FACILITY SURVEY REPORT

For

The Village of Croton-on-Hudson, New York

Croton on Hudson, NY 10520

Prepared by:

New York Power Authority

123 Main Street

White Plains, NY 10601-3170

September 29th, 2005

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Introduction

The purpose of this report is to develop and evaluate preliminary options for improvements to the heating, cooling and other mechanical equipment at the Village of Croton on Hudson. If the village decides to pursue any of the options indicated in the report, a comprehensive facility audit and Feasibility Report will be performed for the selected scope of work. This report will then be presented to the facility with preliminary construction cost estimates for approval to proceed with the design process.

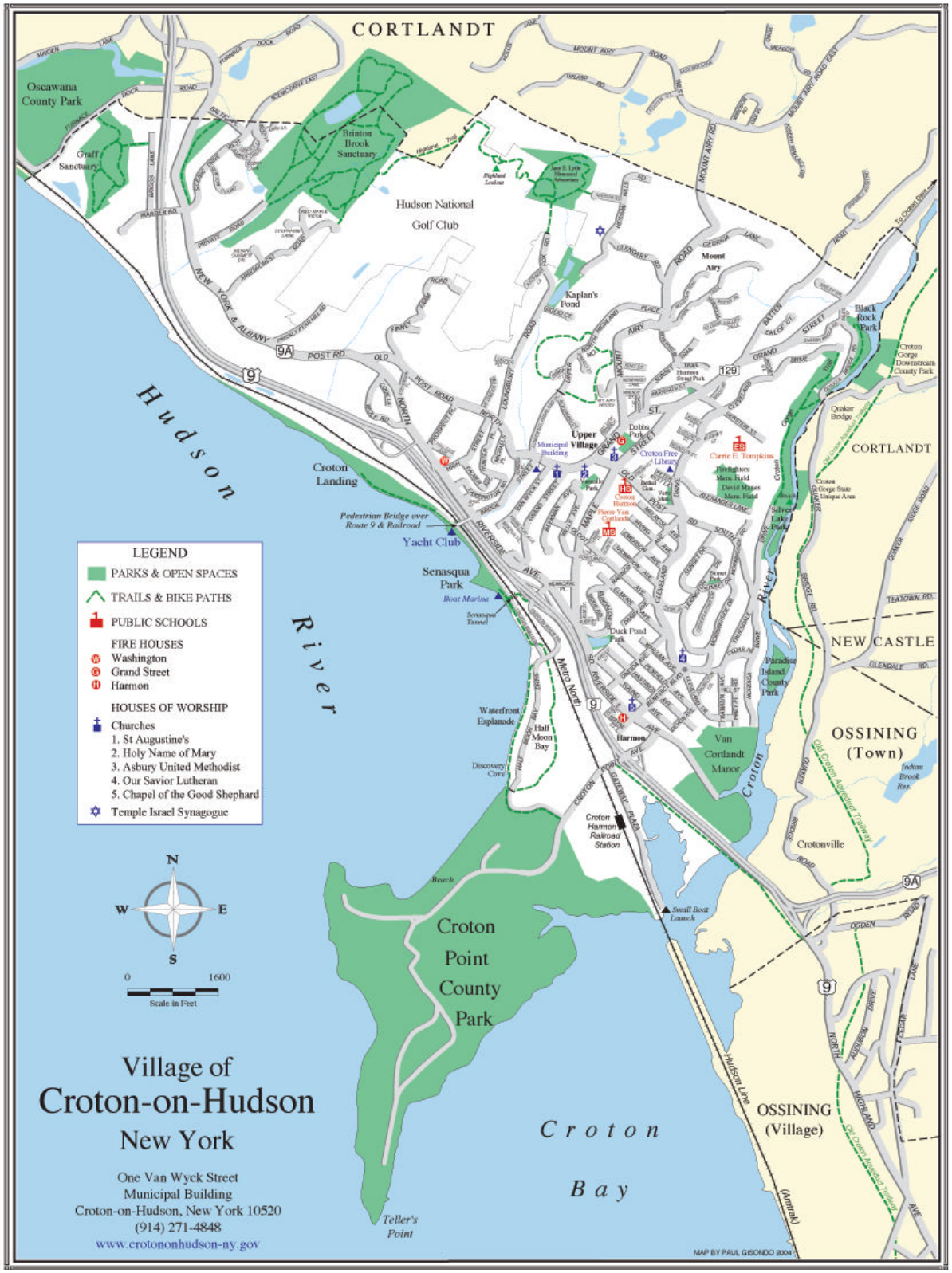
Ten (10) different buildings, including the Stanley H. Kellerhouse Municipal Building, Municipal Garage and Pump Stations were analyzed as part of this Survey Report. The total combined square footage of all buildings total more than 60,000 square feet.

The following table summarizes all of the buildings being analyzed for energy improvements within this Survey Report:

Village of Croton on Hudson Building Summary
Table 1

Building Name	Square Footage	Electricity	Fuel Energy	Firm /Interruptible Gas Rate
Stanley H. Kellerhouse Municipal Building	40,000	AC / Lighting	Oil	N/A
Croton Municipal Garage (Office)	2,000	AC / Lighting	Natural Gas	Firm
Croton Municipal Garage (Garage Space)	10,000	Lighting	Natural Gas	Firm
Parking Lot Office	300	AC / Lighting / Heating	Electric	N/A
Harmon Engine	12,100	AC / Lighting	Natural Gas	Firm
Grant Street Firehouse	5,400	AC / Lighting	Natural Gas	Firm
Washington Engine	4,800	AC / Lighting	Natural Gas	Firm
Water Department 3 Pump Stations	900	Pumps / Lighting	Propane	N/A

Village of Croton on Hudson Street Map



Facility & System Profile

Facility Overview

The Village of Croton on Hudson is located in Westchester County 30 miles North of New York City. The village contains various office buildings, firehouses and pumping stations that are integral to operation of the village.

The buildings included in this report are the Stanley H. Kellerhouse Municipal building, the Croton Municipal Parking Garage, Harmon Engine, Grant Street Firehouse, Washington Engine and Pump Stations #1, #3, & #4. There are other buildings within the Village of Croton where energy conservation opportunities may exist. This survey report was prepared with the intent that it would serve as a guide to help locate various energy conservation opportunities.

Stanley H. Kellerhouse Municipal Building

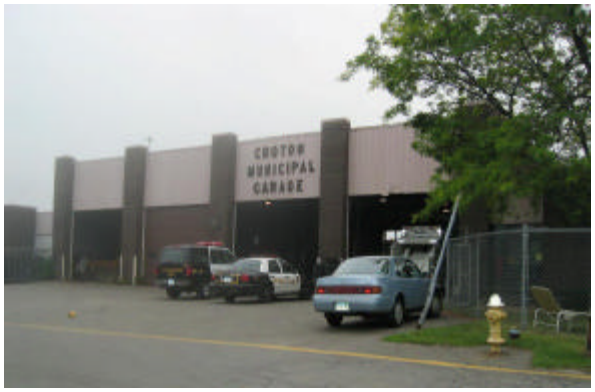
The Stanley H. Kellerhouse Municipal Building is located at 1 Van Wyck Street. It has approximately 40,000 square feet of space that houses the Mayor's Office, Court Clerk's Office, Police Department and various other municipal offices.

The building uses 14 split air conditioning units located throughout the perimeter of the building that provide cooling for various conditioned spaces within the building. These units range in age from 1 -20 years with the majority of the units being approximately 20 years old. In addition to the split units, 5 - 1 ton window air conditioning units pick up additional cooling loads in office spaces.

Heating is provided by one Weil – McLain 78 Series Boiler, model #1278. The boiler operates on #2 fuel oil.

The building has been upgraded with new windows, doors and lighting.

Croton Municipal Garage (Office)



The Croton Municipal Garage is a one story building with approximately 2,000 square feet of office space. The office space is cooled by window air conditioning units and heated by a Crane 200 Series gas furnace.

The garage space is approximately 10,000 square feet comprised of 8 truck bays with rollup doors powered by ¾ HP motors. The garage also has two hydraulic lifts with 3 HP motors and lighting is provided by 15 – 4 ft. T-12 fixtures.

Typically motors larger than 5 HP yield the best project economics and energy savings.

Parking Lot Office

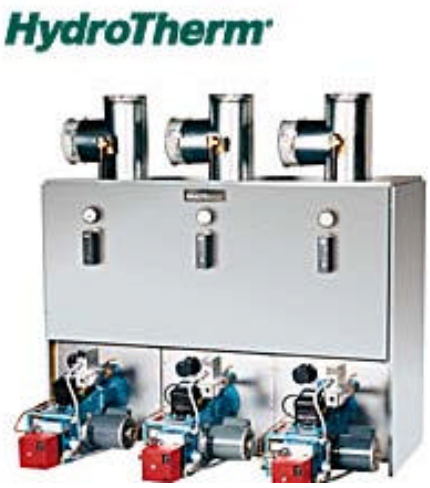
The parking lot office is approximately 200 square feet of space cooled by a split air conditioning unit. This space is occupied by the parking lot attendant throughout the day. The air conditioning unit is approximately 3 years old.

Harmon Engine

The Harmon Engine volunteer firehouse is a two-story building originally constructed in 2000 with brick façade. The building totals approximately 12,100 square feet of offices and two fire truck bays. Hot water is generated by a gas fired modular boiler, 1,064 MBH, manufactured by Hydrotherm, model MOP-1540. The boiler is original to the building construction and appears to be in good condition. The boiler is controlled by a Hydrotherm programmable controller. According to the facility the controller was never programmed correctly and was not wired properly to operate some of the motorized actuated valves. The boiler has dual fuel capable burners but operates on natural gas. There are no oil storage tanks on site in order to make use of the dual fuel capabilities of the boiler.

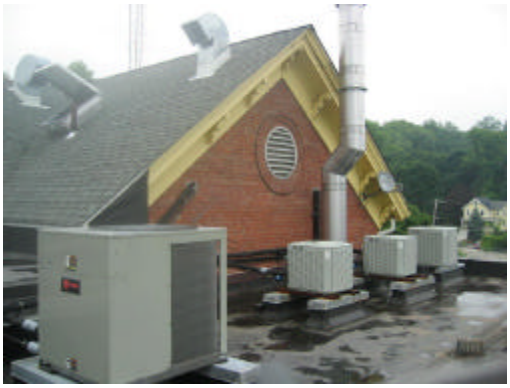
Cooling is provided to the building by means of rooftop air conditioning units which are approximately 3 years old.

The building is maintained empty 90% of the time unless there is an emergency requiring the volunteer fire department to take action. Both heating and cooling are provided to the building on a 24 hour basis regardless of occupancy during the respective seasons.



Grant Street Firehouse

The Grant Street Firehouse is a two story-building with approximately 5,400 square feet of office space and garage space for fire trucks. The building is cooled by four Trane split air conditioning units located on the roof of the building. The units are approximately 4 years old and appear to be in good condition.

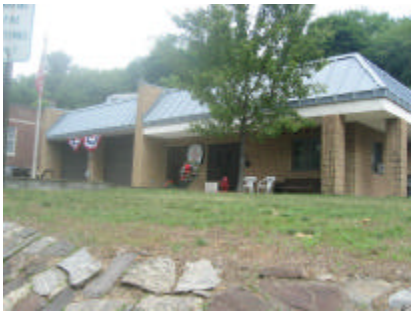


Heat to the building is provided by an H.B. Smith GB 300 cast iron gas fired boiler, 815 MBH.

The building is maintained empty 90% of the time unless there is an emergency requiring the volunteer fire department to take action. Both heating and cooling are provided to the building on a 24 hour basis regardless of occupancy during the respective seasons.

Washington Engine

Washington Engine is a one story brick building that is approximately 4,800 square feet. The building contains some office / common space and a two bay garage. The truck bay is lit by 19 – 4' T-12 fixtures.



The building is cooled by 4 – window, 1 ton air conditioning units. Heating is provided to the building by a Peerless furnace that is in the process of being replaced.

The building also houses an Eagle Air Systems 4,500 psi compressor. The compressor is circa 1989 and appears to be in good operating condition.

Water Department (3 Pump Stations)

The pump station houses are approximately 300 square feet each and pump potable water to the village residents. Pump station #2 is no longer in service.

Pump Station #1

Pump station #1 utilizes a 100 HP U.S. Electric motor and pump set to provide potable water to the village. This motor also makes use of a variable frequency drive (VFD) to modulate the flow necessary for village demand.

Pump Station #3

Pump station #3 utilizes a 75 HP Holloshaft pump set to provide potable water to the village. This pump also incorporates a soft start to reduce inrush current at startup. A variable frequency drive and premium efficiency motor will save on energy costs depending on pump operating parameters. Assumptions were made regarding the operation of the pumps with a VFD (See table attached energy cost & savings table).

Pump Station #4

Pump station #4 utilizes a 100 HP General Electric motor and pump set to provide potable water to the village. A variable frequency drive and premium efficiency motor will save on energy costs depending on pump operating parameters. Assumptions were made regarding the operation of the pumps with a VFD (See table attached energy cost & savings table).

Hazardous Material

As part of the proposed upgrades within the district the removal of hazardous material will be necessary as part of the scope of work. Hazardous material includes asbestos in various parts of each building and lead paint found on pipes and/or existing equipment. The proposed scope of work will minimize the disruption of any existing hazardous waste, which will keep project costs down and reduce health and safety concerns.

The costs associated with removing hazardous material for any recommendation, which may disrupt or change any suspect material has been included in the project cost estimates identified in Appendix A – Project Cost Estimates. During the final design phase of the project, a hazardous material field inspection will be performed to more accurately identify any abatement that will need to be performed based upon the current scope of work.

Proposed Energy Conservation Options

ECO #1: Boiler Control System / Dual Fuel Usage

The existing Hydrotherm Boiler Controls were installed during the capital improvement process, for the Washington and Grant Street Firehouses. The control system was designed and intended to monitor and control the boilers, steam pressure and hydronic systems. It is recommended that the existing Hydrotherm system be properly re-commissioned and adjusted in the Washington and Grant Street Firehouses. In addition to re-commissioning the boiler controls, consideration should be given to using the dual fuel capabilities of the burners at the Grant and Washington Street Firehouses. By switching between fuels as commodity prices fluctuate, the village can generate savings.

(Refer to the detailed cost estimates for each building included in the project, identified in Appendix B – Building Cost Estimates)

ECO #2: Chiller Plant Replacement

This measure includes the replacement of existing inefficient split system units and window units at the Stanley H. Kellerhouse Municipal Building. Most of the split system units in the above building are at the end of their useful life and need to be replaced. The proposed chiller options are:

1. Replacement in-kind of split unit systems
2. Installation of an 80 ton air cooled electric chiller that will be fully equipped with variable speed drives, to provide variable cooling for the buildings during all peak and off-peak thermal load periods.

When comparing the existing split unit air conditioners to the various types of chillers available, an increase in chiller efficiency can be achieved. The existing split system air conditioners operate at approximately 1.3 KW per ton of cooling, new split system units operate at 1 KW per ton and a new 80 ton air cooled water chiller operates at .9 KW per ton providing greater energy savings. As well as providing greater energy savings, the 80 ton air cooled water chiller will be able to follow building cooling loads more precisely than the split system units and provide the added benefit of reduced maintenance costs by only having one chiller to maintain as opposed to various individual systems. All of the instruments and immediate piping associated with the split system chillers that are not appropriately sized will be replaced with new equipment. Some maintenance savings can be associated with the installation of an 80 ton air cooled chiller as opposed to the 15 split unit system.

(Refer to the detailed cost estimates for each building included in the project, identified in Appendix B – Building Cost Estimates)

ECO #3: Lighting Improvements

Although new lighting fixtures were recently installed in some of the buildings, the Municipal Garage and the Washington Engine Firehouse contain 15 – 4 foot fixtures with (2) T-12 lamps each and 19 – 4 foot fixtures with (2) T-12 lamps respectively. It is recommended that additional high efficient lighting fixtures with T-8 fluorescent lamps and electronic ballasts be strategically located throughout the garage bays, to provide additional light levels and visual comfort as well as provide some energy savings.

(Refer to the detailed cost estimates for each building included in the project, identified in Appendix B – Building Cost Estimates)

ECO #4: Variable Frequency Drives / Premium Efficiency Motors

Pump Stations #1, #3 and #4 provide potable water for the Village of Croton residents. Pump station #1 operates with a 100 HP pump with a variable frequency drive (VFD), pump station #3 operates with a 75HP pump and soft starter and pump station #4 operates with a single speed 100 HP motor (Nameplate data 150 HP) based on Energywiz's survey from July 2004, plant personnel and confirmed through energy bills from NYPA September 2004 – August 2005. For the purposes of this survey it is assumed that the pump speeds are lower during late night and early morning hours (see attached energy calculations). The Village of Croton would be able to save on energy costs by installing premium efficiency motors and variable frequency drives at the pump station.

(Refer to the detailed cost estimate identified in Appendix B – Building Cost Estimate)

Savings Analysis & Methodology

The re-commissioning of the existing Hydrotherm boiler control system can generate energy savings in fuel consumption as well as maintenance cost savings due to the inefficient operation of the boilers that could cause the life expectancy of the boilers to shorten. Facility personnel have stated that motor actuated valves controlled by the Hydrotherm system were not wired properly and this causes maintenance problems. Therefore, thermal energy may be reduced. The savings associated with implementing this option is approximately 10% of the existing energy bills in each of the associated recommended buildings.

The installation of a new chiller plant in the Stanley H. Kellerhouse Municipal building will increase the overall thermal efficiency. This equates to moderate annual energy savings for the proposed building. Analysis of this measure considered the annual fossil fuel or electrical consumption of current chiller equipment and the electrical consumption using a higher efficiency electric centrifugal chiller replacement. Annual energy savings are based on the improvement in equipment efficiency, the load characteristics, and operating hours of the equipment. Although energy savings will be recognized with the implementation of this option, initial costs associated with the installation does not allow for a practical payback, therefore, this option should be considered as a capital improvement with significant environmental benefits.

The addition of the variable frequency drives and premium efficiency motors for the pump stations will provide substantial energy savings based on the assumed operating profile for the pumps. The VFD's will provide approximately 30% annual energy savings based on the assumed operating profile.

The replacement of the existing T-12 lamps with T-8 lamps and electronic ballasts will provide some energy savings.

Conclusion

The New York Power Authority has prepared this report for the Village of Croton to review the proposed energy conservation options. By continuing to operate the village under the existing conditions, unavoidable replacement costs are predicted in the near future, and many of the intangible benefits offered by this project will not be available with simple in-kind replacements.

As part of NYPA's energy services program, this project shall be implemented as a turnkey program. The turnkey program will include a complete Feasibility Study and Design Report, including a complete set of specifications and drawings for the bidding process. During construction, a Construction Manager will be assigned to the project, in which their duties will include overseeing day to day operation, permitting and proper training for all facility employees. In addition, upon completion of the project a 12-month warranty on all material and labor shall be incorporated in the final contract.

If all of the recommended options are implemented, the total estimated installed cost is approximately **$1,713,996**, with minimal annual electric and fossil fuel energy savings. Please note that Energy Conservation Opportunities may be selected individually based on the Village of Croton's need.

Appendix A

Project Cost Estimates

New York Power Authority

NYPA: CUSTOMER INSTALLATION COMMITMENT
TOTAL INSTALLED COST SUMMARY

Date: November 21, 2005

Project No.: TBD

Project: Village of Croton on Hudson

Total Installed Project Costs

PROJECT COST

(1) Material Cost	$399,074	(See Note 1)
(2) Labor Cost	$598,610	(See Note 1)
(3) MECHANICAL SUBTOTAL	**$997,684**	
(4) Asbestos		
a) Abatement	$60,000	
b) Design	$0	
c) Air Monitoring	$0	
(5) ASBESTOS SUBTOTAL	**$60,000**	
(6) Gas Service Installation	$0	
(7) Controlled Inspection Services	$0	
(8) Total Material and Labor [(3)+(5)+(6)+(7)]	**$1,057,684**	
(9) Asbestos Contingency Fund [20% of (5)]	$12,000	
(10) Construction Contingency Fund [20% of (3)]	$199,537	
(11) Total Project Contingency Fund [(9) + (10)]	**$211,537**	
(12) Total Direct Construction Cost [(8) + (11)]	**$1,269,221**	
(13) Contractor Fees		
a) Feasibility Study	$30,000	
b) Design & Construction Management [15% of (3)+(10)]	$179,583	
(14) Contractor Fees - Asbestos Management [10% of (4a)+(9)]	$7,200	
(15) AUTHORITY Overheads [12.5% of (12)]	$158,653	
(16) Subtotal Project Cost	**$1,644,657**	
(17) Payment and Performance Bonds	$20,000	
(18) Estimated Interest During Construction	$49,340	(See Note 2)
(19) Total Installed Cost	**$1,713,996**	

NOTES:

1. Material cost is assumed to be 40% and the Labor to be 60%.
2. Estimated IDC based on Subtotal project cost.

Village of Croton on Hudson
Stanley H. Kellerhouse Municipal Building

ECO #	Description	# of Units	Unit	Unit Cost		Energy Savings	Total Cost	Total ECO Cost
				Material	Labor			
ECO-1	Boiler Control System/ Dual Fuel Usage							
	Not Applicable							
ECO-2	Chiller Plant Replacement (80 Ton Air Cooled)	1	LS	$324,373.92	$486,560.88	$1,165.75	$810,934.80	$810,934.80
	Chiller Plant Replacement (Split System)	1	LS	$271,632.92	$407,449.38	$287.75	$679,082.30	$679,082.30
ECO-3	Lighting Improvements							
	Not Applicable							
ECO-4	Variable Frequency Drives / Premium Efficiency Motors							
	Not Applicable							
			Total ECO 2	**$324,373.92**	**$486,560.88**	**$1,165.75**	**$810,934.80**	**$810,934.80**
			Total ECO 2a	**$271,632.92**	**$407,449.38**	**$287.75**	**$679,082.30**	**$679,082.30**

Village of Croton on Hudson
Croton Municipal Garage

ECO #	Description	# of Units	Unit	Unit Cost		Energy Savings	Total Cost	Total ECO Cost
				Material	Labor			
ECO-1	Boiler Control System/ Dual Fuel Usage							
	Not Applicable							
ECO-2	Chiller Plant Replacement							
	Not Applicable							
ECO-3	Lighting Improvements (Municipal Garage)	14	EA	$1,400.00	$2,100.00	$1,400.00	$3,500.00	$3,500.00
ECO-4	Variable Frequency Drives / Premium Efficiency Motors							
	Not Applicable							
			Total ECO	**$1,400.00**	**$2,100.00**	**$1,400.00**	**$3,500.00**	**$3,500.00**

Village of Croton on Hudson
Croton Municipal Garage / Parking Lot Office

ECO #	Description	# of Units	Unit	Unit Cost		Energy Savings	Total Cost	Total ECO Cost
				Material	Labor			
ECO-1	Boiler Control System/ Dual Fuel Usage							
	Not Applicable							
ECO-2	Chiller Plant Replacement							
	Not Applicable							
ECO-3	Lighting Improvements (Municipal Garage)	14	EA	$1,400.00	$2,100.00	$1,400.00	$3,500.00	$3,500.00
ECO-4	Variable Frequency Drives / Premium Efficiency Motors							
	Not Applicable							
			Total ECO	**$1,400.00**	**$2,100.00**	**$1,400.00**	**$3,500.00**	**$3,500.00**

Village of Croton on Hudson
Harmon Engine / Grant Street Firehouse / Washington Engine

ECO #	Description	# of Units	Unit	Unit Cost		Energy Savings	Total Cost	Total ECO Cost
				Material	Labor			
ECO-1	Boiler Control System/ Dual Fuel Usage (Harmon Engine)	1	LS	$5,000.00	$7,500.00	$5,000.00	$12,500.00	$12,500.00
	Boiler Control System/ Dual Fuel Usage (Washington Engine)	1	LS	$5,000.00	$7,500.00	$5,000.00	$12,500.00	$12,500.00
ECO-2	Chiller Plant Replacement							
	Not Applicable							
ECO-3								
	Lighting Improvements (Washington Engine)	19	EA	$1,900.00	$2,850.00	$1,900.00	$4,750.00	$4,750.00
ECO-4	Variable Frequency Drives / Premium Efficiency Motors							
	Not Applicable							
			Total ECO	**$11,900.00**	**$17,850.00**	**$11,900.00**	**$29,750.00**	**$29,750.00**

Village of Croton on Hudson
Water Department (3 Pump Stations)

ECO #	Description	# of Units	Unit	Unit Cost		Energy Savings	Total Cost	Total ECO Cost
				Material	Labor			
ECO-1	Boiler Control System/ Dual Fuel Usage							
	Not Applicable							
ECO-2	Chiller Plant Replacement							
	Not Applicable							
ECO-3	Lighting Improvements							
	Not Applicable							
ECO-4	(2) Variable Frequency Drives w/5 year warranty (2) Premium Efficiency Motors	1	EA	$60,000.00	$90,000.00	$60,000.00	$150,000.00	$150,000.00
			Total ECO	**$60,000.00**	**$90,000.00**	**$60,000.00**	**$150,000.00**	**$150,000.00**

TOTAL	**$75,865.75**	**$997,684.80**	**$997,684.80**

New York Power Authority

PUMPS			
Pump Station #1	100	HP	
Pump Station #3	75	HP	
Pump Station #4	100	HP	
1 HP =	0.746	KW	
Existing Efficiency	0.85		0.9
New Efficiency	0.9		

HVAC		
Split Unit Tonnage	60	Tons
Split Unit Demand	1.3	KW/Ton
New Split Demand	1.3	KW/Ton
New Chiller Tonnage	80	Tons
New Electric Chiller	0.8	KW/Ton
Existing Split Eff.	0.85	
New Chiller Eff.	0.9	

Existing Split KW	91.76	KW
New Split KW	86.67	KW
New Chiller KW	71.11	KW
Existing KWH	88094.12	KWH
New Split KWH	83200.00	KWH
New Chiller KWH	68266.67	KWH
Existing Split $	$5,179.49	Savings / Yr
New Split $	$4,891.74	$287.75
New Chiller $	$4,013.74	$1,165.75

Lighting		
Total T-12 Lamps	94	
Existing T-12	40	Watts
New T-8	32	Watts

Existing Total T-12	3.76	KW
New Total T-8	3.008	KW
Existing Total KWH	7219.2	KWH
NEW KWH	5775.36	KWH
Existing $ / Yr	$344.59	Savings / Yr
New $ / Yr	$275.67	$68.92

Rates	
Production KW $	$6.55
Delivery KW $	$14.69
On Peak KWH $	$0.04
Off Peak KWH $	$0.00

Building Operation		
Days Per Year	365	
Months Per Year	12	
Hours per Year	8760	
Hours per Month	160	Monday - Friday
Cooling Months	6	7:00am - 3:30pm
Heating Months	6	

		Existing Configuration (KW)			New Configuration (KW)			Savings (KW)		
	%VFD Oper.	Pump #1 (VFD)	Pump #3	Pump #4	Pump #1 (VFD)	Pump #3	Pump #4	Pump #1 (VFD)	Pump #3	Pump #4
12:00 AM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
1:00 AM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
2:00 AM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
3:00 AM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
4:00 AM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
5:00 AM	30%	26.33	0.00	0.00	26.33	0.00	0.00	0.00	0.00	0.00
6:00 AM	45%	39.49	62.17	87.76	39.49	27.98	37.30	0.00	34.19	50.46
7:00 AM	60%	52.66	62.17	87.76	52.66	37.30	49.73	0.00	24.87	38.03
8:00 AM	60%	52.66	62.17	87.76	52.66	37.30	49.73	0.00	24.87	38.03
9:00 AM	65%	57.05	0.00	0.00	57.05	0.00	0.00	0.00	0.00	0.00
10:00 AM	45%	39.49	0.00	0.00	39.49	0.00	0.00	0.00	0.00	0.00
11:00 AM	45%	39.49	0.00	0.00	39.49	0.00	0.00	0.00	0.00	0.00
12:00 PM	35%	30.72	0.00	0.00	30.72	0.00	0.00	0.00	0.00	0.00
1:00 PM	35%	30.72	0.00	0.00	30.72	0.00	0.00	0.00	0.00	0.00
2:00 PM	30%	26.33	0.00	0.00	26.33	0.00	0.00	0.00	0.00	0.00
3:00 PM	30%	26.33	0.00	0.00	26.33	0.00	0.00	0.00	0.00	0.00
4:00 PM	40%	35.11	0.00	0.00	35.11	0.00	0.00	0.00	0.00	0.00
5:00 PM	45%	39.49	0.00	87.76	39.49	0.00	37.30	0.00	0.00	50.46
6:00 PM	45%	39.49	0.00	87.76	39.49	0.00	37.30	0.00	0.00	50.46
7:00 PM	25%	21.94	0.00	87.76	21.94	0.00	20.72	0.00	0.00	67.04
8:00 PM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
9:00 PM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
10:00 PM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
11:00 PM	25%	21.94	0.00	0.00	21.94	0.00	0.00	0.00	0.00	0.00
Total KW		57.05	62.17	87.76	57.05	37.30	49.73	0.00	24.87	38.03
Total KWH		754.78	186.50	526.59	754.78	102.58	232.09	0.00	83.93	294.50
Yearly KW		684.56	746.00	1053.18	684.56	447.60	596.80	0.00	298.40	456.38
Yearly KWH		275493.41	68072.50	192204.71	275493.41	37439.88	84712.44	0.00	30632.63	107492.26
Total $$$		**$24,642.50**	**$18,341.26**	**$29,417.61**	**$24,642.50**	**$10,879.94**	**$15,782.44**	**$0.00**	**$7,461.31**	**$13,635.18**

Total Pump Savings	$21,096.49