ENERGY AUDIT – FINAL REPORT
INTERMEDIATE SCHOOL

CEG PROJECT NO. 9C08140

BRIDGEWATER-RARITAN REGIONAL SCHOOL DISTRICT

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REPORT DISCLAIMER

I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted for:

Bridgewater-Raritan School District
Hillside Intermediate School
844 Brown Road
Bridgewater, NJ 08807

Facility Contact Person: Connie Coriell

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs for 2008 at this facility were as follows:

Electricity	$ 94,844
Natural Gas	$ 97,495
Total	$ 192,339

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)
1	Lighting Controls	$2,805	$415	6.7
2	Energy Efficient Window Film	$42,000	$1,637	25.6
3	Replace Unit Ventilators	$3,500/UV	$298/UV	11.7
4	Replace Heating Hot Water Boilers and Replace HW Modulating Valves	$152,000	$22,713	6.7
5	Replace Modulating HW Valves	$24,000	$2,470	9.7
6	Variable Speed HW Circulator	$12,500	$1,815	6.9
7	Install Full DDC System	$320,000	$19,234	16.6
8	Premium Efficient Motors	$4,090	$417	9.8
9	T-5 Lighting System - Gym	$19,200	$2,481	7.7
10	Walk-In Refrigerator Improvements	$1,870	$228	8.2
11	Cooler/Freezer Controls Upgrade	$755	$540	1.5
12	Reduction of Air-Infiltration	$12,400	$3,650	3.4
13	Low-E Window Systems	$94,700	$5,082	18.6
14	Install Boiler Controllers	$40,000	$7,711	5.2
15	Install Programmable Thermostats	$250/Unit; $12,500	$177/Unit; $8,850	1.4

The estimated demand and energy savings are shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		KW REDUCED	KWH REDUCED	THERMS REDUCED
1	Lighting Controls	-	2,770	-
2	Energy Efficient Window Film	-	-	1,010
3	Replace Unit Ventilators	-	67kWh /Unit	178 /Unit
4	Replace Heating Hot Water Boilers and Replace HW Modulating Valves	-	-	14,020
5	Replace Hot Water Modulating Valves	-	-	1,525
6	Variable Speed HW Circulator	-	12,017	-
7	Install Full DDC System	-	5,780	-
8	Premium Efficient Motors	-	2,762	-
9	T-5 Lighting System - Gym	-	16,544	-
10	Walk-In Refrigerator Improvements	-	1,520	-
11	Cooler/Freezer Controls Upgrade	-	3,600	-
12	Reduction of Air-Infiltration	-	24,170	-
13	Low-E Window Systems	-	-	3,137
14	Install Boiler Controllers	-	-	4,760
15	Install Programmable Thermostats	-	-	3,801

Concord Engineering Group (CEG) strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for Hillside Intermediate School:

- **ECM #1:** Lighting Controls
- **ECM #4:** Replace Heating HW Boilers and Replace Modulating HW Valves
- **ECM #6:** Variable Speed HW Circulator
- **ECM #11:** Cooler/Freezer Controls Upgrade
- **ECM #12:** Reduction of Air Infiltration
- **ECM #14:** Install Boiler Controllers
- **ECM #15:** Install Programmable Thermostats

In addition to the above recommendation, CEG also has a secondary suggestion to move forward with ECM #5: Replace Modulating HW Valves (Only if ECM #4 is not implemented), ECM #8: Premium Efficient Motors, ECM #9: T-5 Lighting System - Gym and ECM #10: Walk-in Refrigerator Improvements. These measures estimated simple payback is close to the simple payback threshold as noted above and will provide savings to the Owner over the lifetime of the facility. The Owner should review their applicability and how each ECM will improve the quality of their facility.

In regards to facility operation, the Owner should review the possibility of moving forward with ECM #3: Replace Unit Ventilators. Although ECM #3 provides an estimated 11.7 year simple payback per each unit ventilator installed, the replacement of the existing antiquated equipment is necessary. By replacing the existing unit ventilators the Owner will be able to ensure proper ventilation is being provided to each classroom, over-heating is not occurring and a healthy classroom environment is being maintained. In addition, through proper specification of equipment the Owner can receive electronic controls with the new unit ventilators that will allow for setback controls and more accurate operation; this will allow for minimum run-hours and an increase in overall building efficiency.

II. INTRODUCTION

The Hillside Intermediate School includes the following sections:

Building Section		Area
Pre-2005 Sections		82,023 SF
2005 Addition		8,430 SF
	Total:	90,453 SF

The first task was to collect and review two years worth of utility energy data for electricity and natural gas. This information was used to analyze operational characteristics, calculate energy benchmarks for comparison to industry averages, estimate savings potential, and establish a baseline to monitor the effectiveness of implemented measures. A computer spreadsheet was used to enter, sum, and calculate benchmarks and to graph utility information (see Appendix A).

The Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr) and can be used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting annual consumption of all fuels to BTU's then dividing by the area (gross square footage) of the building. EUI is a good indicator of the relative potential for energy savings. A comparatively low EUI indicates less potential for large energy savings. Engineering drawings obtained from the Board of Education were used to calculate the gross area of the school.

Obtaining Architectural and Mechanical drawings, a building profile was created that included age, occupancy, description, and existing conditions of Architectural and Mechanical Systems. The profile noted the major energy – consuming equipment or systems and components that are inherently inefficient. Also, by reviewing the mechanical drawings and equipment schedules, questions regarding the lighting systems/controls, HVAC zone controls, or setback operations were noted.

The site visit was spent inspecting the actual systems and answering specific questions from the preliminary review. The School District provided occupancy schedules, O & M practices, and other information that has an impact on energy consumption.

The post-site work included evaluation of the information gathered during the site visit, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on mechanical, lighting and building envelope improvements.

III. METHOD OF ANALYSIS

The first step in the energy analysis is the site survey. The auditor walks the entire site to inventory the building envelope (roof, windows, etc.), the heating, ventilation, and air conditioning equipment (HVAC), the lighting equipment, other facility-specific equipment, and to gain an understanding of how each facility is used.

The collected data is then processed using engineering calculations, Microsoft Excel spread sheets and Trane Trace 700™ building simulation software that calculate the anticipated energy usage. The actual energy usage is entered directly from the utility bills. The anticipated energy usage is compared to the actual usage. If necessary, corrections are made to the site-collected data until the anticipated energy usage matches the actual usage. This process develops an end-use baseline for all of the fuels used at the facility. This baseline is used to calculate the energy savings for the measures that are recommended in this report.

The savings in this report are duplicative. The savings for each recommendation will be lower if the individual recommendations were installed instead of the entire project. For example, the lighting module calculates the change in wattage and multiplies it by the existing operating hours instead of the new operating hours (if there was a change in the hours at all). The lighting controls module calculates the change in hours and multiplies it by the old system wattage instead of the new wattage. Therefore, if you chose to install the recommended lighting system but not the lighting controls, the savings achieved with the new lighting system would be lower because there would have been a reduction in the hours of use.

The same principal follows for heating, cooling, and temperature recommendations – even with fuel switching. If there are recommendations to change the temperature settings to reduce fuel use, then the savings for the heating/cooling equipment recommendations are increased, as well.

Our thermal module calculates the savings for temperature reductions utilizing Trane Trace 700™ building simulation software. The savings are calculated in "output" values – meaning energy, not fuel savings. To show fuel savings we multiply the energy values times the fuel conversion factor (these factors are different for electricity, natural gas, fuel oil, etc.) and also take into account the heating/cooling equipment efficiency. The temperature recommendation savings are higher when the heating/cooling equipment is more efficient or is using a cheaper fuel.

Thermal recommendations (insulation, windows, etc.) are evaluated by taking the difference in the thermal load due to reduced heat transfer. Again, the "thermal load" is the thermal load before the other recommendations have been accounted for.

Lastly, installation costs are then applied to each recommendation and simple paybacks along with return on investment are calculated. Costs are derived from Means Cost Data, other industry publications, and local contractors and suppliers. The SmartStart Buildings® incentives are calculated for the appropriate ECM's and subtracted from the installed cost prior to calculation of the simple payback. In addition, where applicable, maintenance cost savings are estimated and applied to the net savings.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Jersey Central Power & Light provides electricity to the facility under the General Service Secondary 3 Phase Rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-08 to December-08. Hess Corporation supplies the natural gas from the wellhead to the PSE&G pipelines. PSE&G charges a rate per therm for delivery of the natural gas via their pipelines to the burners.

Description	Average
Electricity	15.1¢/kWh
Natural Gas	$1.62 / Therm

Table 3
Electricity Bill Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	67,765	200	$9,131
2/08	55,970	200	$7,501
3/08	61,573	200	$7,870
4/08	48,232	184	$6,144
5/08	46,513	184	$6,784
6/08	46,512	190	$7,449
7/08	54,829	190	$10,479
8/08	24,565	157	$4,752
9/08	54,688	211	$7,593
10/08	60,757	195	$9,459
11/08	51,528	190	$8,367
12/08	55,547	200	$9,314
Totals	**628,479**	**211 Max**	**$94,844**

Figure 1
Electricity Usage Profile

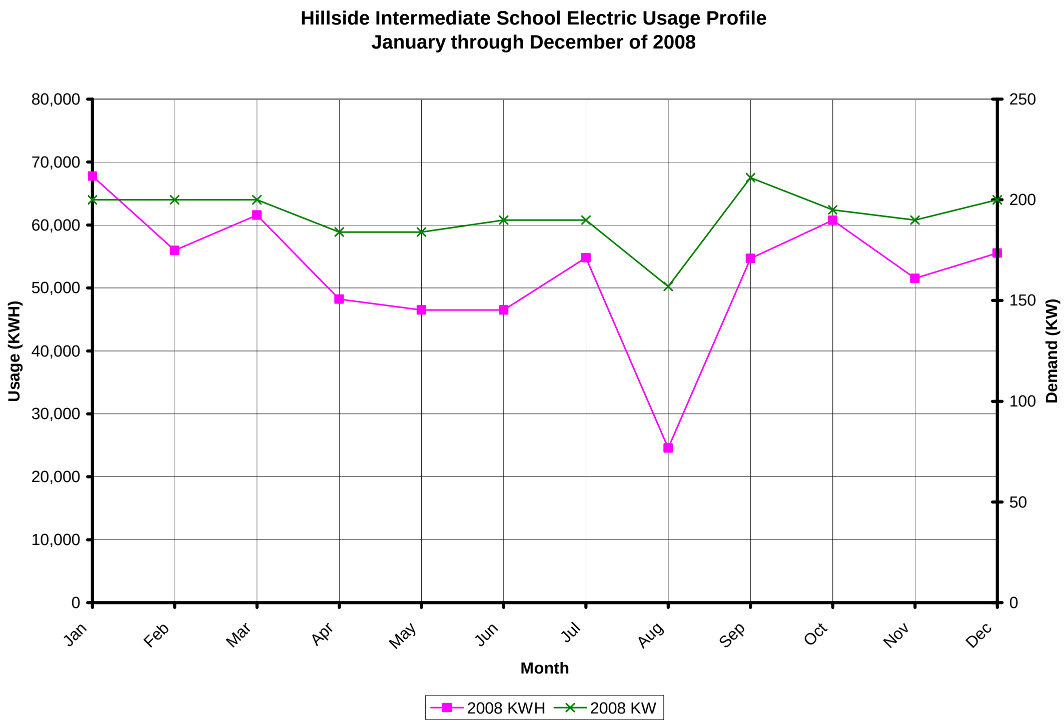
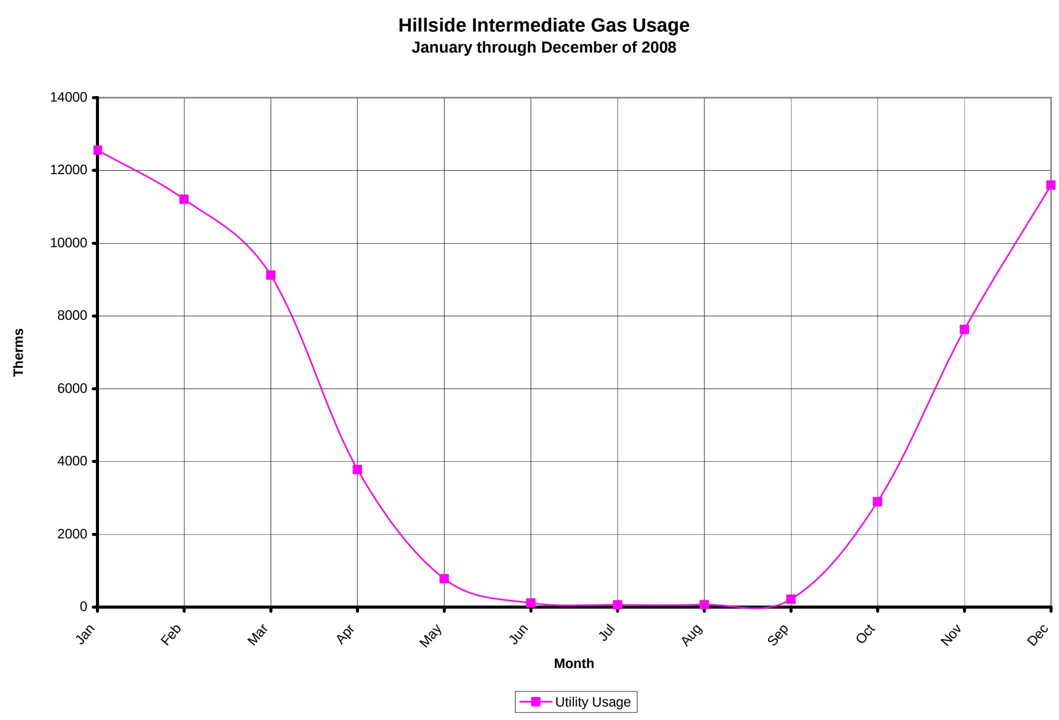


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	12,556	$21,505
2/08	11,205	$18,774
3/08	9,117	$15,667
4/08	3,776	$5,821
5/08	778	$1,226
6/08	117	$278
7/08	63	$197
8/08	67	$186
9/08	215	$369
10/08	2,892	$4,625
11/08	7,627	$11,660
12/08	11,597	$17,187
Totals	**60,010**	**$97,495**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. Their website allows the user to determine how well the client's building energy use intensity (EUI) compares with similar facilities in the U.S. and NJ.

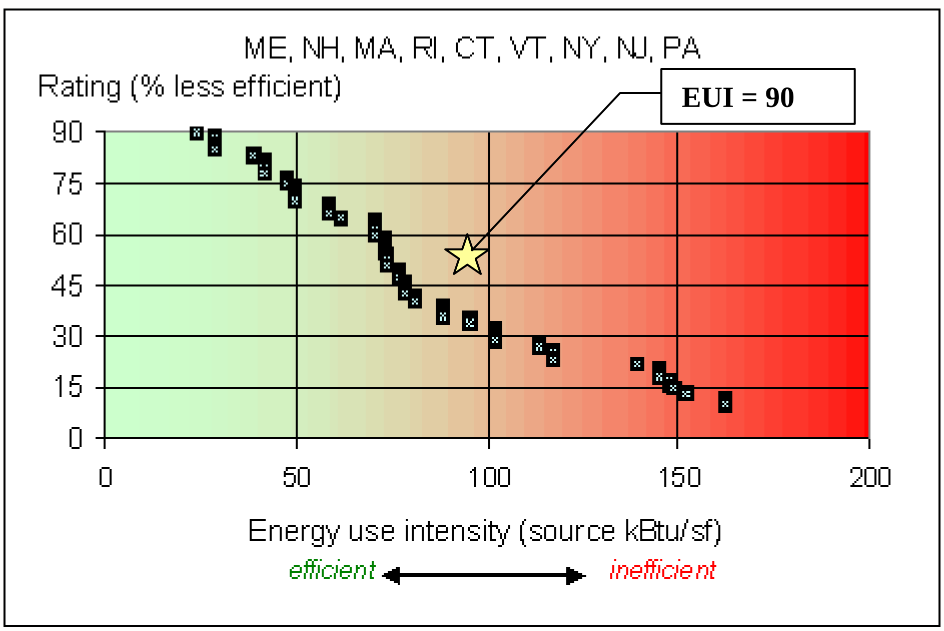
Hillside Intermediate School EUI = (Electric Usage in kWh + Gas Usage in kWh) / SF

= [(628,479 kWh) + (60,010 Therms x 29.3 kWh/Therm)] / SF

= (628,479 kWh + 1,758,293 kWh) / 90,453 SF

EUI = 26.38 kWh / SF x 3.412 kBtu/kWh = <u>90 kBtu/sf</u>

<u>Energy Use Intensity Distributions:</u>



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows you to track and assess energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and more emphasis is being placed throughout multiple arenas on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these priorites and goals. Saving energy will in-turn save the environment.

Utilizing the utility bills and other information provided by the School District and entered into Portfolio Manager, the resultant energy performance rating was calculated. The following is a summary of the facility's Portfolio Manager results:

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Hillside Intermediate School	58	50

Refer to Appendix D for detailed energy benchmarking report entitled "STATEMENT OF ENERGY PERFORMANCE."

V. ENERGY MANAGEMENT PROGRAM

An energy management program involves a suite of activities, which can be grouped into key energy management principles. These principles are good management practices and are similar to management techniques used in other aspects of a business. They include:

- energy policy and plan, adopting a strategic approach, obtaining commitment,
- organization, appointing an energy manager and team,
- understanding energy use and cost, conducting an energy audit,
- staff awareness and training program,
- marketing energy management,
- investing and action, and
- energy monitoring and reporting.

The Bridgewater-Raritan Regional School District has instituted a comprehensive energy management program which includes a written energy policy/plan, developing an energy-efficient culture and support awareness, staff awareness and training, utility reporting software, and externally promotes energy savings. In addition, the School District compares their energy use to previous years, to EPA benchmarks for similar facilities, and sets targets for energy savings.

The next step in energy management for the School District is obtaining updated energy consumption data by installation of an interval metering data system.

Interval metering is when a meter records demand and consumption during a single day to create an energy usage profile. Typical interval lengths are 15, 30 and 60 minutes. This data is typically used in energy management applications when a customer needs to know how much power they are using at various times during the day.

In essence, interval meters allow users to create a fully integrated energy management approach for the targeted facility by:

1. Determining your precise energy consumption
2. Ensuring your LDC has billed you correctly
3. Developing Load Shifting measures to minimize demand charges
4. Engaging in demand response activities when it makes sense
5. Revising your procurement strategy to best suit the facility’s load profile

VI. FACILITY DESCRIPTION

The Hillside Intermediate School is a three-story brick structure that consists of two sections – original building built in 1961 and the addition built in 2005. The facility is approximately 90,453 square feet in size and classes are from 9:30 AM until 3:30 PM during the school year. In addition, the gym and cafeteria are used during the winter months and the cafeteria is used for church services for 4 hours on Sundays all year round which adds 208 hours per year to the lighting and HVAC hours of operation.

Heating System

The older sections of the school (excluding the 2005 Addition) are heated by two H.B. Smith boilers rated at 4,025 MBH each with each burner capacity at 5,862 MBH. The hot water is distributed by two pumps with 10 HP motors.

Heating in the 2005 Addition is provided by an Aerco KC Series 1000 gas-fired hot water system with an input of 1,000,000 Btu/Hr and an output of 860,000 to 930,000 Btu/Hr. The hot water is distributed by a 1.5 HP pump.

Hot water is supplied to rooftop units, air handling units, unit ventilators, fin-tube radiators, unit heaters, cabinet unit heaters, etc.

Domestic Hot Water

Domestic hot water for the older sections of the school is provided by a Bradford White Magnum Series gas-fired, 75 gallon capacity hot water heater rated at 300,000 Btu/hr input. An A. O. Smith 30-gallon, gas-fired hot water heater rated at 35,000 Btu/hr input serves the 2005 Addition.

Cooling System

Cooling is provided in the Administration offices by ductless split systems. Data closets/rooms are also cooled most of the year using split systems.

Controls System

All HVAC units in the older sections are controlled by local or remote pneumatic thermostats. We could not determine an actual level of accuracy. In addition, we observed many air leaks in the tubing and actuators. The 2005 Addition has a full DDC system.

Lighting System

All of the classrooms have pendant-mounted, 2-lamp T8 direct/indirect lighting fixtures with electronic ballasts. Offices, storage rooms, stairwells, corridors, etc. are 2-foot by 4-foot, 2-lamp T8 lighting fixtures. The gym has older style HID fixtures with metal halide lamps.

VII. MAJOR EQUIPMENT LIST

Equipment denoted by an asterisk indicates an estimate of the equipment ratings due to equipment inaccessibility, worn nameplates, lack of nameplates, etc. Refer to Appendix B for a more detailed major equipment list.

HEATING EQUIPMENT						
Description	Qty	Rated Capacity (Each)	Fuel	Approximate Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
HB Smith 28A-18	2	4,629 MBH	NG	20	35	15
Aerco KC-1000	1	930 MBH	NG	4	25	21

COOLING EQUIPMENT						
Tag	Manufacturer	Qty	Capacity	Approximate Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
RTU-1	Aaon	1	25-Ton	4	15	11
RTU-2	Aaon	1	15-Ton	4	15	11
AH-1	Aaon	1	5-Ton	4	15	11
AH-2	Nesbitt	1	2-Ton	4	15	11
AH-3	Nesbitt	1	2-Ton	4	15	11
-	Rheem	1	2-Ton	4	15	11
-	Peake	2	¾-Ton	**	15	**
-	AAON	1	15-Ton	5	15	10
-	Sanyo	2	¾-Ton	4	15	11
-	Sanyo Heat Pump	1	2-Ton	**	15	**
-	Dyna-Zone Heat Pump	1	1-Ton	**	15	**

Note: ** Nameplate information could not be gathered in field.

DOMESTIC HOT WATER SYSTEM						
Description	Qty	Input	Fuel	Approximate Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
Bradford White P75T3003NA	1	300 MBH	NG	10	15	5
A.O. Smith 30-Gallon Capacity	1	35 MBH	NG	2	15	13

HEATING HOT WATER PUMPS					
Description	Qty	Pump HP	Approximate Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
HW Pump	2	10	14	20	6
HW Pump	2	5	14	20	6
HW Pump	1	1.5	14	10	(4)

VIII. ENERGY CONSERVATION MEASURES

ECM #1: Install Lighting Controls

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Timeclocks are often used which allows the user to set an on/off schedule. Timeclocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in a digital format. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all private offices, conference rooms, mechanical rooms, storage rooms, file rooms, teacher rooms, etc.

From Appendix C of this report, we calculated the lighting power density (Watts/ft^2) of the existing facility to be 0.97 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

10% x 0.97 Watts/SF x 10,200 SF x 2,800 hrs/yr.

= 2,770 kWh/yr. x $0.15/kWh

Annual Savings = $415 / yr

CEG would recommend wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper, etc. Installation cost per dual-technology sensor is $75/unit. The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of rooms to be retrofitted is 51 (10,200 SF). Total cost to install sensors is $55 x 51 units = $2,805.

Simple Payback = 6.7 Years.

ECM #2: Install Energy Efficient Window Film

The word "envelope" refers to the "shell" of the building: walls, roof, windows, and doors. To improve the envelope would mean upgrading or adding materials or equipment to enhance the insulation or to reduce the amount of unconditioned outside air that enters the building.

In some cases, envelope improvements require a significant investment. Although the money gets recovered through energy savings, the payback is typically not very attractive. However, other considerations would add a great deal of value to the improvements. For example, in the case of a drafty building, adding insulation or upgrading the windows would improve human comfort. Human comfort affects your bottom line because uncomfortable or unhappy occupants will have a higher absentee rate and/or will require additional time from maintenance personnel as they search for stopgap solutions to the problem. These and other considerations must be taken into account when analyzing envelope measures.

Energy savings calculations for the older sections of the facility:

***** Heating Degree Days = 5,539°F – day/yr.

***** Cooling Degree Days = 918°F – day/yr.

***** Obtained from the Morristown, NJ Weather Station

Total window area to be considered = 12,000 SF (Obtained from the Architectural Drawings)

U_{exist} = 0.87 Btu/hr – ft^2 - °F

U_{new} with high-efficiency window film = 0.68 Btu/hr – ft^2 - °F

<u>Annual Energy Savings (Heating)</u> =

$\frac{8 \text{ hrs}}{\text{Day}}$ * Window Areas * (U_{exist}-U_{new}) * HDD

= 8 * 12,000 * (0.87-0.68) * 5,539 = 101 MMBtu = 1,010 Therms

Total Energy Savings = 1,010 Therms x $1.62

= $1,637/Yr.

Installed Cost of High-Efficiency Window Film = $3.50/SF x 12,000 SF = $42,000

Simple Payback for Upgraded Windows = 25.6 Years

ECM #3: Replace Unit Ventilators

The original building classrooms are heated and ventilated by vintage unit ventilators that consist of hot water coils, fans, and pneumatic controls. During the site audit, many classrooms were measured to be well over 85ºF with the windows open to attempt to cool the spaces. These units are beyond their expected service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these unit ventilators should be replaced.

This ECM would replace the unit ventilators with high-efficiency units that feature a face and bypass damper to allow a variable portion of the mixed return and ventilation air to flow over the heating coil. This method of capacity control also allows for free cooling when the outdoor air is relatively cool and full-stream cooling is not necessary. These unit ventilators would be equipped with DDC controllers that would communicate with the room thermostats (changed to DDC) and other equipment such as the boilers indicating when to supply hot water for heating demand. To make this energy conservation measure viable, it would be necessary to convert the pneumatic controls in each classroom to DDC.

Estimated Energy Savings

The analysis is based on the following assumptions for a typical existing unit ventilator:

- Typically insulated 1,000SF classroom (UA=210 Btuh/ºF)
- 21 person occupancy
- 0.97 watt per square foot lighting load
- Morristown, NJ weather
- Classroom occupied 7 hours per day, 180 days per year
- Thermostat setting of 70ºF occupied and no night time setback
- 60% efficient gas-fired boiler
- $0.15/kWh for electrical cost
- $1.62 per therm of natural gas cost
- Ventilation rate of 15cfm per person
- Unit Ventilator total air supply rate = 1,000 cfm
- Unit ventilator fan static pressure = 0.25” w.g.
- Unit Ventilator fan/motor efficiency = 25%
- Classroom exhaust system flow rate = 310 cfm
- Classroom exhaust system static pressure = 0.5” w.g.
- Classroom exhaust fan efficiency = 30%

During the occupied hours of the classroom, internal heat gains from people, lights, and computer (9,500 Btu/hr) effectively lowers the heating requirements by 17ºF. When the thermostat is set to 70ºF, the classroom does not need heat until the outside temperature drops to 53ºF (assuming no gains from solar heating). During unoccupied hours, the thermostat should be set to 55ºF, but there are no heat gains to lower the heating requirement, hence the classroom space needs heating whenever the outside temperature drops below 55ºF.

Using the assumptions listed above, the existing unit ventilator uses approximately 148kWh/yr during occupied hours and 43 kWh/yr during unoccupied hours. This equates to a total unit ventilator electrical consumption of approximately 191 kWh/yr. In addition, the unit ventilator system requires an exhaust system to exhaust the classrooms. The electrical consumption for running the exhaust fan 1,260 hours per year is 78 kWh/yr. The total electrical cost for the unit ventilator and classroom exhaust is 269 kWh/yr, or $40.62/yr.

The existing unit ventilator also requires approximately 254 Therms of natural gas to produce the required heating hot water during the occupied period and approximately 456 Therms of natural gas to heat during the unoccupied period of the heating season for a total of 710 Therms per year to heat a typical classroom with the existing unit ventilators. This equates to a fuel cost of $1,150.20/yr per unit ventilator.

By installing a high-efficiency unit ventilator with a DDC controller, a digital thermostat and an unoccupied setpoint of 55ºF, it is estimated that the energy savings per unit ventilator would be approximately 25%.

Total energy savings = 25% x [$40.62/yr + $1,150.10/yr] = $298/yr per unit ventilator.

The installed cost of a 1,000 CFM high-efficiency unit ventilator = $3,500

Simple payback for a 1,000 CFM unit ventilator = 11.7 years

ECM #4: Replace Heating Hot Water Boilers (Older Section) and Replace Hot Water Modulating Valves

The older sections of the building are heated by 1989 vintage cast iron, sectional boilers that are 55% efficient at best. For conventional boilers anything over 85% combustion efficiency is traditionally considered efficient.

One of the most innovative combustion technologies currently available in the market is the gas-fired pulse-combustion boilers. When combined with other high-performance elements for heat transfer, the overall efficiency of these heating systems can attain 90%. In a modular heating plant, one boiler is first operated to meet small heating loads. Then, as the load increases, additional boilers are fired and enter on-line to gradually increase the capacity of the heating system. Similarly, as the load decreases, the boilers are taken off-line one by one.

Our building energy simulation software calculated the old sections peak heating load to be 2151.6 MBH. Obviously, the existing hot water heating system is largely oversized. During the site visit on 2/10/09 at 3:00 PM, the outside temperature was 45°F and both existing boilers were firing. The temperature in most of the classrooms was between 76ºF and 78ºF and the teacher’s work room was 80ºF.

We recommend that the two (2) H. B. Smith cast iron, sectional hot water boilers be replaced by four (4) Fulton Pulse QT Fully Condensing Hot Water Modular Boilers or Equal with a net rated capacity of one million Btu/hr each. In addition, the boiler management system that is part of the boilers will sequence the boilers and reset the hot water temperature based on the outside temperature. Furthermore, this ECM also includes the replacement of the existing hot water modulating valves with electronic valves for the terminal equipment. (Refer to ECM #5 description for further information.)

<u>Existing HW Boilers:</u>

Net Rated Capacity = 4,025 MBH natural gas each x 2 units = 8,050 MBH

Combustion Efficiency = 60%
Radiation Losses = 5%
Net Efficiency = 55%

<u>Replacement Boilers:</u>

High Efficiency Fulton Modular Boilers or Equal (with Sequencing Control & O/A HW Reset)

Net Rated Capacity = 1,000 MBH Nat. Gas x 4 units = 4,000 MBH
Combustion Efficiency = 88%
Radiation Losses = 0.5%
Net Efficiency = 84.5%

Operating Data:

Heating Season Fuel Consumption = 40,160 Therms
(Based on gas billing data)
Average Cost of Natural Gas = $1.62/Therm

Operating Hours during Heating Season: 3,240 hrs

Energy Savings = Old Boiler Energy Input * ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 40{,}160 \text{ Therms} \times \frac{(.845-.55)}{(0.845)}$$

= 14,020 Therms

Cost Savings = Annual Energy Savings * $/Therm = 14,020 Therms * $1.62/Therm

= $22,713 / yr. ($2,470/yr. due to replacement of HW modulating valves)

Installed cost of four (4) modular, high-efficiency boilers @ 1,000 MBH (including the new modulating HW valves) = $135,000 + $24,000 = $159,000 (budget costs obtained from Miller & Chitty Co., Inc.). The SmartStart Buildings® incentive is $1.75 per MBH which equates to $7,000. Net installation cost = $152,000

Simple Payback = $152,000/$22,713 = 6.7 Years

ECM #5: Replace Hot Water Modulating Valves on Terminal Units

The function of a hot water modulating valve is to meter hot water into the hot water coil as the room temperature drops and to reduce the flow of water into the coil when the room space temperature is satisfied. During the site survey, many spaces were well above the setpoint of 72ºF at 4:00 PM when a minimum number of spaces were occupied. The hot water valves were discovered to be in the open position on several air handlers and fan coil units even though the temperature in the space was well above 72ºF.

This energy conservation measure will replace the existing hot water modulating valves with electronic valves. It must be implemented along with any boiler control upgrades or boiler replacement measures to obtain the full value of the estimated savings (14,020 Therms).

If this recommended ECM is implemented without replacement of the heating hot water boilers (ECM # 4), the estimated cost would be approximately: 24 valves x $1,000/valve installed: $24,000. The annual fuel savings would be approximately $2,470 for a simple payback of 9.7 years.

ECM #6: Variable Speed Hot Water Circulator

The circulating pumps for most hot water systems are sized to provide constant flow with enough flow and head pressure to satisfy all zones calling for hot water simultaneously under design conditions. As zone valves close, less heat is required. But with a fixed speed circulating pump, the open zone valves will see an increase in flow, with a corresponding drop in heat transfer along with considerable velocity noise. In addition, because of the Smith cast-iron boilers, the higher return water temperatures will cause the boilers to short-cycle, reducing the boiler overall efficiency and consuming more natural gas.

This energy conservation measure would install two variable speed circulating pumps on the heating hot water system along with the appropriate temperature sensors/controls.

For the Heating Hot Water Circulating Pumps:

Base Assumptions:		Operating Assumptions:
Pump Horsepower:	10	4,000 hrs/yr
Assumed Efficiency	82%	30% hrs @ 90% flow
Assumed Load Factor	80%	40% hrs @ 70% flow
		30% hrs @ 50% flow

Estimated Energy Savings:

Energy Calculations:		Cost Assumptions	
Active kW:	6.9	Quantity:	1
kWh Reduction:	12,017	HP:	10
Energy Savings:	$ 1,815	Cost:	$12,500

Simple Payback Period = 6.9 years

ECM #7: Install Full DDC System

Throughout the building there are pneumatic manual wall thermostats for various HVAC units and local pneumatic controls with adjustable settings on the heating/cooling units that were installed in 1961. These indoor temperature controls are inaccurate due to temperature drift, age, cost of maintenance of pneumatics and not having been re-calibrated. These units also do not have night time setback features. In addition, the pneumatic controllers don't have the ability to maintain the temperature at setpoint under changing load conditions.

This energy conservation measure would replace the entire pneumatic temperature control system with a Direct Digital Control System. The Direct Digital Control System will consist of multiple controllers networked over an Ethernet system that will display data at a standard PC via a web browser to allow the School District remote control and monitoring of the HVAC equipment. The advantages of a DDC system include deleting the air compressor, air dryer, and controls along with the maintenance costs of pneumatic systems. With a DDC system, it is possible to develop historical records on the operating characteristics of a building; identifying trends which can lead to better performance. The DDC system also allows for comprehensive alarm management in the event of a mechanical system malfunction. DDC saves time by eliminating the need to change various time clocks for holidays and schedule changes. Finally, this system allows remote access to the controllers for trouble shooting or to more easily change setpoints or occupancy schedules.

In addition to the building operation and alarm management functions of the DDC system, CEG also recommends that the DDC system be configured to accept interval metering data. Based on the School District's interest in monitoring their energy use, CEG believes that interval metering is the next step in being able to fully control the operation of their facility. The School District will be able to review their consumption patterns and identify trends. Based on this information, the School District will be able to develop effective strategies to lower their consumption and save money on their electricity and gas bills. Reducing the peak through these types of programs will not only benefit the School District by lowering their electricity bills, but will also benefit the electricity system, by reducing the pressure to build new generation capacity to respond to growing peak loads. It is pertinent to note that the interval meter itself, is something that the Owner will need to request from their utility provider. Based on the facility's utility usage, the School District should not have issue acquiring the interval meter from the utility.

The cost of a full DDC system with new field devices, thermostats, controllers, computer, software, engineering, etc. is approximately $4 per SF based on recent project cost data and Contractor's estimate pricing. For this facility, the estimated cost of a complete DDC system is approximately $320,000.

The installation of a full DDC system would save an estimated 10% of the total energy costs for this facility.

Annual Savings = 10% x $192,339 = $19,234

Simple Payback = $320,000 / $19,234 = 16.6 years

ECM #8: Install NEMA Premium Efficient Motors

Existing electric motors equal to or greater than one horsepower ranged from 78 to 81% efficient. The improved efficiency of the NEMA premium efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

This energy conservation measure would replace all motors equal to or greater than 1 HP with NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. Using MotorMaster+, Version 4, the energy & cost savings were calculated for the fan/pump motors in this facility that are greater than or equal to 1 HP.

For Example: A 2HP Supply Air Fan Motor with the following:

Existing Motor Efficiency = 80.8%
Annual Hours of Operations = 2,800 (Average)
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.15 / kWh

New NEMA Premium® Motor Efficiency = 86.5%

Existing 2HP Motor Operating Cost =

{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency

= [0.746 x 2 x 0.75 x 2,800 x 0.15] ÷ 0.808 = $582 / Year

New NEMA Premium® Efficiency Motor Operating Cost =

{0.746 x 2 x 0.75 x 2,800 x 0.15} ÷ 0.865 = $543 / Year

Savings = $582 - $543 = $39 / Year

Installed Cost of a 2 HP NEMA Premium® Efficiency Motor = $518 minus the SmartStart Building® incentive of $90 is $428.

Simple Payback = $428 / $39 = 10.9 Years

The following table outlines the motor replacement plan for this facility:

MOTOR REPLACEMENT PLAN

MOTOR HP	QTY	ENCL. TYPE	NO. OF POLES	INSTALLED COST **	TOTAL COST	TOTAL SAVINGS	SIMPLE PAYBACK
1.5	1	ODP	6-Pole	$455	$455	$57	11.35
5	2	ODP	4-Pole	$705	$1,405	$120	
7.5	1	ODP	4-Pole	$990	$990	$116	
10	1	ODP	4-Pole	$1,200	$1,200	$124	44
				Totals:	*$4,090*	*$417*	*9.8*

**** Net Cost after the SmartStart Buildings® incentive is applied.**

ECM #9: Install T-5 Lighting System in Gym

The existing gym lighting system uses thirty (32) 250-Watt Metal-Halide (MH) fixtures which have poor lumen maintenance (approximately 30% reduction in lighting output at 40% of rated lamp life). Also, the fixture ballast can be very noisy, require up to 10 minutes to re-strike after shutdown, and there is a noticeable color shift as the lamp approaches the end of its life.

This ECM would replace each of the existing gym light fixtures with new T-5 high-bay fixtures which would include three, 4-foot T5 High Output (HO) lamps. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 250-Watt MH lamps so there would be a savings in replacement cost/labor. In addition, the T-5 HO lamps have better lighting quality and lumen maintenance. The gym is used 3,800 hours per year by the students (year round) and by the community an additional 900 hours during the winter months for a total of 4,700 hrs per year.

The existing fixtures use 295 Watts per fixture and the new three-lamp T-5 HO units will use 185 Watts per fixture.

The annual energy savings = 32 Fixtures x (295W – 185W) x 4,700 hours = 16,544 kWh

Energy Cost Savings = 16,544 kWh x $0.15/kWh = $2,481

The cost of the three-lamp, 54W T-5 HO fixture with specular reflector is $650 installed.

Total Cost = 32 Fixtures x $650/Fixture = $20,800. The SmartStart Building® incentive is $50 per fixture which equates to $50 x 32 fixtures = $1,600

Net Installed Cost = $19,200

Simple Payback = $19,200 / $2,481 = 7.7 years

ECM #10: Efficiency Improvements – Walk-in Refrigerator

The amount of energy consumed by a refrigeration system can be reduced by retrofitting the items described below. The effects of the following energy efficient retrofits are additive. Each one incrementally and independently reduces the load on the compressor. CEG recommends that all three (3) retrofits be completed in order to provide the most efficiency improvements for the refrigeration system.

- High-efficiency refrigeration compressors use more efficient electric motors and have lower compressor losses. The use of high-efficiency compressors can save from 3 to 5 percent in energy costs.
- High-efficiency evaporator fan motors release less heat into the refrigerated room than conventional induction motors. This reduces the energy draw by the fan motor and the compressor. System energy savings are 5 to 10 percent for these motors.
- A high-efficiency condenser fan motor can reduce energy requirements. System energy savings can be from 3 to 5 percent.

Estimated annual energy cost savings for these three measures is as follows:

Measure	Average Saving (%)	Approximate Annual Savings
HE* Compressor	5%	$98
HE Evaporator Fan Motor	4%	$52
HE Condenser Fan Motor	5%	$78
Total**		$228

***HE = High Efficiency**
****Savings are additive**

The cost of these three measures is estimated to be $1,870

Simple Payback = 8.2 Years

ECM #11: Refrigerated Walk-In Cooler Controls Upgrade

The refrigerated walk-in cooler has a bank of evaporator fans that circulate the cold air over and under the food. These banks of evaporator fans (typically 1/20 HP motors) run continuously and give off heat that must be removed by the refrigeration.

This measure would install an evaporator fan controller that features two-speed operation of the evaporator fans – high speed during cooling, and low speed when not cooling.

The estimated energy savings assumes that the cooler is not opened for 16 hours of each school day and 24 hours/day for the weekends.

Installing a controller on the six (6) evaporator fan motors would save approximately 400 kWh/month x 9 months = 3,600 kWh

Energy Cost Savings = 3,600 kWh x $0.15/kWh = $540

The cost of an evaporator fan controller installed = $755

Simple Payback = 1.49 years

ECM #12: Reduction of Air-Infiltration

For school facilities, the thermal loads due to air infiltration can be significant. It is estimated that for well-insulated buildings, infiltration can contribute up to 40% to the total building heat load. Studies have shown that leaks in exterior walls (frames of windows, doors, plumbing penetrations, etc.) constitute the major sources of air leakage for school buildings.

To improve the air tightness of the building envelope, several methods and techniques are available including:

- Caulking: Several types of caulking (urethane, latex, polyvinyl, etc.) can be applied to seal various leaks, such as those around window and door frames, and any wall penetrations, such as holes for water pipes.
- Weather Stripping: By applying foam rubber with adhesive backing, windows and doors can be air sealed.
- Air Retarders: They consist of one or more air-impermeable components that can be applied around the building exterior shell to form a continuous wrap around the building walls. There are several types such as liquid-applied bituminous, liquid-applied rubber, sheet plastic. Unless they are part of an overall building envelope retrofit, these systems are typically expensive to install for existing buildings.

Using an air infiltration rate of 1.5 air changes per hour (ACH), we will demonstrate the potential savings for this measure using Areas “A” and “B” (not including the Addition, Area “C” or the connecting corridors).

Using the Degree-Days Method, we assume the following:

Caulking and weather-stripping improvements will reduce air filtration by half.
Existing gas-fired boiler net efficiency = 55%
Heating Degree Days = 5,539ºF – day/yr
Gas cost is $1.62/Therm = $0.055/kWh
Existing air infiltration equivalent U-value is 200 W/ºF
New air filtration U-value is 100 W/ºF

Energy Savings = 24 hr/Boiler Efficiency x [(200-100) W/ºF] x 5,539ºF – day/yr =
24hr/0.55 x [100 W/ºF] x 5,539ºF – day/yr = 24,170 kWh

Gas cost savings = 24,170 kWh x $0.055/kWh = $1,329

The estimated cost of caulking/weather-stripping for areas A & B is $12,400.

Simple payback = 9.3 years

ECM #13: Install High-Efficiency Low-E Window Systems

The older sections of the school building have single-pane windows which allow heat losses and gains resulting in cooler interior surfaces during the heating season and warmer interior surfaces during the cooling season. In addition, these windows are a source of cold air leakage into the school and often result in condensation-related problems when this cold air contacts warmer surfaces.

High-performance windows can provide many benefits including:

- Improved comfort by reducing radiant heat exchange
- Improved indoor air quality by reducing air leakage that can bring dirt, dust, and other impurities into the building
- Lower utility bills since these windows are better insulated and more air-tight
- Fewer condensation problems since these windows stay warmer in the heating season resulting in drier windows
- Reduced wear on furnishings, carpeting, window treatments, etc. since low-e coatings block up to 98 % of the ultraviolet radiation of the sun.

This energy conservation measure would replace all of the single-pane windows with high performance, low-e window units. CEG estimated the window square footage utilizing floor plans provided by the Owner and assuming a 60% window to wall ratio for the rooms with fenestration based on information gathered during our site survey such as building floor height and window type. Based on an average nominal window size of 4' x 6' (24 SF) an estimated 500 windows can be replaced.

<u>Energy savings calculations</u>:

Heating Degree Days = 5,539°F – day/yr.

Cooling Degree Days = 918°F – day/yr.

Total window area to be retrofitted = 12,000 SF

Uexist. = 0.87 Btu/hr – ft^2 - °F

CEG would recommend replacement of the existing single pane windows with a commercial window product that meets or exceeds the following performance characteristic. U-Factor = 0.28, Solar Heat Gain Coefficient = 0.21 and Visible Transmittance = 0.49.

Unew = 0.28 Btu/hr – ft^2 - °F

Annual Energy Savings (Heating) =

<u>8 </u>hrs * Window Areas * (Uexist-Unew) * HDD

= 8 * 12,000 * (0.87-0.28) * 5,539 = 313.7 MMBtu = 3,137 Therms

Energy Savings = 3,137 Therms x $1.62 = $5,082

Upgraded Window Cost = $94,700

Simple Payback for Upgraded Windows = 18.6 Years

ECM #14: Install Boiler Controllers

As is shown by the Trane Trace 700™ building simulation software output, the existing Smith sectional hot water boilers have 1.5 to 2 times the heating capacity that is needed to maintain the facility's temperature on the most extreme days. Due to this over-sizing of the boiler, the burner will cycle on and off continuously as was witnessed on 2/10/09 after 3PM when the building was mostly unoccupied. The temperature of the hot water leaving the boilers was 188°F and the hot water was returning to the boilers at 168°F. The detailed weather data from the Morristown Airport for that day shows that the lowest outside air temperature was 29°F. Based on this data, the boiler could have delivered 170°F hot water and would have maintained the building temperature.

This energy conservation measure consists of installing a dynamic boiler controller, a temperature sensor, and LCD readout. Energy is saved by adjusting the burner run pattern to match the system's heat load. The controller determines the heat load by using a strap-on temperature sensor that monitors the boiler's hot water supply temperature and the rate this temperature is changing. Depending on the measured load, the burner is adjusted so that the boiler uses less fuel to generate the required amount of hot water. This action is similar to the industry-accepted method of outdoor air temperature reset control, but does not require an outdoor air temperature sensor.

Most manufacturers of dynamic boiler controllers will guarantee a 10% reduction in fuel consumption.

During 2008, the boilers consumed an estimated 47,600 Therms of natural gas.

Energy savings = 4,760 Therms

Cost savings = 4,760 Therms x $1.62/Therm = $7,711

The estimated cost for the boiler controls system installed is $ 40,000.

Simple payback = 5.2 years

ECM #15: Programmable Thermostat Installation

The majority of the classrooms and offices are fitted with standard, manual wall thermostats for various air handling units and local control with adjustable settings on the unit ventilators. These pneumatic temperature controls are inaccurate due to temperature drift, age, and not having been re-calibrated. These units also do not have night time setback features.

This energy conservation measure would replace existing pneumatic wall thermostats with programmable 7-day thermostats and night time setback control.

Based on the following setpoints,

Occupied heating = 70° F
Occupied cooling = 74° F
Unoccupied heating = 60° F
Unoccupied cooling = 85° F

CEG recommends replacement of the existing remote thermostats with Honeywell RTH7500D 7-day programmable thermostat or equivalent.

The energy savings between the conventional dial thermostats and 7-day programmable thermostats was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. The referenced calculator can be found at www.energystar.gov. Refer to Appendix E for the detailed calculation.

Calculated annual energy savings = $177/Unit

Cost of a 7-day programmable thermostat (installed) = $250/unit

Based on CEG's site survey, an estimated 50 thermostats are required within the Intermediate School. Therefore, the total energy savings, cost and simple payback are as follows:

Total Energy Savings: $177 x 50 = $8,850

Total Installed Cost: $250 x 50 = $12,500

Simple Payback = $12,500 / $8,850 = 1.4 Years

IX. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for Bridgewater-Raritan School District, and concluded that there is potential for solar energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof is necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 4,485S.F. can be utilized for a PV system the Intermediate School Facility. A depiction of the area utilized is shown in Appendix F. Using this square footage it was determined that a system size of 70.38 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 109,831 kWh annually, reducing the overall utility bill by 17.4% percent. A detailed financial analysis can be found in Appendix F. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods and internal rate of return for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	11.5 Years	10.1%
Direct Purchase	11.5 Years	7.7%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for the Bridgewater and has determined that the average wind speed is not high enough to produce electricity.

X. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for January through December 2008.

<u>Electricity:</u>

The chart found in Section IV, Figure 1 demonstrates a typical profile for a facility that is not fully air-conditioned. During the warmer months (May-August) there is a significant drop in electric usage. Electric usage is measured in kilowatt-hours (kWh) consumed and this graphic demonstrates a much lower consumption in the warmer months and a higher consumption in the cooler months. Also witnessed in the above-referenced chart is a relatively consistent consumption throughout the year which is a good sign for energy procurement. As the load becomes flat the price of alternative options becomes more competitive.

<u>Natural Gas:</u>

The chart derived demonstrates a typical heating load (November –March), and complimentary non-heating period (April –October). Consequently there is a clear separation between summer and winter loads consistent with Wholesale Energy Pricing. Heating loads carry a much higher average cost because of the higher demand for natural gas during the winter.

Tariff Analysis

<u>Electricity:</u>

The Hillside School receives electric service through Jersey Central Power & Light (JCP&L) on the General Service Secondary 3 Phase rate, when not receiving commodity by a Third Party Supplier. Customers who normally operate in such a manner that their maximum demands do not occur during their monthly on-peak period and elect to receive Service under this Special provision shall have their monthly demand charges under this Service Classification based upon the greater of A) the maximum on-peak demand created during the month; or B), 40 percent of the maximum off-peak demand created during the month. For the monthly KW Minimum Charge calculation, the Customer's demand will be based on the greater of (a) the maximum on-peak demand created during the current or preceding eleven months; or (b) 40 percent of the maximum off-peak demand created during the current and preceding eleven months (but not less than the Contract Demand). Customers served under this Special Provision shall be billed an additional Supplemental Customer Charge.

Natural Gas:

Bridgewater-Raritan receives its Distribution charges only for natural gas service from Public Service Electric and Gas Company (PSE&G). Bridgewater-Raritan receives Third Party Supply from The Hess Corporation. The meter 2353045 is serviced by the LVG (Large Volume Service) rate class. Below is a description of the details of the TPS contract and the associated natural gas tariffs:

- *LVG Rate:* This utility tariff is for firm delivery service for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). It is pertinent to note, should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

- *Alternative Supplier:* The Bridgewater-Raritan School District is utilizing the services of a Third Party Supplier, The Hess Corporation. The contract is administered by The Alliance for Competitive Service (ACES). ACES is the energy aggregation program of the New Jersey School Boards Association of School Administrators. The term per the contract is June 2008 and is expiring on or before May 31, 2010. The process was reviewed and approved by the New Jersey Department of Community Affairs. Per the ACES agreement, the pricing structure that is described is 50% above current market levels.

Recommendations:

CEG recommends that the Bridgewater-Raritan School District schedule a meeting with their current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that might be available to the School System. CEG suggests that Bridgewater-Raritan School District pay special attention to the electric service from JCP&L. The school should request JCP&L explain the current tariff in detail as well as the advantages of Third Party Supply during the above-recommended meeting.

CEG also recommends that Bridgewater-Raritan School District review the specifics of their ACES agreement for third party supply. In CEG's review, it was noted that Page 1 of the agreement states the term is June 2006 for a 24 month term. However, Page 3 of the agreement states the term of the contract is 24 months from June 2008 through May 2010. CEG has reviewed the price in the ACES Agreement and notes that the price is 50% above current market levels. The Bridgewater-Raritan School District should see if they can re-negotiate the agreement with HESS through the ACES organization. In addition, CEG recommends the District investigate the use of an Energy Advisor in addition to their current efforts and a "Managed Approach" to Energy Procurement. If the District is able to renegotiate their current utility contracts, CEG believes the District will be able to realize approximated energy cost savings as described below:

- *Electricity:* The Hillside School has a yearly average cost of electricity of $.1341 per kWh. However, the invoice for December 4, 2008-Janaury 2, 2009 outlines a cost of $.18 per kWh (kilowatt hour). The average price to compare for a 1-year baseline fixed price of electricity is approximately $.095 per kWh. There appears to be a wide variance in the cost of electricity.

- *Natural Gas:* The Hillside School has an average annual cost for natural gas for the period of January-December 2008 of $15.90 per deka-therm (dTh.) The current baseline 1-year fixed price for natural gas is approximately $6.50 per dTh. Based on the Hillside School's annual consumption of 6,001 dTh's, there is an estimated savings of over $50,000 per year.

XI. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the Owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XII. ADDITIONAL RECOMMENDATIONS

CEG has reviewed the operational characteristics of the facility and believes that the School District should review the implementation of a Retro-Commissioning Plan. Retro-commissioning is a quality-oriented process for verifying and documenting that HVAC systems perform as closely as possible to defined performance criteria. The benefits include documenting accurately the existing system's function and performance; Verifying that system performance meets the facility's requirements; benchmarking the performance of existing systems for future changes; and identifying problems in the system. The following is the estimated energy savings calculations for Retro-Commissioning:

> The cost of retro-commissioning for the Hillside Intermediate School is between $0.15 and $0.30 per Square Foot (Source: Thorne & Nadel "Retro-Commissioning: Program Strategies To Capture Energy Savings in Existing Buildings (2003)" – average Retro-Commissioning costs of $0.22 in TX, TN, CO, MA, AZ, OR, CA).
>
> The energy savings from retro-commissioning critical systems such as HVAC and power systems is approximately 5% of the total energy used (Source: E. Mills et al, "Cost-effectiveness of Commissioning 224 Buildings across 21 states – 2004").
>
> Estimated Cost of Retro-Commissioning = $0.15 x 90,453 SF = $13,568
>
> Estimated Energy Savings = 5% x $192,339 = $9,617
>
> The simple payback for this measure is approximately 1.4 years.

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

B. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

C. Maintain all weather stripping on windows and doors.

D. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

E. Repair/replace piping and ductwork insulation in the above ceiling spaces.

F. Reduce lighting in specified areas where the foot-candle levels are above 70 in private offices, classrooms, etc. and above 30 foot-candles in corridors, lobbies, etc.

G. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ. Many of the cabinet unit heaters and unit ventilators air filters are plugged with dust. Many of the hot water coils are dirty which reduces the heat transfer efficiency.

H. Recalibrate existing sensors serving the fan coil/air handling units.

I. Install a Vending Miser system to turn off vending machines when not in use.

J. Install LED bulbs in display refrigerators, coolers, or freezers.

K. Efficient parking lot lighting fixtures can reduce the energy use on the site without compromising safety or illumination. “Hockey puck” fixtures which use 175-Watt metal halide lamps use 70% less electricity than “cobra head” fixtures using 250-watt high pressure sodium lamps.

L. Correct refrigerant charge on air conditioners and heat pumps can improve unit efficiency by up to 10%.

M. Night covers on refrigerated cases to reduce infiltration into the cases during unoccupied hours.

N. Confirm that outside air economizers on the air handling units and rooftops are functioning properly to take advantage of free cooling.

O. Various water conservation measures can be found in Appendix G.

Summary of Natural Gas Cost

2006

Hillside Indermediate School

	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Total
Account# …..	31	28	31	30	31	30	31	31	30	31	30	31	
Meter# ……													
Meter 337507													
Total MCF										3956	5679	9532	19,167
BTU Factor													0
Therms (Burner Tip)													0
Total Distribution Cost													0
Cost per Therm													#DIV/0!
Total Commodity Cost													0
Cost per Therm													#DIV/0!
Total Cost										$5,958	$9,603	$15,971	$31,532
Cost per Therm													#DIV/0!

2007

Hillside Intermediate School

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Total
Account# …..	31	28	31	30	31	30	31	31	30	31	30	31	
Meter# ……													
Meter 337507													
Total MCF													0
BTU Factor													0
Therms (Burner Tip)	10873	14425	9776	5822	749	230	191	175	262	881	6547	10470	60,401
Total Distribution Cost													0
Cost per Therm													$0.000
Total Commodity Cost													0
Cost per Therm													$0.00
Total Cost	$18,318	$24,217	$17,134	$10,483	$1,313	$432	$366	$354	$470	$1,459	$11,814	$18,188	$104,549
Cost per Therm	$1.68	$1.68	$1.75	$1.80	$1.75	$1.88	$1.92	$2.02	$1.79	$1.66	$1.80	$1.74	$1.73

2008

Hillside Intermediate School

	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Account# …..	31	28	31	30	31	30	31	31	30	31	30	31	
Meter# ……													
Meter 337507													
Total MCF													0
BTU Factor													0
Therms (Burner Tip)	12556	11205	9117	3776	778	117	63	67	215	2,892	7,627	11,597	60,010
Total Distribution Cost													0
Cost per Therm													$0.000
Total Commodity Cost													0
Cost per Therm													$0.00
Total Cost	$21,505	$18,774	$15,667	$5,821	$1,226	$278	$197	$186	$369	$4,625	$11,660	$17,187	$97,495
Cost per Therm	$1.71	$1.68	$1.72	$1.54	$1.58	$2.38	$3.13	$2.78	$1.72	$1.60	$1.53	$1.48	$1.62

Electric Cost Summary

Hillside Intermediate School

2006

Account # ……
Meter # …..

Month	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	#REF!	
KWH										60,733	60,232	58,880	179,845	
KW										171	169	184	184	Max
Monthly Load Factor										48%	50%	43%	47%	
Electric Delivery, $													$0	
Delivery $/kwh										$0.000	$0.000	$0.000	$0.000	
Electric Supply, $													$0	
Supply $/kwh										$0.000	$0.000	$0.000	$0.000	
Total Cost, $										$6,165	$6,103	$6,701	$18,970	
$/KWH										$0.1015	$0.1013	$0.1138	$0.1055	

Hillside Intermediate School

2007

Account # ……
Meter # …..

Month	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	66,709	64,169	64,248	60,910	54,046	53,795	40,578	40,000	58,764	61,358	52,509	55,726	672,812	
KW	199	199	199	195	195	190	190	211	211	211	183	185	211	Max
Monthly Load Factor	45%	48%	43%	43%	37%	39%	29%	25%	39%	39%	40%	40%	39%	
Electric Delivery, $													$0	
Delivery $/kwh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	
Electric Supply, $													$0	
Supply $/kwh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	
Total Cost, $	$7,693	$7,352	$7,181	$6,771	$6,612	$9,435	$6,505	$6,095	$7,293	$7,644	$6,596	$7,510	$86,687	
$/KWH	$0.1153	$0.1146	$0.1118	$0.1112	$0.1223	$0.1754	$0.1603	$0.1524	$0.1241	$0.1246	$0.1256	$0.1348	$0.1288	

Hillside Intermediate School

2008

Account # ……
Meter # …..

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	67,765	55,970	61,573	48,232	46,513	46,512	54,829	24,565	54,688	60,757	51,528	55,547	628,479	
KW	200	200	200	184	184	190	190	157	211	195	190	200	211	Max
Monthly Load Factor	46%	42%	41%	36%	34%	34%	39%	21%	36%	42%	38%	37%	37%	
Electric Delivery, $													$0	
Delivery $/kwh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	
Electric Supply, $													$0	
Supply $/kwh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	
Total Cost, $	$9,131	$7,501	$7,870	$6,144	$6,784	$7,449	$10,479	$4,752	$7,593	$9,459	$8,367	$9,314	$94,844	
$/KWH	$0.1347	$0.1340	$0.1278	$0.1274	$0.1459	$0.1602	$0.1911	$0.1934	$0.1388	$0.1557	$0.1624	$0.1677	$0.1509	

**Numbers in yellow are estimated values.

BUILDING EQUIPMENT LIST

CONCORD ENGINEERING SERVICES

HILLSIDE INTERMEDIATE SCHOOL

Boilers

Location	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Vintage	Efficiency (%)	Fuel
Boiler Room	H.B. Smith	2	28A-18	N90-145 N91-2035	5862 MBh	4629 MBh	1990 1991	79%	Nat. Gas
1st - Flr - Add. Closet	Aerco	1	KC		1000 MBh	860-930 MBh		87%	Nat. Gas

Boiler - Burner

Location	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Vintage	Efficiency (%)	Fuel
Boiler Room	NG Burner	2	MPG-63	30642-1	5862			Nat. Gas

Boiler - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	GPM	Ft. Hd	HP	RPM	Vintage	Frame Size	Volts	Amps	Phase
Boiler Room		2					5	1735	1995	215	208-220/440	13.8	3
Boiler Room	B&G / US motors	2	E659A				10	1725	1995	215T	208-230/460	60	3
1st - Flr - Add. Closet	B&G	1	Series 80		64	50	1.5	1750					

Domestic Hot Water Heater

Location	Manufacturer	Qty.	Model #	Serial #	Input	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Vintage	Volts	Amps	Phase
Boiler Room	Bradford White	1	D75T3003NA	MAGNUM Series	300 MBH	290.9	75		2002			
Storage 226A	A.O. Smith	1			4500 W		30			208		1

Air Handling Units

Location	Manufacturer	Qty.	Model #	Serial #	Vintage	Cooling Coil	Heating Coil	Fan HP	Fan RPM	Volts	Phase	Amps	Notes
Roof - RTU - 1	AAON	1	6016 3	RM-025-8-0-AB02-EHL	2005	25 Ton / R-22 - DX 10.4 EER	HW						Serves new classrooms. VFD fans Power Exhaust
Roof - RTU - 2	AAON	1	6016 2	RM-015-8-0-000-ehl	2005	15 Ton - DX 10.6 EER	HW	5		208	3	60	Serves Aux Gym. Barometric relief
Gym Ceiling	Unknown	2					HW						Units not Accessible.
Classroom 303 A AH-1	AAON	1	H2-B-2-16-200		2005	91 MBh - DX	44.2 MBh - HW						
Corr. 228 - AH-2 Room 116A - AH-3	Nesbittait	2	hwx-750		2005	22.7 MBh - DX	18.6 MBh - HW						

Split Systems and AC Condensers

Location	Manufacturer	Qty.	Model #	Serial #	Vintage	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Amps
Roof	Rheem	1	RAK-024AZ	6950-M290517870	2005	2 Ton	10 SEER	R-22			14
Roof	Peake	2	PCU009B216STD			9000 Btu/h	10 SEER	R-22	208	1	
Roof	AAON	1	CAO156	200412-CCCF04495	2004	15-Ton	4.31 COP	R-22	208	3	70
Room 331 - Closet	Sanyo	1	09KS51 / 09KLS51		2005	9000 Btu/h	10 SEER	R-22	115		8.8 FLA
Room 229 - Closet	Sanyo	1	09KS51 / 09KLS51		2005	9000 Btu/h	10 SEER	R-22	115		8.8 FLA

Heat Pumps

Location	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Heating Capacity	Eff.	Refrigerant	Volts	Phase	Amps
Roof	Sanyo	1	SAP244CH		2 Ton		10 Seer	R-410A	208-230	1	40
Roof	Dynazone	1	S121HES - C121HC		11200/11400 Btu	12500/12900 BTu/h					

Air Compressor

Location	Manufacturer	Qty.	Model #	Serial #	HP	Pressure	Capacity	Volts	Phase	FLA
Boiler Room		1			1.5			208-230/460		6.2-5.8/2.9

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08140
Project: Bridgewater-Raritan School District - Hillside Intermediate
Address: 844 Brown Rd., Bridgewater, NJ 08807
City: Bridgewater-Raritan
Building SF: 90453 2 - Story Middle School

DATE: 03/27/2009
KWH COST: **$0.1500**

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1		100 - Corridor	22	2'x2' Below Ceiling, 4-lamp- T8	2800	68	1.50	4188.8	$628.32	22	No Change Required (NCR)	68	1.50	4188.8	$628.32	$0.00	$0.00	0.00	0	$0.00	0.0
2		100 - Corridor	12	2'x2' Below Ceiling, 3-lamp- T8 with reflector	2800	51	0.61	1713.6	$257.04	12	NCR	51	0.61	1713.6	$257.04	$0.00	$0.00	0.00	0	$0.00	0.0
3		Storage	9	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	100	64	0.58	57.6	$8.64	9	NCR	64	0.58	57.6	$8.64	$0.00	$0.00	0.00	0	$0.00	0.0
4		Boiler Room	16	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	1000	64	1.02	1024	$153.60	16	NCR	64	1.02	1024	$153.60	$0.00	$0.00	0.00	0	$0.00	0.0
5		101	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
6		103	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
7		105	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
8		107	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
9		108	2	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
10		109	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
11		110	27	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	1.73	4838.4	$725.76	27	NCR	64	1.73	4838.4	$725.76	$0.00	$0.00	0.00	0	$0.00	0.0
12		111	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$1.99	$29.85	0.00	0	$0.00	0.0

13		113	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
14		114	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
15		115	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
16		116	9	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.58	1612.8	$241.92	9	NCR	64	0.58	1612.8	$241.92	$0.00	$0.00	0.00	0	$0.00	0.0
17		117	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
18		118	9	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.58	1612.8	$241.92	9	NCR	64	0.58	1612.8	$241.92	$0.00	$0.00	0.00	0	$0.00	0.0
19		119	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
20		120	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
21		121	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
22		122	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
23		123	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
24		124	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
25		125	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
26		127	25	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	1.60	4480	$672.00	25	NCR	64	1.60	4480	$672.00	$0.00	$0.00	0.00	0	$0.00	0.0
27		100 - Men's Room	3	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0

28		100 - Women's Room	3	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
29		Stair - 111	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
30			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
31		Stair - 114	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
32			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
33		Stair - 115	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
34			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$1.99	$1.99	0.00	0	$0.00	0.0
35		Stair - 116	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
36			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
37		Stair - 117	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
38			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
39		200 - Corridor	22	2'x2' Below Ceiling, 4-lamp- T8	2800	68	1.50	4188.8	$628.32	22	NCR	68	1.50	4188.8	$628.32	$0.00	$0.00	0.00	0	$0.00	0.0
40			12	2'x2' Below Ceiling, 3-lamp- T8 with reflector	2800	51	0.61	1713.6	$257.04	12	NCR	51	0.61	1713.6	$257.04	$0.00	$0.00	0.00	0	$0.00	0.0
41		201	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
42		202	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0

43		203	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
44		204	11	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.70	1971.2	$295.68	11	NCR	64	0.70	1971.2	$295.68	$0.00	$0.00	0.00	0	$0.00	0.0
45		205	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
46		206	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
47		207	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0
48		208	5	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.32	896	$134.40	5	NCR	64	0.32	896	$134.40	$0.00	$0.00	0.00	0	$0.00	0.0
49		209	27	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	1.73	4838.4	$725.76	27	NCR	64	1.73	4838.4	$725.76	$0.00	$0.00	0.00	0	$0.00	0.0
50		209A	3	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
51		210	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
52		211	27	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	1.73	4838.4	$725.76	27	NCR	64	1.73	4838.4	$725.76	$0.00	$0.00	0.00	0	$0.00	0.0
53		212	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
54		213	5	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.32	896	$134.40	5	NCR	64	0.32	896	$134.40	$0.00	$0.00	0.00	0	$0.00	0.0
55		214	12	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$1.99	$23.88	0.00	0	$0.00	0.0
56		215	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
57		216	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.96	2688	$403.20	15	NCR	64	0.96	2688	$403.20	$0.00	$0.00	0.00	0	$0.00	0.0

58		217	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
59		218	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
60		219	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
61		220	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
62		221	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
63		222	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
64		223	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
65		200 - Men's Room	3	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
66		200 - Women's Room	3	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
67		224	38	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	2.43	6809.6	$1,021.44	38	NCR	64	2.43	6809.6	$1,021.44	$0.00	$0.00	0.00	0	$0.00	0.0
68		225	5	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.32	896	$134.40	5	NCR	64	0.32	896	$134.40	$0.00	$0.00	0.00	0	$0.00	0.0
69		226	12	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	2800	64	0.77	2150.4	$322.56	12	NCR	64	0.77	2150.4	$322.56	$0.00	$0.00	0.00	0	$0.00	0.0
70		227	5	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.32	896	$134.40	5	NCR	64	0.32	896	$134.40	$0.00	$0.00	0.00	0	$0.00	0.0
71		229	5	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.32	896	$134.40	5	NCR	64	0.32	896	$134.40	$0.00	$0.00	0.00	0	$0.00	0.0
72		200 - Storage	15	4' - T8 2 Lamp with a wrap around prism lens, mounted below ceiling.	100	64	0.96	96	$14.40	15	NCR	64	0.96	96	$14.40	$0.00	$0.00	0.00	0	$0.00	0.0
73		Stair 211	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0

74		Stair - 211	1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
75		Stair - 214	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
76			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
77		Stair - 215	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
78			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
79		Stair - 216	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
80			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
81		Stair - 217	2	4' T-8 1 lamp Below ceiling	2800	64	0.13	358.4	$53.76	2	NCR	64	0.13	358.4	$53.76	$0.00	$0.00	0.00	0	$0.00	0.0
82			1	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.06	179.2	$26.88	1	NCR	64	0.06	179.2	$26.88	$0.00	$0.00	0.00	0	$0.00	0.0
83		Second Floor - Addition Corridor	24	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	1.54	4300.8	$645.12	24	NCR	64	1.54	4300.8	$645.12	$0.00	$0.00	0.00	0	$0.00	0.0
84		300 - Corridor	50	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	3.20	8960	$1,344.00	50	NCR	64	3.20	8960	$1,344.00	$0.00	$0.00	0.00	0	$0.00	0.0
85		301	9	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.58	1612.8	$241.92	9	NCR	64	0.58	1612.8	$241.92	$0.00	$0.00	0.00	0	$0.00	0.0
86		302	8	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.51	1433.6	$215.04	8	NCR	64	0.51	1433.6	$215.04	$0.00	$0.00	0.00	0	$0.00	0.0
87		303	4	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.26	716.8	$107.52	4	NCR	64	0.26	716.8	$107.52	$0.00	$0.00	0.00	0	$0.00	0.0
88		305	4	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.26	716.8	$107.52	4	NCR	64	0.26	716.8	$107.52	$0.00	$0.00	0.00	0	$0.00	0.0

89		310	7	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.45	1254.4	$188.16	7	NCR	64	0.45	1254.4	$188.16	$0.00	$0.00	0.00	0	$0.00	0.0
90		312	3	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
91		314	3	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.19	537.6	$80.64	3	NCR	64	0.19	537.6	$80.64	$0.00	$0.00	0.00	0	$0.00	0.0
92		316	6	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.38	1075.2	$161.28	6	NCR	64	0.38	1075.2	$161.28	$0.00	$0.00	0.00	0	$0.00	0.0
93		318	21	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	1.34	3763.2	$564.48	21	NCR	64	1.34	3763.2	$564.48	$0.00	$0.00	0.00	0	$0.00	0.0
94		320	6	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.38	1075.2	$161.28	6	NCR	64	0.38	1075.2	$161.28	$0.00	$0.00	0.00	0	$0.00	0.0
95		322	7	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.45	1254.4	$188.16	7	NCR	64	0.45	1254.4	$188.16	$0.00	$0.00	0.00	0	$0.00	0.0
96		324	7	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.45	1254.4	$188.16	7	NCR	64	0.45	1254.4	$188.16	$0.00	$0.00	0.00	0	$0.00	0.0
97		326	7	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.45	1254.4	$188.16	7	NCR	64	0.45	1254.4	$188.16	$0.00	$0.00	0.00	0	$0.00	0.0
98		328	13	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	0.83	2329.6	$349.44	13	NCR	64	0.83	2329.6	$349.44	$0.00	$0.00	0.00	0	$0.00	0.0
99		330 - Aux Gym	8	Biaxial Fixture	2800	320	2.56	7168	$1,075.20	8	NCR	320	2.56	7168	$1,075.20	$0.00	$0.00	0.00	0	$0.00	0.0
100		331	21	4' 2-Lamp T-8 Direct Indirect fixture, (New)	2800	64	1.34	3763.2	$564.48	21	NCR	64	1.34	3763.2	$564.48	$0.00	$0.00	0.00	0	$0.00	0.0
101		Kitchen	18	2'x2' Below Ceiling, 4-lamp- T8 with reflector	2800	68	1.22	3427.2	$514.08	18	NCR	68	1.22	3427.2	$514.08	$0.00	$0.00	0.00	0	$0.00	0.0
102		APR	36	Recessed 2'x4' 4-lamp T-8 fixture with prism reflector	3008	128	4.61	13860.9	$2,079.13	36	NCR	128	4.61	13860.9	$2,079.13	$0.00	$0.00	0.00	0	$0.00	0.0
103		Gym	32	High-bay HID Metal Halide	4700	295	9.44	44368	$6,655.20	32	T-5 High Output high-bay lights	185	5.92	27824	$4,173.60	$600.00	$19,200.00	3.52	16544	$2,481.60	7.7
104		Main Office	12	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	3000	64	0.77	2304	$345.60	12	NCR	64	0.77	2304	$345.60	$0.00	$0.00	0.00	0	$0.00	0.0
105		Conference	4	Recessed 2'x4' 2-lamp T-8 fixture with prism reflector	2800	64	0.26	716.8	$107.52	4	NCR	64	0.26	716.8	$107.52	$0.00	$0.00	0.00	0	$0.00	0.0
		Totals	1140				84.64	250050	$37,507.45	1140			81.12	233506	$35,025.85		$19,255.72	3.52	16544	$2,481.60	7.76

STATEMENT OF ENERGY PERFORMANCE
Hillside Intermediate School

Building ID: 1372760
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 21, 2009

Facility
Hillside Intermediate School
844 Brown road
Bridgewater, NJ 08807

Facility Owner
Bridgewater-Raritan Regional School District
826 Newmans Lane
Bridgewater, NJ 08807

Primary Contact for this Facility
Connie Coriell
826 Newmans Lane
Bridgewater, NJ 08807

Year Built: 1961
Gross Floor Area (ft²): 90,453

Energy Performance Rating[2] (1-100) 58

Site Energy Use Summary[3]	
Electricity (kBtu)	2,144,370
Natural Gas (kBtu)[4]	6,001,000
Total Energy (kBtu)	8,145,370

Energy Intensity[5]	
Site (kBtu/ft²/yr)	90
Source (kBtu/ft²/yr)	149

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	646

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	97
National Average Source EUI	161
% Difference from National Average Source EUI	-8%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 South Burnt Mill Rd.
Voorhees, NJ 08043

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Hillside Intermediate School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	844 Brown road, Bridgewater, NJ 08807	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐

Hillside Intermediate School (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	90,453 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	287	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	3	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	30 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

Months	12 (Optional)	Is this school in operation for at least 8 months of the year?		☐
High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electricity (kWh) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2008	12/31/2008	55,547.00
11/01/2008	11/30/2008	51,528.00
10/01/2008	10/31/2008	60,757.00
09/01/2008	09/30/2008	54,688.00
08/01/2008	08/31/2008	24,565.00
07/01/2008	07/31/2008	54,829.00
06/01/2008	06/30/2008	46,512.00
05/01/2008	05/31/2008	46,513.00
04/01/2008	04/30/2008	48,232.00
03/01/2008	03/31/2008	61,573.00
02/01/2008	02/29/2008	55,970.00
01/01/2008	01/31/2008	67,765.00
Electricity Consumption (kWh)		**628,479.00**
Electricity Consumption (kBtu)		**2,144,370.35**
Total Electricity Consumption (kBtu)		**2,144,370.35**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Natural Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2008	12/31/2008	11,597.00
11/01/2008	11/30/2008	7,627.00
10/01/2008	10/31/2008	2,892.00
09/01/2008	09/30/2008	215.00
08/01/2008	08/31/2008	67.00
07/01/2008	07/31/2008	63.00
06/01/2008	06/30/2008	117.00
05/01/2008	05/31/2008	778.00
04/01/2008	04/30/2008	3,776.00

03/01/2008	03/31/2008	9,117.00
02/01/2008	02/29/2008	11,205.00
01/01/2008	01/31/2008	12,556.00
Natural Gas Consumption (therms)		**60,010.00**
Natural Gas Consumption (kBtu)		**6,001,000.00**
Total Natural Gas Consumption (kBtu)		**6,001,000.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

Certifying Professional

(When applying for the ENERGY STAR, this must be the same PE that signed and stamped the SEP.)

Name: ____ Date: _____________

Signature: _______________________________________

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Hillside Intermediate School
844 Brown road
Bridgewater, NJ 08807

Facility Owner
Bridgewater-Raritan Regional School District
826 Newmans Lane
Bridgewater, NJ 08807

Primary Contact for this Facility
Connie Coriell
826 Newmans Lane
Bridgewater, NJ 08807

General Information

Hillside Intermediate School	
Gross Floor Area Excluding Parking: (ft^2)	90,453
Year Built	1961
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Hillside Intermediate School	
Space Type	K-12 School
Gross Floor Area(ft^2)	90,453
Open Weekends?	Yes
Number of PCs	287
Number of walk-in refrigeration/freezer units	3
Presence of cooking facilities	Yes
Percent Cooled	30
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 09/30/2007)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	58	52	75	N/A	50
Energy Intensity					
Site (kBtu/ft2)	90	94	76	N/A	97
Source (kBtu/ft2)	149	157	126	N/A	161
Energy Cost					
$/year	$ 192,338.51	$ 188,526.74	$ 162,670.75	N/A	$ 208,016.07
$/ft2/year	$ 2.13	$ 2.08	$ 1.80	N/A	$ 2.30
Greenhouse Gas Emissions					
$MtCO_2e$/year	646	683	546	N/A	699
$kgCO_2e/ft^2$/year	7	8	6	N/A	8

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Programmable Thermostat(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of Units	1
Initial Cost per ENERGY STAR Unit (retail price)	$250
Initial Cost per Conventional Unit (retail price)	$73
Unit Fuel Cost (Cooling) ($/kWh)	$0.134
Unit Fuel Cost (Heating) ($/Therm)	$1.59

24 Hour Typical Usage Patterns*

	Weekday	Weekend
Nighttime Set-Back/Set-Up Hours	14	24
Daytime Set-Back/Set-Up Hours	10	0
Hours without Set-Back/Set-Up	0	0

Choose your city from the drop-down menu → **City**: PA-Philadelphia

Heating Season*

Typical Indoor Temperature w/o Set-Back	70
Nighttime Set-Back Temperature (Average)	60
Daytime Set-Back Temperature (Average)	62
Heating System Type	Gas Boiler

Cooling Season*

Typical Indoor Temperature w/o Set-Up	76
Nighttime Set-Up Temperature (Average)	85
Daytime Set-Up Temperature (Average)	85
Cooling System Type	Central AC

**All temperatures are in degrees Fahrenheit. Setpoint is defined as the temperature setting for any given time period. Set-back temperature is defined as the lower setpoint temperature for the energy-savings periods during the heating season, generally nighttime and daytime. Set-up temperature is defined as the higher setpoint temperature for the energy-savings periods during the cooling season, generally nighttime and daytime.*

Annual and Life Cycle Costs and Savings for 1 Programmable Thermostat(s)

	1 ENERGY STAR Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Energy Costs			
Heating Energy Cost	$744	$1,037	$293
Heating Energy Consumption (MBTU)	*47*	*65*	*18*
Cooling Energy Cost	$137	$265	$128
Cooling Energy Consumption (MBTU)	*3.5*	*6.7*	*3*
Total	**$882**	**$1,302**	**$420**
Life Cycle Costs			
Energy Costs	$9,801	$14,475	$4,674
Heating Energy Costs	*$8,274*	*$11,527*	*$3,252*
Heating Energy Consumption (MBTU)	702	978	276
Cooling Energy Costs	$1,527	$2,949	$1,422
Cooling Energy Consumption (MBTU)	52	101	49
Purchase Price for 1 Unit(s)	*$250*	*$73*	*-$177*
Total	**$10,051**	**$14,548**	**$4,497**

Simple payback of initial cost (years) **0.4**

Summary of Benefits for 1 Programmable Thermostat(s)

Initial cost difference	**$177**
Life cycle savings	**$4,674**
Net life cycle savings (life cycle savings - additional cost)	**$4,497**
Life cycle energy saved (MBTU)-includes both Heating and Cooling	**325**
Simple payback of additional cost (years)	**0.4**
Life cycle air pollution reduction (lbs of CO_2)	**46,590**
Air pollution reduction equivalence (number of cars removed from the road for a year)	**4**
Air pollution reduction equivalence (acres of forest)	**5**
Savings as a percent of retail price	**1799%**

Assumptions for Programmable Thermostats

Category	Value		Data Source
Heating/Cooling System Efficiencies			
Gas Furnace	84.0		LBNL 2004, Average of ENERGY STAR and Conventional
Gas Boiler	82.5		LBNL 2004, Average of ENERGY STAR and Conventional
Oil Furnace	84.0		LBNL 2004, Average of ENERGY STAR and Conventional
Oil Boiler	82.5		LBNL 2004, Average of ENERGY STAR and Conventional
Baseline Energy Consumption (MBTU)			
Gas Furnace	54.1		DOE 2001
Gas Boiler	56.1		DOE 2001
Oil Furnace	68.7		DOE 2001
Oil Boiler	71.2		DOE 2001
Central Air Conditioner	9.5		DOE 2001
Reference Degree Days (Heating/Cooling)			
Gas Furnace	4,255		DOE 2001
Gas Boiler	4,255		DOE 2001
Oil Furnace	5,339		DOE 2001
Oil Boiler	5,339		DOE 2001
Central Air Conditioner		1701	DOE 2001
Typical Indoor Temperature (Heating Season)	70		ENERGY STAR Programmable Thermostat Eligibility Criteria. Pre-programmed settings for heating include a morning and evening temperature ≤70°F and an adjustment of at least 8 °F (≤62°F) during daytime and nighttime.
Typical Indoor Temperature (Cooling Season)	78		ENERGY STAR Programmable Thermostat Eligibility Criteria. Pre-programmed settings for cooling include a morning and evening temperature ≥78°F and an adjustment of at least 7 °F (≥85°F) during daytime and an adjustment of at least 4°F (≥82°F) at nighttime.
Energy Prices			
Natural Gas ($/Therm)	$1.2700	$/Therm	EIA 2008
Fuel Oil ($/Gallon)	$2.6800	$/gal	EIA 2008
Electric Price (Residential)	$0.1059	$/kWh	EIA 2008
Usage			
Nighttime Hours	8		Default shipped setting, ENERGY STAR specification
Daytime Hours	10		Default shipped setting, ENERGY STAR specification
Carbon Dioxide Emissions Factors			
Oil Carbon Emission Factor	161.27	lbs CO_2/MBtu	EPA 2007
Gas Carbon Emission Factor	116.97	lbs CO_2/MBtu	EPA 2007
Electricity Carbon Emission Factor	1.54	lbs CO_2/kWh	EPA 2008
Thermostat Savings			
Savings per Degree of Setback (Heating Season)	3%		Industry Data 2004
Savings per Degree of Setback (Cooling Season)	6%		Industry Data 2004
Thermostat Lifetime	15	years	LBNL 2007
Initial Cost			
ENERGY STAR Programmable Thermostat	$92		Industry Data 2008
Conventional Thermostat	$73		Industry Data 2008
CO_2 Equivalents			
Annual CO_2 sequestration per forested acre	9,700	lbs CO_2/acre-yr	EPA 2007
Annual CO_2 emissions for "average" passenger car	12,037	lbs CO_2/acre-yr	EPA 2007
Discount Rate			
Commercial and Residential Discount Rate (real)	4%		A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).

Project Name: LGEA Solar PV Project - Hillside Intermediate School
Location: Bridewater, NJ
Description: Photovoltaic System 95% Financing - 25 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$633,420
Annual kWh Production	109,831
Annual Energy Cost Reduction	$16,574
Annual SREC Revenue	$38,441
First Cost Premium	**$633,420**
Simple Payback:	**11.51** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.151**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$31,671	0	0	0	$0	0	0	(31,671)	0
1	$0	109,831	$16,574	$0	$38,441	$41,669	$14,315	($970)	($32,641)
2	$0	109,282	$17,071	$0	$38,249	$40,634	$15,350	($665)	($33,306)
3	$0	108,736	$17,583	$0	$38,057	$39,524	$16,460	($344)	($33,649)
4	$0	108,192	$18,110	$0	$37,867	$38,335	$17,650	($7)	($33,656)
5	$0	107,651	$18,654	$1,109	$37,678	$37,059	$18,926	($762)	($34,418)
6	$0	107,113	$19,213	$1,103	$37,489	$35,691	$20,294	($385)	($34,802)
7	$0	106,577	$19,790	$1,098	$37,302	$34,223	$21,761	$10	($34,793)
8	$0	106,044	$20,383	$1,092	$37,116	$32,650	$23,334	$422	($34,370)
9	$0	105,514	$20,995	$1,087	$36,930	$30,964	$25,021	$854	($33,517)
10	$0	104,987	$21,625	$1,081	$36,745	$29,155	$26,829	$1,304	($32,212)
11	$0	104,462	$22,273	$1,076	$36,562	$27,215	$28,769	$1,775	($30,437)
12	$0	103,939	$22,942	$1,071	$36,379	$25,136	$30,849	$2,266	($28,172)
13	$0	103,420	$23,630	$1,065	$36,197	$22,906	$33,079	$2,777	($25,395)
14	$0	102,902	$24,339	$1,060	$36,016	$20,514	$35,470	$3,311	($22,084)
15	$0	102,388	$25,069	$1,055	$35,836	$17,950	$38,034	$3,866	($18,218)
16	$0	101,876	$25,821	$1,049	$35,657	$15,201	$40,784	$4,444	($13,774)
17	$0	101,367	$26,596	$1,044	$35,478	$12,252	$43,732	$5,046	($8,728)
18	$0	100,860	$27,394	$1,039	$35,301	$9,091	$46,893	$5,671	($3,057)
19	$0	100,356	$28,215	$1,034	$35,124	$5,701	$50,283	$6,322	$3,265
20	$0	99,854	$29,062	$1,028	$34,949	$2,066	$53,918	$6,998	$10,263
21	$0	99,354	$29,934	$1,023	$34,774	$1,752	$49,567	$12,365	$22,628
22	$0	98,858	$30,832	$1,018	$34,600	$1,199	$40,789	$22,425	$45,054
23	$0	98,363	$31,757	$1,013	$34,427	$0	$0	$65,171	$110,224
24	$0	97,872	$32,709	$1,008	$34,255	$0	$0	$65,956	$176,180
25	$0	97,382	$33,691	$1,003	$34,084	$0	$0	$66,771	$242,952
	Totals:	2,095,350	$445,337	$17,091	$733,372	$517,936	$601,749	$692,105	$123,335
				Net Present Value (NPV)				**$24,708**	
				Internal Rate of Return (IRR)				**10.1%**	

Project Name: LGEA Solar PV Project - Hillside Intermediate School
Location: Bridewater, NJ
Description: Photovoltaic System

Simple Payback Analysis

	Photovoltaic System
Total Construction Cost	$633,420
Annual kWh Production	109,831
Annual Energy Cost Reduction	$16,574
Annual SREC Revenue	$38,441
First Cost Premium	**$633,420**
Simple Payback:	**11.51** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.151**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$633,420	0	0	0	$0	(633,420)	0
1	$0	109,831	$16,574	$0	$38,441	$55,014	($578,406)
2	$0	109,282	$17,071	$0	$38,249	$55,319	($523,086)
3	$0	108,736	$17,583	$0	$38,057	$55,640	($467,446)
4	$0	108,192	$18,110	$0	$37,867	$55,978	($411,468)
5	$0	107,651	$18,654	$1,109	$37,678	$55,223	($356,245)
6	$0	107,113	$19,213	$1,103	$37,489	$55,599	($300,646)
7	$0	106,577	$19,790	$1,098	$37,302	$55,994	($244,652)
8	$0	106,044	$20,383	$1,092	$37,116	$56,407	($188,245)
9	$0	105,514	$20,995	$1,087	$36,930	$56,838	($131,407)
10	$0	104,987	$21,625	$1,081	$36,745	$57,289	($74,119)
11	$0	104,462	$22,273	$1,076	$36,562	$57,759	($16,360)
12	$0	103,939	$22,942	$1,071	$36,379	$58,250	$41,890
13	$0	103,420	$23,630	$1,065	$36,197	$58,762	$100,652
14	$0	102,902	$24,339	$1,060	$36,016	$59,295	$159,946
15	$0	102,388	$25,069	$1,055	$35,836	$59,850	$219,796
16	$0	101,876	$25,821	$1,049	$35,657	$60,428	$280,225
17	$0	101,367	$26,596	$1,044	$35,478	$61,030	$341,255
18	$0	100,860	$27,394	$1,039	$35,301	$61,656	$402,910
19	$0	100,356	$28,215	$1,034	$35,124	$62,306	$465,216
20	$0	99,854	$29,062	$1,028	$34,949	$62,982	$528,199
21	$1	99,354	$29,934	$1,023	$34,774	$63,684	$591,883
22	$2	98,858	$30,832	$1,018	$34,600	$64,414	$656,296
23	$3	98,363	$31,757	$1,013	$34,427	$65,171	$721,467
24	$4	97,872	$32,709	$1,008	$34,255	$65,956	$787,423
25	$5	97,382	$33,691	$1,003	$34,084	$66,771	$854,195
	Totals:	2,095,350	$445,337	$17,091	$733,372	$1,487,615	$1,161,619
				Net Present Value (NPV)		**$854,220**	
				Internal Rate of Return (IRR)		**7.7%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Intermediate School	4485	Sunpower SPR230	306	14.7	4,499	70.38	109,831	10,098	15.64


.= Proposed PV Layout

Notes:
1. Estimated kWH based on 4.68 hours full output per day per 365 day year. Actual kWH will vary day to day.

Water Conservation Savings Calculations

Concord Engineering Group

"Hillside Intermediate School"

Hillside Intermediate Faucets
Install 0.5 GPM Neoperl Faucet Aerators from existing Faucets
Assume occupants have 10 minutes/day sink usage at 50 degrees F rise

Number of Occupants: 813

Q=GAL * 60%(MIX) * 8.34 lb/gal * dT
$16.20 per MMbtu Nat. Gas
$3.80 per kGal

LOCATION	EXIST. GPM	PROP. GPM	MIN/DAY	DAYS/YR	OCC RATE	# FAUCETS	EXISTING GPY	PROPOSED GPY	EXISTING W/S COST	EXISTING Water Heating MMbtu Annual	EXISTING Water Heating Cost	PROP. W/S COST	PROP. Water Heating MMbtu Annual	PROP. Water Heating Cost	TOT SAVINGS	TOT SAV (GPY)
Rest Rooms	2.5	0.5	2	180	10.00%	36	2,634,120	526,824	$10,010	790.87	$12,812	$2,002	158.17	$2,562	$18,258	2,107,296
Nurse's Office	2.5	0.5	2	210	10.00%	1	85,365	17,073	$324	25.63	$415	$65	5.13	$83	$591	68,292
Main Office	2.5	0.5	2	210	10.00%	1	85,365	17,073	$324	25.63	$415	$65	5.13	$83	$591	68,292
Faculty Room	2.5	0.5	2	210	10.00%	1	85,365	17,073	$324	25.63	$415	$65	5.13	$83	$591	68,292
Janitor Locker Room	2.5	0.5	2	260	1.00%	1	10,569	2,114	$40	3.17	$51	$8	0.63	$10	$73	8,455
Total							2,900,784	580,157	$11,022	870.93	$14,108	$2,205	174.19	$2,821	**$20,104**	2,320,627

Hillside Intermediate Showers
Install 2.0 GPM Oxygenics Fivestar 400 Model Low Flow Shower Heads from existing 2.5 GPM Showerheads
Assume 2 occupants have 10 minute shower usage per day at 50 degrees F rise

$16.20 per MMbtu Nat. Gas
$3.80 per kGal

LOCATION	EXIST. GPM	PROP. GPM	MIN/DAY	DAYS/YR	OCC RATE	# SHOWERS	EXIST.GPY	PROP. GPY	EXIST W/S COST	Exist. Water Heating MMbtu Annual	Exist. Water Heating Cost	PROP. W/S COST	PROP. Water Heating MMbtu Annual	PROP. Water Heating Cost	TOT SAV	TOT SAV (GPY)
Janitor Locker Room	3	2	10	260	1.00%	1	63,414	42,276	$241	19.04	$308	$161	12.69	$206	$182	21,138
Total							63,414	42,276	$241	19.04	$308	$161	12.69	$206	**$182**	21138

Hillside Intermediate Water Closets
Replace existing EPACT 1992 1.6 GPF Toilets with Pressure Assisted Kohler Model K-3393 Dual Flush Mode Toilet 0.9 GPF or 1.4 GPF
Assumes 2 Guests per room with 2.5 uses per day per guest, and that one of the flushes is 1 GPF and 3 are 1.4 GPF

$3.80 per kGal

LOCATION	EXIST. GPF	PROP. GPF	# TOILETS	OCCUP. RATE	USES PER DAY PER GUEST	DAYS/YR	Gallons per Year (Existing)	Annual Cost of Water (Existing)	Gallons per Year (Proposed)	Annual Cost of Water (Proposed)	TOT SAV	TOT SAV (GPY)
Rest Rooms	1.8	1.3	35	20.00%	2	180	3,687,768	$14,014	2,663,388	$10,121	$3,893	1,024,380
Nurse's Office	1.8	1.3	1	30.00%	2	210	184,388	$701	133,169	$506	$195	51,219
Main Office	1.8	1.3	1	30.00%	2	210	184,388	$701	133,169	$506	$195	51,219
Faculty Room	1.8	1.3	1	30.00%	2	210	184,388	$701	133,169	$506	$195	51,219
Janitor Locker Room	1.8	1.3	1	1.00%	3	260	11,415	$43	8,244	$31	$12	3,171
Total							4,252,348	16,160	$3,071,140	11,670	**$4,490**	1181207.7

Hillside Intermediate Urinals
Replace existing EPACT 1992 1 GPF Urinal with a 0.5 GPF American Standard Flowise Urinal Flush Valve Model 6063505.002

$3.80 per kGal

LOCATION	# of Urinals	Existing GPF	Proposed GPF	OCCUP. RATE	USES PER DAY PER PERSON	Days per Year	Gallons per Year (Existing)	Annual Cost of Water (Existing)	Gallons per Year (Proposed)	Annual Cost of Water (Proposed)	TOT SAV	TOT SAV (GPY)
Rest Rooms	21	1	0.5	33.00%	5	180	5,070,681	$19,269	2,535,341	$9,634	9635	2535341
Total							5,070,731	$19,269.00	2,535,366	$9,634.00	**9635**	2535366

Water Fixture Retrofit	Annual Water Use Savings, Gallons	Annual Water Savings, $	Annual Water Heating Reduction, MMbtu	Annual Water Heating Savings, $	Material Cost	Labor Cost	Total Cost	Simple Payback, years
Faucets	2,320,627	$20,104	697	$11,287	$113	$1,388	$1,500	0.05
Showerheads	21,138	$182	6	$126	$61	$38	$99	0.32
Water Closets	1,181,208	$4,490	0	$0	$39,601	$11,700	$51,301	11.43
Urinals	2,535,366	$9,635	0	$0	$11,125	$3,188	$14,313	1.49
TOTAL	6,058,338	$34,411	703	$11,413	$50,900	$16,313	$67,212	1.47

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	\$12 - \$170 per ton
Air-Cooled Chillers	\$8 - \$52 per ton

Gas Cooling

Gas Absorption Chillers	\$185 - \$400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

	\$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	\$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	\$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	\$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	\$300 - \$400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive