920	71.3%	130.0	182.5	136.1	397,448
Blower 2	2,920	71.3%	130.0	182.5	136.1	397,448
Blower 3	2,920	71.3%	130.0	182.5	136.1	397,448
Total:	8,760				136.1	1,192,344

Proposed System Parameters: **2 Blowers**

Proposed Motor Nameplate HP: 200 HP

Blower BHP = Motor HP x PR

Input HP = Blower BHP / ME

kW = (HP * 0.746)

ME = 0.95

BE = 0.85

Proposed Blower

Average Rated Flow (CFM)[2]	Hours	Power Ratio (PR)[1]	Blower BHP	Input HP	Output kW	Input kWh
3,517	4,380	60.0%	120.0	126.3	94.2	412,734
3,517	4,380	60.0%	120.0	126.3	94.2	412,734
Total:	8,760				94.2	825,469

Summary

Estimated Existing Total Hours per Year	8,760
Estimated Proposed Hours per Year	8,760
Estimated Monthly kW Savings	41.9
Estimated kWh Savings	366,875
Estimated Cost / kW	$6.30
Estimated Cost / kWh	$0.086
Estimated Dollar Savings	$34,717

Assumptions:

% kWh savings were compared to a study in the Water Environment &Technology (WE&T) publication from the Water Environment Federation (WEF) where there was a 37% power reduction draw when a centrifugal blower was replaced with a turbo blower (see attachment).

Notes:

1. Power Ratio (PR) found on manufacturer provided blower curve (see attachment)
2. Average air flow was calculated based on one year of hydraulic and loading data provided by the City of

LABOR & MATERIAL ESTIMATE

WENDEL

	Project : City of Beacon EPC	Estimated by:	CLM
	Project #: 4471-01	Checked by:	BMS
	Measure: Aeration Blower Upgrades	Approved by:	
	Date: 05/02/11	File:	Cost Estimate

Item				Material		Labor		Total Cost
No.	Description	Qty.	Unit	Unit Price	Total	Unit Price	Total	Labor & Material
1	Blue Heron Bid 4/1/11	1	LS	$219,639.60	$219,639.60	$146,426.40	$146,426.40	$366,066.00
2	Bond	1	LS	$7,393.20	$7,393.20		$0.00	$7,393.20
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
26					$0.00		$0.00	$0.00
27					$0.00		$0.00	$0.00
28					$0.00		$0.00	$0.00
29					$0.00		$0.00	$0.00
30					$0.00		$0.00	$0.00
31					$0.00		$0.00	$0.00
32					$0.00		$0.00	$0.00
33					$0.00		$0.00	$0.00
34					$0.00		$0.00	$0.00
35								
36					$0.00		$0.00	$0.00
37					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$227,032.80		$146,426.40	$373,459.20
						Contingency:	10.0%	$37,345.92
							TOTAL DIRECT CONSTRUCTION COST:	$410,805.12
						Audit, Engineering, & Construction Management:	32.0%	$131,457.64
							SUBTOTAL:	$542,262.76
							Asbestos Abatement Services:	$0.00
						Contingency:	0.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$542,262.76

Section 9

FIM #8: Belt Press and Polymer System Upgrades

FIM #8: BELT PRESS AND POLYMER SYSTEM UPGRADES

INVESTIGATION

The City of Beacon wastewater treatment plant has an existing 3-belt filter press (3DP) for sludge dewatering that was installed in 2000. The belt press is used to dewater undigested primary and waste activated sludge (WAS). The performance of the press is greatly dependent on the ratio of primary to WAS, with greater dewatering occurring when higher percentages of more easily dewatered primary sludge is present. This condition would generally occur when significant amounts of solids are washed into the plant from the combined sewer system following storm events. Generally, sludge is conditioned with the addition of polymer, partially dewatered in the initial gravity belt section of the 3DP, and subsequently directed between two (2) continuous porous belts where water is squeezed from it to create a cake with a high percentage of dry solids. Optimum performance is dependent on the feed sludge solids concentration, the nature of the solids, and prior sludge conditioning.

The existing 3DP belt press at the wastewater treatment plant would benefit from upgrades to make the dewatering process more efficient. Significantly upgraded processes are available to produce a dryer dewatered sludge cake that will result in reduced disposal (tipping fees) and hauling costs.

BELT FILTER PRESS UPGRADES

The existing 3-belt press was manufactured by BDP Industries and was installed in the year 2000. While the dewatering press has performed well (producing 17 to 24 % solids: annual average 21.6%), several design improvements for 3-belt presses have been developed over the past ten (10) years and have been successfully incorporated into recent installations. These improvements are available as retrofits and would enhance the City of Beacon operation.

Adding two (2) additional furrowing plows to the gravity belt section will increase gravity water drainage in this section of the 3DP unit. Water removed in this section has less chance of interfering with the effectiveness of dewatering in the subsequent pressure dewatering zone.

Adding a “curved wedge” zone to the pressure zone of the 3DP unit will allow for a gradual increase in pressure on the conditioned partially dewatered sludge. In conjunction with the existing perforated main roller, the curved wedge will increase the amount of water removed and minimize the amount of solids “wash/squeeze-out” and the amount of sludge “rewetting” which often occurs with the current configuration.

To maximize the life of the existing belt press paint coating, several areas are in need of sanding and recoating. This will extend the useful life of the dewatering press and delay the need for costly frame overhaul/rebuilding by providing protection from the corrosive environment.

The estimated annual cost savings due to the combination of the improvements detailed above is based on an $83.24 per ton haul/disposal cost, provided by the City of Beacon.

RECOMMENDATION

It is recommended that the existing belt press be refurbished with the following upgrades:

- Two new furrowing plows which will continuously push aside sludge to expose the surface of the belt to allow more efficient draining should be added to the gravity drainage portion of the process.
- A new curved wedge zone should be added to the pressure zone. This will allow a gradual increase of pressure on the sludge cake as it approaches the pressure zone to enhance dewatering and eliminate cake washout.
- Areas of the press frame where the paint coating has deteriorated should be sanded and recoated. This will prevent further deterioration and extend the life of the equipment.

Belt Press Upgrades
City of Beacon Wastewater Treatment Facility
Project No.: 4471-01

Measure Summary Table

4/22/2009

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings	$48,628	Per Year
Energy Savings ($)	$0	Per Year
Total Energy & O&M Savings	$48,628	Per Year
Project Costs		
Total Measure Cost	$51,846	
Payback		
Simple Payback	1.1	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	1.1	Year(s)

Project Name: City of Beacon
Project Number: 4471-01
Calculated By: FAN
Checked By: BMS
Date: 3/15/2010

Existing Condition:

The City of Beacon currently utilizes a three-belt filter press installed in the year 2000. Since then, several design improvements to the technology have resulted in improved solids dewatering capabilities and subsequent savings for waste hauling and disposal (based on weight of waste solids).

Proposed Condition:

It is proposed that the City of Beacon implement the following improvements to the existing belt press to make the dewatering process more efficient:

- ◊ Install two new furrowing plows to push sludge aside and allow better gravity drainage
- ◊ Install a new curved wedge zone to the pressure portion of the belt press
- ◊ Sand and repaint areas of the press frame that have deteriorated due to corrosion

Given and Assumed Data:

Existing System Parameters:

Existing Wet Tons Solids:	=	6837.80
Existing % Solids:	=	21.48%
Current Disposal Rate (per wet ton):	=	$83.24
Current Disposal Cost:	=	$569,178

Proposed System Parameters:

Proposed Wet Tons Solids:	=	6253.60
Proposed % Solids:	=	23.48%
Proposed Disposal Rate (per wet ton):	=	$83.24
Proposed Disposal Cost:	=	$520,550

Assumptions:

- ◊ Current disposal rate (as given by plant personnel) will remain the same
- ◊ The improvements will enable the plant to add 2% to the average solids concentration

Project Name: City of Beacon
Project Number: 4471-01
Calculated By: FAN
Checked By: BMS
Date: 3/15/2010

Calculations:

Existing System Monthly Sludge Production:

MONTH	Loads*	Wet Tons**	% Solids	Dry Tons (given)	Dry Tons (calc)
January-09	28	535.20	23.0%	123.1	123.1
February-09	24	420.98	19.9%	83.8	83.8
March-09	35	601.88	24.0%	144.5	144.5
April-09	30	514.66	24.0%	123.5	123.5
May-09	37	727.49	20.0%	145.5	145.5
June-09	38	678.78	23.9%	162.2	162.2
July-09	40.5	779.94	21.4%	166.9	166.9
August-09	29.5	520.08	22.9%	119.1	119.1
September-09	32	621.32	23.0%	142.9	142.9
October-09	26	493.09	21.0%	103.6	103.5
November-09	32	516.38	17.7%	91.4	91.4
December-09	24	428.00	17.0%	72.8	72.8
TOTAL/AVG	376	6837.80	21.48%	1479.2	1479.2

* Stone
** Veolia

Proposed System Monthly Sludge Production:

Percent Solids Increase: 2.0%

MONTH	Wet Tons	% Solids	Dry Tons
January-09	492.38	25.0%	123.1
February-09	382.53	21.9%	83.8
March-09	555.58	26.0%	144.5
April-09	475.07	26.0%	123.5
May-09	661.35	22.0%	145.5
June-09	626.36	25.9%	162.2
July-09	713.28	23.4%	166.9
August-09	478.31	24.9%	119.1
September-09	571.61	25.0%	142.9
October-09	450.21	23.0%	103.5
November-09	463.96	19.7%	91.4
December-09	382.95	19.0%	72.8
TOTAL/AVG	6253.60	23.48%	1479.2

Summary:

Estimated sludge wet tonnage savings:	584.20
Estimated hauling and disposal dollar savings:	$48,628.41
Estimated cost to implement:	$51,846.38
Simple Payback (Years):	1.1

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon Wastewater Treatment Facility	Estimated by:	FAN
Project #:	4471-01	Checked by:	BMS
Measure:	Belt Press Upgrades	Approved by:	
Date:	04/22/09	File:	Cost Estimate

Item				Material		Labor		Total Cost
No.	Description	Qty.	Unit	Unit Price	Total	Unit Price	Total	Labor & Material
1	Blue Heron Bid Price	1	LS	$21,000.00	$21,000.00	$14,000.00	$14,000.00	$35,000.00
2	Bonds	1	LS	$706.87	$706.87		$0.00	$706.87
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$21,706.87		$14,000.00	$35,706.87
						Contingency:	10.0%	$3,570.69
							TOTAL DIRECT CONSTRUCTION COST:	$39,277.56
						Audit, Engineering, & Construction Management:	32.0%	$12,568.82
							SUBTOTAL:	$51,846.38
							Asbestos Abatement Services:	$0.00
						Contingency:	10.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$51,846.38

Section 10

FIM #9: Well Site Pump Upgrades

FIM #9: WELL SITE PUMP UPGRADES

INVESTIGATION

The City of Beacon currently has two (2) ground water wells (Wells 1 and 2) that provide a portion of the City's raw water supply. The wells are operated one at a time, with usage alternating yearly between them. The opportunity exists to increase efficiency of the existing pumps by pump coating, motor replacement, or pump replacement/rehabilitation. It was determined that new variable frequency drives were also needed for these pumps.

Existing System

The wells utilize the following existing pumps to provide raw water to the water treatment plant for processing:

Item Description	Motor Efficiency	Pump Efficiency	Operating hours	Q (gpm)	TDH (ft)	Motor HP	VFD
Well Site 1[1]	86.0%	74.3%	4380	800	495	150	Yes
Well Site 2[1]	86.0%	84.0%	4380	1200	425	200	Yes

1. Motor efficiencies were not available for well site pump 1 or well site pump 2; therefore, it was assumed that they had an efficiency of 86% for calculations.

An analysis was performed on well site pump 2 to find the actual pump efficiency based on electrical data and flow. It was discovered that the pump efficiency of well site 2 is actually approximately 39%. This efficiency was used in further analysis of energy savings. It was also assumed that well site pump 1 also had a pump efficiency of 39% because it was not in service at the time to gather data.

Proposed System

Wendel investigated four (4) options for increasing the efficiency of the pumps currently operating at the City of Beacon well sites. These options, which include motor replacement, pump coating, and pump replacement, are described below.

Option 1: Motor Replacements

The motors at the well sites met the 5HP and 2,000 or more operating hours per year criteria for consideration for upgrade. However, Wendel was unable to obtain information on the current motor efficiencies for the well pumps. Therefore, it was assumed that the motors had an efficiency of 86% for this study. The calculations that follow this section indicate the energy savings, projected costs and simple payback for this option. Equipment and replacement costs were obtained from vendors, and pump data was obtained from plant personnel.

Option 2: Pump Coating

It is proposed that the pumps which are in service for at least 2,000 hours per year receive pump coating to increase their efficiencies. According to the website of Belzona coating manufacturer, increases in efficiency following pump coating range from 7% to 40%, depending on the age and condition of the pump, with the newest pumps having the lowest efficiency gains. This is due to the fact that the cited efficiency improvements include efficiency gains provided by disassembly and preparation (sand blasting and cleaning) of pump prior to coating. In addition, a white paper highlighting a pilot study performed by the Monroe County Water Authority (MCWA) with funding from NYSERDA showed increases in efficiency of 6-14% attributable to pump coating alone. Based on the MCWA study, an average efficiency increase of 3% due to the pump coating process was utilized for this analysis on new pumps.

Based on the above criterion, both pumps at the well sites were evaluated for pump coating. The calculations that follow this section indicate the energy savings, projected costs and simple payback for this option. Coating costs were obtained from a vendor. Pump disassembly and reassembly costs were not able to be obtained dues to a lack of information on the wells; therefore, it was assumed that the cost was approximately twice the cost of the pump coating materials. Pump efficiencies were provided by plant personnel.

Option 3: VFD Improvements

It is proposed that both well site pumps receive new variable frequency drives (VFDs). This is due to requests by City of Beacon Water Department personnel due to the poor condition of their existing VFDs. There are no energy savings calculations for this option due to a lack of data at this time; however a cost estimate is provided at the end of this section. The materials were estimated by a vendor and the installation cost was taken as a percentage of the equipment costs, based on previous similar jobs.

In addition, Well Site No. 2 also has an existing PRV on the well site discharge that is always open. If this valve is removed, the approximate 8 psi of head loss it creates will be eliminated and the associated pressure can be replaced with the VFD reducing energy usage.

Option 4: Pump Replacement

It is proposed that both well site pumps 1 and 2 be replaced due to such low existing pump efficiencies. The calculations that follow this section indicate the energy savings, projected costs, and simple payback for this option.

RECOMMENDATIONS

It is recommended that the following improvements be implemented at the City of Beacon well sites:

- Replace existing pump at Well Site No. 1 with new pump.
- Replace existing pump at Well Site No. 2 with new pump.
- Install a new 18-pulse VFD for the pump at Well Site No. 1.
- Install a new 18-pulse VFD for the pump at Well Site No. 2.
- Install pump coating on the pump at Well Site No. 1.
- Install pump coating on the pump at Well Site No. 2.
- Well Site Inspection & Cleaning (FIM – 13 on "Total Project Summary")

Pump Replacement

City of Beacon Well Sites # 1 & # 2

Project No.: 4471-01

Measure Summary Table

2-May-11

Savings		
Annual Demand Savings	515.0	kW/Year
Electrical Energy Savings	375,927	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year*
Energy Savings ($)	$38,329	Per Year
Total Energy & O&M Savings	$38,329	Per Year
Project Costs		
Total Measure Cost	$553,013	
Payback		
Simple Payback	14.4	Year(s)

Project Name: City of Beacon
Project Number 4471-01
Calculated By: CLM
Checked By: BMS
Date: 1/10/2011

Well Site # 1 - Well Pump Installation

Existing System Parameters: **1** Pump
Existing Motor Nameplate HP: **150** HP
Pump BHP = (Flow * Head * SG / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Existing Operating Head : **317** ft
Name Plate Head: **495** ft
Name Plate Capacity: **800** gpm

Existing Pumps

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
640	4,380	49.0%	86.0%	104.6	121.6	90.7	397,399
Total:	4,380					90.7	397,399

Proposed System Parameters: 1 Pump
Proposed Motor Nameplate HP: **150** HP
Pump BHP = (Flow * Head * Specific Gravity / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Proposed Operating Head: **317** ft
Name Plate Head: **495** ft
Name Plate Capacity: **800** gpm

Proposed Pump

Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
640	4,380	83.0%	92.4%	61.7	66.8	49.9	218,359
Total:	4,380					49.9	218,359

Summary

Estimated Existing Total Hours per Year	4,380
Estimated Proposed Hours per Year	4,380
Estimated Monthly kW Savings	40.9
Estimated kWh Savings	179,040
Estimated Cost / kW	$8.00
Estimated Cost / kWh	$0.091
Estimated Dollar Savings	$18,255

Assumptions:
It was assumed that the Pump Efficiency for Well Site # 1 as the same as Well Site # 2. It was also assumed that the VFD was running at 80% load therefore the head is only 316.80 feet and the flow is only 640 gpm. No PRV was assumed in this Well Site.

Project Name: City of Beacon
Project Number 4471-01
Calculated By: CLM
Checked By: BMS
Date: 1/10/2011

Well Site # 2 - Well Pump Installation

Existing System Parameters: **1 Pump**
Existing Motor Nameplate HP: **200 HP**
Pump BHP = (Flow * Head * SG / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Existing Head : **272 ft**
Name Plate Head: **425** ft
Name Plate Capacity: **1200** gpm

Existing Pumps

Avg. Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
488	4,380	39.0%	86.0%	86.1	100.1	74.7	327,157
Total:	4,380					74.7	327,157

Proposed System Parameters: **1 Pump**
Proposed Motor Nameplate HP: **200 HP**
Pump BHP = (Flow * Head * Specific Gravity / 3956 / Pump Efficiency)
Input Hp = Pump BHP / ME
Input kW = (Input Hp * 0.746)
Proposed Operating Head: **254** ft
Name Plate Head: **425** ft
Name Plate Capacity: **1200** gpm

Proposed Pumps

Avg Rated Flow (GPM)	Hours	Pump Efficiency (PE)	Motor Efficiency (ME)	Pump BHP	Input HP	Input kW	Input kWh
488	4,380	83.0%	94.5%	37.7	39.9	29.7	130,270
Total:	4,380					29.7	130,270

Summary

Estimated Existing Total Hours per Year	4,380
Estimated Proposed Hours per Year	4,380
Estimated Monthly kW Savings	45.0
Estimated kWh Savings	196,887
Estimated Cost / kW	$8.00
Estimated Cost / kWh	$0.091
Estimated Dollar Savings	$20,074

Assumptions:
It was also assumed that the VFD was running at 80% load therefore the head is only 272 feet. PRV was assumed to be removed from this Well Site, which was assumed to lower the pressure by 8 psi (18.48 ft) therefore the proposed head is 254 feet.

Notes:
1. The average flows are from measured data.
2. Existing kW was measured.

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon EPC	Estimated by:	CLM
Project #:	4471-01	Checked by:	BMS
Measure:	Well Site Pump Replacement - New Efficient Pumps	Approved by:	
Date:	01/10/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Blue Heron Bid 4/1/11	1	LS	$223,993.80	$223,993.80	$149,329.20	$149,329.20	$373,323.00
2	Bond	1	LS	$7,539.76	$7,539.76		$0.00	$7,539.76
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
26					$0.00		$0.00	$0.00
27					$0.00		$0.00	$0.00
28					$0.00		$0.00	$0.00
29					$0.00		$0.00	$0.00
30					$0.00		$0.00	$0.00
31					$0.00		$0.00	$0.00
32					$0.00		$0.00	$0.00
33					$0.00		$0.00	$0.00
34					$0.00		$0.00	$0.00
35					$0.00		$0.00	$0.00
36					$0.00		$0.00	$0.00
37					$0.00		$0.00	$0.00
38					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$231,533.56		$149,329.20	$380,862.76
						Contingency:	10.0%	$38,086.28
							TOTAL DIRECT CONSTRUCTION COST:	$418,949.04
						Audit, Engineering, & Construction Management:	32.0%	$134,063.69
							SUBTOTAL:	$553,012.73
							Asbestos Abatement Services:	$0.00
						Contingency:	0.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$553,012.73

Section 11

FIM #10: Electric Room Heat Recovery

FIM #10: ELECTRIC ROOM HEAT RECOVERY

INVESTIGATION

The Beacon WTP currently has an electrical room that generates large amounts of heat that is currently vented to the outside. The WTP also has dehumidification equipment located in the basement/pipe gallery of the WTP. The existing dehumidification unit utilizes a desiccant rotor to remove humid air from the space. The humid air is absorbed the desiccant by then removed though the exhaust stream as the desiccant is heated by the reactivation electric heater. This process of heating the desiccant can be costly to operate.

Figure 2-1 Existing Desiccant Dehumidifier with Electric Heat

The potential exists to transfer the warm air from the electrical room to the basement and tunnels and reduce the need to operate the localized dehumidification and electric heating equipment. This approach will reduce operating hours of the existing equipment and save energy.

Proposed System

A simple supply and relief duct system would be used to divert some of electric room exhaust air into the tunnel. This would involve the installation of a new fan in the supply duct, dampers, ductwork and controls. Humidistat control would be utilized to start and stop the supply fan to provide the electric room air to the cool damp pipe chase areas to provide dehumidification. Interlocks will be utilized to ensure the dampers remain closed on the heat recovery ducts during

operation of the backup generator. The relief duct returns the cooler air from the pipe chase to the electrical room and provides pressure equalization between the spaces.

Energy savings calculations are based on the electric heater in the dehumidifier operating 25% of the time and that the utilizing air from the electric room will reduce the run hours to 12%. The energy savings also considered that a new ventilation fan installed in order to reduce the electric heater run time. There were no maintenance savings identified for this measure. Construction cost estimates are based contractor bids.

RECOMMENDATIONS

It is recommended that a heat recovery ducting and ventilation system be installed based on the project economics.

Electric Room Heat Recovery
City of Beacon WTP
Project No.: 447101

Measure Summary Table

4/22/2010

Savings		
Annual Demand Savings	(7.9)	kW/Year
Electrical Energy Savings	21,565	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,835	Per Year
Total Energy & O&M Savings	$1,835	Per Year
Project Costs		
Total Measure Cost	$23,549	
Payback		
Simple Payback	12.8	Year(s)

Project Name: City of Beacon WTP ECM #
Project Number: 447101
Calculated By: DI
Checked By:
Date: 4/22/2010

Electric Room Heat Recovery

Existing Condition:

A desicant dehumidier with electric heater is used to deumidify the air in the basement/pipe gallery areas of the WTP.

Proposed Condition:

Utilize heat from the adjjacent electric room to dehumidfiy the air in the pipe gallery by installing an air to air heat exchanger to miniize the need for th electric heater in the exising dehumidifier.

Given and Assumed Data:

Existing System Parameters:

A	Dehumidifier Nameplate Amperage:	=		36	Amps
B	Dehumidifier Voltage:	=		460	V
C	Electric Heater Size:	=		24	kW
D	Unit Operating Hours Per Year:	=		8,760	hrs
E	% Operating Hours of Electric Heater	=		25%	
F	Electric Usage Cost	=	$	0.088	per kWh
G	Demand Cost	=	$	8.00	per kW

Proposed System Parameters:

H	% Operating Hours of Electric Heater	=		12.5	%
I	Proposed Fan HP	=		1	Hp
J	Proposed Fan Operating Hours	=		8,760	hrs
K	% Operating Hours of Electric Heater	=		12%	
		=			
		=			

Conversion Factors:

Horsepower to Power:	=		0.0746	kW/hp

Project Name: City of Beacon WTP ECM #
Project Number: 447101
Calculated By: DI
Checked By:
Date: 4/22/2010

Calculations:

Existing System Energy Costs:

L	Dehumidifier Electric Heater Demand (C)	=		24	kW
M	Annual Electric Heater Usage (C x D x E)	=		52,560	kWh
N	Total Annual Energy Cost (M x F)	=	$	4,625	

Proposed System Energy Costs:

O	Dehumidifier Electric Heater Demand (C)	=		24	kW
P	Annual Electric Heater Usage (C x J x K)	=		25,229	kWh
Q	Additional Fan kW (I x 0.746 x 0.75 LF / 0.85 Eff)	=		0.66	kW
R	Additional Annual Fan Usage (Q x J)	=		5,766	kWh
S	Total Annual Energy Cost ((P + R) x F + Q x 12 x G)	=	$	2,791	
		=			

Savings:

T	Annual Energy Usage Savings (M - P - R)	=		21,565	kWh
U	Annual Demand Savings (-Q x 12)	=		-7.90	kW
V	Annual Energy Cost Savings (N - S)	=	$	1,835	

References:

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon WTP	Estimated by:	AMB
Project #:	447101	Checked by:	DI
Measure:	Electric Room Heat Recovery	Approved by:	DI
Date:	04/22/10	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Lewis Mechanical Bid	1	LS	$9,540.00	$9,540.00	$6,360.00	$6,360.00	$15,900.00
2		1	LS	$318.07	$318.07		$0.00	$318.07
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
8					$0.00		$0.00	$0.00
9					$0.00		$0.00	$0.00
10					$0.00		$0.00	$0.00
11					$0.00		$0.00	$0.00
12					$0.00		$0.00	$0.00
13					$0.00		$0.00	$0.00
14					$0.00		$0.00	$0.00
15					$0.00		$0.00	$0.00
16					$0.00		$0.00	$0.00
17					$0.00		$0.00	$0.00
18					$0.00		$0.00	$0.00
19					$0.00		$0.00	$0.00
20					$0.00		$0.00	$0.00
21					$0.00		$0.00	$0.00
22					$0.00		$0.00	$0.00
23					$0.00		$0.00	$0.00
24					$0.00		$0.00	$0.00
25					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
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					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$9,858.07		$6,360.00	$16,218.07
						Contingency:	10.0%	$1,621.81
							TOTAL DIRECT CONSTRUCTION COST:	$17,839.88
						Audit, Engineering, & Construction Management:	32.0%	$5,708.76
							SUBTOTAL:	$23,548.64
							Asbestos Abatement Services:	$0.00
						Contingency:	0.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	0.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$23,548.64

Section 12

FIM #12: Demand Curtailment

FIM #12: DEMAND CURTAILMENT

The City of Beacon Water and Wastewater Treatment Plants have an opportunity to apply to one of several energy curtailment programs available in New York State. In this type of program, the City agrees to reduce load from the power grid during periods of high demand by utilizing their onsite generation. The City of Beacon would receive an agreed upon annual compensation for having the ability to reduce load. Due to the age/condition of the existing generator and transfer switch equipment at the Wastewater treatment plant it is recommended that it be replaced as a part of this scope.

Section 13

FIM #14: Generator Replacement

FIM #14: GENERATOR REPLACEMENT

INVESTIGATION

The facility personnel noted that while the existing backup generator at the wastewater treatment plant is still in operable condition the generator is aging and some repair parts are no longer available. While investigating the existing equipment it was also found that the transfer switch equipment is nearing the end of its useful life. Facility personnel would also like a generator that could run the entire plant in the event of an outage. Currently the generator only provides power to one portion of the service that includes the equipment in the blower building such as the Raw Sewage Pumps, Aeration Blowers, Return Activated Sludge Pumps as well as some other processes.

Proposed System

It is proposed that a 750kW generator be installed near the existing plant transformer and switchgear. This generator can be tied into the power distribution system just after the switch gear and with two transfer switches can run all of the processes of the plant. Since the administration building is still on a separate electrical service this building will not be on the generator at this time. The proposed generator has additional capability for when the administration building gets tied into the same transformer the load can easily be added to the generator. The existing generator is to be decommissioned and the existing transfer switch be bypassed to accommodate the new equipment.

The demand response measure is affected by this installation as the program is based on how much load can be shed during the event period. With the tie in to the rest of the processes more of the plant load can be offset and therefore the city would be eligible for more compensation for participation in the program. The main benefit of this replacement is the increase in reliability and reduction in potential maintenance costs. With the existing equipment having reached or exceeded its expected service life any equipment failure could leave the plant without any backup and a large bill for emergency replacement or repair.

Section 14

FIM #15: Roof Replacement

FIM# 15 ROOF REPLACEMENT

INVESTIGATION

The City identified several facilities where the roofing was past or nearing the end of its useful life. These facilities include the Memorial Building, Transfer Station, and both well sites. The Memorial Building and Transfer Station roofing systems have failed to a point where water is infiltrating the buildings. Well Site #1 has had a roofing system failure as well as some masonry damage but shows no signs of infiltration. Well Site #2 is in the best condition of the facilities identified however is showing signs of its age. Due to the possibility of hazardous materials in the existing roofing construction an environmental testing company was brought in and it was found that the built up roofing material at the Memorial building contained Asbestos as well as the mortar at Well Site #1 and flashing in miscellaneous locations. These need to be remediated as a part of the replacement process.

Proposed System

It is recommended that the roofs identified be replaced with a cold applied modified bituminous roofing system. This build up system is durable, reliable, and easy to maintain. The roofing system will have a 20 year warranty. At Well Site #1 it is recommended that the section of parapet wall that has started to fail be rebuilt and where the mortar joints have failed the masonry is to be repointed. The Well Sites and Transfer Station use very little energy to heat the facility and therefore are minimally impacted by the improvement of the insulation value of the roofing. However the Memorial building roof is a large footprint over a frequently occupied space and heating energy savings will result from the improved insulation value of the new roofing. Energy savings calculations can be found at the end of this section outlining the savings involved with this measure.

ROOF REPLACEMENT

City of Beacon Memorial Building

Project No.: 4471-01

Measure Summary Table

8-Apr-11

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	75	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$919	Per Year
Total Energy & O&M Savings	$919	Per Year
Project Costs		
Total Measure Cost	$160,915	
Payback		
Simple Payback	175.0	Year(s)

Project Name: City of Beacon Memorial Building ECM# 244
Project Number: 4471-01
Calculated By: AMB
Checked By: DI
Date: 4/8/11

ROOF REPLACEMENT

Existing Condition:

The Memorial Building Roof above the Bingo Hall is failing and in need of replacement

Proposed Condition:

Replace roofing and increase insulation value.

Given and Assumed Data:

R Value of Proposed Roofing (Rp):	20.0	h ft2 F/Btu
R Value of Existing Roofing (Re):	7.5	h ft2 F/Btu
Average Temperature Inside (Ti):	72	F
Average Temperature Outside (To):	34	F
Heating Season Hours (H):	5,940	Hr
Energy Unit Conversion:	1,000,000	Btu/mmBtu
Dollar Cost Per Energy Unit (EUR):	$12.22	$/mmBtu
Roof Area (A):	4,000	ft2

Calculations:

Rate of Heat Transfer for Proposed Roofing (qp=(Ti-To)/Rp):	1.90	Btu/h ft2
Rate of Heat Transfer for Existing Roofing (qe=(Ti-To)/Re):	5.07	Btu/h ft2
Differential Rate of Heat Transfer (qd= qp-qe) :	3.17	Btu/h ft2
mmBtu Savings per year (ts = (qd x A / 1,000,000) x H)	75.2	mmBtu
$ Savings per year (S = ts x EUR)	$919.43	

LABOR & MATERIAL ESTIMATE

WENDEL

Project :	City of Beacon Memorial Building	Estimated by:	RS Roofing
Project #:	4471-01	Checked by:	AMB
Measure:	ROOF REPLACEMENT	Approved by:	DI
Date:	04/08/11	File:	Cost Estimate

Item No.	Description	Qty.	Unit	Material		Labor		Total Cost
				Unit Price	Total	Unit Price	Total	Labor & Material
1	Estimate	1	LS	$65,368.80	$65,368.80	$43,579.20	$43,579.20	$108,948.00
2	Bond	1	LS	$1,874.98	$1,874.98		$0.00	$1,874.98
3					$0.00		$0.00	$0.00
4					$0.00		$0.00	$0.00
5					$0.00		$0.00	$0.00
6					$0.00		$0.00	$0.00
7					$0.00		$0.00	$0.00
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					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
					$0.00		$0.00	$0.00
				SUBTOTALS:	$67,243.78		$43,579.20	$110,822.98
						Contingency:	10.0%	$11,082.30
							TOTAL DIRECT CONSTRUCTION COST:	$121,905.28
						Audit, Engineering, & Construction Management:	32.0%	$39,009.69
							SUBTOTAL:	$160,914.97
							Asbestos Abatement Services:	$0.00
						Contingency:	10.0%	$0.00
							TOTAL ASBESTOS CONSTRUCTION COST:	$0.00
						Asbestos Abatement Services Fee:	9.0%	$0.00
							Asbestos SUBTOTAL:	$0.00
							TOTAL:	$160,914.97

Section 15

FIM# 16: Furnace Replacement

FIM# 16 FURNACE REPLACEMENT

At the City's Highway garage an oil fired forced air furnace has reached the end of its service life and is in need of replacement. This furnace provides heat for an office and several storage and work spaces at the facility. This equipment will be replaced in kind.

Appendix A

Utility Data

Project Name: City of Beacon - Well Site #2
Project Address: Heath Road
Beacon, NY 12508
Facility Area: 3,000 sq.ft.

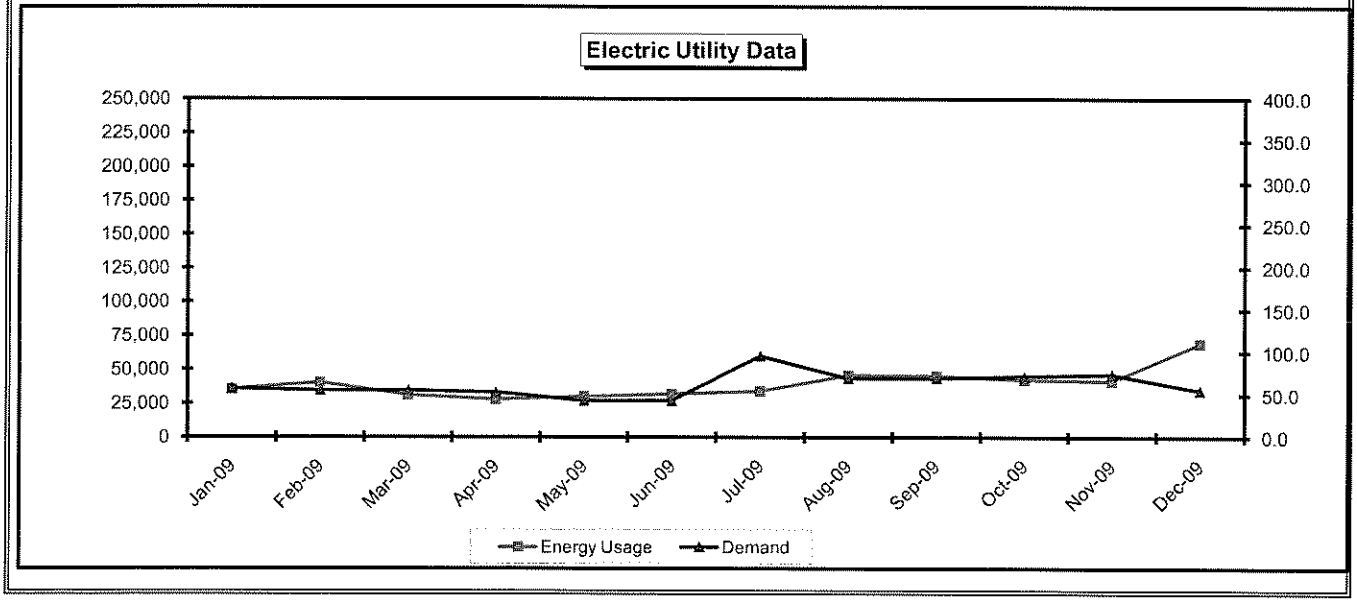
Utility Company: Central Hudson
Acct. No.: 7632-0130-00
Date: 5/12/2010
Rate: E201

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	57.6	$461	35,520	$20,848	$21,309	30	720	0.86
Feb-09	55.2	$442	40,320	$25,377	$25,819	31	744	0.98
Mar-09	55.2	$442	31,200	$17,449	$17,891	28	672	0.84
Apr-09	52.8	$422	27,840	$14,256	$14,678	31	744	0.71
May-09	43.2	$346	30,000	$10,786	$11,131	30	720	0.96
Jun-09	43.2	$346	31,920	$9,002	$9,347	31	744	0.99
Jul-09	96.0	$768	34,080	$11,912	$12,680	30	720	0.49
Aug-09	69.6	$557	45,840	$11,352	$11,909	31	744	0.89
Sep-09	69.6	$557	45,360	$18,558	$19,115	31	744	0.88
Oct-09	72.0	$576	42,480	$12,546	$13,122	30	720	0.82
Nov-09	74.4	$595	41,520	$13,577	$14,172	31	744	0.75
Dec-09	55.2	$442	69,120	$13,954	$14,395	30	720	1.74
Avg./Totals:	**62.0**	**$5,952**	**475,200**	**179,617**	**$185,569**	**364**	**8,736**	**0.91**

Energy Intensity (kWh/sq.ft.):	**158.40**	**Avg. Cost/kWh:**	**$0.378**
Blended Cost (inc.demand)/kWh:	**$0.391**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon - Waste Water Treatment Plant - Exterior lighting
Project Address: 90 Dennings Ave
Beacon, NY 12508
Facility Area: 14,500 sq.ft.

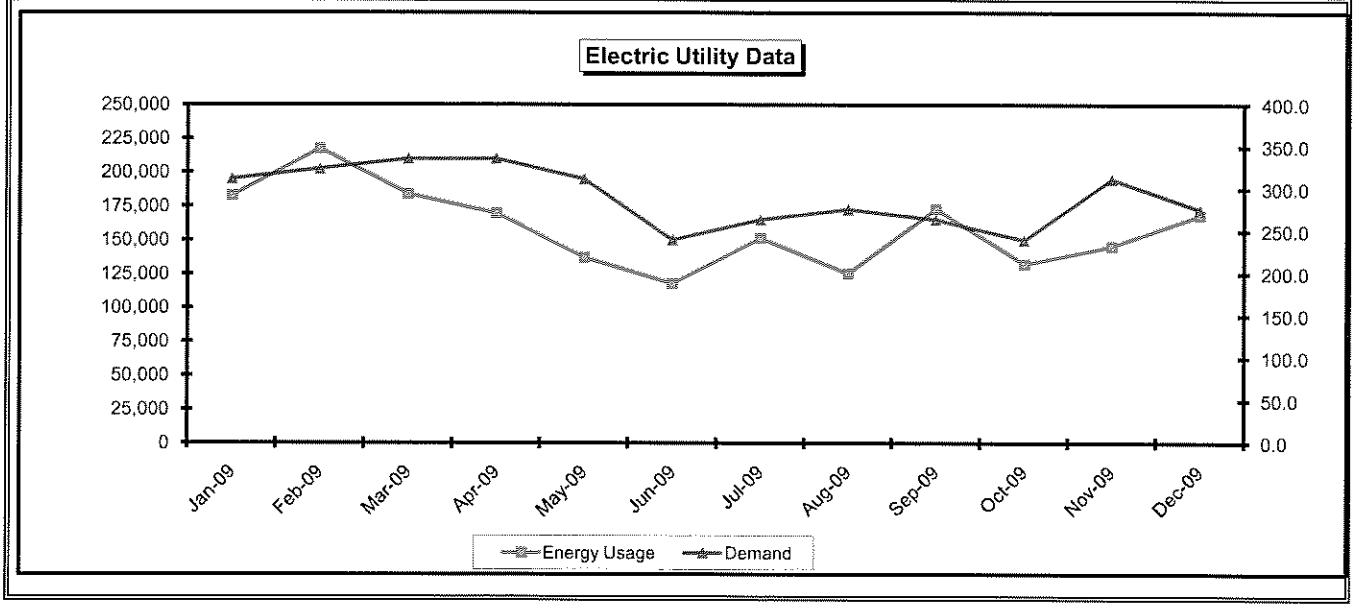
Utility Company: Central Hudson
Acct. No.: 7410-0450-00-1
Date: 5/12/2010
Rate: E230

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	312.0	$1,966	182,400	$19,343	$21,309	30	720	0.81
Feb-09	324.0	$2,041	217,200	$23,777	$25,819	31	744	0.90
Mar-09	336.0	$2,117	183,600	$15,774	$17,891	28	672	0.81
Apr-09	336.0	$2,117	169,200	$12,562	$14,678	31	744	0.68
May-09	312.0	$1,966	136,800	$9,166	$11,131	30	720	0.61
Jun-09	240.0	$1,512	117,600	$7,835	$9,347	31	744	0.66
Jul-09	264.0	$1,663	151,200	$11,017	$12,680	30	720	0.80
Aug-09	276.0	$1,739	124,800	$10,170	$11,909	31	744	0.61
Sep-09	264.0	$1,663	172,800	$17,452	$19,115	31	744	0.88
Oct-09	240.0	$1,512	132,000	$11,610	$13,122	30	720	0.76
Nov-09	312.0	$1,966	145,200	$12,207	$14,172	31	744	0.63
Dec-09	276.0	$1,739	168,000	$12,657	$14,395	30	720	0.85
Avg./Totals:	**291.0**	**$22,000**	**1,900,800**	**163,569**	**$185,569**	**364**	**8,736**	**0.75**

Energy Intensity (kWh/sq.ft.):	**131.09**	**Avg. Cost/kWh:**	**$0.086**
Blended Cost (inc.demand)/kWh:	**$0.098**	**Avg. Cost/kW:**	**$6.30**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: Water Plant Howland Ave, Liberty St Water Plant
Beacon, NY 12508
Facility Area: 17,500 sq.ft.

Utility Company: Central Hudson
Acct. No.: 7635-0261-00-4
Date: 5/12/2010
Rate: E201

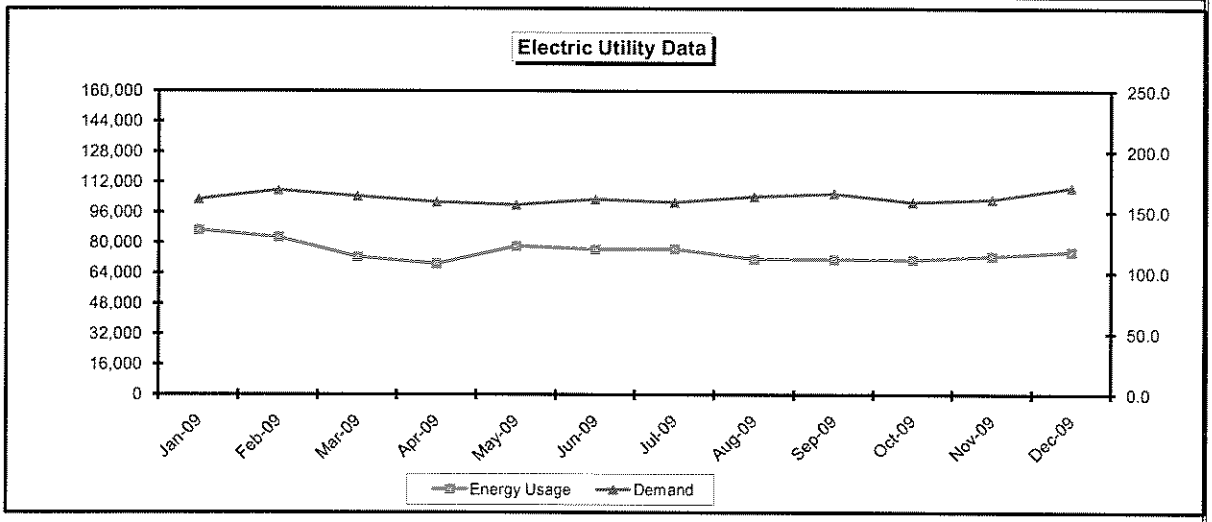
ANNUAL ELECTRIC UTILITY DATA

		A		B		C	D	E	F
	Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
	2009								
	Jan-09	160.8	$1,286	86,400	$8,123	$9,409	30	720	0.75
	Feb-09	168.0	$1,344	82,560	$9,334	$10,678	31	744	0.66
	Mar-09	163.2	$1,306	72,240	$6,480	$7,786	28	672	0.66
	Apr-09	158.4	$1,267	68,640	$5,363	$6,631	31	744	0.58
	May-09	156.0	$1,248	78,000	$5,546	$6,794	30	720	0.69
	Jun-09	160.8	$1,286	76,320	$5,367	$6,654	31	744	0.64
*	Jul-09	158.4	$1,267	76,560	$5,898	$7,165	30	720	0.67
	Aug-09	163.2	$1,306	71,280	$6,410	$7,715	31	744	0.59
	Sep-09	165.6	$1,325	71,040	$7,640	$8,965	31	744	0.58
*	Oct-09	158.4	$1,267	70,800	$6,632	$7,899	30	720	0.62
	Nov-09	160.8	$1,286	72,720	$6,518	$7,804	31	744	0.61
	Dec-09	170.4	$1,363	75,120	$6,363	$7,726	30	720	0.61
	Avg./Totals:	**162.0**	**$15,552**	**901,680**	**79,674**	**$95,226**	**364**	**8,736**	**0.64**

Energy Intensity (kWh/sq.ft.):	**51.52**	**Avg. Cost/kWh:**	**$0.088**
Blended Cost (inc.demand)/kWh:	**$0.106**	**Avg. Cost/kW:**	**$8.00**

*note - Missing bills calculated usage from similar months.

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: South Ave
Beacon, NY 12508
Facility Area: 10,000 sq.ft.

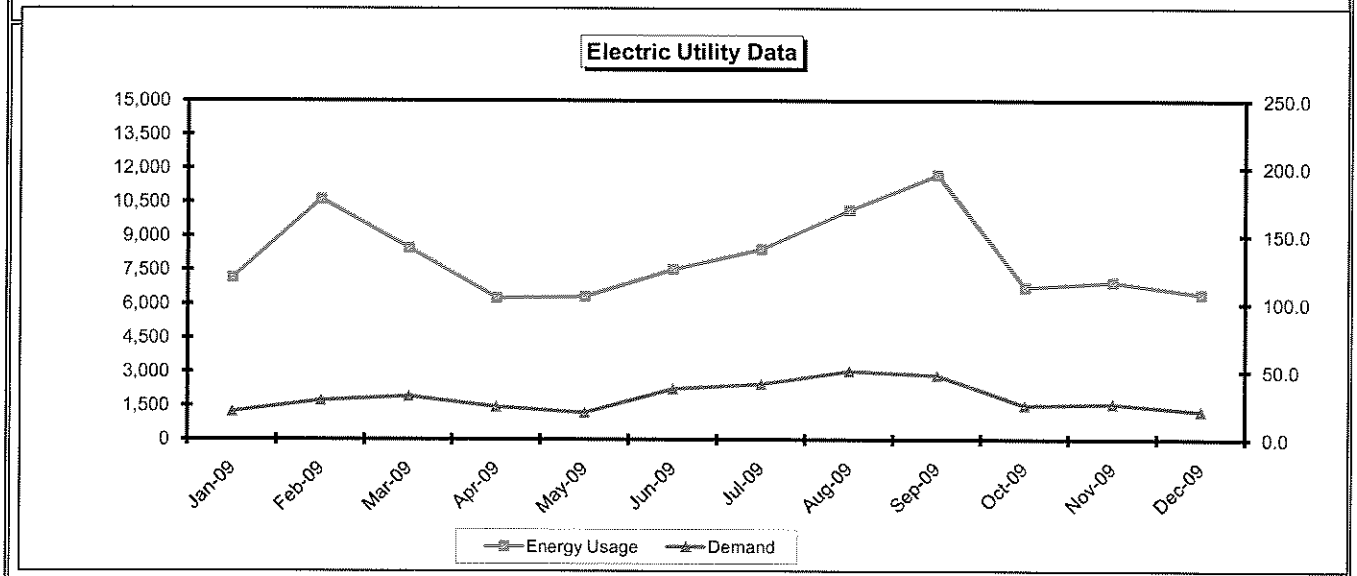
Utility Company: Central Hudson
Acct. No.: 7640-1260-00-5
Date: 5/12/2010
Rate: E200

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	20.4	$163	7,140	$696	$860	30	720	0.49
Feb-09	28.8	$230	10,620	$1,189	$1,420	31	744	0.50
Mar-09	31.8	$254	8,460	$978	$1,232	28	672	0.40
Apr-09	24.0	$192	6,240	$583	$775	31	744	0.35
May-09	19.8	$158	6,300	$518	$676	30	720	0.44
Jun-09	37.2	$298	7,500	$552	$850	31	744	0.27
Jul-09	40.8	$326	8,400	$619	$945	30	720	0.29
Aug-09	50.4	$403	10,140	$844	$1,247	31	744	0.27
Sep-09	47.4	$379	11,700	$1,094	$1,473	31	744	0.33
Oct-09	25.2	$202	6,720	$771	$972	30	720	0.37
Nov-09	26.4	$211	6,960	$699	$910	31	744	0.35
Dec-09	21.0	$168	6,420	$622	$790	30	720	0.42
Avg./Totals:	**31.1**	**$2,986**	**96,600**	**9,166**	**$12,151**	**364**	**8,736**	**0.37**

Energy Intensity (kWh/sq.ft.):	**9.66**	**Avg. Cost/kWh:**	**$0.095**
Blended Cost (inc.demand)/kWh:	**$0.126**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: South Ave
Beacon, NY 12508
Facility Area: 10,000 sq.ft.

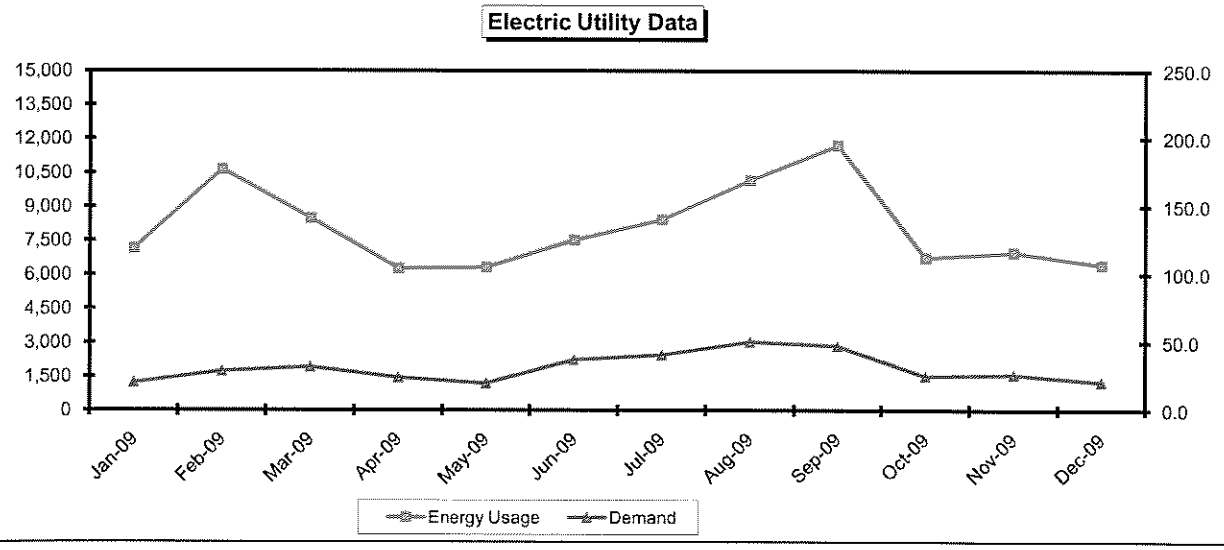
Utility Company: Central Hudson
Acct. No.: 7640-1260-00-5
Date: 5/12/2010
Rate: E200

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	20.4	$163	7,140	$696	$860	30	720	0.49
Feb-09	28.8	$230	10,620	$1,189	$1,420	31	744	0.50
Mar-09	31.8	$254	8,460	$978	$1,232	28	672	0.40
Apr-09	24.0	$192	6,240	$583	$775	31	744	0.35
May-09	19.8	$158	6,300	$518	$676	30	720	0.44
Jun-09	37.2	$298	7,500	$552	$850	31	744	0.27
Jul-09	40.8	$326	8,400	$619	$945	30	720	0.29
Aug-09	50.4	$403	10,140	$844	$1,247	31	744	0.27
Sep-09	47.4	$379	11,700	$1,094	$1,473	31	744	0.33
Oct-09	25.2	$202	6,720	$771	$972	30	720	0.37
Nov-09	26.4	$211	6,960	$699	$910	31	744	0.35
Dec-09	21.0	$168	6,420	$622	$790	30	720	0.42
Avg./Totals:	**31.1**	**$2,986**	**96,600**	**9,166**	**$12,151**	**364**	**8,736**	**0.37**

Energy Intensity (kWh/sq.ft.):	**9.66**	**Avg. Cost/kWh:**	**$0.095**
Blended Cost (inc.demand)/kWh:	**$0.126**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: 57 E Main St
Beacon, NY 12508
Facility Area: 10,000 sq.ft.

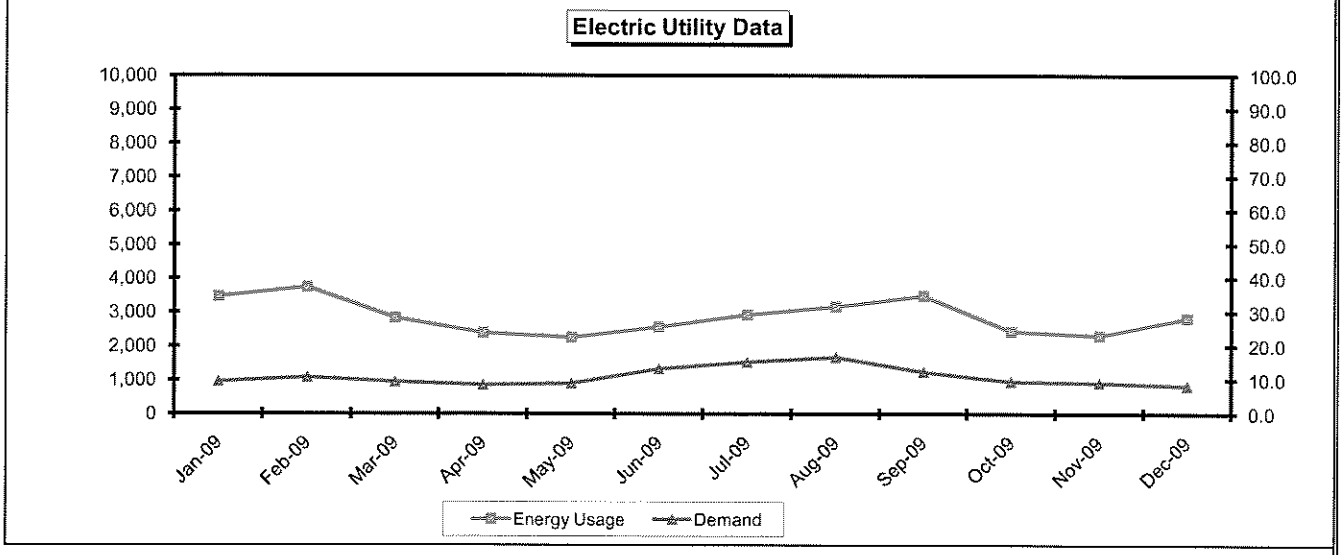
Utility Company: Central Hudson
Acct. No.: 7641-1685-00-1
Date: 5/12/2010
Rate: E200

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	9.5	$76	3,456	$407	$483	30	720	0.51
Feb-09	10.8	$86	3,726	$449	$535	31	744	0.46
Mar-09	9.4	$75	2,826	$282	$357	28	672	0.45
Apr-09	8.5	$68	2,376	$214	$282	31	744	0.38
May-09	9.0	$72	2,250	$188	$260	30	720	0.35
Jun-09	13.3	$106	2,556	$206	$312	31	744	0.26
Jul-09	15.3	$122	2,916	$163	$285	30	720	0.26
Aug-09	16.7	$134	3,150	$332	$466	31	744	0.25
Sep-09	12.4	$99	3,474	$422	$521	31	744	0.38
Oct-09	9.5	$76	2,430	$277	$353	30	720	0.36
Nov-09	9.2	$74	2,304	$256	$329	31	744	0.34
Dec-09	8.3	$66	2,826	$275	$342	30	720	0.47
Avg./Totals:	**11.0**	**$1,055**	**34,290**	**3,471**	**$4,526**	**364**	**8,736**	**0.37**

Energy Intensity (kWh/sq.ft.):	**3.43**	**Avg. Cost/kWh:**	**$0.101**
Blended Cost (inc.demand)/kWh:	**$0.132**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: 423-425 Main St
Beacon, NY 12508
Facility Area: 17,124 sq.ft.

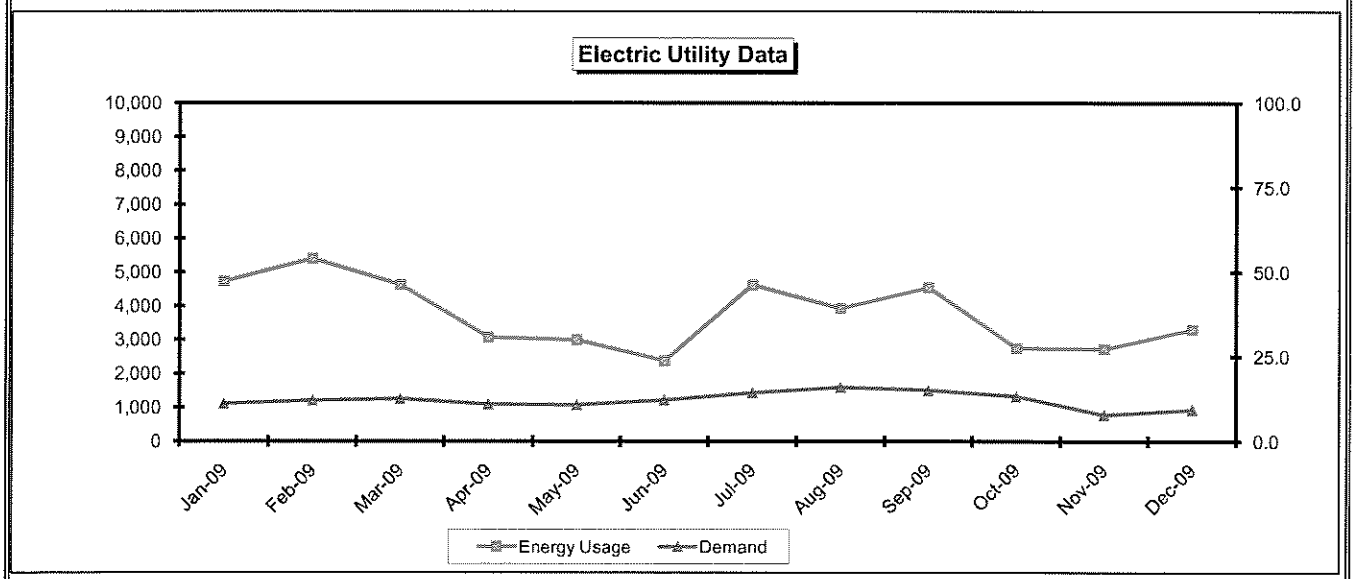
Utility Company: Central Hudson
Acct. No.: 7641-1310-00-6
Date: 5/12/2010
Rate: E200

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	11.2	$90	4,716	$546	$635	30	720	0.58
Feb-09	12.1	$97	5,382	$636	$733	31	744	0.60
Mar-09	12.6	$101	4,608	$441	$542	28	672	0.54
Apr-09	11.0	$88	3,060	$649	$737	31	744	0.37
May-09	10.8	$86	2,988	$240	$326	30	720	0.38
Jun-09	12.2	$98	2,376	$169	$267	31	744	0.26
Jul-09	14.4	$115	4,608	$421	$536	30	720	0.44
Aug-09	16.0	$128	3,924	$401	$529	31	744	0.33
Sep-09	15.1	$121	4,536	$536	$656	31	744	0.40
Oct-09	13.3	$106	2,736	$306	$412	30	720	0.29
Nov-09	7.9	$63	2,718	$292	$356	31	744	0.46
Dec-09	9.4	$75	3,294	$312	$388	30	720	0.49
Avg./Totals:	**12.2**	**$1,168**	**44,946**	**4,949**	**$6,117**	**364**	**8,736**	**0.43**

Energy Intensity (kWh/sq.ft.):	**2.62**	**Avg. Cost/kWh:**	**$0.110**
Blended Cost (inc.demand)/kWh:	**$0.136**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name: City of Beacon
Project Address: RT 9D Municipal Ctr
Beacon, NY 12508
Facility Area: 20,000 sq.ft.

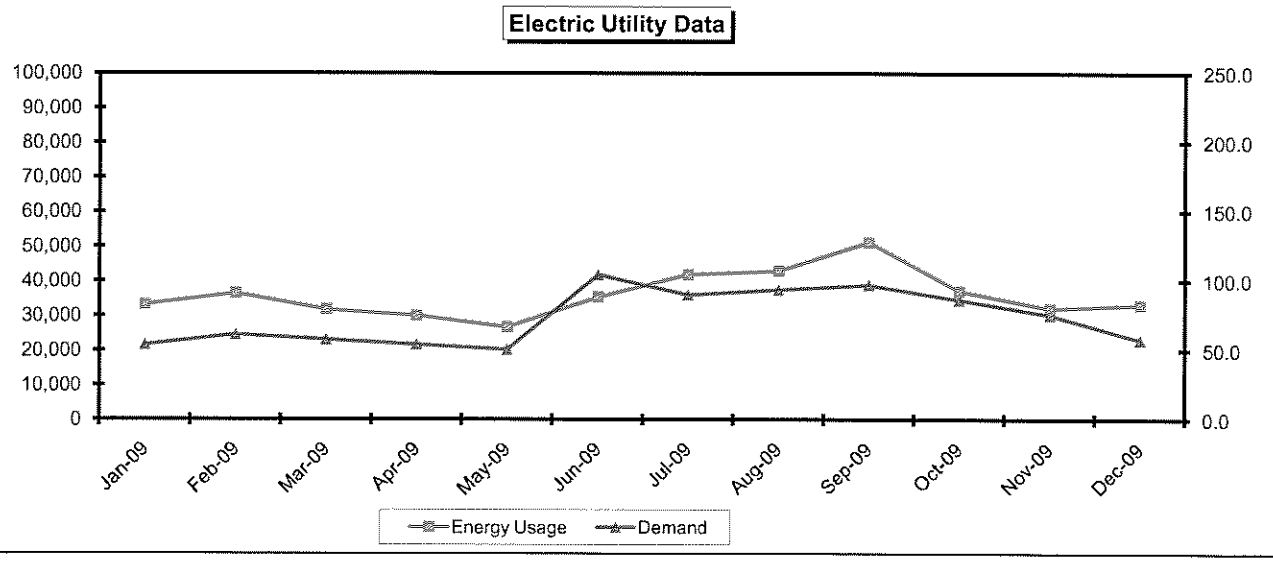
Utility Company: Central Hudson
Acct. No.: 7640-1062-00-5
Date: 5/12/2010
Rate: E201

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009								
Jan-09	54.0	$432	33,120	$3,135	$3,567	30	720	0.85
Feb-09	61.2	$490	36,360	$4,013	$4,503	31	744	0.80
Mar-09	57.6	$461	31,680	$3,603	$4,064	28	672	0.82
Apr-09	54.0	$432	29,880	$2,701	$3,133	31	744	0.74
May-09	50.4	$403	26,640	$2,104	$2,508	30	720	0.73
Jun-09	104.4	$835	35,280	$2,512	$3,347	31	744	0.45
Jul-09	90.0	$720	41,760	$2,974	$3,694	30	720	0.64
Aug-09	93.6	$749	42,840	$3,391	$4,140	31	744	0.62
Sep-09	97.2	$778	51,120	$4,599	$5,377	31	744	0.71
Oct-09	86.4	$691	37,080	$4,019	$4,710	30	720	0.60
Nov-09	75.6	$605	32,040	$3,033	$3,637	31	744	0.57
Dec-09	57.6	$461	33,120	$2,995	$3,456	30	720	0.80
Avg./Totals:	**73.5**	**$7,056**	**430,920**	**39,079**	**$46,135**	**364**	**8,736**	**0.69**

Energy Intensity (kWh/sq.ft.):	**21.55**	**Avg. Cost/kWh:**	**$0.091**
Blended Cost (inc.demand)/kWh:	**$0.107**	**Avg. Cost/kW:**	**$8.00**

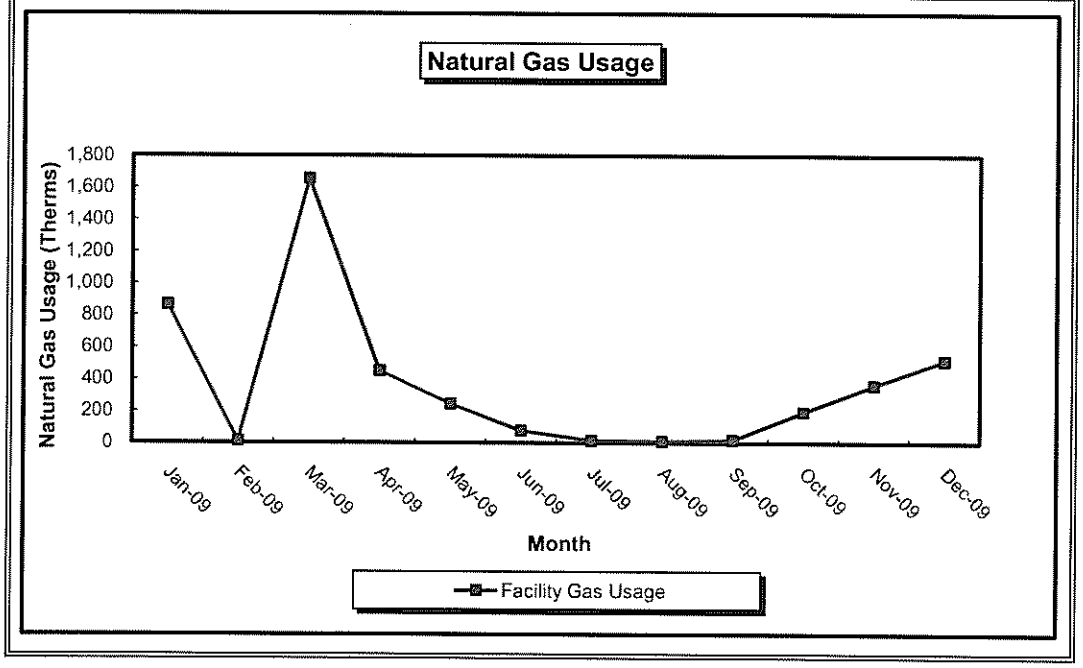
Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



Project Name:	City of Beacon
Project Address:	57 E Main St
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7641-1685-00-1
Date:	5/12/2010
Facility Area:	10,000 SQ. FT.
Rate:	G200

ANNUAL NATURAL GAS USAGE

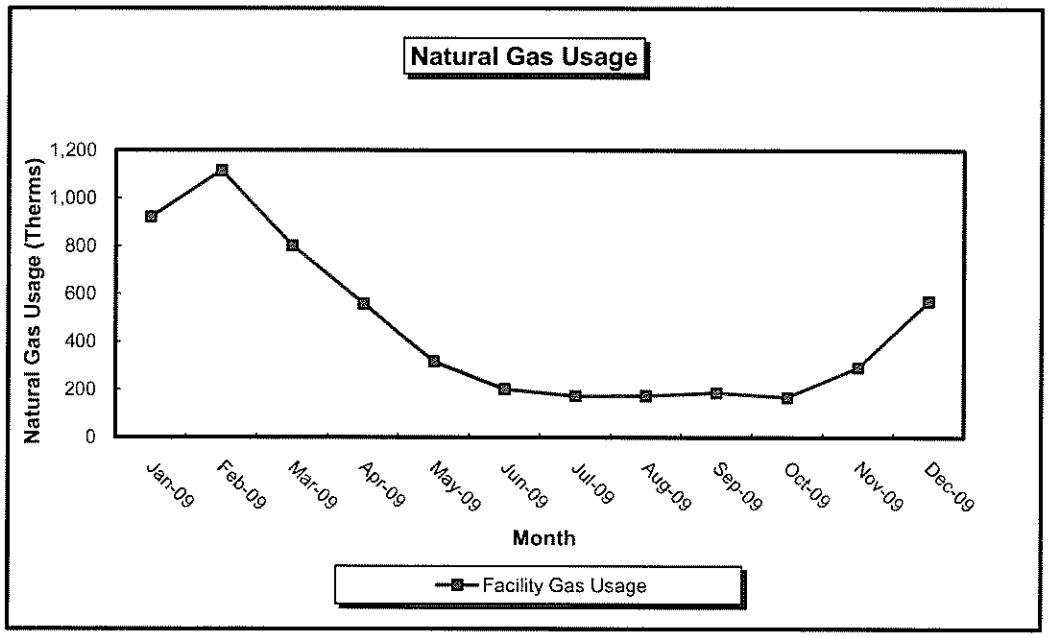
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Jan-09	866	$0.00	$1,354.53	$1,354.53
Feb-09	11	$0.00	$36.81	$36.81
Mar-09	1,657	$0.00	$2,327.90	$2,327.90
Apr-09	450	$0.00	$566.62	$566.62
May-09	245	$0.00	$256.64	$256.64
Jun-09	77	$0.00	$94.86	$94.86
Jul-09	16	$0.00	$41.78	$41.78
Aug-09	10	$0.00	$41.45	$41.45
Sep-09	19	$0.00	$52.17	$52.17
Oct-09	193	$0.00	$240.46	$240.46
Nov-09	362	$0.00	$427.62	$427.62
Dec-09	518	$0.00	$608.64	$608.64
Totals:	**4,424**	**$0**	**$6,049**	**$6,049**
Energy Intensity (MMBTU/SQ FT):				**0.044**
Average Cost per MMbtu:				**$13.67**
Average Cost per Unit:				**$1.37**



Project Name:	City of Beacon
Project Address:	Tompkins Hose Fire House
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7640-1260-00-5
Date:	5/12/2010
Facility Area:	10,000 SQ. FT.
Rate:	G220

ANNUAL NATURAL GAS USAGE

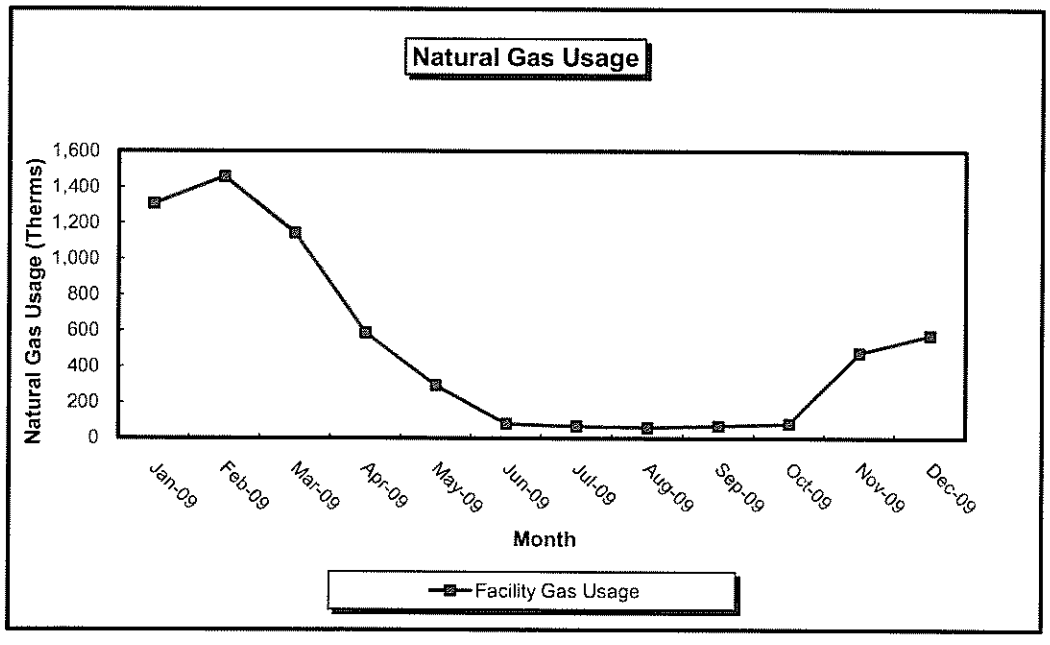
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Jan-09	921	$0.00	$1,452.87	$1,452.87
Feb-09	1,116	$0.00	$1,650.56	$1,650.56
Mar-09	801	$0.00	$1,141.01	$1,141.01
Apr-09	558	$0.00	$750.12	$750.12
May-09	317	$0.00	$331.85	$331.85
Jun-09	202	$0.00	$201.77	$201.77
Jul-09	173	$0.00	$187.48	$187.48
Aug-09	174	$0.00	$221.91	$221.91
Sep-09	187	$0.00	$238.33	$238.33
Oct-09	167	$0.00	$213.45	$213.45
Nov-09	292	$0.00	$343.98	$343.98
Dec-09	569	$0.00	$675.51	$675.51
Totals:	**5,477**	**$0**	**$7,409**	**$7,409**
Energy Intensity (MMBTU/SQ FT):				**0.055**
Average Cost per MMbtu:				**$13.53**
Average Cost per Unit:				**$1.35**



Project Name:	City of Beacon
Project Address:	Water Plant Howard Ave, Liberty ST Water Plant
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7635-0261-00-4
Date:	5/12/2010
Facility Area:	17,500 SQ. FT.
Rate:	G200

ANNUAL NATURAL GAS USAGE

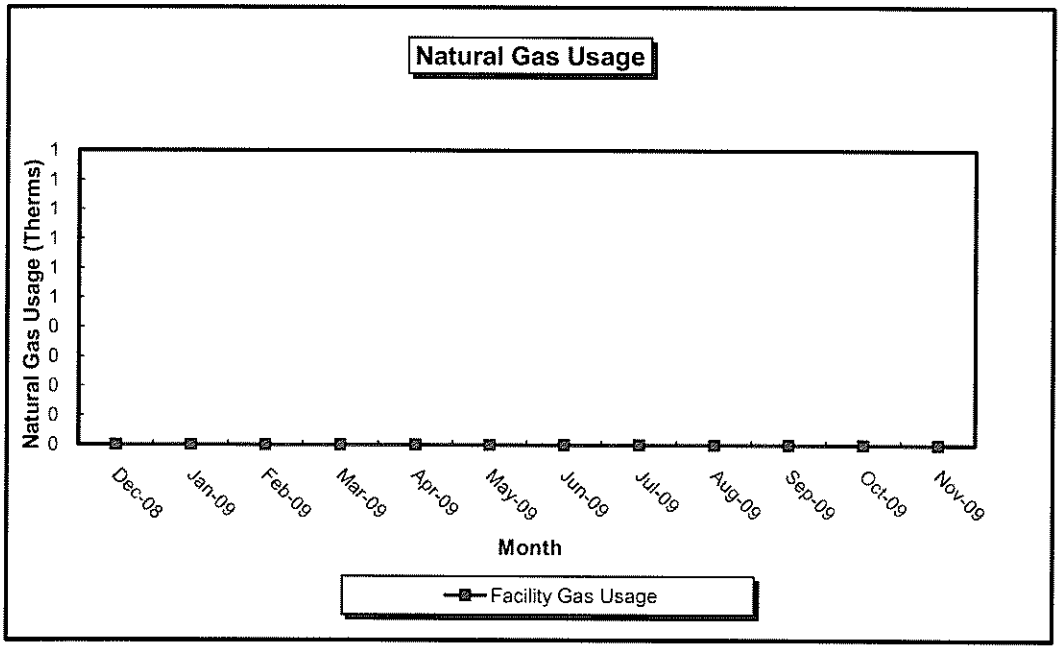
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Jan-09	1,307	$0.00	$2,038.76	$2,038.76
Feb-09	1,457	$0.00	$2,134.57	$2,134.57
Mar-09	1,144	$0.00	$1,615.79	$1,615.79
Apr-09	587	$0.00	$775.65	$775.65
May-09	295	$0.00	$307.92	$307.92
Jun-09	80	$0.00	$97.72	$97.72
Jul-09	68	$0.00	$95.77	$95.77
Aug-09	60	$0.00	$101.57	$101.57
Sep-09	69	$0.00	$112.66	$112.66
Oct-09	81	$0.00	$124.97	$124.97
Nov-09	476	$0.00	$542.92	$542.92
Dec-09	574	$0.00	$668.83	$668.83
Totals:	**6,198**	**$0**	**$8,617**	**$8,617**
Energy Intensity (MMBTU/SQ FT):				**0.035**
Average Cost per MMbtu:				**$13.90**
Average Cost per Unit:				**$1.39**



Project Name:	City of Beacon
Project Address:	90 Dennings Plant
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7410-0450-00-1
Date:	5/12/2010
Facility Area:	14,500 SQ. FT.
Rate:	G220

ANNUAL NATURAL GAS USAGE

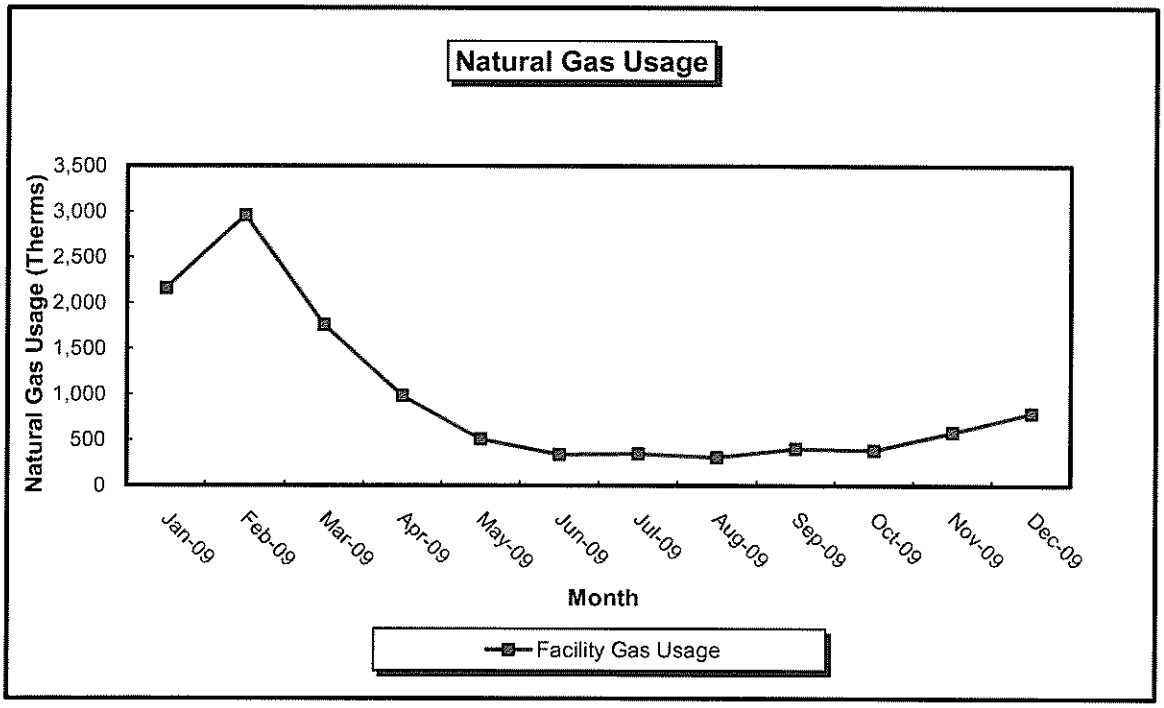
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Dec-08	0	$0.00	$0.00	$0.00
Jan-09	0	$0.00	$0.00	$0.00
Feb-09	0	$0.00	$0.00	$0.00
Mar-09	0	$0.00	$0.00	$0.00
Apr-09	0	$0.00	$0.00	$0.00
May-09	0	$0.00	$0.00	$0.00
Jun-09	0	$0.00	$0.00	$0.00
Jul-09	0	$0.00	$0.00	$0.00
Aug-09	0	$0.00	$0.00	$0.00
Sep-09	0	$0.00	$0.00	$0.00
Oct-09	0	$0.00	$0.00	$0.00
Nov-09	0	$0.00	$0.00	$0.00
Totals:	**0**	**$0**	**$0**	**$0**
Energy Intensity (MMBTU/SQ FT):				**0.000**
Average Cost per Unit:				**#DIV/0!**



Project Name:	City of Beacon
Project Address:	RT 9D Municpal CTR
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7640-1062-00-5
Date:	5/12/2010
Facility Area:	20,000 SQ. FT.
Rate:	G200

ANNUAL NATURAL GAS USAGE

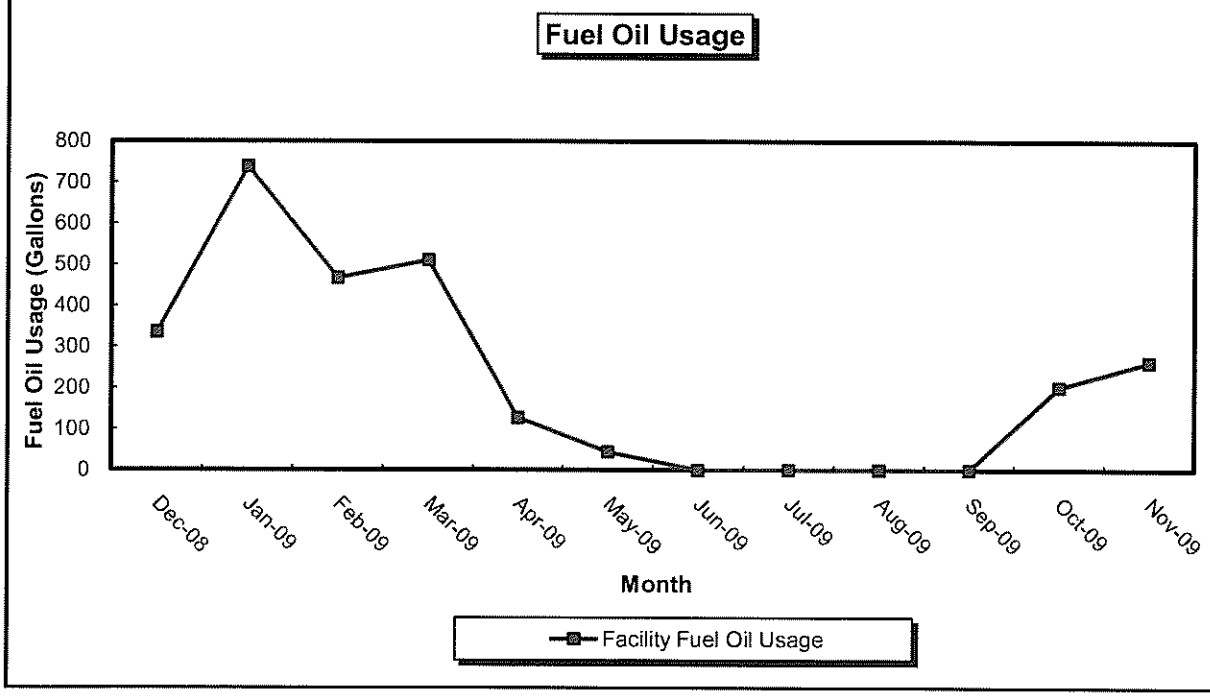
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Jan-09	2,159	$0.00	$3,364.58	$3,364.58
Feb-09	2,959	$0.00	$4,321.74	$4,321.74
Mar-09	1,761	$0.00	$2,467.35	$2,467.35
Apr-09	983	$0.00	$1,284.38	$1,284.38
May-09	509	$0.00	$511.66	$511.66
Jun-09	339	$0.00	$315.30	$315.30
Jul-09	345	$0.00	$336.63	$336.63
Aug-09	308	$0.00	$354.40	$354.40
Sep-09	401	$0.00	$454.01	$454.01
Oct-09	384	$0.00	$426.02	$426.02
Nov-09	583	$0.00	$637.07	$637.07
Dec-09	791	$0.00	$919.60	$919.60
Totals:	**11,522**	**$0**	**$15,393**	**$15,393**
Energy Intensity (MMBTU/SQ FT):				**0.058**
Average Cost per MMbtut:				**$13.36**
Average Cost per Unit:				**$1.34**



Project Name:	City of Beacon	Utility Company:	Central Hudson
Project Address:	90-96 Dennings Avenue	Acct. No.:	7410-0450-00-1
	Beacon NY 12508	Date:	5/12/2010
Facility Area:	14,500 sq.ft.		

ANNUAL FUEL USAGE

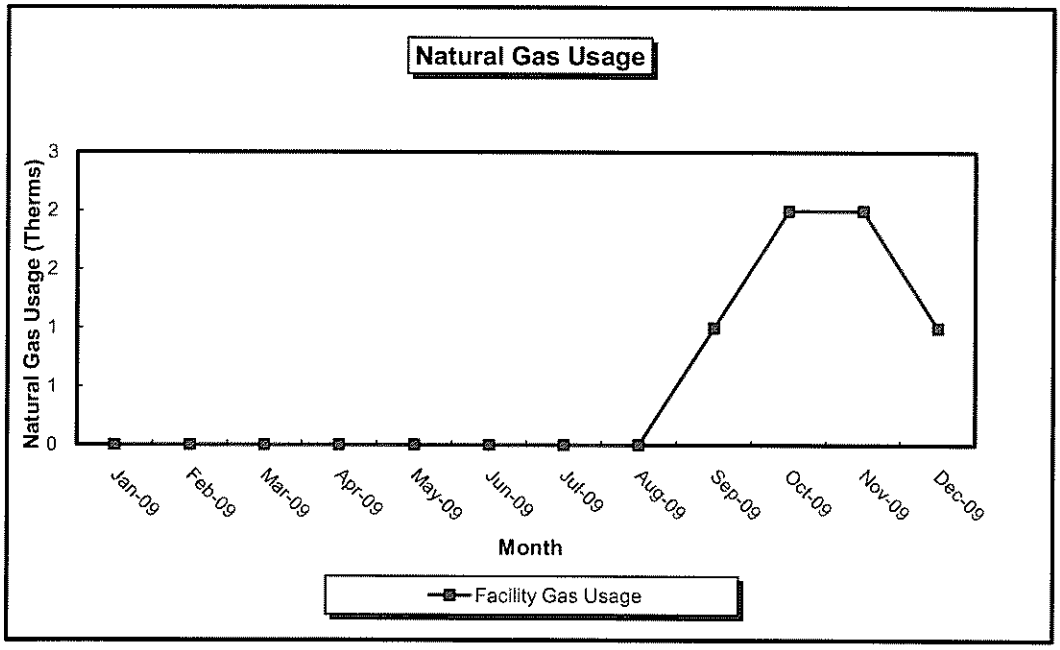
Billing Period	Natural Gas Usage (CCF)	Natural Gas Total Cost	Fuel Oil #2 Usage (Gal)	Fuel Oil #2 Total Cost	Total Cost
Dec-08	0	$0	335	$574	$574
Jan-09	0	$0	738	$1,263	$1,263
Feb-09	0	$0	467	$799	$799
Mar-09	0	$0	510	$873	$873
Apr-09	0	$0	127	$218	$218
May-09	0	$0	44	$76	$76
Jun-09	0	$0	0	$0	$0
Jul-09	0	$0	0	$0	$0
Aug-09	0	$0	0	$0	$0
Sep-09	0	$0	0	$0	$0
Oct-09	0	$0	202	$345	$345
Nov-09	0	$0	263	$450	$450
Totals:	**0**	**$0**	**2,687**	**$4,597**	**$4,597**
Period	**1.00**	**years**			
Est. Annual Totals:			**2,687**	**$4,597**	**$4,597**
Total annual mmBtu:			**376**		
Avg. $/mmBtu:	**N/A**		**$12.22**		
Energy Intensity (mmBtu/sq. ft.):			**0.03**		



Project Name:	City of Beacon
Project Address:	423-425 Main St
	Beacon, NY 12508
Utility Company:	Central Hudson
Account No.:	7641-1310-00-6
Date:	5/12/2010
Facility Area:	7,000 SQ. FT.
Rate:	G200

ANNUAL NATURAL GAS USAGE

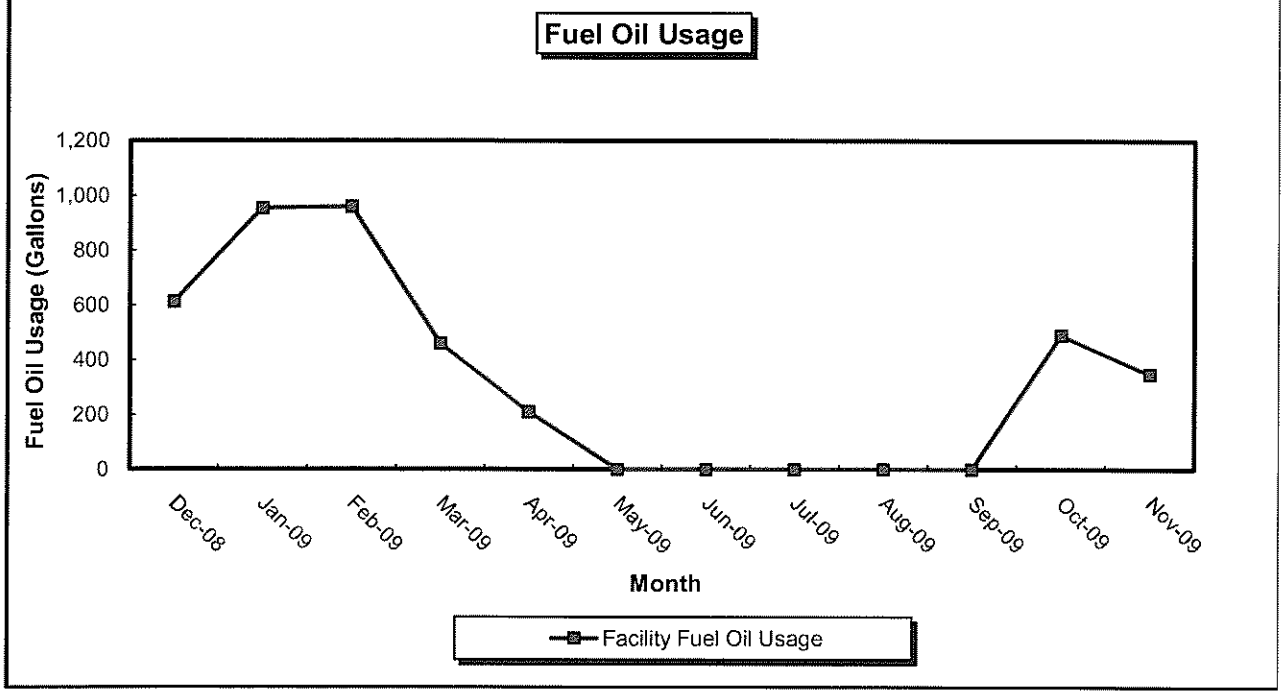
Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009				
Jan-09	0	$0.00	$20.24	$20.24
Feb-09	0	$0.00	$20.23	$20.23
Mar-09	0	$0.00	$20.23	$20.23
Apr-09	0	$0.00	$20.23	$20.23
May-09	0	$0.00	$20.23	$20.23
Jun-09	0	$0.00	$16.19	$16.19
Jul-09	0	$0.00	$29.34	$29.34
Aug-09	0	$0.00	$30.35	$30.35
Sep-09	1	$0.00	$31.06	$31.06
Oct-09	2	$0.00	$31.78	$31.78
Nov-09	2	$0.00	$31.89	$31.89
Dec-09	1	$0.00	$31.15	$31.15
Totals:	**6**	**$0**	**$303**	**$303**
Energy Intensity (MMBTU/SQ FT):				**0.000**
Average Cost per Unit:				**$50.49**



Project Name:	City of Beacon	Utility Company:	Central Hudson
Project Address:	423-425 Main St	Acct. No.:	7641-1310-00-6
	Beacon NY 12508	Date:	5/12/2010
Facility Area:	7,000 sq.ft.		

ANNUAL FUEL USAGE

Billing Period	Natural Gas Usage (CCF)	Natural Gas Total Cost	Fuel Oil #2 Usage (Gal)	Fuel Oil #2 Total Cost	Total Cost
Dec-08	0	$0	612	$1,047	$1,047
Jan-09	0	$0	954	$1,632	$1,632
Feb-09	0	$0	959	$1,641	$1,641
Mar-09	0	$0	458	$784	$784
Apr-09	0	$0	209	$358	$358
May-09	0	$0	0	$0	$0
Jun-09	0	$0	0	$0	$0
Jul-09	0	$0	0	$0	$0
Aug-09	0	$0	0	$0	$0
Sep-09	0	$0	0	$0	$0
Oct-09	0	$0	490	$839	$839
Nov-09	0	$0	347	$594	$594
Totals:	**0**	**$0**	**4,030**	**$6,895**	**$6,895**
Period	**1.00**	**years**			
Est. Annual Totals:			**4,030**	**$6,895**	**$6,895**
Total annual mmBtu:			**564**		
Avg. $/mmBtu:	**N/A**		**$12.22**		
Energy Intensity (mmBtu/sq. ft.):			**0.08**		



Project Name:	City of Beacon	Utility Company:	Central Hudson
Project Address:	423 Main St	Acct. No.:	7641-1310-00-6
	Beacon NY 12508	Date:	5/12/2010
Facility Area:	7,000 sq.ft.		

ANNUAL FUEL USAGE

Billing Period	Natural Gas Usage (CCF)	Natural Gas Total Cost	Fuel Oil #2 Usage (Gal)	Fuel Oil #2 Total Cost	Total Cost
Dec-08	0	$0	1,138	$1,947	$1,947
Jan-09	0	$0	935	$1,600	$1,600
Feb-09	0	$0	926	$1,584	$1,584
Mar-09	0	$0	715	$1,223	$1,223
Apr-09	0	$0	523	$894	$894
May-09	0	$0	0	$0	$0
Jun-09	0	$0	0	$0	$0
Jul-09	0	$0	0	$0	$0
Aug-09	0	$0	0	$0	$0
Sep-09	0	$0	0	$0	$0
Oct-09	0	$0	0	$0	$0
Nov-09	0	$0	839	$1,436	$1,436
Totals:	**0**	**$0**	**5,075**	**$8,684**	**$8,684**
Period	**1.00**	**years**			
Est. Annual Totals:			**5,075**	**$8,684**	**$8,684**
Total annual mmBtu:			**711**		
Avg. $/mmBtu:	**N/A**		**$12.22**		
Energy Intensity (mmBtu/sq. ft.):			**0.10**